Government of Chhattisgarh

WATER RESOURCES DEPARTMENT

WATER YEAR BOOK 2013

Deputy Director
Hydrometeorology Dn. No.-4
Raipur

Superintending Engineer
W.R.&GWS Circle
Raipur

Chief Engineer
Mahanadi Godavari Basin
Raipur

CHIEF ENGINEER/PROJECT CO-ORDINATOR HP-II
MAHANADI GODAWARI BASIN
WATER RESOURCES DEPARTMENT
GOVERNMENT OF CHHATTISGARH RAIPUR

FOREWORD

The increasing demand for water from all sections of society has put the supply system in a stressful situation. The selection of choices is reducing drastically, as so-called cheap water is not more reality. This necessitates the need for understanding the facts about water availability, its use by different groups and evolving optimized solution on equitable basis so that everybody is given his/her due share.

The information on rainfall, river discharges and meteorological parameters as well as on surface water quality plays vital role in deriving sustainable solution to the water problem.

This document of water yearbook is a sample of what kind of data available with the State Data Storage Center (SDSC) Raipur, Those who are interested in getting detailed data on a particular parameter in a particular area can obtain the data as per prescribed procedure. Dy. Director Hydrometeorology Division Raipur has prepared this water yearbook, which is the backbone of validation and hence play a great role in making available the factual data. I appreciate and would like to put on record the efforts taken by Mr. S. K. Awadhiya Superintending Engineer Water Resources & Ground Water Survey Circle Raipur and Mr. D. K. Sonkusale (Dy. Director Hydrometeorology Division No.-4 Raipur) and his team for bringing out this water year book.

Raipur
January 2014

(R. N. Divya)
Chief Engineer

SUPERINTENDING ENGINEER/NODAL OFFICER HP-II
WATER RESOURCES & GROUND WATER SURVEY CIRCLE
CHHATTISGARH RAIPUR

FOREWORD

The water yearbook comprises the information regarding water quality & Hydro meteorological field data collection through the network stations established under World Bank aided Hydrology Project, which is ready for dissemination at State Data Storage Center Raipur to the users. An accurate Hydrological Information System (HIS) is being disseminated to the users after complete validation, processing by exclusively trained Hydrologists of the processing as well as storage centers of the State.

An accurate HIS information is developed as a result of strict implementation of the standardized protocols for various HIS activities such as station set up, staffing plan, HIS job descriptions, field data collection, O&M of network stations.

The Hydrologists & Expert staffs are working with full enthusiasm & seal for timely data dissemination to the users. Mr. D. K. Sonkusale Deputy Director Hydrometeorology Dn. No.-4 Raipur is the key person behind this spectacular picture.

It is worthwhile to note here “Efforts taken by Mr. Akhilesh Verma Assistant Engineer WR & GWS Circle Raipur, Mr. R. K. Sharma SDO Hydrometeorology Sub Dn. No.-10 Raipur and his team, Mr. R. A. Abbasi Assistant Engineer, Mr. Jayant Dass Sub Engineer of Hydrometeorology Dn. No.-4 Raipur, which resulted into preparation of excellent water yearbook of Hydrology Project for the year 2013.

Raipur
January 2014

(S. K. Awadhiya)
Nodal Officer HP-II

Preface

With the development of water resources for multipurpose and consumptive use of human society, knowledge of hydrometeorology has become indispensable for computing any kind of hydraulic data, An evaluation of meteorological parameters, measurements of precipitation and run off and inter relation of different climatologically, geographical and topographical characteristics resulting into water yields and floods is a vital and yet complex phenomenon.

With the advancement of technology and the society water is fast becoming an essential commodity to meet the varying uses of consumptive and non consumptive uses of water in industries, irrigation water-power, navigation etc. It is necessary to measure rainfall and runoff daily at all the key points in each major river valley. Furthermore the data thus collected has to be analyzing to determine water availability at various times in the river. This kind of analysis enables to determine the amount of water to be stored during monsoon period for regular uses during succeeding long dry period and also the amount of carryover required from a wet year to meet deficiencies during any dry year.

An accurate HIS information is developed as a result of strict implementation of the standardized protocols for various HIS activities such as station set up, staffing plan, HIS job descriptions, field data collection, O&M of network stations.

The most important use of Hydrology in Water Resources Engineering is application of observed, computed and projected data in design and estimation of structure and hydraulics of Reservoirs, Drinking and Industrial water use projects, Irrigation, Power, Flood Control, Navigation, Erosion control and pollution abatement.

In order to collect the data in a standard and systematic manner Hydrological net work was formulated under C.G. Major Projects component founded from World Bank Assistance (G-1177-IN) and a post of Director Hydrometeorology was created with Dy. Directors with Head quarters at Raipur; Several G.D. Sites have been commissioned at various stations in the state of Chhattisgarh.

Regular training were organized by NIH & WRD CG time to time for good use of software and rainfall estimation & flood control data validation in HYMOS system.

The water yearbook comprises the information regarding Hydro meteorological field data collection through the network stations established under World Bank aided Hydrology Project, which is ready for dissemination at state Data Storage Center Raipur to the users. An accurate Hydrological Information System (HIS) is being disseminated to the users after complete validation, processing by exclusively trained Hydrologists of the processing as well as storage centers of the state.

Following Hydro meteorological Network are under observation.

- 27 Rainfall station (SRG) of Hydrology Project & 138 Rainfall station (SRG) of WRD & other Department and 32 Gauge & Discharge site in Mahanadi Basin.
- 8 Rainfall station (SRG) of Hydrology Project & 12 rainfall station (SRG) of WRD & other Department and 10 Gauge & Discharge site in Godavari basin.
- 13 rainfall station (SRG) of WRD & other Department in Ganga Basin.
- 02 Rainfall station (SRG) of WRD & other Department and 01 Gauge & Discharge site in Bramhani Basin.
- 2 Full Climatic Stations at Sarangpal-Kanker & Sakri Bilaspur.
- 6 water Quality Laboratory.

The present book is the Second attempt to publish the Hydro-Meteorological observation carried out under ***World Bank Assistance*** **Hydrology Project** and also includes brief description of river basin in Chhattisgarh & Onset and withdrawal trend of South-West Monsoon in Chhattisgarh and its effect on Rainfall.

The central idea of the water year book is to review and communicates to the target readers, what kind of hydro-meteorological and hydrological scenario prevailed in the region during the year under consideration. Various types of data, viz. rainfall, evaporation, river water level and flows can be summarized with the help of graph and data tables. Graphical illustration showing the process during the year under consideration against the long term pattern could be very effective. Together with the graphical illustrations summarizing hydrological and hydro meteorological behavior, it is worthwhile to tabulate the daily data and the important monthly and yearly statistics along with it. Such tabulations enable easy referencing to any particular data at any point of time, without requiring interrogating the database for retrieving the same.

D. K. Sonkusale
Deputy Director

Abbreviation

ARG	Automatic Rainfall Station
CWC	Central Water Commission
CWPRS	Central Water & Power Research Station
CPCB	Central Pollution Control Board
CGWB	Central Ground Water Board
FCS	Full Climatic Station
GD	Gauge & Discharge Site
GW	Ground Water
HDUG	Hydrological Data User Group
HIS	Hydrological Information System
HP	Hydrology Project
IMD	Indian Meteorological Department
IST	Indian Standard Time
MoWR	Ministry of Water Resources
NIH	National Institute of Hydrology
NWA	National Water Academy
PDS	Purpose Driven Studies
SW	Surface Water
SRG	Standard Rainfall Station
WQ	Water Quality
WB	World Bank
WRD	Water Resources Department

WATER YEAR BOOK 2013

INDEX

1. Introduction

(Hydrological Information System)

Water plays crucial role in socio-economic development of the country. Safe drinking water is required for very large and growing population. Water has also become a major constraining factor for the growth of the agricultural and industrial sectors. In contrast, flooding frequently threaten populations and civil structures. Because of competing demands between users, the state requires proper planning, design and management of water resources and water use systems. The availability of an efficient and comprehensive Hydrological Information System (HIS), comprising a reliable database on all aspects of the hydrological cycle, is a prerequisite for such planning, design and management, to arrive at better decisions as well as to achieve efficiency.

The Hydrological Information System provides information about Hydrological and Hydro meteorological parameters that vary with respect to time and space. The information is regularly updated so that the decisions/policy makers, designers and researchers can use this information to make decisions for long term planning, design or can study the water resources system at large or its components.

Earlier, Water Resources Department (Govt. of MP/CG) was collecting the Hydrological Information System (HIS) Data and was recording manually in the form of registers for the use of Water Resources Department only. In 1995 National Hydrology Project was established in collaboration with MoWR (Ministry of Water Resources Government of India), CWC, CGWB, National Institute of Hydrology (Roorkee), CWPRS (Pune) CPCB, India Meteorological Department, with Nine States i.e. Maharashtra, Orissa, Tamilnadu, Madhya Pradesh, ***Chhattisgarh***, Andhra Pradesh, Gujarat, Karnataka & Kerala to develop sustainable HIS information with following characteristics.

- Demand driven i.e. output is as per the user's needs.
- Use of standardized equipments and adequate procedures for data.
- Collection and processing.
- Computerized, comprehensive and easily accessible database.
- Proper infrastructure to ensure sustainability.

Under this project since 1995, Hydrology Project Surface Water (SW), Water Resources Department, MP/CG State has started to collect the data on these lines and entering it in electronic mode to process it at Primary validation in Sub Division, Secondary validation in Division Office, then Hydrological validation in State Data Processing Center Raipur. Interagency partial validation is carried out with Central Water Commission and India Meteorological Department for accuracy and quality. Such finally validated data is then stored in State Data Storage Center, Raipur to make it available to *Hydrological Data Users* online/offline with nominal cost.

Before National Hydrology Project, State Government was preserving every year rainfall as well as Gauge-Discharge data in discrete manner in a shape of hard copy. Now **W*ater Year Book*** is made available in electronics format (on CD) as well as in hard copy. This water year book contains graphs showing isohyets map of rainfall, Time series graph of rainfall, Discharge, & Evaporation, Flood Hydrographs, etc. to get hydrometeorology of the region to the readers and intended users. The sample graphical representation of data given in this water year book gives just an idea of type of data available with this organization. Intended data user can obtain the requisite data from the data available with this organization after depositing requisite fees.

The water year book includes the information of the hydro-meteorological regime of the Chhattisgarh.

1. Brief description of river basin in Chhattisgarh
2. Onset and withdrawal trend of South-West Monsoon in Chhattisgarh and its effect on Rainfall
3. Rainfall events of year 2013 in the Chhattisgarh
4. Average District wise rainfall from year 1975 to 2012).
5. Basin wise daily maximum & annual minimum rainfall in Chhattisgarh state.
6. Year 2013 Rainfall Isohyets & Thiessen Polygon.
7. Water Quality result of year 2012
8. Sedimentation Studies in Kodar Reservoir

Some significant trends in rainfall and flow of rivers in the State have been included in this water year book to know about the trends of rainfall & flow pattern of rivers.

The idea of preparing and publishing water year book is to communicate the intended data users, the kind of meteorological and hydrological scenario prevailed in the basins of the state during the hydrological year under consideration. Hydro meteorological and river gauging network is also included in this water year book in the form of maps and list of the stations (Annexure A). Various types of data i.e. rainfall, river water levels, runoff (computed), maximum, minimum, dry bulb, wet bulb temperature, humidity, wind speed, wind direction, pan evaporation, pan water temperature and sunshine duration have been summarized with the help of graphs and data tables. The intended users can have these data from data bank as per the procedure laid down. Analysis of data is illustrated basin wise and basin is the unit for presentation of this data for Chhattisgarh state.

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2. Hydrological Review

2.10 Basin of Chhattisgarh

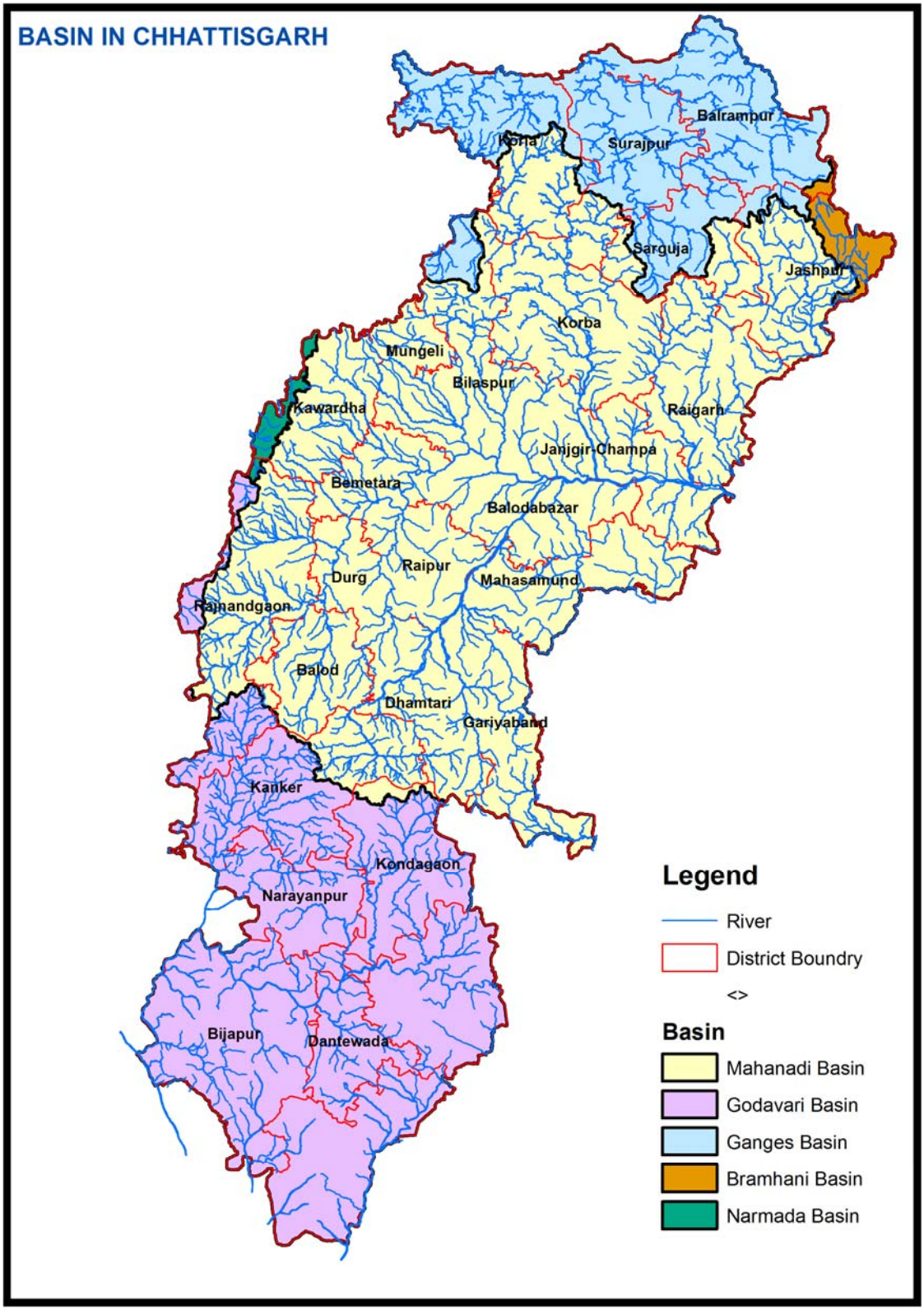


Figure 2.1 Basin Map of Chhattisgarh

Nature is very kind to Chhattisgarh in terms of rainfall as compared to several other states of the Union. Average rainfall in the state is around 1200mm. and about 90% of the total rainfall is confined in the Monsoon season i.e. 15th June to 15th October. The rainfall has erratic temporal and spatial distribution in the state. Due to this variation in the rainfall, the agriculture production of the state, which is mainly Paddy, is affected. In fact; every third year, there is always a threat of drought, which is due to uneven occurrence of rainfall rather than deficient rain. It is obvious that irrigation is the prime need of the state.

Mahanadi River is an Inter-state river system originating from Chhattisgarh and falling through Orissa to join the Bay of Bengal. Out of total drainage area of 1,35,097 sq. km. of the Mahanadi River about 53% lies in the State of Chhattisgarh and rest in the State of Orissa. About 44% of it is covered with forests.

The total geographical area of the Chhattisgarh State is 135,097 Sq. Kms. and state can be divided into five river basins shown in figure 2.1 & Table 2.1

S. No.	*Basin*	*Area in SqKm*	*% area of State*	*District covered*	
				Fully	*Partial*
1	Mahanadi Basin	75858.11	56.15	9	7
2	Godavari Basin	38694.36	28.64	5	5
3	Ganga Basin	18406.65	13.63	1	7
4	Bramhani Basin	1394.45	1.03	0	2
5	Narmada Basin	743.66	0.55	0	2
	Total	**135097.23**	**100**	**15**	**23**

Table 2.1:- * Basin wise Geographical Area of Chhattisgarh as per GIS

DISTRICTWISE AREA OF RIVER BASINS IN CHHATTISGARH *							
							Area in SqKm
S.No	District	Ganga Basin	Bramhani Basin	Mahanadi Basin	Narmada Basin	Godavari Basin	Total
1	Baster	0.00	0.00	366.16	0.00	5019.84	5386.00
2	Kondagaon	0.00	0.00	0.00	0.00	5063.26	5063.26
3	Narayanpur	0.00	0.00	0.00	0.00	3748.77	3748.77

4	Bilaspur	858.85	0.00	4671.73	0.00	0.00	5530.58
5	Mungeli	0.00	0.00	2774.67	0.00	0.00	2774.67
6	Bijapur	0.00	0.00	0.00	0.00	9378.71	9378.71
7	Dantewada	0.00	0.00	0.00	0.00	2885.05	2885.05
8	Sukma	0.00	0.00	0.00	0.00	5443.83	5443.83
9	Dhamatari	0.00	0.00	4068.72	0.00	9.20	4077.92
10	Durg	0.00	0.00	2260.14	0.00	0.00	2260.14
11	Balod	0.00	0.00	3395.07	0.00	9.32	3404.39
12	Bemetara	0.00	0.00	2862.25	0.00	0.00	2862.25
13	Janjgir Champa	0.00	0.00	3859.56	0.00	0.00	3859.56
14	Jashpur	504.59	1243.45	4106.52	0.00	0.00	5854.56
15	Kanker	0.00	0.00	2354.55	0.00	4845.89	7200.44
16	Kawardha	0.00	0.00	3525.13	663.27	0.00	4188.40
17	Korba	0.33	0.00	6604.16	0.00	0.00	6604.49
18	Koriya	4042.36	0.00	2562.87	0.00	0.00	6605.23
19	Mahasamund	0.00	0.00	4745.36	0.00	0.00	4745.36
20	Raigarh	0.73	0.00	7030.06	0.00	0.00	7030.79
21	Raipur	0.00	0.00	2903.92	0.00	0.00	2903.92
22	Balodabazar	0.00	0.00	4661.19	0.00	0.00	4661.19
23	Gariyaband	0.00	0.00	4837.21	0.00	0.00	4837.21
24	Rajnandgaon	0.00	0.00	5683.81	80.39	2290.49	8054.69
25	Sarguja	1296.45	151.00	2585.03	0.00	0.00	4032.48
26	Surajpur	4447.00	0.00	1004.48	0.00	0.00	5451.48
27	Balrampur	6251.86	0.00	0.00	0.00	0.00	6251.86
Total		**18406.65**	**1394.45**	**75858.11**	**743.66**	**38694.36**	**135097.23**
Percentage		**13.63**	**1.03**	**56.15**	**0.55**	**28.64**	**100.00**

2.20 Brief Description of River Basin

2.21 Mahanadi Basin:

River Mahanadi Originates from Sihawa Mountains about 100 Km, South-East of Dhamtari towns in District Dhamtari region in the state of Chhattisgarh at an elevation of about 442.00m above mean sea level near village Nagri, River Mahanadi flows in North-west direction for the initial length of about 42.00 kms and after passing 375 Km through the Chhattisgarh State, it flows in Orissa State and after travelling total 851 Km finally it fall in the Bay of Bengal near Katak. The catchment area of this basin in Chhattisgarh is 75858.45 SqKm, thus the contribution is 56.15 % of the Chhattisgarh State.

The Characteristics of main tributaries are as under :-

1. Seonath:

The river originates near village Markaskasa of Maharashtra State near Chhattisgarh Border. It flows initially from West to East the North-east, North and finally again South-east, and joins river Mahanadi near Seorinarayan a town in District Bilaspur. The catchment area of this sub-basin is 30,800 SqKm. thus its contribution is to the tune of about 40.60% i.e. maximum for the Mahanadi Basin. It joins Mahanadi River after running a length of about 383 kms. Its main tributaries are Tandula, Kharun, Amner, Surhi, Hamp, Arpa and Lilagar etc.

2. Jonk:

This river originates from State Orissa, near village Amamara of District Mahasamund Chhattisgarh. More or less it travels South to North and joins river Mahanadi near village Kharidih of the Mahasamund District. It's catchment area is 2446.1 SqKm, thus the contribution is only 3.20% which is minimum of the all of the major tributaries of the Mahanadi river. It travels about 196 kms. from it's origin to the confluence where it joins river Mahanadi near Seorinarayan.

3. Hasdeo:

This river originates near village Biharpur District Koriya of Chhattisgarh. It travels originally south-west then south east and later on it joins to river Mahanadi near village Bamnidih of Janjgir-Champa District of Chhattisgarh. Total length of the river is about 333 Km. and its main tributary is river Gej. The total catchment area of this river is 10,535.96 SqKm, thus the contribution is 13.9 % to the Mahanadi basin with-in Chhattisgarh State.

4. Mand:

It originates from village Bargidih of District Sarguja of Chhattisgarh state. It runs about 164 Km from its origin to confluence point, where river Mahanadi near village Aapos-Padigaon of District Raigarh/Janjgir-Champa. Initially it travels north-south then east-west and later on again north-south and south-east. The total contributes area is 5,576.78 SqKm thus it contributes only 7.35% towards Mahanadi basin with in Chhattisgarh State.

5. IB & Kelo:

The river IB originate from village Pendrap at of District Jashpur initially it travels south-east and flows on north-south before it joins river Mahanadi near town Belpahad of Orissa state. The total catchment area including Kelo etc. comes out to be 6225.77 SqKm i.e. 8.20% of the total catchment area of the Mahanadi Basin.

2.22 Godavari Basin:

Godavari originates from the Sahyadris near Trimbakeswar, about 80 km from the shore of Arabian Sea, at an elevation of 1,067 m in the Nasik district of Maharashtra. After flowing for about 1,465 km in a general south-easterly direction through Maharashtra and Andhra Pradesh, Godavari falls into the Bay of Bengal north of Rajahmundry. The basin lies between latitudes 16^0 16' 0" N and 23^0 43` N longitudes 73^0 26' E and 83^0 07' E. The basin extends over an area of 312,813 Sq km, which is nearly 10% of the total geographical area of the country. Out of the total basin area of 312,813 Sq km, the major parts of the basin fall in Maharashtra state. Further, about 38694.36 Sq km which is only 12.36% of the basin area falls in the Chhattisgarh state. The contribution is 28.64 % of the Chhattisgarh State.

2.23 Ganga Basin:

The catchment area of the Ganga lies between east longitudes 73°30' to 89° 0' and north latitudes 22° 30' to 31° 30' which falls in four countries, namely India, Nepal, Tibet (China), and Bangladesh with major part in India.

The Ganga basin extends over an area of 1,086,000 Sq km. The drainage area lying in India is 862,769 Sq km which is nearly 26.2% of the total geographical area of the country. Out of the total basin area about 18,406.65 Sq km which is only 1.70 % of the basin area falls in the Chhattisgarh State under tributary Son, thus the contribution is 13.62% of the Chhattisgarh State.

2.24 Bramhani Basin:

The Bramhani Basin lies between latitude 20° 28' to 23° 35' N and longitude 83° 52' to 87° 30' E in the districts of Raigarh and Sarguja in Chhattisgarh, Ranchi and Singhbhumi in Jharkhand and Sundergarh, Deogarh, Sambalpur, Angul, Dhenkanal, Keonjhar, Jajpur and Kendrapara in Orissa. Brahmani basin is situated between Mahanadi Basin (on the right) and Baitarani Basin (on the left). Chhotanagpur Plateau in the East and South bound the basin, in the north a ridge separates it from Mahanadi basin, and to the east of the basin lie the Bay of Bengal and the Baitarani basin. Out of the total basin area of 39,269 Sqkm, the major parts of the basin falls in Orissa state. Further, about 1,394.45 Sqkm which is only 3.55% of the basin area falls in the Chhattisgarh state. The contribution is 1.03 % of the Chhattisgarh State.

2.25 Narmada Basin:

The Narmada River, originates from the Amarkantak Plateau of Maikal range in the Shahdol district of Madhya Pradesh at an elevation of 1057 meters above mean sea level at a latitude 22° 40' north and a longitude of 81° 45' east. The river travels a distance of 1,312 km before it falls into Gulf of Cambay (Khambat) in the Arabian Sea near Bharuch in Gujarat.

The Narmada basin extends over an area of 98,796 Sq km and Out of the total basin area about 743.66 Sq km which is only 0.75% of the basin are falls in the Chhattisgarh state. The contribution is 0.55 % of the Chhattisgarh State.

2.3 Hydro-Meteorological Network in Chhattisgarh

Hydro-meteorological network comprises of 266 Stations, including 21 ARG(HP), 35 SRG(HP), 43 GD, 02 FCS and 165 SRG(Non HP)

S.No.	Name of Basin	ARG (HP Station)	SRG (HP Station)	GD	FCS	SRG Non HP Station
1	Mahanadi Basin	18	27	32	02	138
2	Godavari Basin	03	08	10	0	12
3	Bramhani Basin	00	00	01	00	02
4	Ganga Basin	00	00	00	0	13
Total		**21**	**35**	**43**	**02**	**165**

Table 2.2:- Basin wise Hydro-meteorological Network

ARG :- Automatic Rain Gauge **SRG :-** Standard Rain Gauge
GD :- Gauge and Discharge Site **FCS :-** Full Climatic Station
SRG Non HP Station :- Other than Hydrology Project which include WRD, Revenue Department.

3. Meteorological Observation Sites

In the monsoon season of India, most of the weather systems that develop in the Indian Ocean and Bay of Bengal passes through Chhattisgarh and gives good amount of monsoon rainfall to this area. Chhattisgarh state is major producer of rice and known as "***Rice bowl of in India***". The production of crop in Chhattisgarh is very much dependent on monsoon rainfall even today as irrigation facilities are limited to a small part of the region nearly 35%. Thus, the rainfall has a great influence on economy of the State.

On a regional basis, the transformation of natural land cover by soil cultivation, industrialization and pollution may measurably influence the climate. Thus, man is responsible for altering the climate. India is a big country with geographical variation, therefore climatic variation is also too much. The regional rainfall does not necessarily match with all India rainfall. Farmers are more interested in the weather of their region. Therefore, the regional study is more important to understand the rainfall pattern of state.

3.1 Onset and withdrawal trend of South-West Monsoon in Chhattisgarh and its effect on Rainfall (Source:- T. Sai Giridhar BIT Raipur)

Monsoon is traditionally defined as a seasonal reversing wind accompanied by corresponding changes in precipitation (rain), but is now used to describe seasonal changes in atmospheric circulation and precipitation associated with the asymmetric heating of land and sea. The **South-West summer monsoon** occurs from June to September in India. The Thar Desert and adjoining areas of the Northern and Central Indian subcontinent heats up considerably during the hot summers. This causes a low pressure area over the northern and central Indian subcontinent. To fill this void, the moisture-laden winds from the Indian Ocean rush in to the subcontinent. These winds, rich in moisture, are drawn towards the Himalayas. The Himalayas act like a high wall, blocking the winds from passing into Central Asia, and forcing them to rise. As the clouds rise their temperature drops and precipitation occurs. Some areas of the subcontinent receive more than 10,000 mm of rain annually.

We will investigate the onset and withdrawal trend of monsoon in Chhattisgarh state during recent period. The district wise map of Chhattisgarh helps

us to know about the various Districts of Chhattisgarh and related stations will be undertaken into study for the rainfall pattern.

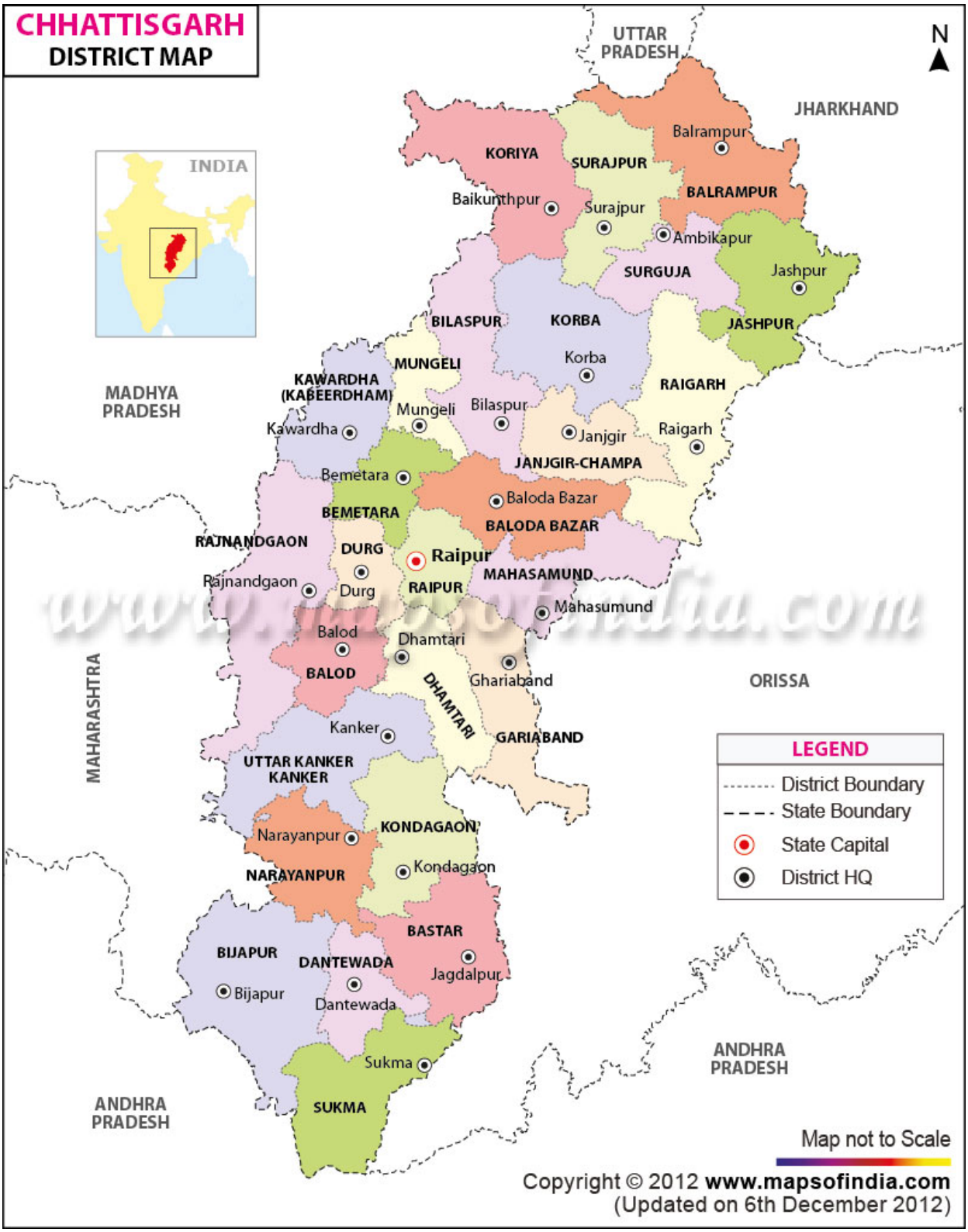


Fig 3.1.1Districtwise map of Chhattisgarh state

The normal onset date of southwest monsoon in India is shown below in the Fig.3.1.2

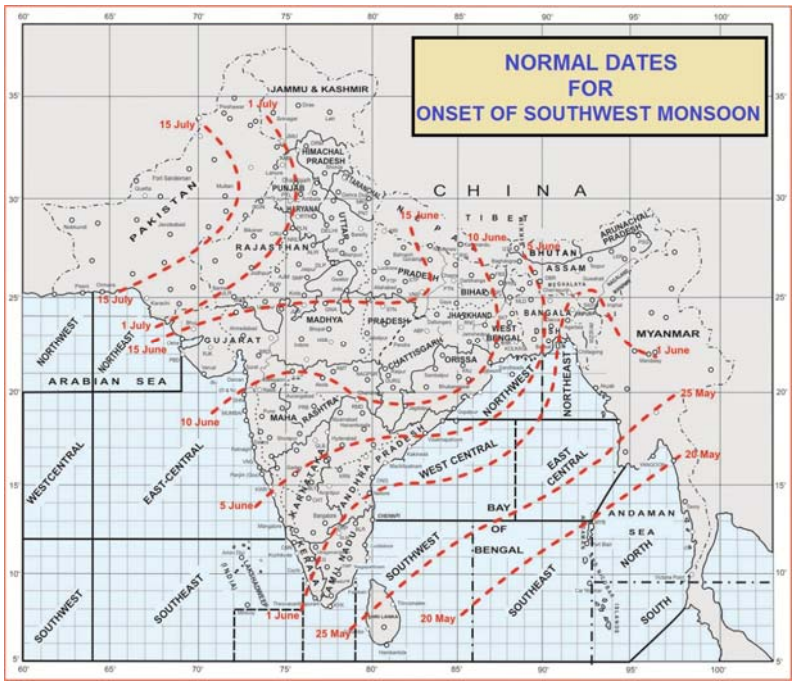


Fig – 3.1.2

Similarly, the normal withdrawal dates of southwest monsoon is shown in Fig. 3.1.3 :

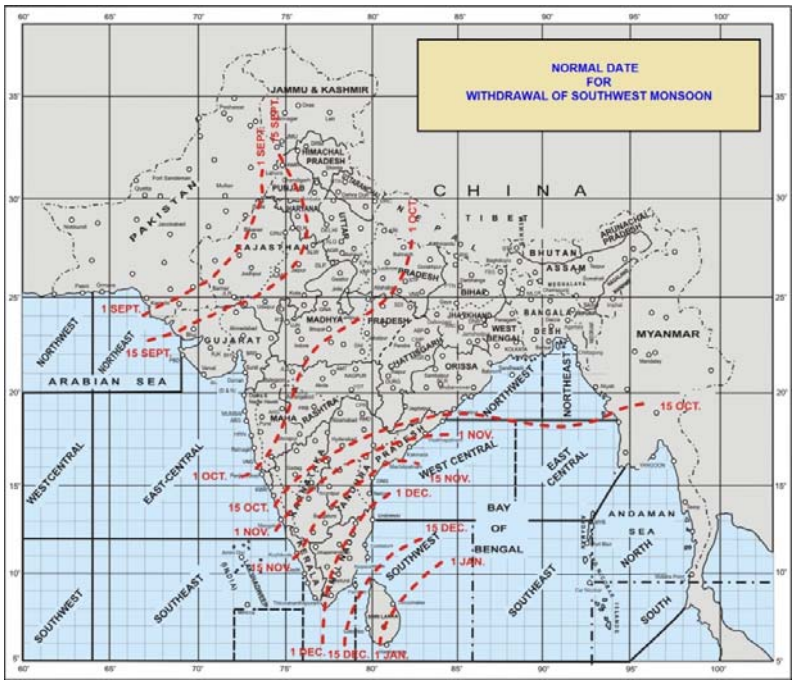


Fig – 3.1.3

Methodology adopted while analyzing was the study of onset trend of 52 years data from 1961 to 2012 taken for three stations i.e. Jagdalpur, Raipur and Ambikapur which covers South, Central and North part of the State. While withdrawal trend of 38 years data from 1975 to 2012 for Chhattisgarh as a whole is taken as it mostly simultaneous. The data was plotted in the graphical format and the observations can be seen in the Fig.3.1.4, Fig.3.5 and Fig.3.1.6.

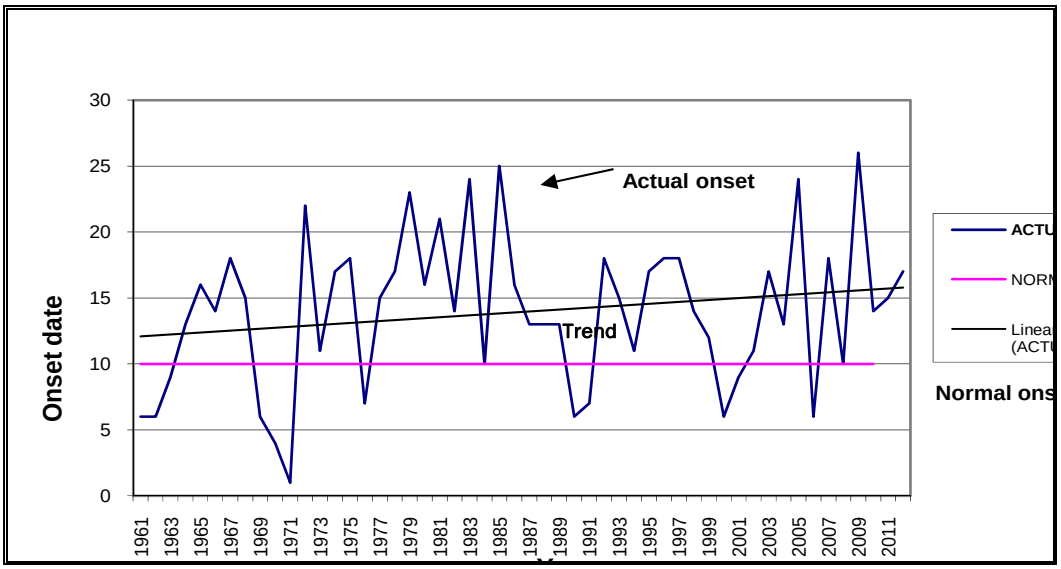


Fig – 3.1.4 Onset of monsoon at Jagdalpur

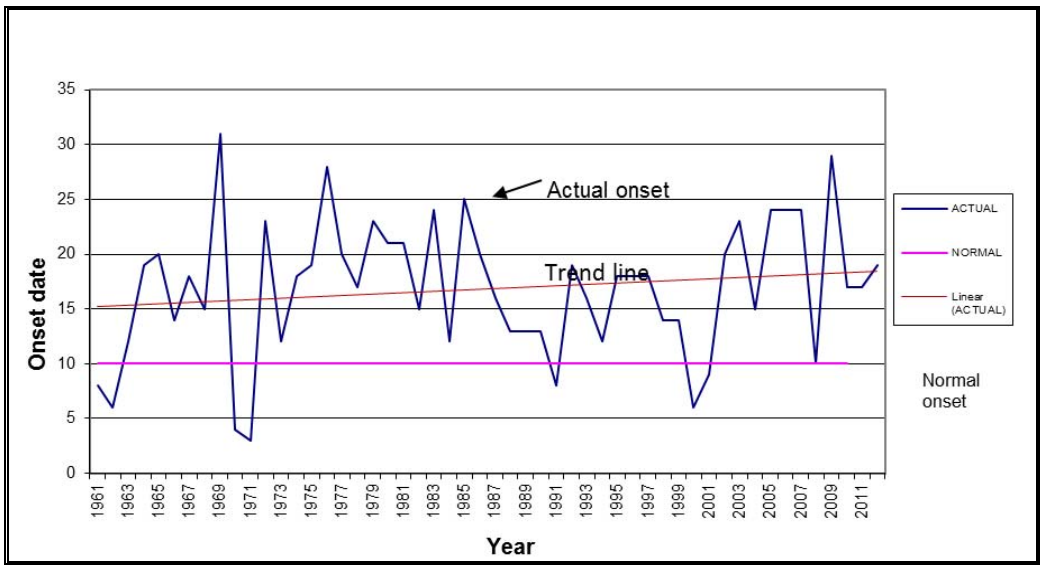


Fig – 3.1.5 Onset of monsoon at Raipur

Similarly the onset data for the last station (Ambikapur) is plotted into graph shown in Fig 3.1.6.

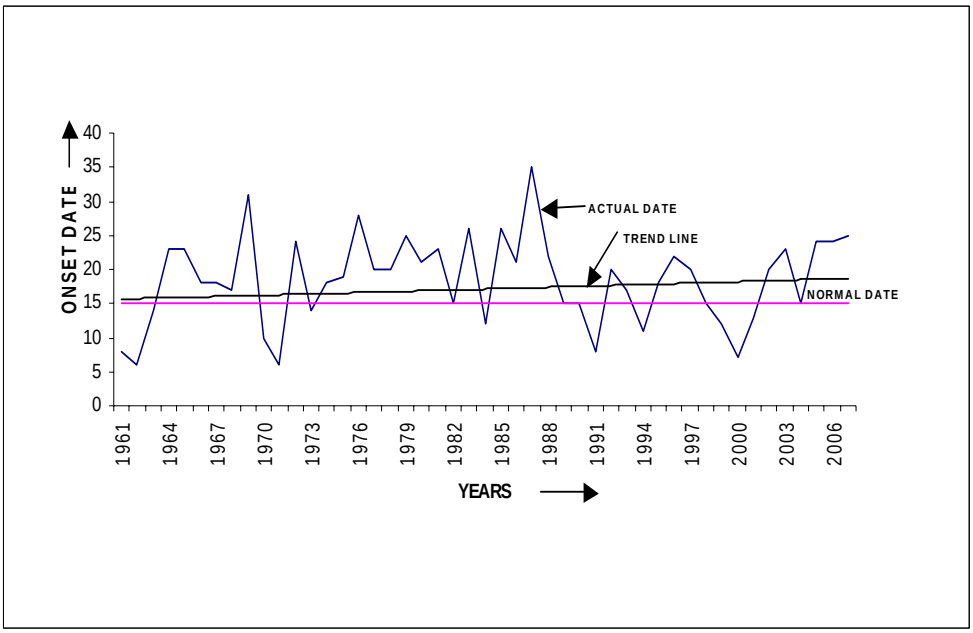


Fig – 3.1.6 Onset of monsoon at Ambikapur

On the basis of the study, frequency analysis has been done. The frequency of onset is shown in Fig. 3.1.7 and withdrawal is shown in Fig. 3.1.8.

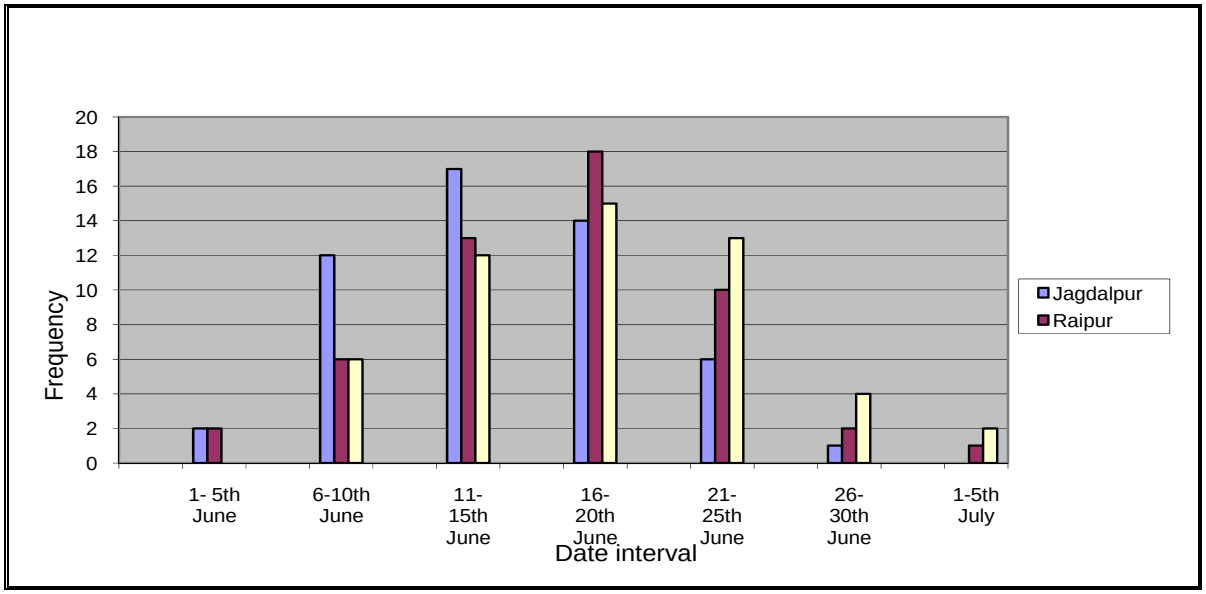


Fig – 3.1.7 Frequency of onset of monsoon

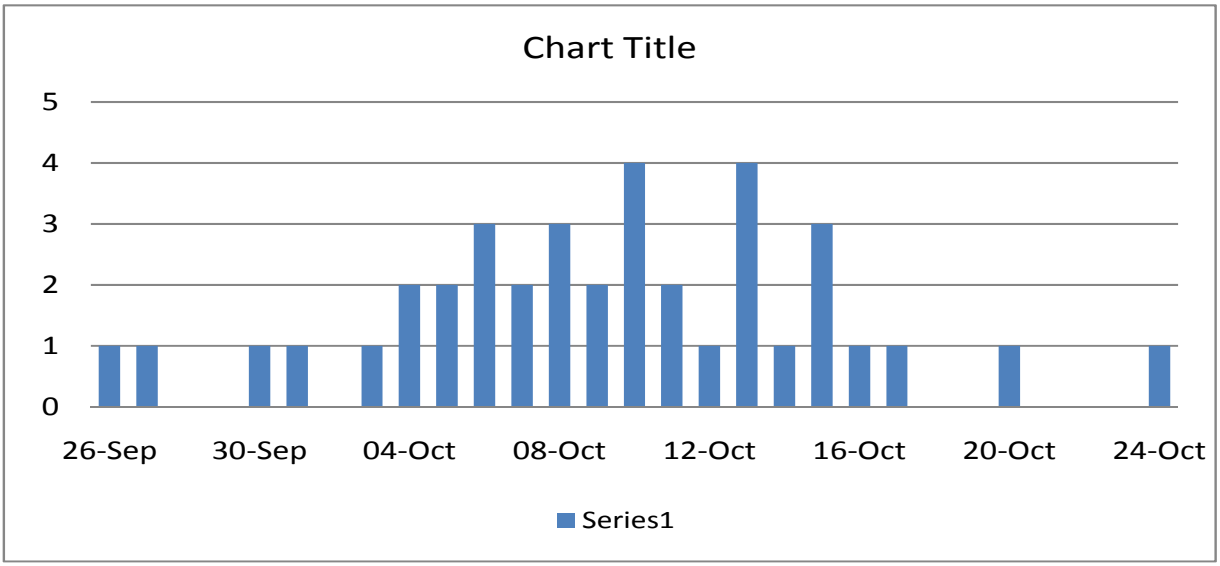


Fig – 3.1.8 Frequency of withdrawal of monsoon

An interesting fact that can be seen from the above graphs is that we have drawn onset trend of monsoon for three different stations covering whole Chhattisgarh but the withdrawal trend has been plotted for whole Chhattisgarh at once. The reason behind the fact is that monsoon enters the state slowly and makes it way slowly to the north, while leaving it quits at once from the state. So the withdrawal trend has been plotted as a whole. *The conclusion drawn from the above study is that the onset of monsoon at different stations in the state is mostly delayed in recent years. The new dates may be 14th of June in place of 10th at Jagdalpur, 17th June in place of 10th at Raipur, 20th June in place of 15th at Ambikapur. The mean date for withdrawal of monsoon is 10th of October.* ***So there is 3 to 7 days delay in onset of monsoon and no much change in withdrawal of date over the state***. ***Thus there is decrease in length of monsoon in Chhattisgarh.***

As per our study we may finally conclude that the average period of monsoon is 116.87 days which is less than normal period of 123 days which may be one of the reasons for decrease in monsoon rainfall over Chhattisgarh during recent years.

3.2 Rainfall Year 2013

3.2.1 Thiessen Polygon Method

Computation of areal average using Thiessen polygon method is accomplished by first getting the Thiessen polygon layer (defining the boundary of Thiessen polygon for each contributing point rainfall station). The station weights are automatically worked out on the basis of areas of these polygons with respect to the total area of the catchment. The layout of the Thiessen polygons as worked out by the system is graphically shown in Fig. 3.1 and the corresponding station weights are as given in Table 3.2. On the basis of these Thiessen polygon weights the areal average of the Chhattisgarh is computed and this is shown in Fig. 3.2 for the year 2013.

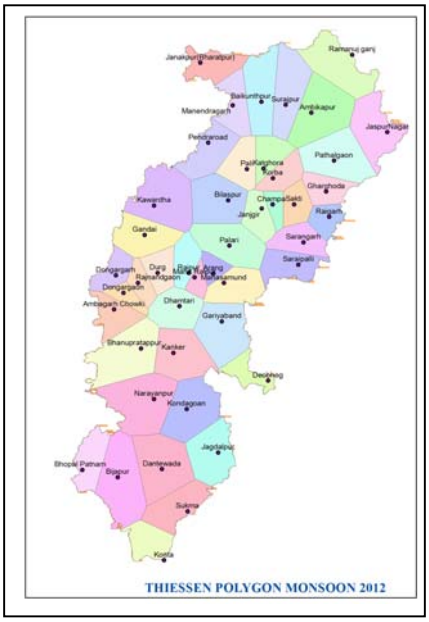


Table 3.2: Calculation of Yearly Average (Jan. to Dec. 2013) Rainfall of Chhattisgarh

S. No.	Name of Rainfall (SRG) Station	District Name	Area in SqKm	Weightage of Rainfall Station in CG	Total Rainfall of Station (Year 2013)	Representative Rainfall of Station in CG
1	Bijapur	Bijapur	5458.717	0.04041	3204.80	129.49
2	Bhopalpatnam	Bijapur	2582.069	0.01911	2332.40	44.58
3	Sukma	Sukma	3169.964	0.02346	1906.80	44.74
4	Arang	Raipur	990.24	0.00733	1898.70	13.92
5	Pendra road	Bilaspur	3195.051	0.02365	1775.90	42.00
6	Ambagarh Chowki	Rajnandgaon	2279.906	0.01688	1706.90	28.81
7	Mana-Raipur	Raipur	819.958	0.00607	1706.00	10.35
8	Bhanupratappur	Kanker	5261.847	0.03895	1701.20	66.26
9	Rajnandgaon	Rajnandgaon	1329.741	0.00984	1594.80	15.70

10	Narayanpur	Narayanpur	5592.225	0.04139	1576.80	65.27
11	Mahasamund	Mahasmund	2866.438	0.02122	1561.60	33.13
12	Raipur	Raipur	1887.42	0.01397	1547.70	21.62
13	Kanker	Kanker	4029.853	0.02983	1542.90	46.02
14	Dongarharh	Rajnandgaon	1765.397	0.01307	1541.10	20.14
15	Jagdalpur	Bastar	3815.34	0.02824	1538.30	43.44
16	Baikunthpur	Koriya	3941.818	0.02918	1520.20	44.36
17	Dhamtari	Dhamtari	2954.91	0.02187	1462.10	31.98
18	Saraipali	Mahasmund	2610.729	0.01932	1461.00	28.23
19	Janakpur	Koriya	2405.518	0.01781	1429.20	25.45
20	Konta	Dantewada	2269.636	0.01680	1387.90	23.32
21	Dantewada	Dantewada	5003.817	0.03704	1358.90	50.33
22	Deobhog	Gariyaband	1571.37	0.01163	1332.90	15.50
23	Kondagaon	Kondagaon	4451.183	0.03295	1330.20	43.83
24	Manendragarh	Koriya	2405.741	0.01781	1324.80	23.59
25	Gharghoda	Korba	1996.549	0.01478	1318.30	19.48
26	Janjgir	Janjgir-Champa	1963.382	0.01453	1304.30	18.96
27	Dongargaon	Rajnandgaon	1070.706	0.00793	1294.40	10.26
28	Durg	Durg	1847.747	0.01368	1253.80	17.15
29	Bilaspur	Bilaspur	3990.58	0.02954	1231.70	36.38
30	Korba	Korba	1836.658	0.01360	1219.60	16.58
31	Champa	Janjgir-Champa	917.532	0.00679	1214.40	8.25
32	Pali	Korba	2374.423	0.01758	1209.80	21.26
33	Palari	Balodabazar	4063.736	0.03008	1206.20	36.28
34	Raigarh	Raigarh	1494.365	0.01106	1195.90	13.23
35	Pathalgaon	Jashpur	4552.143	0.03370	1178.10	39.70
36	Katghora	Korba	1948.885	0.01443	1152.90	16.63

37	Sarangarh	Raigarh	2359.66	0.01747	1126.60	19.68
38	Gandai	Kabirdham	3361.754	0.02488	1108.00	27.57
39	Sakti	Janjgir-Champa	1737.447	0.01286	1102.30	14.18
40	Ambikapur	Sarguja	5015.267	0.03712	1097.50	40.74
41	Kawardha	Kabirdham	5165.673	0.03824	1074.00	41.07
42	Gariyaband	Gariyaband	4407.228	0.03262	1013.90	33.08
43	Jashpurnagar	Jashpur	4006.435	0.02966	828.10	24.56
44	Ramanujganj	Balrampur	4278.067	0.03167	721.00	22.83
45	Surajpur	Surajpur	4050.109	0.02998	549.30	16.47
Total			**135097**	**1.00**	**39179.00**	**1406.39**
Source:- IMD						

Average by Arithmetic = 39179.00/45 = 1451.07 mm

Average by Theissen Polygon = 1406.39 mm

3.3 Rainfall 2013 Isohyetal Map of Chhattisgarh

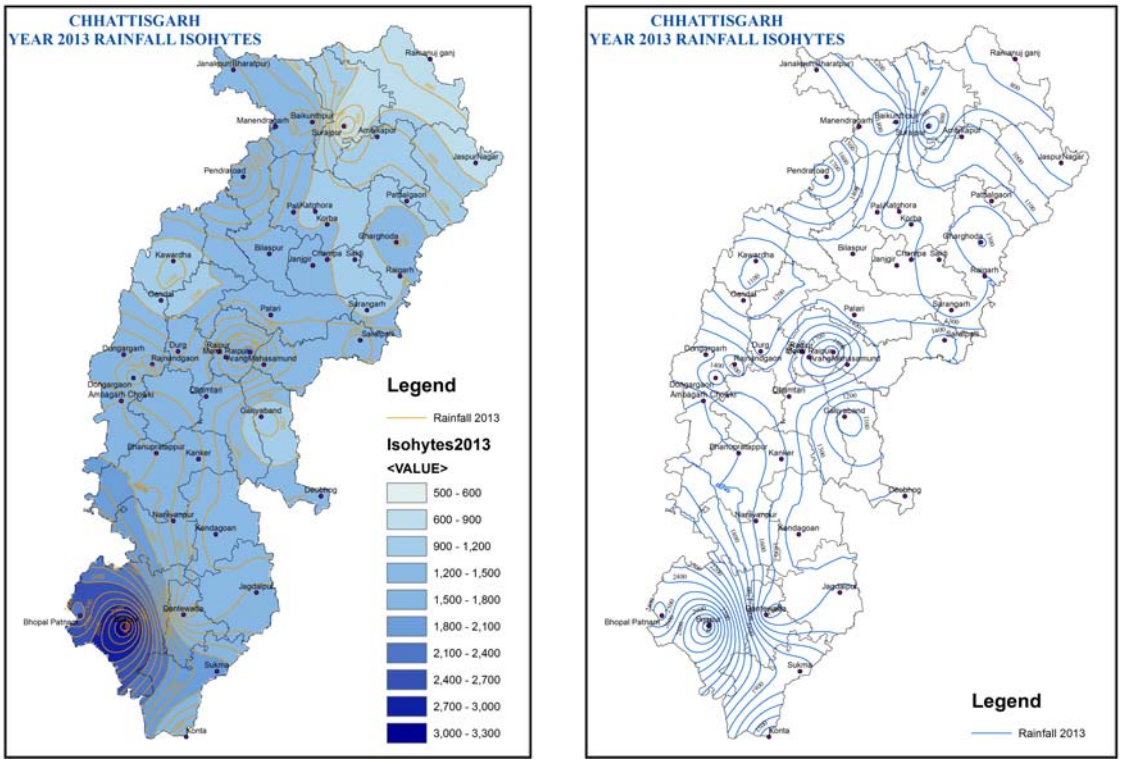


Figure 3.3.1 Rainfall 2013 Isohytes Map

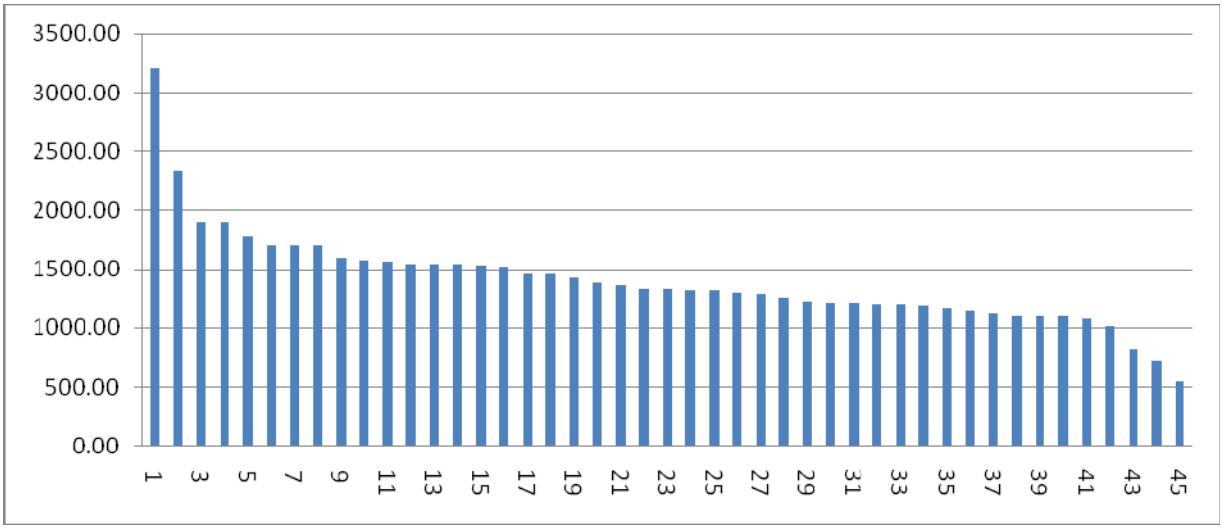


Figure 3.3.2 Bar Diagram Rainfall Year 2013 of 45 Station as per list.

After analyzing the rainfall 2013, it is observed that the ***minimum rainfall is 549.30mm at Surajpur and maximum 3204.80mm is at Bijapur***. By going through isohyets it has been observed that the nature of rainfall pattern varies minimum to maximum from north to south.

3.4 Maximum Rainfall in Basin

After analyzing the daily rainfall data basin wise, it is observed that the maximum daily rainfall is not same as that of the previous years. Also it is observed that the maximum daily rainfall is not occurring on same station. It varies with respect to the location and period. It is also observed that yearly maximum rainfall and maximum daily rainfall is not occurring on the same station. The comparison is shown in the table given below.

Table 3.3:- Maximum Annual & Maximum Daily Rainfall

S.No.	Name of Basin	Maximum Daily Rainfall in mm		Annual Maximum Rainfall In mm	
		Station	Rainfall	Station	Rainfall
1	Mahanadi Basin	Raigarh	470.00 (08/09/2011)	Jashpur	2472.00 (Yr 2003)
2	Godawari Basin	Konta	340.00 (03/08/2006)	Dantewada	2684.50 (Yr 2003)

3.4 District wise average Historical Rainfall for the period 1975- 2012

S. No.	District	Latitude	Longitude	Yearly Average Rainfall in mm
1	Jashpur	22°53'00"	84°08'00"	1521.90
2	Sarguja(Ambikapur)	23°10'00"	82°15'00"	1438.40
3	Kanker	20°15'00"	81°30'00"	1362.70
4	Bastar(Jagdalpur)	19°05'00"	82°02'00"	1309.20
5	Bijapur	18°47'00"	80°49'00"	1304.50
6	Korba	22°36'15"	82°36'00"	1273.70
7	Dantewada	18°53'00"	81°21'00"	1268.80
8	Narayanpur	19°43'00"	81°15'00"	1236.30
9	Koriya(Baikunthpur)	23°15'15"	82°33'00"	1225.50
10	Janjgir-Champa	21°59'00"	82°34'00"	1203.60
11	Kondagaon	19°36'00"	81°39'00"	1192.50
12	Gariyaband	20°38'00"	82°03'34"	1192.20
13	Dhamtari	20°42'00"	81°34'00"	1175.00
14	Balrampur	23°36'30"	83°37'10"	1172.60
15	Sukma	18°23'00"	81°40'00"	1170.10
16	Raigarh	21°53'00"	83°34'00"	1168.90
17	Bilaspur	20°01'00"	82°08'00"	1168.00
18	Surajpur	23°13'00"	82°52'00"	1141.90
19	Mungeli	22°04'00"	81°41'00"	1119.60
20	Mahasamund	21°06'00"	82°06'00"	1064.60
21	Balod	20°44'00"	81°50'00"	1023.20
22	Raipur	21°13'00"	81°40'00"	1001.70
23	Rajnandgaon	21°05'00"	81°02'00"	987.70
24	Bemetara	21°43'45"	82°09'50"	971.70

25	Balodabazar	21°39'25"	82°09'50"	941.00
26	Durg	20°40'00"	81°29'00"	929.90
27	Kawardha	22°13'00"	81°15'00"	801.90
Total Rainfall				**31367.10**
Average Rainfall				**1161.74**

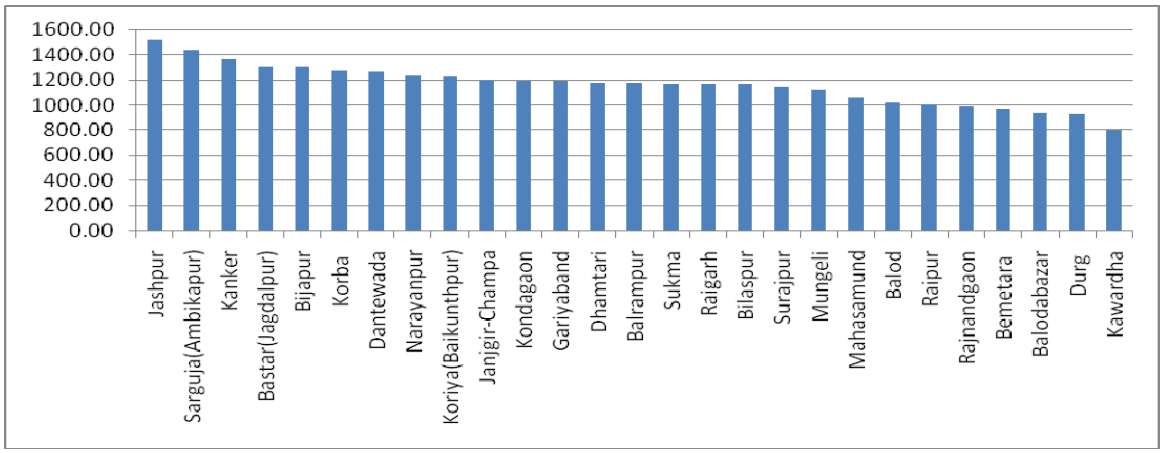


Figure 3.4.1 Bar Chart of average District Rainfall

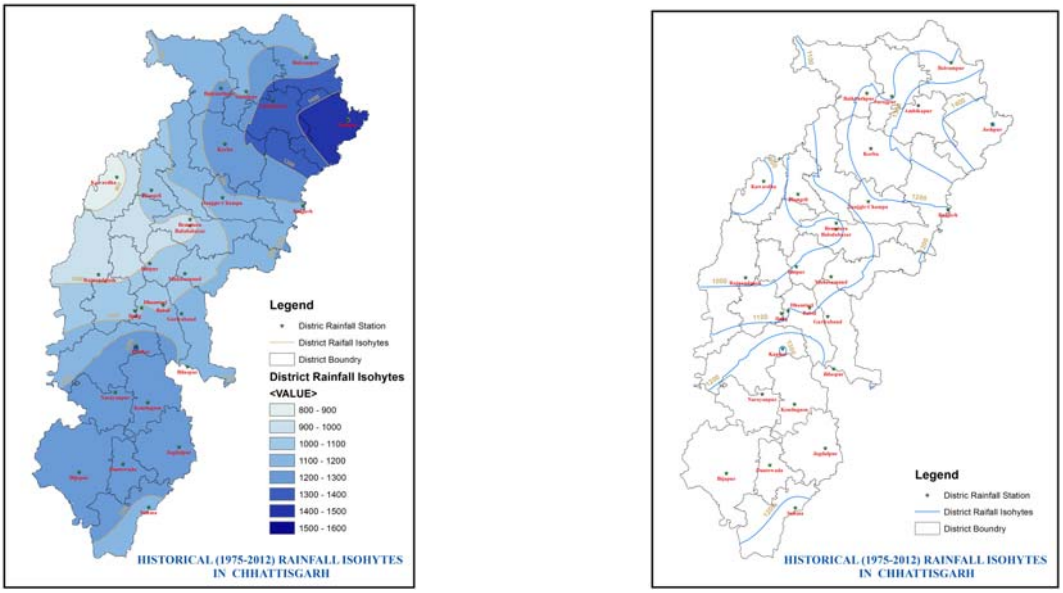


Figure 3.4.2 Historical Average Rainfall (1975-2012) Iysohytes

District wise Yearly average rainfall over Chhattisgarh is shown in previous table. ***That Maximum average rainfall occurred in 1521.90 mm in Jashpur district and minimum average 801.90mm rainfall occurred in Kabirdham (Kawardha) District.***

Chhattisgarh average rain fall is 1161.74 mm

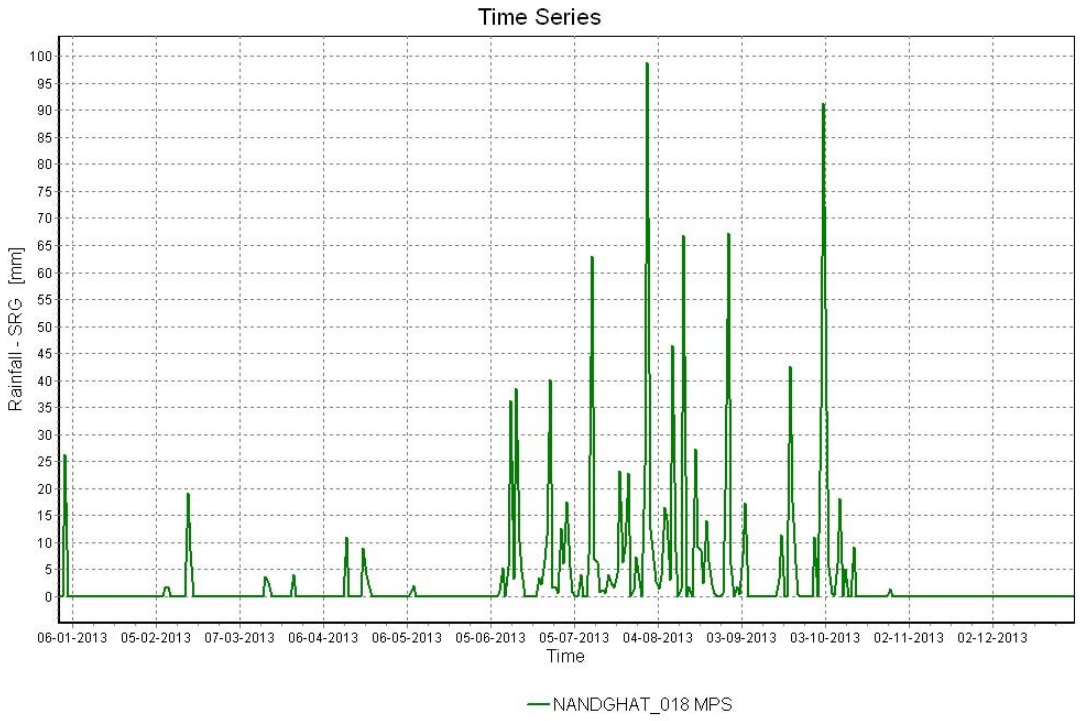


Figure 3.4.3 Daily Rainfall at Seonath Nandghat GD Site

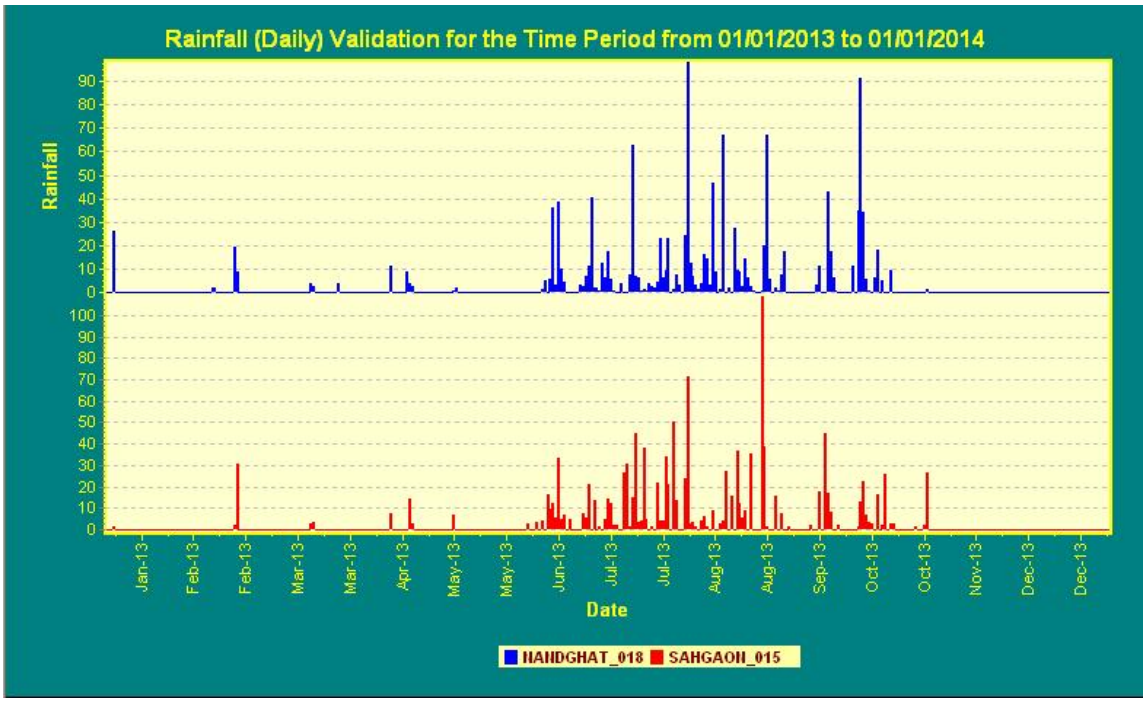


Figure 3.4.4 Rainfall Daily validations for Station Nandghat & Sahgaon in Seonath river the time period from 01/01/2013 to 31/12/2013

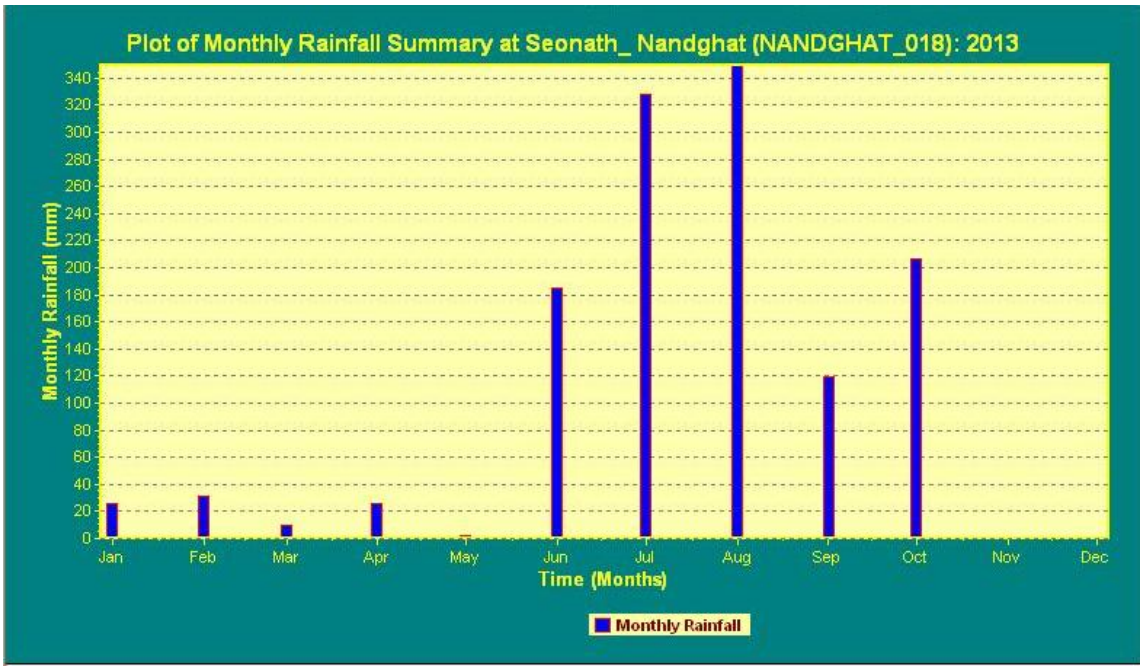


Figure 3.4.5 Monthly Rainfall at Seonath Nandghat GD Site

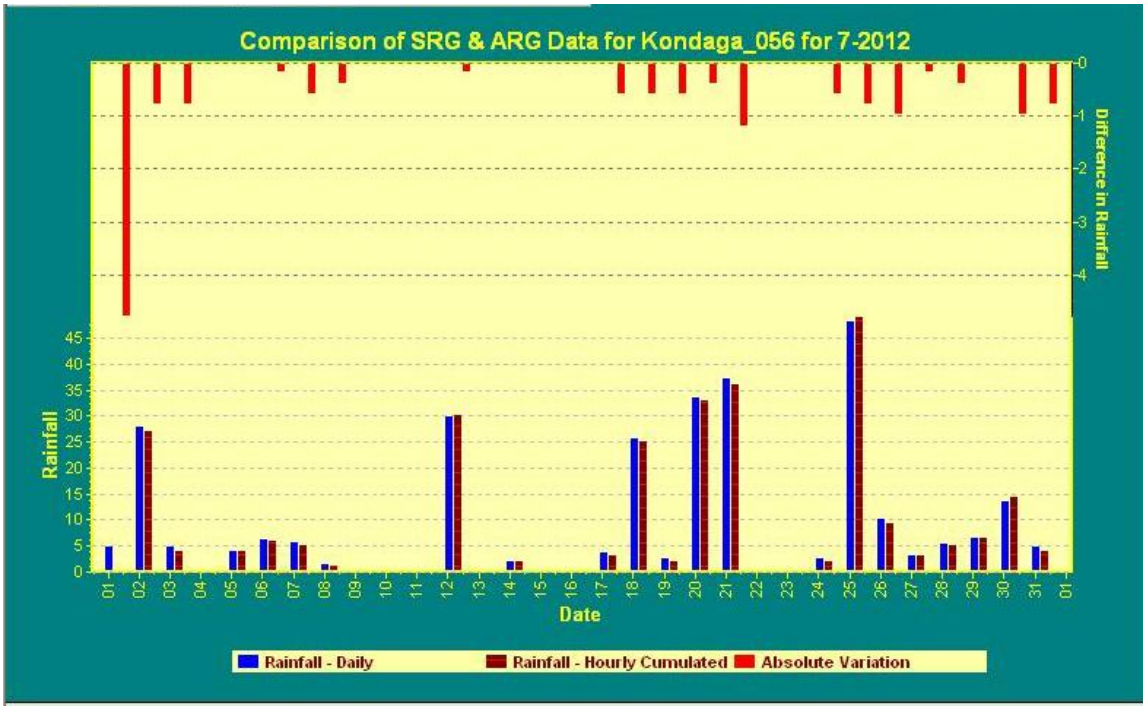
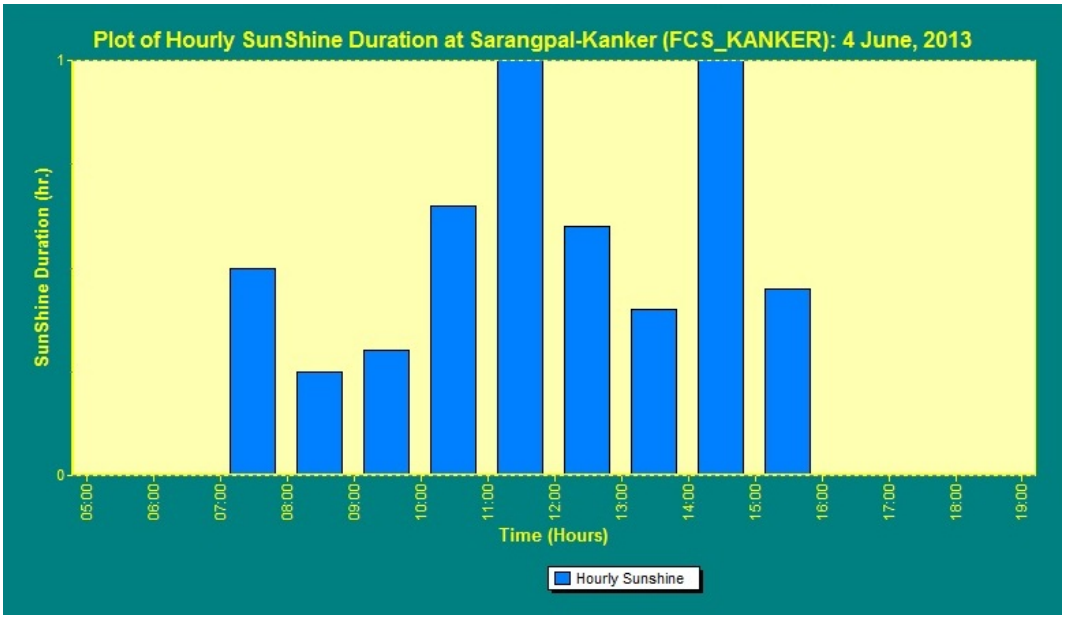


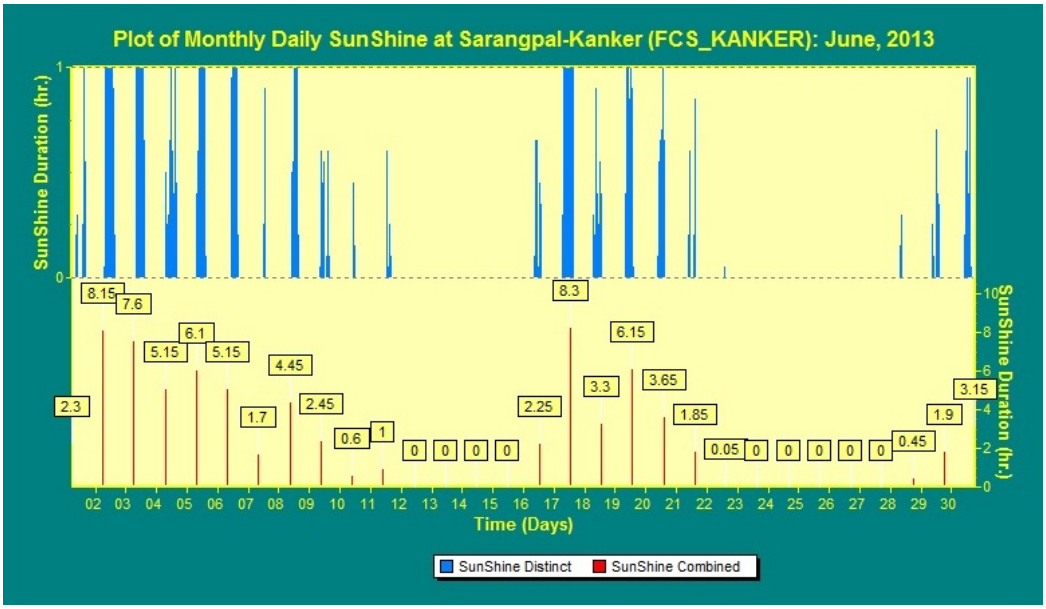
Figure 2.4.6 Comparison of Rainfall ARG With SRG at Kondagaon GD site

4. Climatic Data Observation

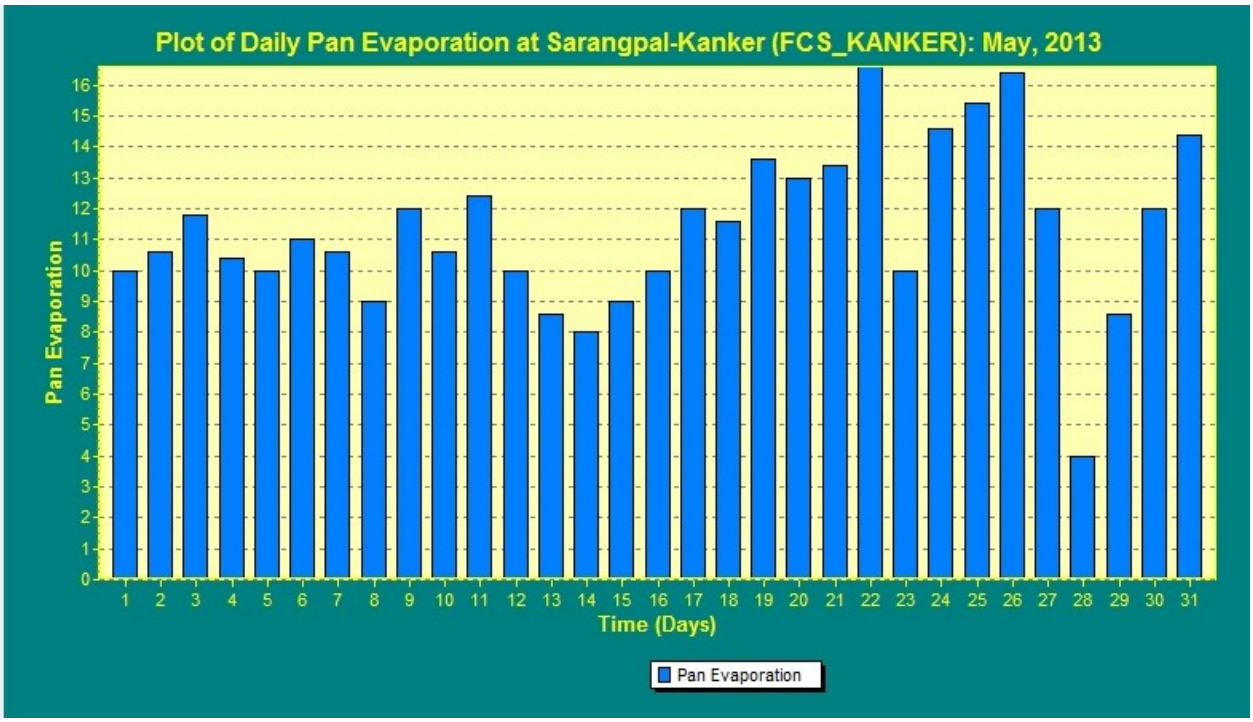
There are two full climatic station established in Mahanadi basin. One at Sarangpal Kanker district and other is Sakri Bilaspur. Observation has been taken from 2008 & 2003 respectively. Some climatic graphs are shown below:-



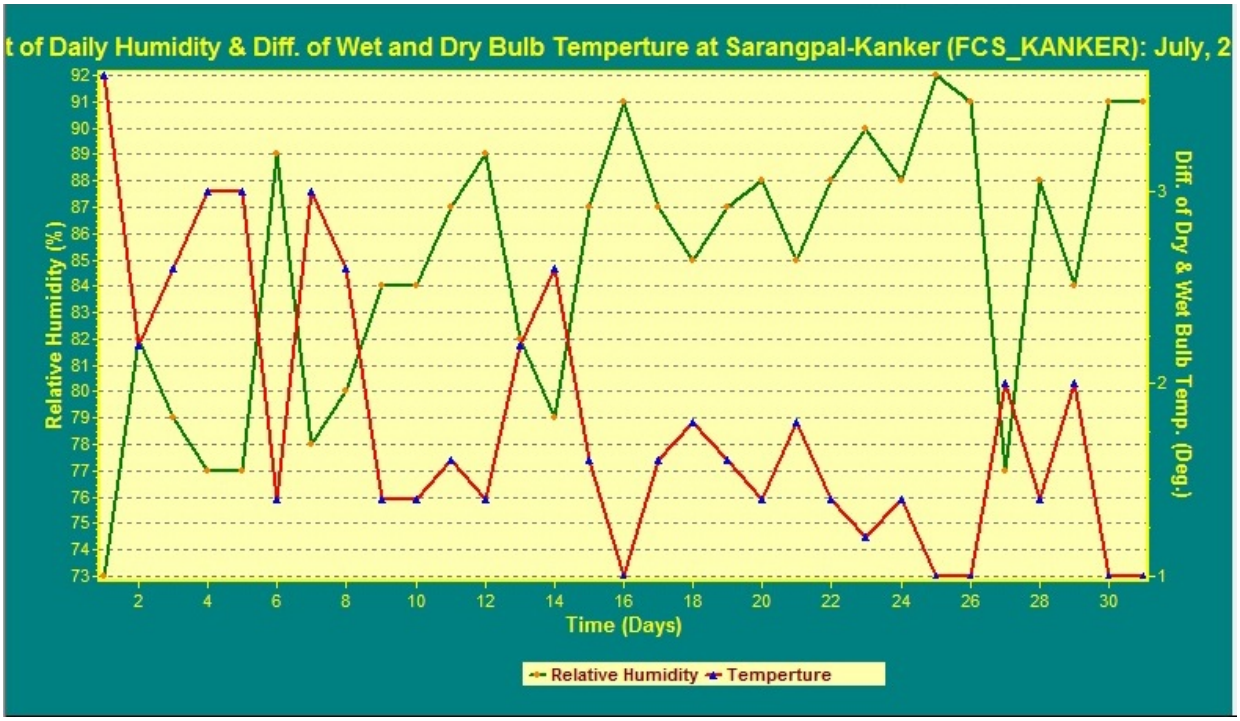
In this plot each hourly value represent the duration of Sunshine during the hourly intervals ending at each of clock hours. In Urban areas the amount of bright sunshine may be reduced by atmospheric pollution and In Coastal areas it may be reduced by sea mists.



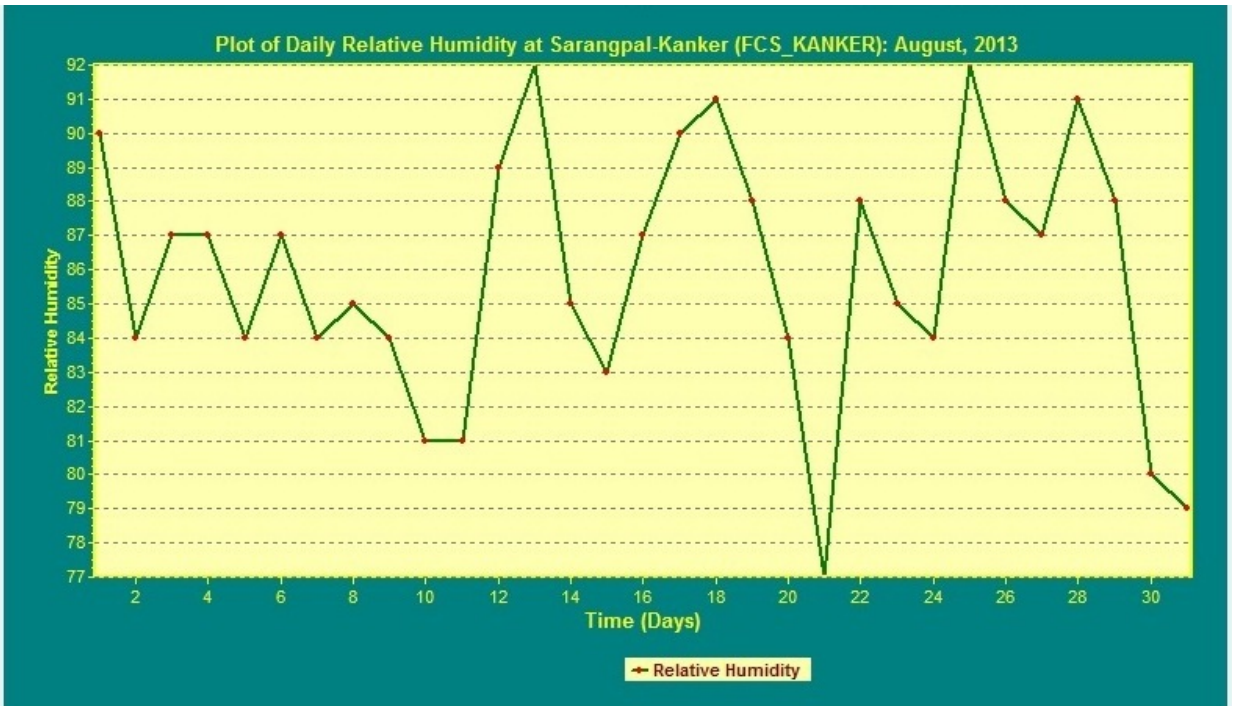
This plot shows daily variation of sunshine during a month and condensed hourly variation within each day of month.



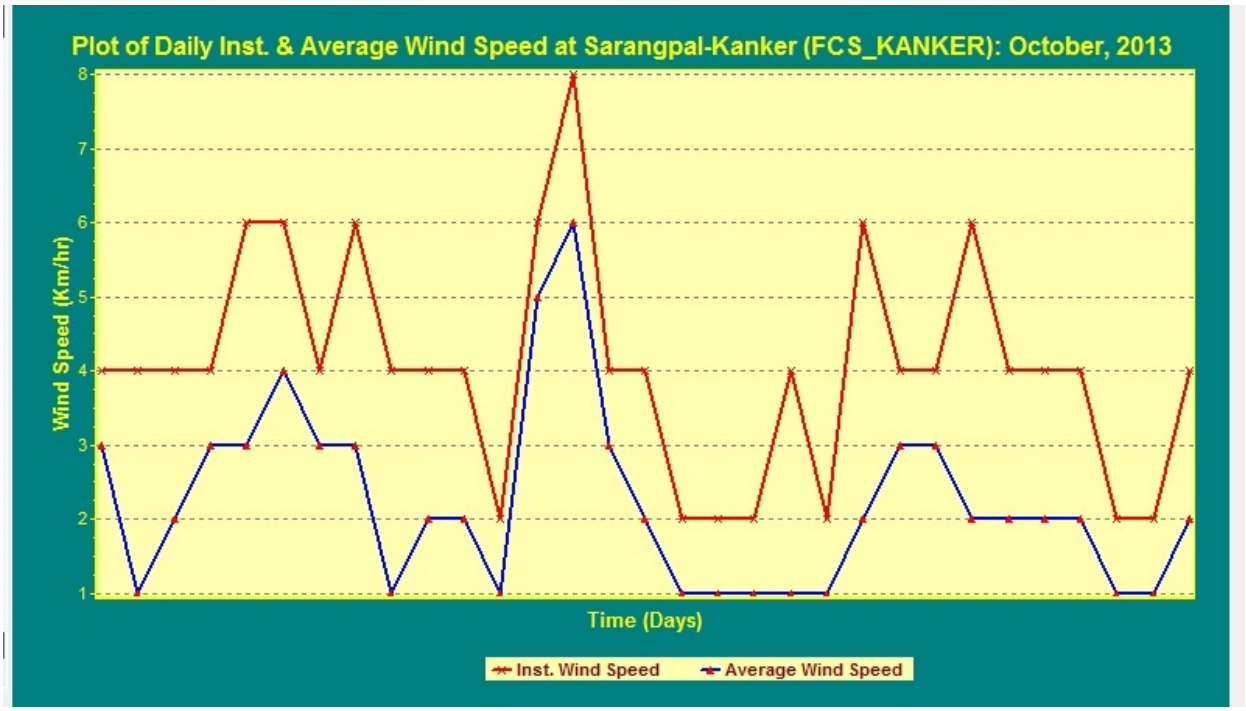
This Plot indicates the daily depth of Evaporation. Pan Evaporation provides an estimate of open water evaporation. Rate of Evaporation is a function of climatic variables.



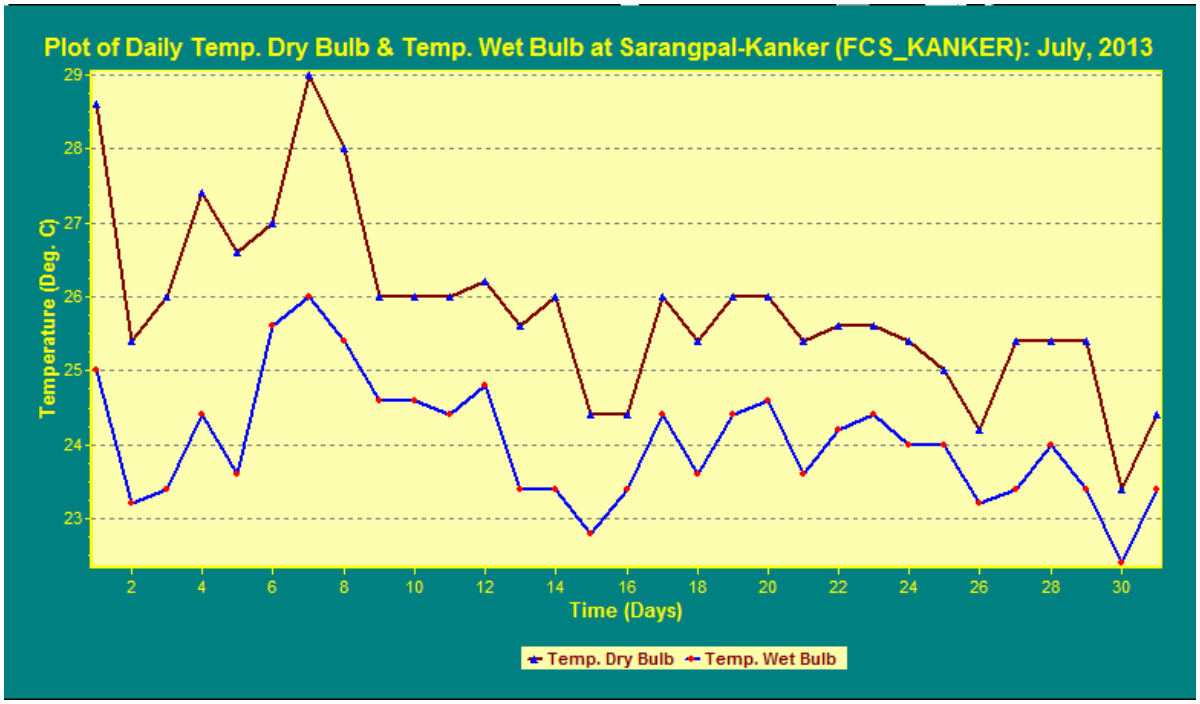
This Plot is a comparison of Relative Humidity and difference of Dry and Wet bulb Temperatures July 2013.



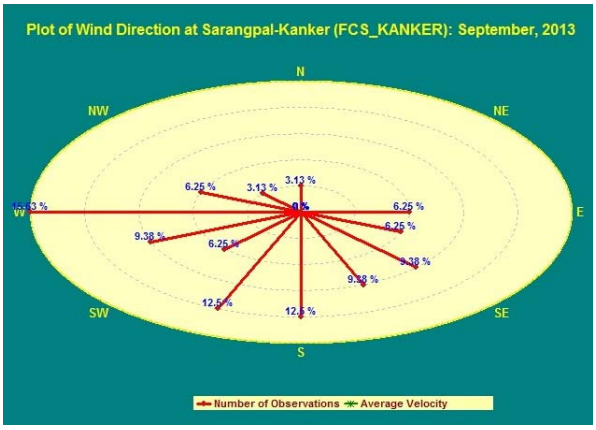
This Plot indicates the joint measurement of Dry and Wet Bulb temperature which gives Relative Humidity.

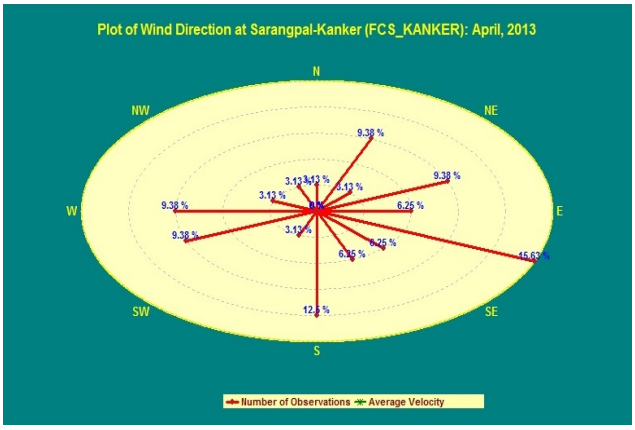


This Plot indicates the Instantaneous & Average wind speed. It is the wind speed occurring at a specific instant in time.



This Plot indicates the comparison of Dry Bulb Temperature & Wet Bulb Temperature. Dry Bulb Temperature measures the air Temperature. Wet Bulb Temperature used to calculate the Relative Humidity.





This plot indicates a Circle with a line joining straight down from it. This indicates the Wind was coming from south. Wind direction is used in calculation of evapo-transpiration to find fetch of the wind.

5.- Hydrological Observation Sites

Observations on water discharges, volume of sediments deposited on the flow areas & examinations of water qualities are made at different water releasing points of the river basins. Geographical locations of observation sites, types of experiments done on those sites and dates of commencement of experiments are also given for understanding distribution of waters on participating areas. There are 43 such sites in Chhattisgarh out of 32 sites in Mahanadi basin, 10 sites in Godavari basin and 1 site in Bramhani basin. Frequency of Monitoring of Gauge Discharge sites varies from once to thrice in a day.

5.1 Basin wise description is as follows:

5.1.1 Mahanadi Basin:

This is a large basin in area in respect of drainage area. There are 32 observation sites in the basin for which information is given. The reference period varies site to site starting from 1989 to 2001. The maximum drainage area 13027.00 sq km is covered by Kasdol site in the basin while Khoring-Khorangmal site covers minimum drainage area i.e. 475.00 sq km. The maximum stage of peak water depth 10.90 m is observed at Kasdol site on 29.08.2003.

5.1.1.2 Seonath Sub Basin:

This is a large sub basin in Mahanadi basin, Its drainage area is about 30800.00 SqKm. There are 14 observation sites in the sub basin for which information is given. The reference period varies site to site starting from 2000 to 2001. The maximum drainage area 19600.00 sq km is covered by Nandghat site in the sub basin while Khorsi-Balodabazar site covers minimum drainage area i.e. 525.00 sq km. The maximum stage of peak water depth 14.77m is observed at Nandghat site on 17.09.2005.

5.1.2 Bramhani Basin:

A one observation site have been reported in the basin and is the site established in 2001. Gauge/Discharge observations are being recorded since then. The maximum drainage area 650.00 sq km is covered at site. Maximum Peak water depth 3.24 m was reported on 26.06.2011.

5.1.3 Godavari Basin:

There are 10 observation sites in the basin for which information is given. The reference period varies site to site starting from 2000 to 2003. The maximum

drainage area 7380.00 sq km is covered by Jagdalpur site in the Indrāvati sub basin while Chhotedongar-Gudra site covers minimum drainage area i.e. 680.00 sq km. The maximum stage of peak water depth 10.96 m is observed at Indrawati Jagdalpur site on 06.08.2010.

Graphical presentation of observed water levels & discharges at various Gauge Discharge sites.

a. Mahanadi Basin (Seonath Nandghat Gauge Discharge Site)

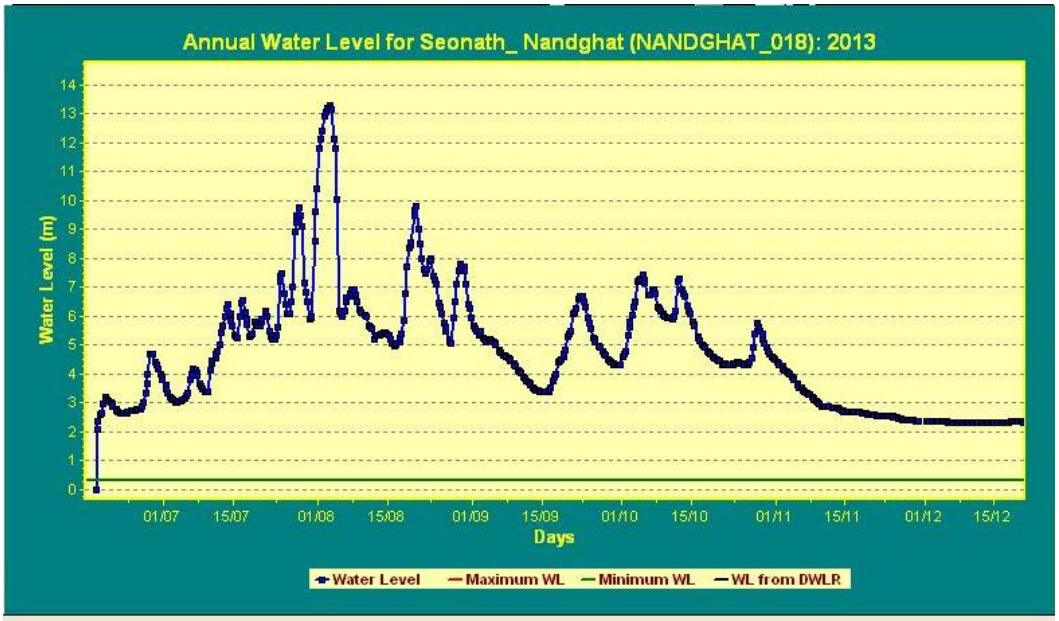


Figure 5.1:- Water level of Seonath Nandghat Site(01/01/2013 to 31/12/2013

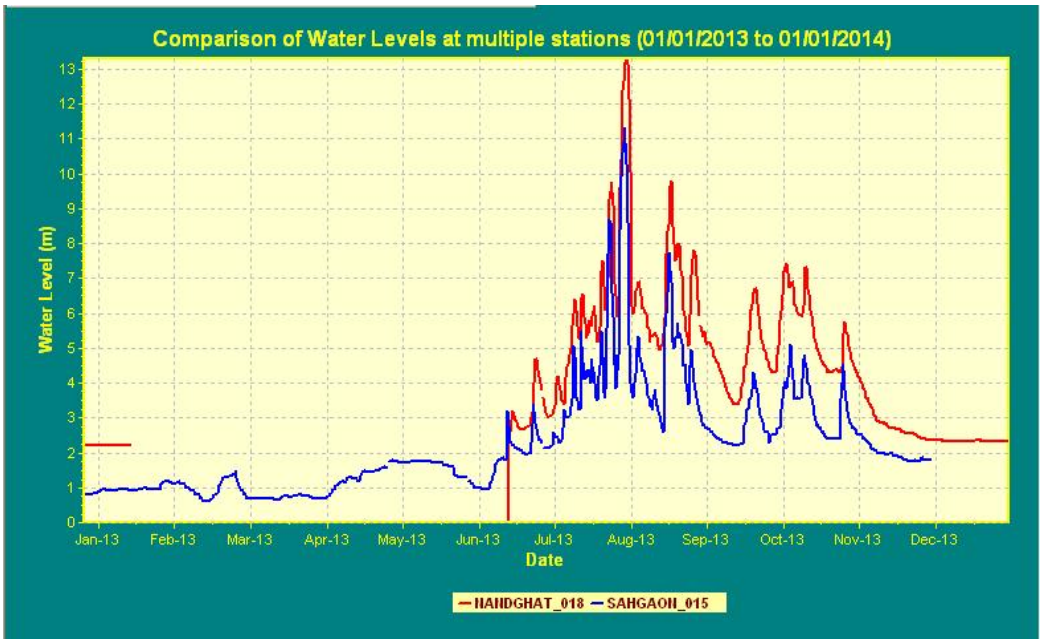


Figure 5.2 Comparison of Water Level multiple stations on same Seonath River at Nandghat & Sahgaon GD site Year 2013.

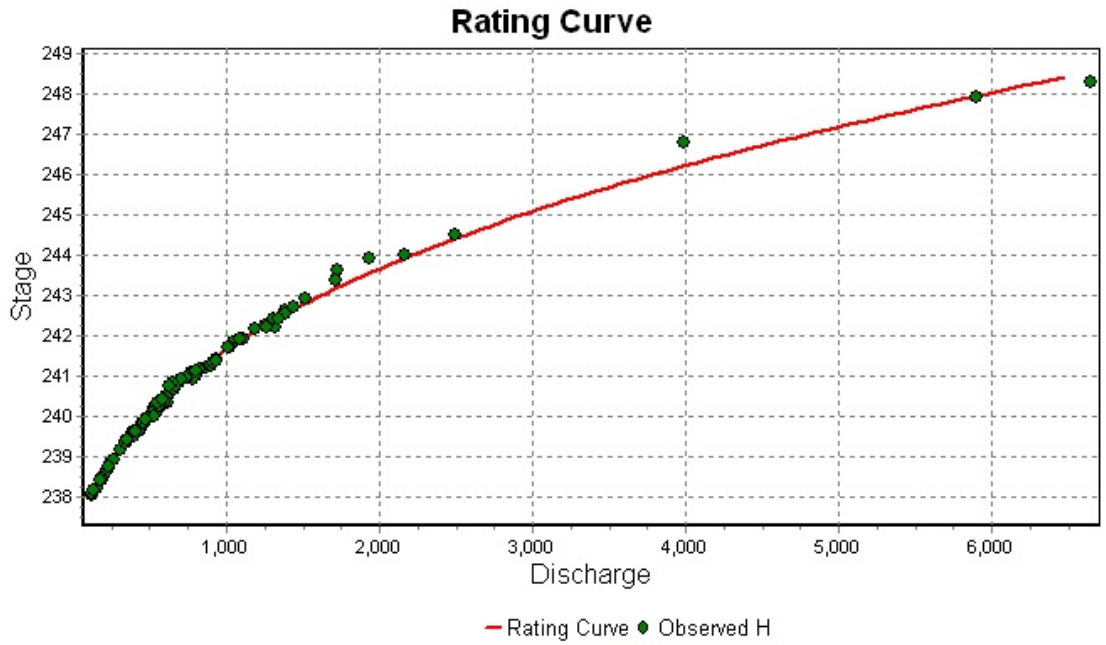


Figure 5.3:- The Rating Curve of Seonath Nandghat GD Site relationship thus established is use to transform the observed stage into the corresponding Discharge in its simplest from, A rating Curve can be illustrated graphically as shown above figure

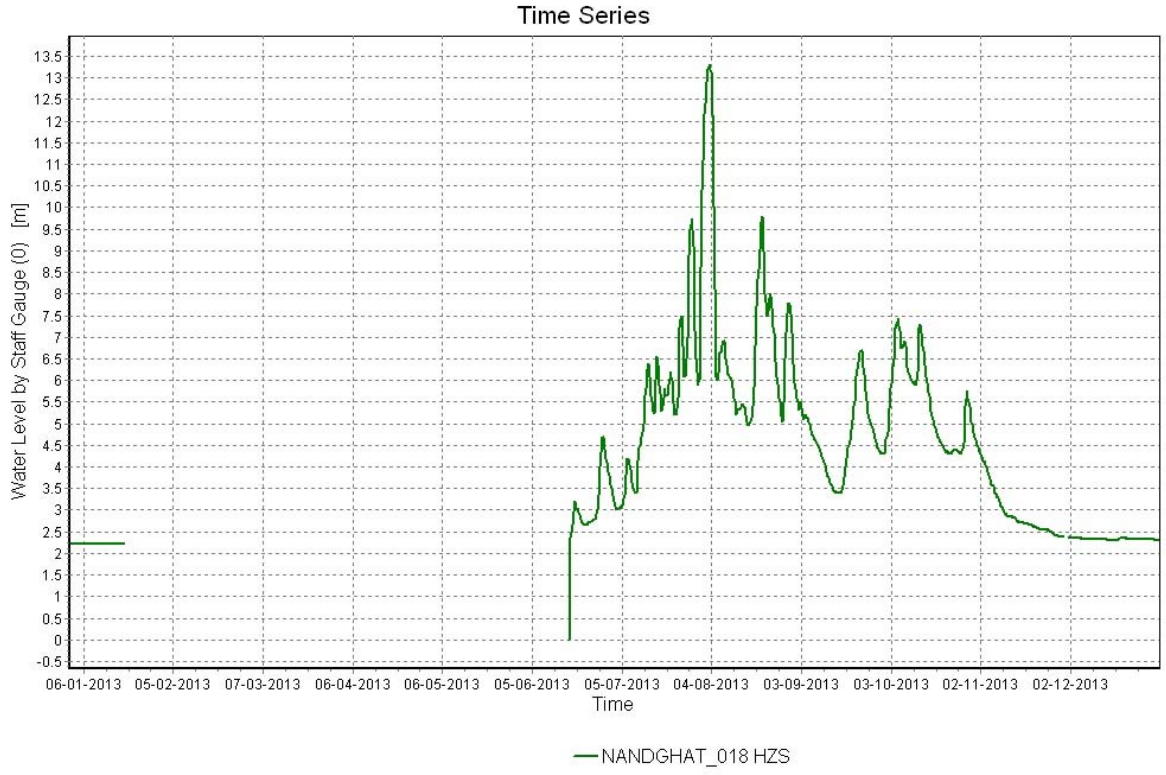


Figure 5.4 Seonath Nandghat GD Site 2013 Water Level

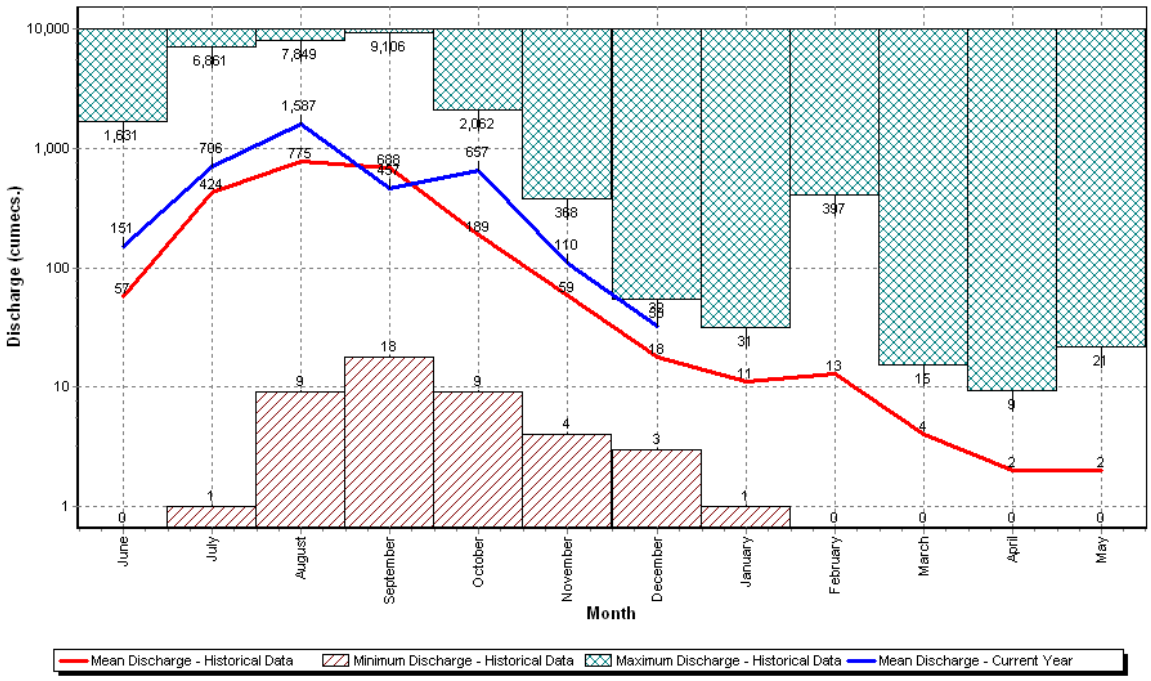


Figure 5.5 Histogram-Hydrograph Nandghat GD site

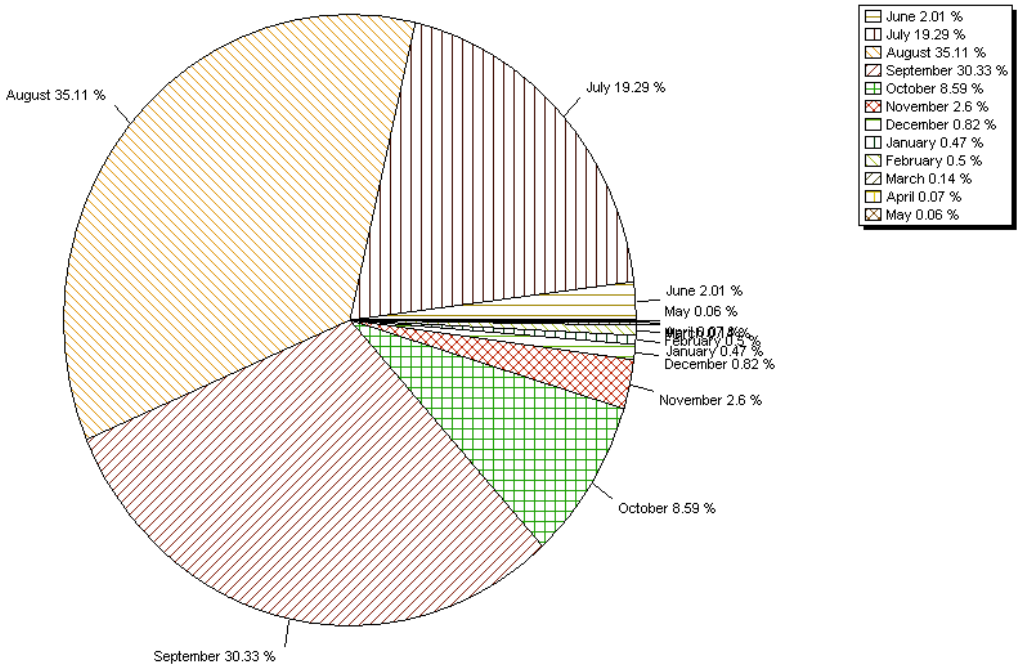


Figure 5. 6 Graph Monthly Average Runoff –Pie Chart for Nandghat GD site

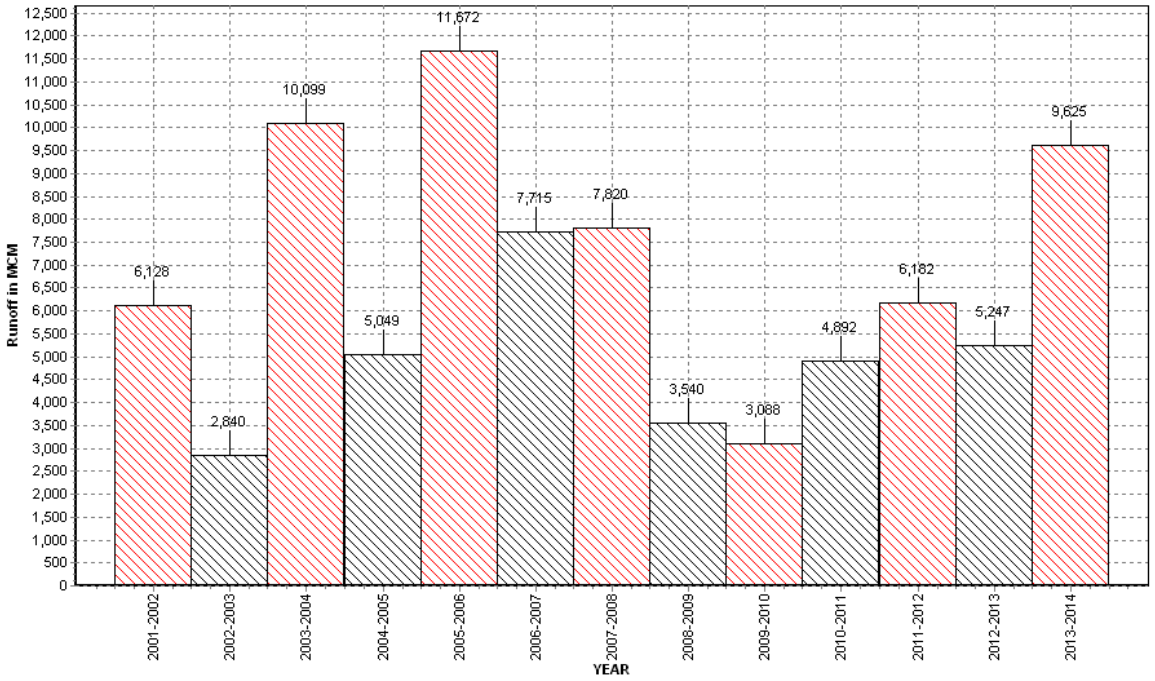


Figure 5.7 Graph Annual Runoff of Seonath Nandghat Site

b. Godavari Basin Kondagaon Narangi GD Site

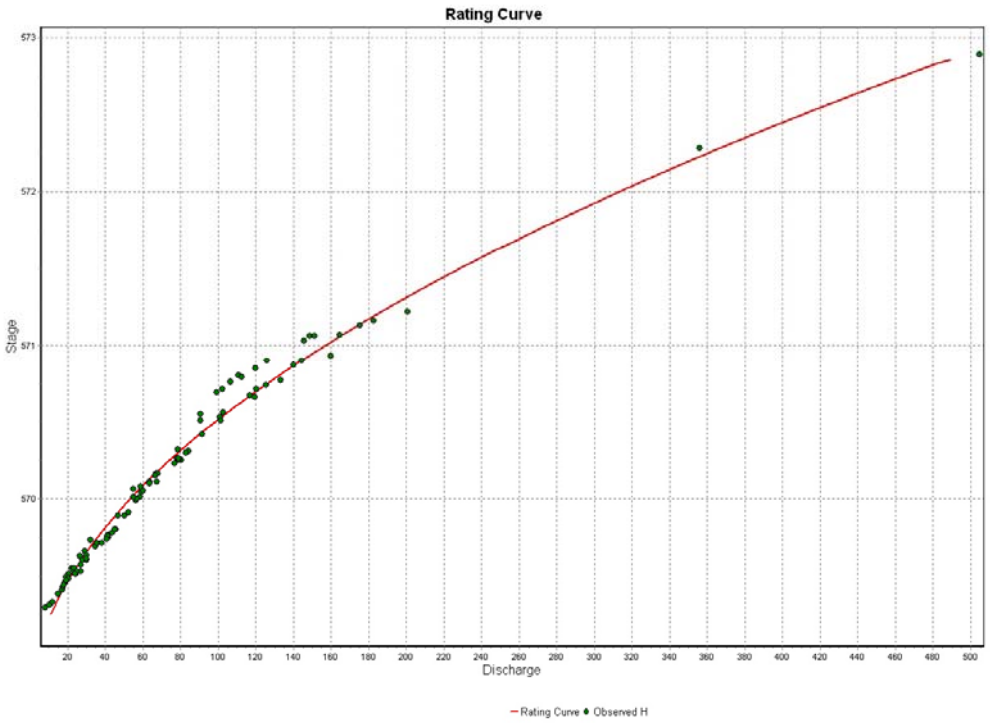


Figure 5.8 Rating Curve at Kondagaon Narangi GD Site

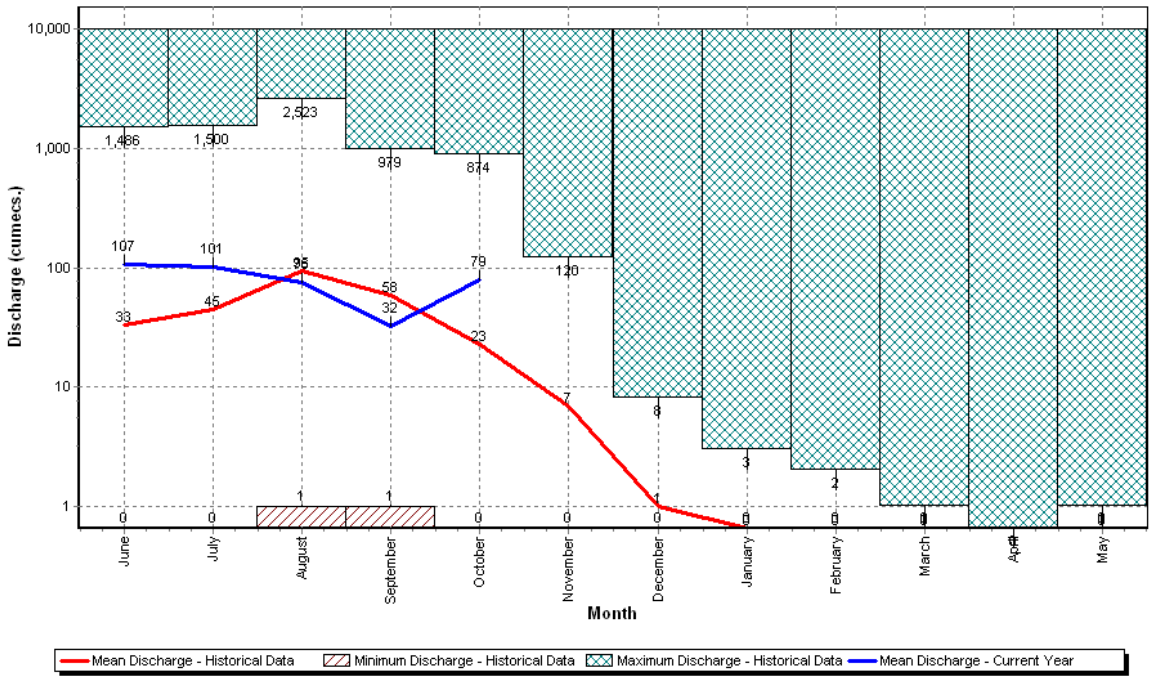


Figure 5.9 Histogram-Hydrograph Kondagaon Narangi GD Site

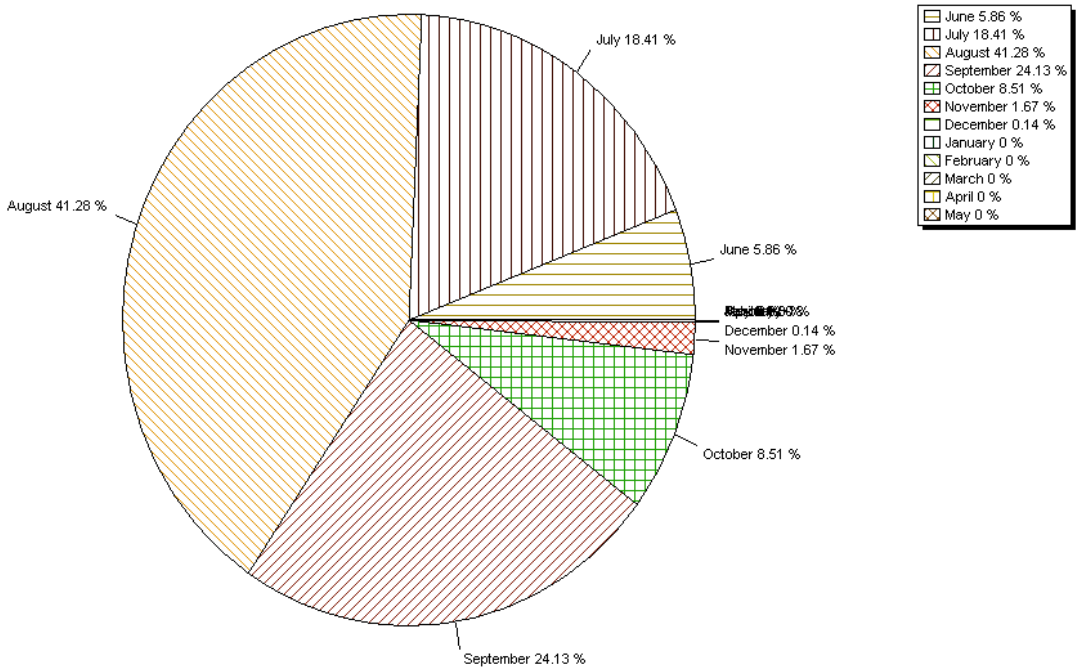


Figure 5.10 Graph Monthly Average Runoff Kondagaon Narangi GD Site

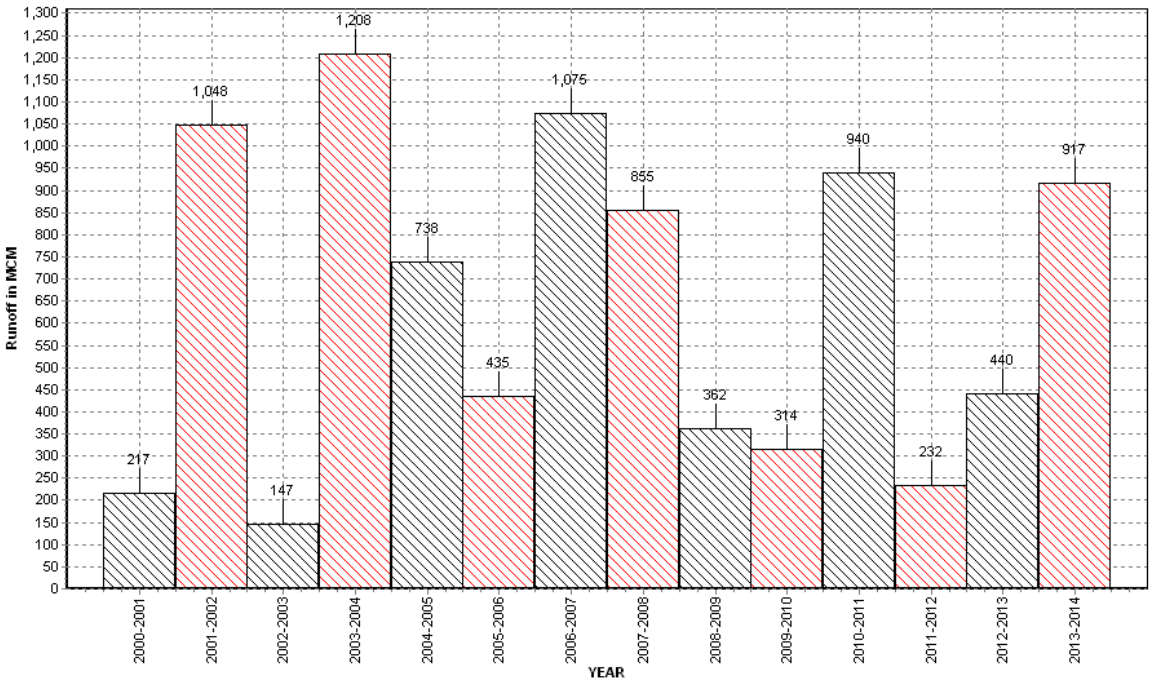


Figure 5.11 Graph Annual Runoff Kondagaon Narangi GD Site

6. Water Quality

Water is a prime necessity for human survival and growth of agriculture as well as industrial development. Effective management of water resource, monitoring and control of its quality are becoming increasingly important for sustainable development and human welfare. Pollution of water and maintaining water quality at acceptable levels has become a universal phenomenon in present day context; Environmental Protection Act also includes, as one of its objectives, protection of water from pollution. Now-a-days greater emphasis is given to water quality because of concern of environmentalists. Degradation of water quality is not only caused by increasing inflow of domestic and industrial waste into water course but also from the abstraction of water from rivers rendering them dry or with insufficient flow leading to concentration of pollution.

Water quality is an essential for the rational management of water Resources. Being a Universal solvent water quality in terms of physicals and chemical properties represent wide spatial variation. Water quality largely affected by atmospheric aerosol, soil & parent rock composition.

The chemical characteristics of water largely determine its suitability for industry, agriculture & domestic purposes.

Surface Water Monitoring

For Surface Water Quality analysis samples are collected from 13 sites by Hydrometeorology Sub Division No. 10 Raipur (CG), Sub Division No. 12 Jagdalpur (CG) and Sub Division No. 13 Jagdalpur (CG) under jurisdiction of Deputy Director, Hydrometeorology Division No. 4 Raipur (CG).

Surface Water samples are being collected in every month.

Surface Water Quality

In the year 2012-13 total 19 samples & in the year 2013-14 total 26 samples are collected from different GD sites for quality analysis. In these sample, quality parameter pH, Electrical Conductivity, TDS, Total Hardness, Calcium Hardness,

Calcium, Magnesium, Sodium, Potassium, Chloride, Primary Alkalinity, Total Alkalinity, Carbonate and Bicarbonate are analyzed.

Values of all parameter are found under permissible limit. Result of Kharun Amdi is enclosed Annexure – Sample data

Conclusion

The Surface Water quality in the GD sites is good and suitable for Industrial, Irrigation purpose and it is suitable for drinking purpose after primary treatment.

7. Reservoir Sedimentation Study

7.1 Intoduction

The process of sedimentation embodies the sequential processes of erosion, entrainment, transportation, deposition and compaction of sediment. The study of erosion and sediment yield from catchments is of most importance as the deposition of sediment in reservoir reduces its capacity, and thus affecting the water availability for the designated use. Negative effects of sedimentation tend to become more and more relevant on a global scale due to population growth, increasing vulnerability of many territories, and more severe climatic conditions, which facilitate more and more soil erosion. Amongst several causes of soil erosion and loss of nutrients, the major ones are improper and unwise utilization of watershed resources without any proper vision.

7.2 Study Area

The Kodar reservoir has been selected for the systematic and scientific study of reservoir sedimentation, sediment yield from catchment areas, prioritization of catchment for soil conservation measures, sediment modeling in the inflowing rivers and impact assessment analysis on runoff and sediment inflows in the reservoir. The Kodar reservoir is constructed across river Kodar, a tributary of river Mahanadi and first impounded in 1976-77. The catchment area of the river up to dam site is 317.17 sq. km. and mean annual rainfall in the catchment area is about 1433.1 mm. The dead storage capacity and gross storage capacity of reservoir are 11.33 MCM and 160.35 MCM respectively. The length of earthen dam is 2363 m with a maximum height of 23.32m, a waste weir 183m long to pass designed flood and head regulators on both the flanks to feed the canal system. Two canals of length 23.30 km (Left Bank Canal) and 10.60 km (Right Bank Canal) are envisaged from the sluices located on left and right

flanks of the earthen dam to provide irrigation to 16,066 ha and 7,406 ha respectively.

7.3 Objectives of the PDS

The Kodar reservoir which is constructed on river Kodar, a tributary of river Mahanadi has been selected for the systematic and scientific study of reservoir sedimentation prioritization of catchment for soil conservation measures, sediment modeling in the inflowing rivers and impact assessment analysis on sedimentation with the following objectives:

- Assessment of present status of reservoir storage by estimating revised capacity using remote sensing approach.
- Sediment modeling.
- Assessment of soil loss from catchment area.
- Prioritization of catchment area based on geo-morphological characteristics, sediment yield and risk of erosion and soil loss from sub-catchments.
- Impact assessment analysis
- Development of management plan for catchment area with area specific soil conservation measures for minimizing sedimentation in reservoir.

7.4 Methodology

7.4.1 Creation of Data Base in GIS

GIS plays an important role in generating automated spatial datasets and in establishing spatial relationships. In the present study, a GIS base data base has been generated for Kodar catchment which will be useful for future planning and scientific management of water resources. For development of GIS data base, various thematic maps including catchment and command areas, river network, road network, geology, geomorphology, soil, contour, digital elevation model (DEM),village maps have been prepared in Integrated Land and Water Information System (ILWIS 3.0 & 3.6). The drainage, land use, soil, sub watershed maps of the study area have been prepared in Arc GIS 9.3 for implementation of SWAT model.

7.4.2 Collection of Meteorological, Hydrological, RS data

The long-term meteorological data of Raipur has been collected from 1981 to 2012 and analyzed for preparation of weather generator and implementation of SWAT model. A gauging site on river Kodar near Koma village has been maintained

for collection of discharge data and sediment samples from 2010 to 2012. The soil testing for various in-situ and laboratory analysis including texture analysis, infiltration, hydraulic conductivity, field and dry density etc. have been carried out on eleven sites in the catchment. Multi-date LISS III and LISS IV data of IRS 1D/P6 have been purchased from NRSC Hyderabad for revised capacity estimation and land use detection.

7.4.3 Revised Capacity using Remote Sensing and GIS

The basic principle of revised capacity estimation using remote sensing and GIS is that when the sedimentation occurred in a reservoir its water spread reduced with respect to its original area before impoundment and the revised water spreads at different levels can be computed using image analysis of remote sensing data in GIS software.

7.4.4 Soil Investigation for Soil Erosion and Sediment Modeling

The detachment, entrainment and transportation which are the primary processes in soil erosion and sediment modeling may vary with the soil characteristics require detail soil analysis and their spatial distribution in the catchment. Also, the soil properties are used as inputs in most of the soil erosion and sediment models. In the present study, infiltration tests using double ring infiltrometer, saturated hydraulic conductivity using Guelph permeameter, particle size analysis using coarse sieve and pipette analysis, sp. gravity using density bottle and dry density using core cutter method have been estimated on eleven sites covering all types of soils in the study area.

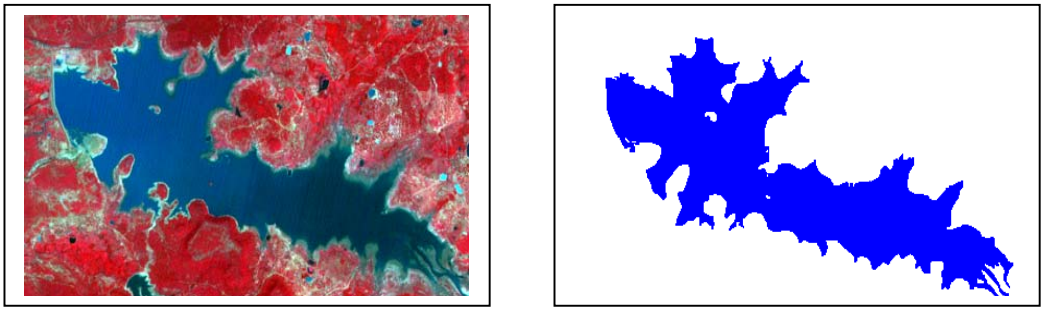
7.4.5 Development of Catchment Area Treatment (CAT) Plan

The CAT plan pertains to preparation of a management plan for treatment of erosion prone area of the catchment through mechanical, agronomic and biological measures. The CAT plans were prepared by overlaying the various thematic and base maps using ILWIS GIS software. The land use map obtained from digital image analysis of RS data, soil, hydro-geomorphology, slope and sub-watershed themes were built as raster features, whereas streams and roads were built as line features. All the thematic maps were overlaid in GIS environment and suitable conservation measures have been proposed using standard criterions. The areas suitable for different agronomic measures may be determined using cross facility of raster

operation in ILWIS. The slope, land use and soil map have been crossed and an attribute table has been created to define various agronomic measures considering soil and slope for agriculture land. This attribute table has been used to generate a map showing the suitable areas for various agronomic measures. The biological measures have been suggested in barren and open forest for generation of source of income for rural population.

7.5 RESULT AND IMPLICATION

For estimation of revised capacities at different levels of Kodar reservoir, eight different IRS LISS III images to cover whole range of live storage have been identified and purchased from NRSC, Hyderabad. The *NDWI*, *NDVI* and band ratio (*BR*) followed by slicing methods of image classification have been used to differentiate the water pixels from other land uses. The False Color Composite (FCC) and masked out water spread areas of one date has been presented in Fig. 2 (a). The original and revised capacity curves for Kodar reservoir has been depicted in Fig. 1 (b). The sedimentation analysis of Kodar reservoir indicated that 24.94 Mm^3 of gross storages and 4.89 Mm^3 of dead storage have been lost in 32 years (1976-77 to 2008-09).



FCC Extracted water spread

Fig.2: False color composite and extracted water spread on Oct 24, 2009 (Res. Level: 291.69 m)

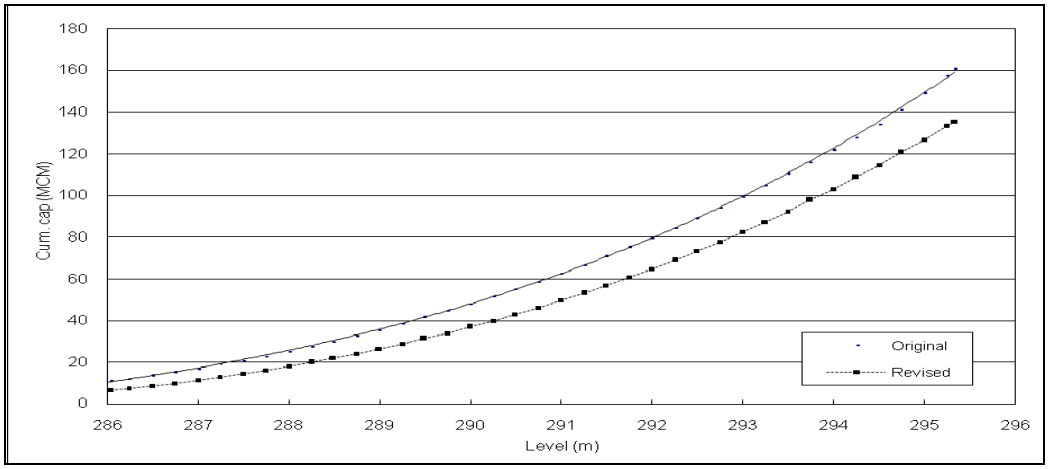


Fig 3: Original and revised capacity curves of Kodar reservoir

7.6 Result of the study

- Development of Catchment Area Treatment (CAT) Plan has been carried out using GIS platform while overlapping many layers with respect to their coordinates. The layers being streams, land use maps, slope and roads etc. The map showing CAT plan of the study area consisting of suitable areas for agronomic and biological soil conservation measures and location of mechanical measures have been given.
- The sedimentation analysis of Kodar reservoir indicated that **24.94 Mm3 of gross storage (15.5%) and 4.89 Mm3 of dead storage (43%) have been lost in 32 years (1976-77 to 2008-09).**
- Having conducted many soil testing techniques, it is concluded that the soils in the study area are mainly silt loamy and sandy loam which is prone to erosion and conservation measures are necessary to reduce displacement of soils.
- Soil erosion could be reduced from **2.97 t/ha to 1.63 t/ha through a series of 37 gully plugs, 22 Nalla plugs, 21 Boulder bunds and 6 Check dams with terraces**, bank stabilization with land use modifications (e.g. a forestation) providing further options to control sediment inflows to Kodar reservoir.

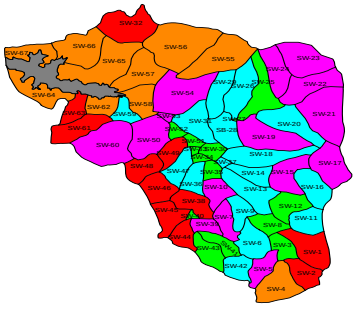
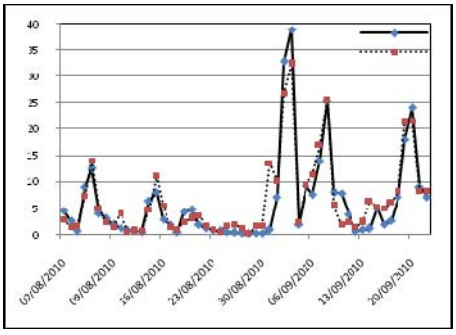


Figure 3Sub-Watersheds in Kodar catchment



Sediment load (calibration, 2010)

7.7 Conclusions

The important conclusions drawn from this study are given below:

- Mean monthly maximum temperature varies from 44.2 ^{0}C in the month of May to 24.1 ^{0}C in January. Similarly, mean monthly minimum temperature ranges from 8.4^{0}C in the month of January to 28.6 ^{0}C in the month of June.
- The sedimentation analysis of Kodar reservoir indicated that 24.94 Mm^3 of gross storages and 4.89 Mm^3 of dead storage have been lost in 32 years (1976-77 to 2008-09).
- The land use analysis using supervised classification of LISS IV data concluded that the Kodar reservoir catchment is an agriculture watershed covering 80% area under agriculture with mainly paddy crops both in rabi and kharif seasons.
- The results of modeling the infiltration process concluded the modified Kostiakov's model can be used for modeling the infiltration process in the Kodar catchment and similar type of soils in the region.
- The soils in the study area are mainly silt loamy and sandy loams which are prone to erosion and conservation measures are necessary to reduce displacement of soils. The sp. gravity of soils in the region ranges from 2.21 to 2.59.
- The whole Kodar catchment has been divided into sixty seven sub-watersheds with area ranging from 0.05 sq. km. to 13.05 sq. km.
- The soil loss (*SL*) has maximum weight as 0.33, while circulatory ratio (R_c) with weight of 0.02 exhibits the least importance in prioritization decision.
- The AHP analysis suggested that more than 21 sub-watersheds covering 117 sq. km area of Kodar reservoir catchment fall under very high and high priority.
- The CAT plan suggests 101.61 ha land can be used for a forestation, 114.86 ha for agro-forestry and 11.41 ha land for development of grazing land which will be beneficial for rural population for their additional income and environmental health of the watershed.
- It may be concluded that nearly 41 sq. km area in Kodar catchment is suitable for farm ponds.
- The mechanical measure under the CAT Plan of Kodar reservoir catchment includes 37 gully plugs, 22 nala plugs, 21 boulder bunds and 6 check dams.
- The SWAT model for Kodar catchment up to Koma G/D has been developed and sensitivity analysis confirmed that the *GWQMN* (threshold depth of water in shallow aquifer required for return flow to occur) and *CH_N2* (Manning's N value for main channel) are the most important parameters for runoff and sediment modeling respectively.
- The Nash-Suctliff efficiency (η) and root mean square error (*RMSE*) have been found as 80.46 % and 0.055 for runoff while the same have been computed as

91.16 % and 0.407 for sediment during calibration. In the validation, efficiency of model was found as 83.65% for runoff and 70.04 % for sediment with independent data of 2011 indicative of reasonably appropriate match.

- The simulation run has been made for 2010 to 2012 data with base line scenario (Pre BMP) and improved scenario (Post BMP) in impact assessment analysis. From the analysis of results of impact assessment analysis, it may be concluded that the maximum sediment load under Pre-BMP scenario in the month of Sept 2011 which was 2.97 t/ha can be reduced to 1.63 t/ha under same rainfall condition, if suitable measures applied in Kodar catchment.

Reservoir Sedimentation Result

Name of Reservoir	RSP	Tandula	Kodar
	1	2	3
Year of Construction	1977	1921	1976-77
Period in year	24	80	32
Gross capacity in MCM	909.32	321.285	160.35
Gross capacity Loss in MCM	45.93	22.4	24.94
Gross capacity Loss in %	5.05%	6.97%	15.55%
Dead Capacity in MCM	143		11.33
Dead Capacity Loss in MCM	31		4.89
Dead capacity Loss in %	21.68%		43.16%
Live Capacity in MCM	766.32		149.02
Live Capacity Loss in MCM	14.93		20.05
Live capacity Loss in %	1.95%		13.45%
Catchment area in Sqkm	3670.00	787.44	317.17
Sediment in Mcum/year	1.91	0.28	0.78
Specific gravity of sediment load in Tonne/Cum	1.05	1.05	2.59
Sediment in Tonne/Hact/year	5.475	3.734	63.644
Probable loss of live capacity in MCM next 10 year	6.221	0.000	6.266
Probable loss of live capacity in MCM next 20 year	12.442	0.000	12.531
Probable loss of live capacity in MCM next 20 year	18.663	0.000	18.797

Source:- NIH Report & PDS Studies under HP-II

8. Time Schedule For Data Observation

8.1 Daily Rainfall

All rainfall observations are made at 08:30 hrs IST daily. The quantity of rainfall recorded at 08:30 hrs is the rainfall of the preceding 24 hours ending at 08:30 hrs of the observation day (Today's date). In other words, the rainfall of the day is the total rainfall collected in the rain gauge from 08:30 hrs IST of previous day to 08:30 hrs IST of the current day and is recorded (entered) against today's date.

8.2 River Water Level

River water level in all the GD sites is measured thrice a day i.e. at 08:00, 13.00 & 18:00 hrs IST respectively.

8.3 River Discharge

The process of River Discharge measurement in all GD site starts every day at 08:00 hrs IST daily.

8.4 Climatic Parameter

Six Climatic parameter (Rainfall, Temperature, Evaporation, Humidity, Wind direction, Wind velocity and Sunshine duration etc.) measured daily.

9. Data Dissemination

9.1 Introduction

In the set up of the Hydrological Information System, the first question to be addressed is the type of information to be provided. This determines the layout of the observation network (Parameters, network density, observation frequency, equipment, etc.) and the data available in the databases. The type of information to be provided requires an analysis of the potential hydrological data users. The central and State Government agencies which support the Hydrological Information System are the major users of the generated information. There are sources or other government non-government and private agencies also, which make good use of this information. It is obvious that the hydrological data needs of the users also changes time to time. Normally, it is expected that the hydrological information service agencies satisfy most of the genuine data needs of the potential users in particular and society at large. For ensuring an optimal use of the public therefore very essential to have a proper balance between the data needs of various users and mandate of various services supporting the hydrological information system. To ensure that the HIS output remains at all times 'demand driven' each state/agency has to constitute a Hydrological Data Users Group (HDUG). These HDUGs must represent all potential users within the state or intended to be covered by an agency.

Hydrological Data Users Group is a state or National Level Representative Group of current & potential large scale and repeat users of HIS data who have a stake in water resources utilization, assessment & management.

Purpose

1. To provide a common platform for discussion between hydrology data users & data provider.
2. To create awareness amongst users about Hydrological information system (HIS) data & educate them.
3. To understand, analyze & update information on the changing needs of data users.
4. To review & recommend addition/deletion in the data collection networks related to HIS, if appropriate.

Stage discharge data is measured on GD stations. Hourly & Daily rainfall is measured on ARG & SRG stations respectively. On FCS station climatic parameters namely minimum & Maximum temperature, dry & wet bulb temperature, humidity, pan evaporation, wind direction & wind velocity, pan water temperature are measured.

All these data is observed daily, thrice daily or hourly & entered into computer using SWDES software. This data is then validated using HYMOS software & after final validation, it is ready for dissemination.

Table 9.1 The extent of data availability

S.No.	Data Type	No. of stations	Data Availability
1	Rainfall	165	Since 1958
2	Rainfall (HP Station)	35	Since 2000
3	River Gauge	43	Since 2000
4	Climatic	2	Since 2003

9.2 The user can request for the data as below

Any user can request the data by filling the request form.

(Please see Annexure-B). Data is made available online/offline through any available media such as E-mail, CD, Type or hard copy against payment for the required data. Catalogue services are being launched on web site shortly and will be available on internet.

The Data request form may be downloaded from our website

http://hydrologyproject.cgwrd.in

The Pricing of Data

All available data @ Rs. 400/ Per Stations / Per Year

(Govt.of Chhattisgarh Water Resources Department Vide letter No. 2811/150/2001 , Raipur dated 25/04/2003)

Note:-

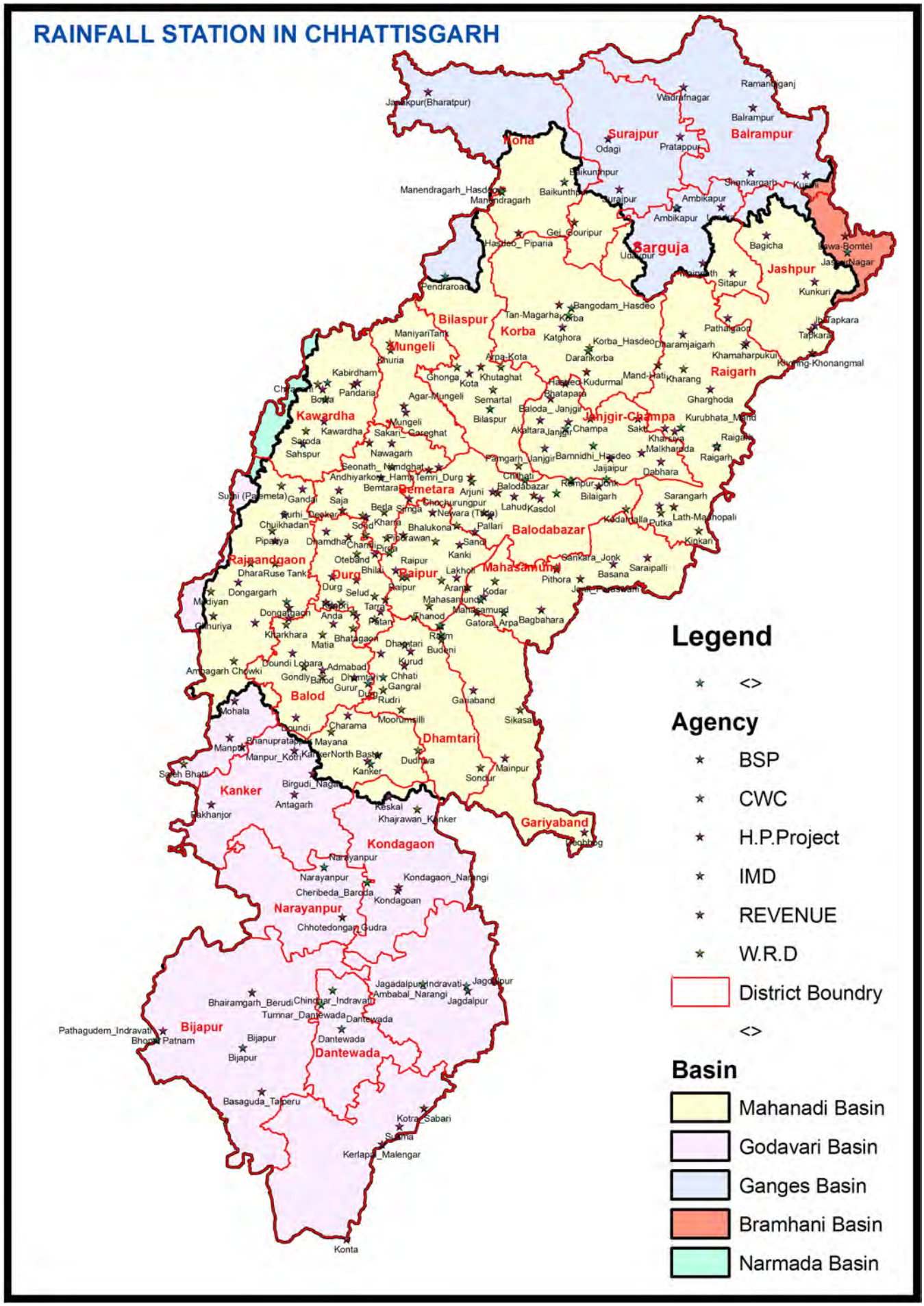
- Individual students Research or Academic purpose having no grants for research from any source, data will be supplied free of cost.

Meta Data of 200 Rain gauge stations, Gauge-Discharge data of 43 No. stations at various rivers and Climatic data of 2 No Stations are available in the web site of Hydrology Project ***http://hydrologyproject.cgwrd.in*** *Details including Name of station, Location of station, Type of data and Duration of data are available under surface water in the web site.*

THE MEMBER OF HYDROLOGY DATA USER GROUP (HDUG)

Core member		
1	Secretary, Water Resources Department, Raipur	Chairman
2	Engineer-in-Chief, Water Resources Department, Raipur	Member
3	Engineer-in-Chief, P.H.E.D., Raipur	Member
4	Engineer-in-Chief, P.W.D., Raipur	Member
5	Director, Agriculture Department, Raipur	Member
6	Director, Panchayat / Rural Department, Raipur	Member
7	Director, Geology / Mining, Raipur	Member
8	Director, Fisheries Department, Raipur	Member
9	Chief Engineer, Mahanadi Godavari Basin , Raipur	Member / Secretary / Convener
10	Superintending Engineer, W.R.& Ground Water Survey Circle , Raipur	Permanent Invitee
Associate Members		
11	Chief Engineer, CSEB, Raipur	
12	Director, IMD, Bhopal / Raipur	
13	Director, CWC, Bhubneshwar	
14	Regional Director, CGWB, Raipur	
15	Vice Chancellor Indira Gandhi Kirishi Vishwavidyalaya, Raipur	
16	Superintending Engineer, RES, Raipur	
17	Chairman, Audyogik Kendra Vikas Nigam, Raipur	
18	Regional Manager, State Bank of India , Raipur	
19	Pt. Ravi Shankar Shukla University (Geology Branch)	
20	Principal, Govt. College of Engineering and Technology, Raipur	

ANNEXURE


RAINFALL STATION IN CHHATTISGARH
Legend
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Agency
BSP
CWC
H.P.Project
IMD
REVENUE
W.R.D
District Boundry
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Mahanadi Basin
Godavari Basin
Ganges Basin
Bramhani Basin
Narmada Basin
Koriya
Surajpur
Balrampur
Surguja
Jashpur
Bilaspur
Korba
Mungeli
Raigarh
Kawardha
Janjgir-Champa
Sakti
Rajnandgaon
Durg
Raipur
Mahasamund
Balodabazar
Dhamtari
Gariyaband
Balod
Kanker
Kondagaon
Narayanpur
Bijapur
Dantewada
Ramanujganj
Wadrafnagar
Jamkpur(Bharatpur)
Balrampur
Odagi
Pratappur
Manendragarh_Hasdeo
Manendragarh
Baikunthpur
Surajpur
Ambikapur
Shankargarh
Gej_Gouripur
Hasdeo_Piparia
Udaipur
Bagicha
Lawa-Bomtel
Jashpur Nagar
Mainpath
Sitapur
Kunkuri
Pendraroad
Bangodam_Hasdeo
Tan-Magarha
Korba
Pathalgaon
Tapkara
Maniyari Tank
Katghora
Korba_Hasdeo
Dharamjaigarh
Khamaharpukur
Khoong-Khonangmal
Phuria
Arpa-Kota
Darrikorba
Kabirdham
Ghonga
Khutaghat
Kota
Hasdeo-Kudurmal
Mand-Hati
Kharang
Ghargoda
Pandaria
Agar-Mungeli
Semartal
Bhatapara
Baloda_Janjgir
Bilaspur
Akaltara
Janjgir
Champa
Sakti
Kharsiya
Malkharoda
Raigarh
Kawardha
Mungeli
Sakari_Goreghat
Sarsoda
Sahspur
Nawagarh
Pamgarh_Janjgir
Bamnidhi_Hasdeo
Jaijaipur
Dabhara
Seonath_Namdghat
Andhiyarkor_Hamp
Temri_Durg
Chhati
Balodabazar
Rampur_Jonk
Bilaigarh
Sarangarh
Bemetara
Arjuni
Bemtara
Ganda
Saja
Chochurungpur
Lahud
Kasdol
Kodardalla
Putka
Lath-Mandhopali
Kurhi_Deokar
Bedla
Simga
Newara (Tilda)
Chukhadan
Sond
Kharra
Bhalukona
Pallari
Kinkari
Pipariya
Dhamdha
Chandipirda
Pharawan
Sanod
Kanki
Otebond
Raipur
Sankara_Jonk
Saraipalli
Dhararuse Tank
Bhilai
Lakhori
Pithora
Basana
Durg
Raipur
Arang
Kodar
Dongargarh
Selud
Mahasamund
Dongargaon
Anda
Tarra
Patan
Thanod
Mahasamund
Bagbahara
Gatora_Arpa
Kharkhara
Bhatagaon
Rarra
Matia
Dhamtari
Budeni
Kurud
Doundi Lohara
Admabad
Ambagarh Chowki
Gondly
Balod
Dhamtari
Chhati
Gangral
Gurur
Duru
Rudri
Gariaband
Mohala
Moorumsilli
Sikasal
Doundi
Charama
Bhanupratapur
Mayana
Manpur
Kanker
North Basta
Dudhwa
Mainpur
Manpur_Koi
Kanker
Sonour
Birgudi_Nagar
Antagarh
Pakhanjor
Keskal
Khajrawan_Kanker
Deobhog
Narayanpur
Narayanpur
Kondagaon_Narangi
Cheribeda_Baroda
Kondagoan
Chhotedongar
Gudra
Jagadalpur
Indravati
Jagdalpur
Ambabal_Narangi
Bhairamgarh_Berudi
Chindgar_Indravati
Jagdalpur
Tumnar_Dantewada
Dantewada
Pathagudem_Indravati
Bhopal Patnam
Bijapur
Dantewada
Bijapur
Basaguda_Tarperu
Kotra_Sabari
Sukma
Kerlapal_Malengar
Konta

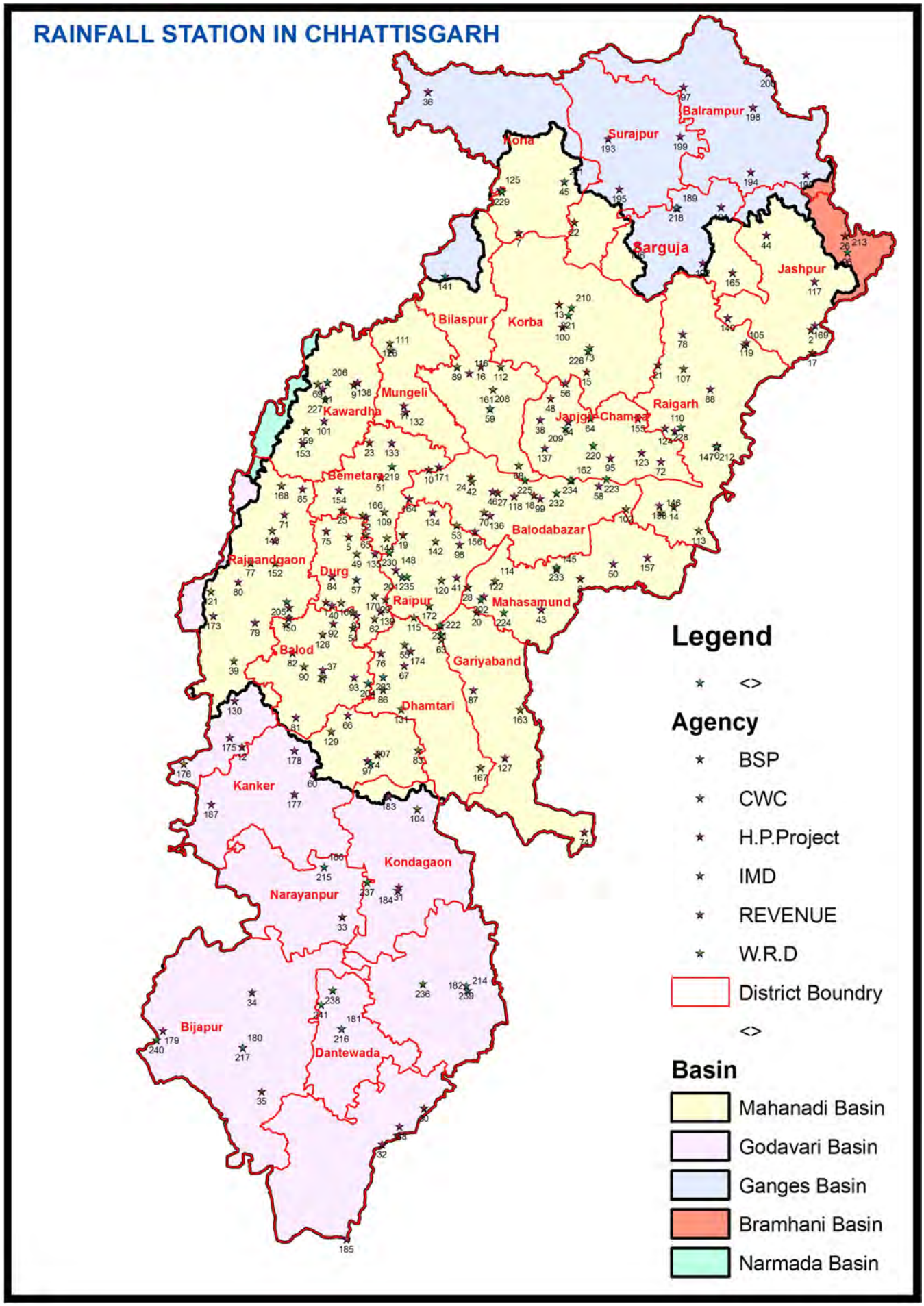
Gauge Discharge Network

Annexure: A1

S.No	Station Name	District	Tahsil	Latitude	Longitude	Topo Sheet No	Name of Basin	C.A.in SqKm	Data Available		Remarks
									From	To	
1	Khoring-Khorangmal	Jashpur	Kunkuri	22°21'57"	83°56'02"	64N/15	Mahanadi	475.00	2001	Dec-13	
2	Khorsi_Balodabazar	Balodabazar	Balodabazar	21°39'10"	82°11'32"	64K/02	Mahanadi	525.00	2003	Dec-13	
3	Hamp-Pandariya	Kawardha	Pandariya	22°12'24"	81°23'44"	64F/08	Mahanadi	550.00	2000	Dec-13	
4	Jamunia_Godhi	Balodabazar	Balodabazar	21°43'52"	82°02'38"	64K/02	Mahanadi	575.00	2000	Dec-13	
5	Bagnai_ Jamgaon	Mahasamund	Mahasamund	21°02'10"	82°04'37"	64K/04	Mahanadi	580.00	2000	Dec-13	
6	Ib-Narayanpur	Jashpur	Kunkuri	22°50'11"	83°54'51"	64N/13	Mahanadi	624.00	2000	Dec-13	
7	Tan-Magarha	Korba	Katghora	22°37'15"	82°31'58"	64J/10	Mahanadi	725.00	2001	Dec-13	
8	Maini-Wangaon	Jashpur	Kunkuri	22°37'30"	83°40'35"	64N/10	Mahanadi	764.00	2000	Dec-13	
9	Kolhan_ Kapasda	Raipur	Raipur	21°25'55"	81°40'23"	64G/10	Mahanadi	800.00	2000	Dec-13	
10	Agar-Mungeli	Mungeli	Mungeli	22°05'52"	81°40'25"	64F/12	Mahanadi	875.00	1989	Dec-13	
11	Gej_ Gouripur	Surguja	Surajpur	23°02'40"	82°35'20"	64 I/12	Mahanadi	980.00	1990	Dec-13	
12	Lath-Madhopali	Raigarh	Sarangarh	21°34'38"	83°09'45"	64O/02	Mahanadi	984.00	1990	Dec-13	
13	Sakari_ Goreghat	Bemetara	Bemetara	21°54'29"	81°29'03"	64G/05	Mahanadi	1000.00	1989	Dec-13	
14	Surhi_Deokar	Durg	Dhamdha	21°33'29"	81°20'12"	64G/06	Mahanadi	1050.00	1989	Dec-13	
15	Pairi_Nahargaon	Gariaband	Gariaband	20°39'20"	82°05'55"	64L/02	Mahanadi	1117.00	1989	Dec-13	

S.No	Station Name	District	Tahsil	Latitude	Longitude	Topo Sheet No	Name of Basin	C.A.in SqKm	Data Available		Remarks
									From	To	
16	Kelo-Raigarh	Raigarh	Raigarh	21°53'30"	83°24'05"	64O/05	Mahanadi	1175.00	2001	Dec-13	
17	Maniyari-Takhatpur	Bilaspur	Takathpur	22°07'52"	81°52'08"	64F/16	Mahanadi	1250.00	2000	Dec-13	
18	Khutgaon_Tel	Gariyaband	Deobhog	19°52'51"	82°42'00"	65I/09	Mahanadi	1373.00	1989	Dec-13	
19	Kharun_Amdi	Raipur	Raipur	21°05'56"	81°34'37"	64G/12	Mahanadi	1550.00	2000	Dec-13	
20	Amner_Tuma	Durg	Durg	21°22'58"	81°16'26"	64G/07	Mahanadi	1580.00	2001	Dec-13	
21	Arpa-Kota	Bilaspur	Kota	22°18'05"	82°05'55"	64J/03	Mahanadi	1700.00	2000	Dec-13	
22	Tandula_Vinayakpur	Durg	Gunderdehi	21°05'00"	81°15'00"	64G/08	Mahanadi	2000.00	2001	Dec-13	
23	Hasdeo_ Piparia	Koria	Manendragarh	23°01'00"	82°20'00"	64I/08	Mahanadi	2060.00	2000	Dec-13	
24	Jonk_Paraswani	Mahsamund	Basna	21°12'30"	82°38'51"	64K/12	Mahanadi	2500.00	2000	Dec-13	
25	Mahanadi_ Sarangpal	Kanker	Kanker	20°17'49"	81°32'19"	64H/07	Mahanadi	2530.00	2000	Dec-13	
26	Seonath_Singdai	Rajnandgaon	Rajnandgaon	21°03'14"	81°02'53"	64G/04	Mahanadi	2580.00	2000	Dec-13	
27	Ib-Tapkara	Jashpur	Kunkuri	22°29'03"	83°55'35"	64N/14	Mahanadi	3334.00	2001	Dec-13	
28	Mand-Hati	Raigarh	Dharamjaygarh	22°18'32"	83°04'42"	64N/03	Mahanadi	3930.00	2001	Dec-13	
29	Seonath_Sahagaon	Balod	Balod	21°25'18"	81°22'17"	64G/07	Mahanadi	9350.00	1990	Dec-13	
30	Mahanadi_ Arang	Raipur	Raipur	21°09'48"	82°01'44"	64K/04	Mahanadi	10125.00	1989	Dec-13	
31	Mahanadi_ Kasdol	Balodabazar	Kasdol	21°38'20"	82°23'30"	64K/06	Mahanadi	13027.00	1988	Dec-13	
32	Seonath_ Nandghat	Balodabazar	Simga	21°46'10"	81°48'43"	64G/07	Mahanadi	19600.00	1989	Dec-13	

S.No	Station Name	District	Tahsil	Latitude	Longitude	Topo Sheet No	Name of Basin	C.A.in SqKm	Data Available		Remarks
									From	To	
33	Hasdeo-Kudurmal	Korba	Korba	22°16'30"	82°41'00"	64J/11	Mahanadi	9380.00	2001	2010	Site Closed
34	Chhotedongar_Gudra	Narayanpur	Narayanpur	19°27'33"	81°21'06"	65E/07	Godavari	680.00	2000	Dec-13	
35	Kerlapal_Malengar	Sukma	Konta	18°17'27"	81°34'22"	65F/11	Godavari	720.00	2001	Dec-13	
36	Koylibeda_Mendaki	Kanker	Pakhanjur	19°57'35"	80°59'52"	65A/13	Godavari	730.00	2001	Dec-13	
37	Basaguda_Talperu	Bijapur	Bhopalpattnam	18°33'31"	80°55'19"	65B/14	Godavari	775.00	2001	Dec-13	
38	Manpur_Kotri	Rajnadgaon	Manpur	20°20'00"	80°47'47"	64D/15	Godavari	860.00	2001	Dec-13	
39	Kondagaon_Narangi	Kondagaon	Kondagaon	19°36'58"	81°39'23"	65E/10	Godavari	1090.00	2000	Dec-13	
40	Bhairamgarh_Berudi	Bijapur	Bijapur	19°04'03"	80°51'54"	65A/16	Godavari	1300.00	2001	Dec-13	
41	Balenga_Markandi	Bastar	Jagdalpur	19°16'10"	81°53'11"	65E/15	Godavari	1555.00	2000	Dec-13	
42	Jagdalpur_Indravati	Bastar	Jagdalpur	19°05'39"	82°02'13"	65I/04	Godavari	7380.00	2000	Dec-13	
43	Kotra_Sabari	Sukma	Konta	18°28'35"	81°47'52"	65F/15	Godavari	7569.00	2001	Dec-13	
44	Chhindgarh_GoraliPhul	Sukma	Konta	18°31'11"	81°45'09"	65F/14	Godavari	510.00	2001	2006	Site Closed
45	Pratappur_Kotri	Kanker	Pakhanjur	19°59'40"	80°43'47"	65A/09	Godavari	2464.00	2000	2002	Site Closed
46	Sangampalli_ChintaVagu	Bijapur	Bhopalpattnam	18°45'21"	80°33'32"	65B/09	Godavari	750.00	2003	2004	Site Closed
47	Sonpur_Nibra	Narayanpur	Narayanpur	19°41'41"	81°00'55"	65E/02	Godavari	800.00	2000	2004	Site Closed
48	Lawa-Bomtel	Jashpur	Jashpur	22°57'57"	84°07'23"	73B/01	Bramhani	650.00	2001	Dec-13	


RAINFALL STATION IN CHHATTISGARH
Balrampur
Surajpur
Sarguja
Jashpur
Bilaspur
Korba
Mungeli
Kawardha
Janjgir Champa
Raigarh
Bemetara
Balodabazar
Rajnandgaon
Durg
Raipur
Mahasamund
Balod
Gariyaband
Dhamtari
Kanker
Kondagaon
Narayanpur
Bijapur
Dantewada
Legend
<>
Agency
BSP
CWC
H.P.Project
IMD
REVENUE
W.R.D
District Boundry
<>
Basin
Mahanadi Basin
Godavari Basin
Ganges Basin
Bramhani Basin
Narmada Basin

Rain Fall Station Network Chhattisgarh

Annexure: A2

S. No.	Station Name	District	Latitude			Longitude			Basin	Data Available		Agency
										From	To	
1	Tandula_Vinayakpur	Balod	21	5	0	81	15	0	Mahanadi	2000	2013	H.P.Project
2	Ib-Tapkara	Jashpur	22	29	3	83	55	35	Mahanadi	2000	2013	H.P.Project
3	Seonath_Singdai	Rajnadgaon	21	3	14	81	2	53	Mahanadi	2000	2013	H.P.Project
4	Mahanadi_ Sarangpal	Kanker	20	17	49	81	32	19	Mahanadi	2001	2013	H.P.Project
5	Seonath_Sahagaon	Durg	21	25	18	81	22	17	Mahanadi	2000	2013	H.P.Project
6	Kelo-Raigarh	Raigarh	21	53	30	83	24	5	Mahanadi	2000	2013	H.P.Project
7	Hasdeo_ Piparia	Surguja	22	59	28	82	18	24	Mahanadi	2000	2013	H.P.Project
8	Jonk_Paraswani	Mahasamund	21	12	30	82	38	51	Mahanadi	2000	2013	H.P.Project
9	Hamp-Pandariya	Bemetara	22	12	24	81	23	44	Mahanadi	2000	2013	H.P.Project
10	Seonath_ Nandghat	Balodabazar	21	46	10	81	48	43	Mahanadi	2000	2013	H.P.Project
11	Agar-Mungeli	Mungeli	22	5	52	81	40	25	Mahanadi	2000	2013	H.P.Project
12	Manpur_Kotri	Rajnadgaon	20	20	0	80	47	47	Mahanadi	2003	2013	H.P.Project
13	Tan-Magarha	Korba	22	37	15	82	31	58	Mahanadi	2000	2013	H.P.Project
14	Lath-Madhopali	Raigarh	21	34	38	83	9	45	Mahanadi	2000	2013	H.P.Project
15	Hasdeo-Kudurmal	Korba	22	16	30	82	41	0	Mahanadi	2000	2013	H.P.Project
16	Arpa-Kota	Bilaspur	22	18	5	82	5	55	Mahanadi	2000	2013	H.P.Project
17	Khoring-Khonangmal	Jashpur	22	21	57	83	56	2	Mahanadi	2000	2013	H.P.Project
18	Mahanadi_ Kasdol	Balodabazar	21	38	20	82	23	30	Mahanadi	2000	2013	H.P.Project
19	Kolhan_ Kapasda	Raipur	21	25	55	81	40	23	Mahanadi	2000	2013	H.P.Project
20	Bagnai_ Jamgaon	Mahasamund	21	2	10	82	4	37	Mahanadi	2000	2013	H.P.Project
21	Mand-Hati	Raigarh	22	18	32	83	4	42	Mahanadi	2000	2013	H.P.Project
22	Gej_Gouripur	Surguja	23	2	44	82	37	4	Mahanadi	2000	2013	H.P.Project

S. No.	Station Name	District	Latitude			Longitude			Basin	Data Available		Agency
										From	To	
23	Sakari_ Goreghat	Bemetara	21	54	29	81	29	3	Mahanadi	2000	2013	H.P.Project
24	Jamunia_Godhi	Raipur	21	43	52	82	2	38	Mahanadi	2000	2013	H.P.Project
25	Surhi_Deokar	Durg	21	33	29	81	20	12	Mahanadi	2000	2013	H.P.Project
26	Lawa-Bomtel	Jashpur	22	57	57	84	7	23	Mahanadi	2000	2013	H.P.Project
27	Khorsi_Balodabazar	Balodabazar	21	39	10	82	11	32	Mahanadi	2000	2013	H.P.Project
28	Mahanadi_ Arang	Raipur	21	9	48	82	1	44	Mahanadi	2001	2013	H.P.Project
29	Kharun_Amdi	Raipur	21	5	56	81	34	37	Mahanadi	2000	2013	H.P.Project
30	Kotra_Sabari	Sukma	18	28	35	81	47	52	Godavari	2001	2013	H.P.Project
31	Kondagaon_Narangi	Kondagoan	19	36	58	81	39	23	Godavari	2000	2013	H.P.Project
32	Kerlapal_Malengar	Dantewada	18	17	27	81	34	22	Godavari	2003	2013	H.P.Project
33	Chhotedongar_Gudra	Bastar	19	27	33	81	21	6	Godavari	2003	2013	H.P.Project
34	Bhairamgarh_Berudi	Dantewada	19	4	3	80	51	54	Godavari	2000	2013	H.P.Project
35	Basaguda_Talperu	Bijapur	18	33	31	80	55	19	Godavari	2000	2013	H.P.Project
36	Janakpur(Bharatpur)	Koria	23	43	0	81	48	0	Son	1958	2012	REVENUE
37	Admabad	Balod	20	42	0	81	14	0	Mahanadi	1958	2013	W.R.D
38	Akaltara	Bilaspur	22	1	37	82	25	38	Mahanadi	1997	2011	REVENUE
39	Ambagarh Chowki	Rajnadgaon	20	46	40	80	44	55	Mahanadi	1958	2013	W.R.D
40	Anda	Durg	21	4	0	81	17	0	Mahanadi	1964	2013	REVENUE
41	Arang	Raipur	21	12	45	81	58	0	Mahanadi	1958	2013	REVENUE
42	Arjuni	Baladabagar	21	42	30	82	3	0	Mahanadi	1958	2013	W.R.D
43	Bagbahara	Mahasamund	21	3	0	82	25	54	Mahanadi	1975	2013	REVENUE
44	Bagicha	Jashpurnagar	22	58	30	83	41	07	Mahanadi	1975	2011	REVENUE
45	Baikunthpur	Koria	23	15	15	82	33	45	Mahanadi	1958	2012	REVENUE
46	Balodabazar	Baladabagar	21	39	25	82	9	50	Mahanadi	1958	2013	REVENUE
47	Balod	Balod	20	44	0	81	14	0	Mahanadi	1964	2013	REVENUE

S. No.	Station Name	District	Latitude			Longitude			Basin	Data Available		Agency
										From	To	
48	Baloda_ Janjgir	Janjgir	22	8	13	82	29	0	Mahanadi	2000	2007	REVENUE
49	Banbarod	Durg	21	20	0	81	25	0	Mahanadi	1974	2009	W.R.D
50	Basana	Mahasamund	21	17	0	82	49	44	Mahanadi	1990	2013	REVENUE
51	Bemtara	Bemetara	21	43	45	81	32	55	Mahanadi	1958	2013	REVENUE
52	Berla	Bemetara	21	31	28	81	28	5	Mahanadi	1993	2013	REVENUE
53	Bhalukona	Raipur	21	29	0	81	58	0	Mahanadi	1958	2013	W.R.D
54	Bhatagaon	Durg	20	57	0	81	24	0	Mahanadi	1958	1996	W.R.D
55	Bhatagaon	Dhamtari	20	52	0	81	41	0	Mahanadi	1958	2013	W.R.D
56	Bhatapara	Raipur	21	73	0	81	94	0	Mahanadi	2007	2013	REVENUE
57	Bhilai	Durg	21	12	0	81	25	0	Mahanadi	1958	2004	BSP
58	Bilaigarh	Balodabazar	21	41	12	82	45	0	Mahanadi	1999	2013	REVENUE
59	Bilaspur	Bilaspur	22	5	0	82	9	0	Mahanadi	1958	2011	REVENUE
60	Birgudi_Nagari	Dhamtari	20	12	0	81	11	0	Mahanadi	1975	2013	REVENUE
61	Bodla	Kabirdham	22	10	54	81	13	24	Mahanadi	1974	2013	REVENUE
62	Borid	Durg	21	0	0	81	31	0	Mahanadi	1964	2004	W.R.D
63	Budeni	Raipur	20	53	34	81	53	8	Mahanadi	1958	2013	W.R.D
64	Champa	Janjgir-champa	22	2	0	82	42	10	Mahanadi	1958	2008	IMD
65	Chandi	Durg	21	26	0	81	28	0	Mahanadi	1964	2007	W.R.D
66	Charama	Kanker	20	30	0	81	22	27	Mahanadi	1985	2011	REVENUE
67	Chhati	Dhamtari	20	45	30	81	40	54	Mahanadi	1984	2013	REVENUE
68	Chilhati	Korba	21	47	30	82	18	30	Mahanadi	1964	2010	W.R.D
69	Chirapani	Kabirdham	22	12	30	81	11	45	Mahanadi	1981	2013	W.R.D
70	Chuchurungpur	Raipur	21	33	0	82	7	0	Mahanadi	1974	2013	W.R.D
71	Chuikhadan	Rajnadgaon	21	32	0	81	1	0	Mahanadi	1958	2013	REVENUE
72	Dabhara	Raigarh	21	48	37	83	5	30	Mahanadi	1995	2010	REVENUE

S. No.	Station Name	District	Latitude			Longitude			Basin	Data Available		Agency
										From	To	
73	Dararikorba	Korba	22	24	0	82	42	0	Mahanadi	1974	2011	W.R.D
74	Deobhog	Gariyaband	19	54	0	82	40	0	Mahanadi	1958	2013	REVENUE
75	Dhamdha	Durg	21	27	0	81	15	0	Mahanadi	1993	2013	REVENUE
76	Dhamtari	Dhamtari	20	49	19	81	33	8	Mahanadi	1958	2013	REVENUE
77	Dhara	Rajnadgaon	21	17	0	80	50	0	Mahanadi	1961	2013	W.R.D
78	Dharamjaigarh	Raigarh	22	28	0	83	13	0	Mahanadi	1958	2011	REVENUE
79	Dongargaon	Rajnadgaon	20	58	30	80	51	45	Mahanadi	1997	2013	REVENUE
80	Dongargarh	Rajnadgaon	21	11	0	80	46	0	Mahanadi	1958	2013	REVENUE
81	Doundi	Balod	20	29	16	81	5	20	Mahanadi	1993	2013	REVENUE
82	Doundi Lohara	Balod	20	49	12	81	4	7	Mahanadi	1993	2013	REVENUE
83	Dudhwa	Kanker	20	19	23	81	45	32	Mahanadi	1981	2013	W.R.D
84	Durg	Durg	21	13	0	81	17	0	Mahanadi	1958	2013	REVENUE
85	Gandai	Kabirdham	21	40	0	81	7	0	Mahanadi	1958	2013	REVENUE
86	Gangral	Dhamtari	20	38	0	81	34	0	Mahanadi	1979	2013	W.R.D
87	Gariaband	Gariaband	20	38	0	82	3	34	Mahanadi	1958	2013	REVENUE
88	Gharghoda	Raigarh	22	11	0	83	22	0	Mahanadi	1958	2011	REVENUE
89	Ghonga	Bilaspur	22	18	0	81	58	0	Mahanadi	1981	2011	W.R.D
90	Gondly	Balod	20	45	0	81	8	0	Mahanadi	1965	2013	W.R.D
91	Gudhiyari	Durg	21	1	0	81	25	0	Mahanadi	1974	1996	REVENUE
92	Gundardehi	Balod	20	58	20	81	17	30	Mahanadi	1993	2013	REVENUE
93	Gurur	Balod	20	41	45	81	24	30	Mahanadi	1993	2013	REVENUE
94	Janjgir	Janjgir-champa	22	1	0	82	35	0	Mahanadi	1958	2011	REVENUE
95	Jaijaipur	Janjgir-champa	21	49	49	82	48	48	Mahanadi	2008	2011	REVENUE
96	Jahspurnagar	Jashpurnagar	22	53	0	84	8	0	Mahanadi	1958	2011	REVENUE
97	Kanker	Kanker	20	16	0	81	29	0	Mahanadi	1960	2013	REVENUE

S. No.	Station Name	District	Latitude			Longitude			Basin	Data Available		Agency
										From	To	
98	Kanki	Balodabazar	21	23	0	81	59	0	Mahanadi	1958	2013	REVENUE
99	Kasdol	Balodabazar	21	37	15	82	25	35	Mahanadi	2000	2013	REVENUE
100	Katghora	Korba	22	30	15	82	33	0	Mahanadi	1958	2011	REVENUE
101	Kawardha	Kabirdham	22	1	0	81	14	0	Mahanadi	1958	2013	REVENUE
102	Kedarnalla	Raigarh	21	34	0	82	54	0	Mahanadi	1974	2009	W.R.D
103	Khairagarh	Rajnadgaon	21	24	0	80	58	0	Mahanadi	1958	2013	REVENUE
104	Khajrawan_Kanker	Kanker	20	1	10	81	45	18	Mahanadi	1971	2006	W.R.D
105	Khamaharpukui	Raigarh	22	24	30	83	33	30	Mahanadi	1982	2010	W.R.D
106	Khapri	Durg	21	2	0	81	24	0	Mahanadi	1958	2013	W.R.D
107	Kharang	Bilaspur	22	17	21	83	13	12	Mahanadi	1980	2011	W.R.D
108	Kharkhara	Balod	20	58	0	81	2	0	Mahanadi	1970	2013	W.R.D
109	Kharra	Durg	21	33	0	81	34	0	Mahanadi	1958	2013	W.R.D
110	Kharsiya	Raigarh	21	59	0	83	7	0	Mahanadi	1985	2011	REVENUE
111	Khuria	Bilaspur	22	23	15	81	35	56	Mahanadi	1958	2011	W.R.D
112	Khutaghat	Bilaspur	22	18	0	82	12	30	Mahanadi	1958	2011	W.R.D
113	Kinkari	Raigarh	21	27	17	83	17	58	Mahanadi	1978	2010	W.R.D
114	Kodar	Mahasamund	21	11	50	82	10	40	Mahanadi	1991	2013	W.R.D
115	Kondapar	Raipur	21	0	30	81	44	0	Mahanadi	1974	2013	W.R.D
116	Kota	Bilaspur	22	16	0	82	2	0	Mahanadi	1981	2011	REVENUE
117	Kunkuri	Jashpurnagar	22	44	0	83	57	0	Mahanadi	1977	2010	REVENUE
118	Lahud	Raipur	21	38	0	82	17	0	Mahanadi	1958	2011	REVENUE
119	Lailunga_Raigarh	Raigarh	22	25	13	83	34	7	Mahanadi	2000	2011	REVENUE
120	Lakholi	Raipur	21	12	0	81	53	0	Mahanadi	1958	2007	W.R.D
121	Madiyan	Rajnadgaon	21	8	0	80	37	0	Mahanadi	1961	2008	W.R.D
122	Mahasamund	Mahasamund	21	7	0	82	7	0	Mahanadi	1958	2013	REVENUE

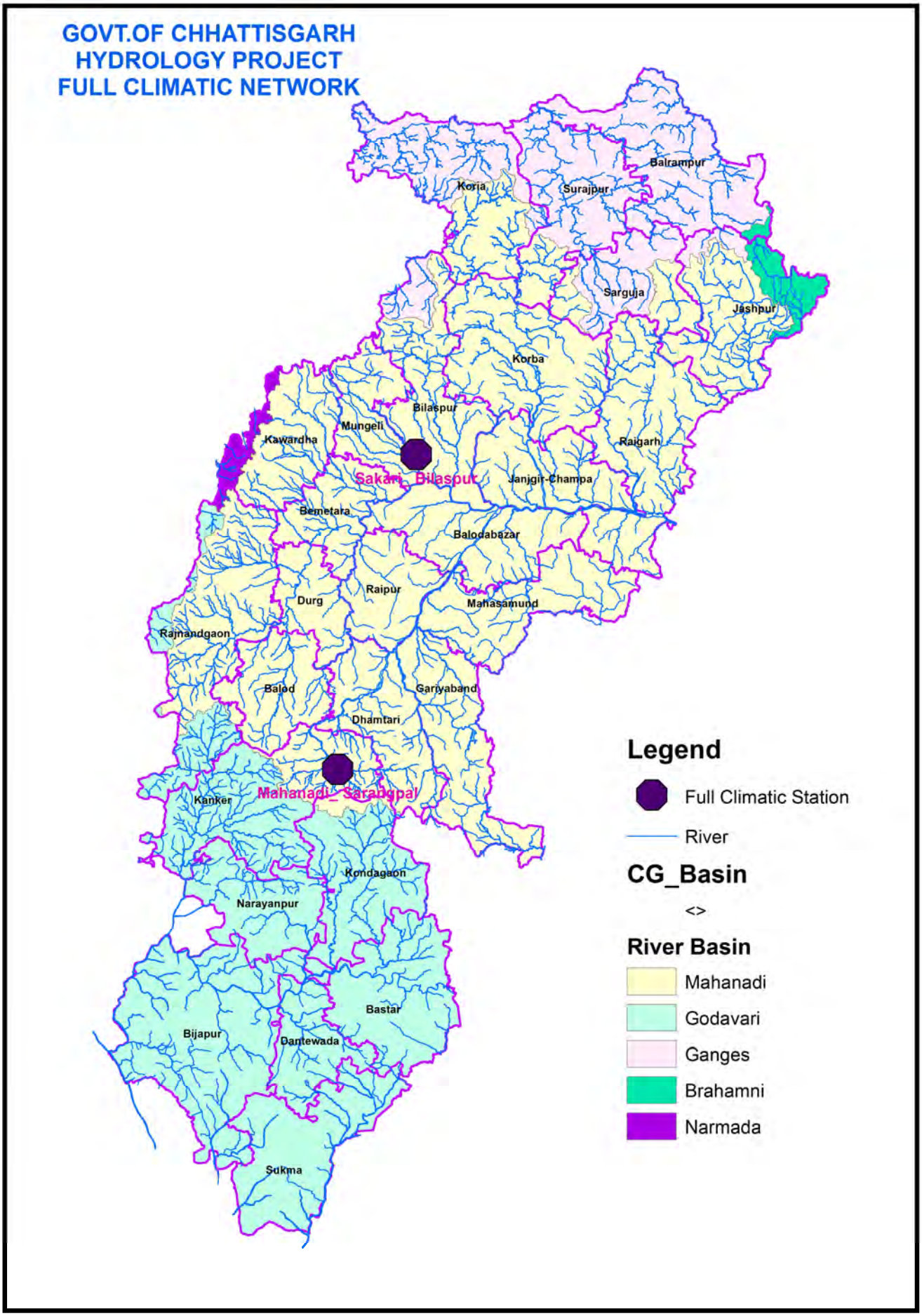
S. No.	Station Name	District	Latitude			Longitude			Basin	Data Available		Agency
										From	To	
123	Malkharoda	Bilaspur	21	51	30	82	59	7	Mahanadi	1994	2011	REVENUE
124	Mand [Bhalunara]	Raigarh	21	58	6	83	10	8	Mahanadi	1978	2008	REVENUE
125	Manendragarh	Koria	23	12	45	82	12	20	Mahanadi	1972	2012	REVENUE
126	ManiyariTank	Mungali	22	25	15	81	35	36	Mahanadi	1966	2011	W.R.D
127	Mainpur	Gariaband	20	17	0	82	14	0	Mahanadi	1975	2011	REVENUE
128	Matia	Durg	20	55	0	81	14	0	Mahanadi	1964	2013	W.R.D
129	Mayana	Kanker	20	25	0	81	17	0	Mahanadi	1981	1993	W.R.D
130	Mohala	Rajnadgaon	20	34	15	80	45	15	Mahanadi	1975	2013	REVENUE
131	Moorumsilli	Dhamtari	20	32	0	81	40	0	Mahanadi	1975	2013	W.R.D
132	Mungeli	Mungeli	22	4	0	81	41	0	Mahanadi	1958	2011	REVENUE
133	Nawagarh	Bemetara	21	54	22	81	36	21	Mahanadi	1993	2013	REVENUE
134	Newara (Tilda)	Raipur	21	33	0	81	50	0	Mahanadi	1981	2013	REVENUE
135	Oteband	Durg	21	20	0	81	31	0	Mahanadi	1964	2013	REVENUE
136	Pallari	Balodabazar	21	32	0	82	9	0	Mahanadi	1998	2013	REVENUE
137	Pamgarh_Janjgir	Janjgir-champa	21	52	52	82	27	7	Mahanadi	1997	2011	REVENUE
138	Pandaria	Bilaspur	22	13	0	81	25	0	Mahanadi	1958	2011	REVENUE
139	Patan	Durg	21	2	15	81	33	0	Mahanadi	1993	2013	REVENUE
140	Pathalgaon	Jashpurnagar	22	33	0	83	28	0	Mahanadi	1958	2011	REVENUE
141	Pendraroad	Bilaspur	22	46	0	81	54	0	Mahanadi	1958	2011	IMD
142	Pindrawan	Raipur	21	24	0	81	51	0	Mahanadi	1975	2013	W.R.D
143	Pipariya	Rajnadgaon	21	27	0	80	57	0	Mahanadi	1980	2000	W.R.D
144	Pirda	Durg	21	25	0	81	35	0	Mahanadi	1964	1996	W.R.D
145	Pithora	Mahasamund	21	15	30	82	31	0	Mahanadi	1975	2013	REVENUE
146	Putka	Raigarh	21	32	48	83	5	30	Mahanadi	1977	2009	W.R.D
147	Raigarh	Raigarh	21	53	0	83	24	0	Mahanadi	1958	2011	REVENUE

S. No.	Station Name	District	Latitude			Longitude			Basin	Data Available		Agency
										From	To	
148	Raipur	Raipur	21	15	0	81	38	0	Mahanadi	1958	2013	REVENUE
149	Rajim	Gariaband	20	58	0	81	53	0	Mahanadi	1980	2013	REVENUE
150	Rajnandgaon	Rajnandgaon	21	0	0	81	2	45	Mahanadi	1958	2013	REVENUE
151	Rudri	Dhamtari	20	38	0	81	34	0	Mahanadi	1958	2013	W.R.D
152	Ruse Tank	Rajnadgaon	21	17	0	80	58	10	Mahanadi	1974	2013	W.R.D
153	Sahspur	Kabirdham	21	54	0	81	7	0	Mahanadi	1964	2013	REVENUE
154	Saja	Bemetara	21	39	44	81	19	0	Mahanadi	1993	2013	REVENUE
155	Sakti	Janjgir-champa	22	2	0	82	58	0	Mahanadi	1958	2011	REVENUE
156	Sandi	Raipur	21	27	0	82	4	0	Mahanadi	1958	2013	REVENUE
157	Saraipalli	Mahasamund	21	19	0	83	1	0	Mahanadi	1975	2013	REVENUE
158	Sarangarh	Raigarh	21	35	0	83	5	0	Mahanadi	1975	2013	REVENUE
159	Saroda	Kabirdham	21	58	0	81	8	0	Mahanadi	1970	2013	W.R.D
160	Selud	Durg	21	5	0	81	20	0	Mahanadi	1958	2013	W.R.D
161	Semartal	Bilaspur	22	11	0	82	10	0	Mahanadi	1964	2010	W.R.D
162	Sheorinarayan	Janjgir-champa	21	43	0	82	36	0	Mahanadi	1958	2010	REVENUE
163	Sikasar	Gariaband	20	32	0	82	19	0	Mahanadi	1974	1997	W.R.D
164	Simga	Balodabazar	21	37	13	81	42	18	Mahanadi	1981	2013	REVENUE
165	Sitapur	Surguja	22	47	0	83	29	45	Mahanadi	1975	2012	REVENUE
166	Sond	Durg	21	32	0	81	27	0	Mahanadi	1964	2013	W.R.D
167	Sondur	Dhamtari	20	14	0	82	6	0	Mahanadi	1981	2013	W.R.D
168	Surhi (Palemeta)	Kabirdham	21	41	0	81	0	0	Mahanadi	1964	2000	W.R.D
169	Tapkara	Jashpurnagar	22	30	30	83	57	0	Mahanadi	1962	2010	REVENUE
170	Tarra	Durg	21	7	0	81	31	0	Mahanadi	1964	1994	W.R.D
171	Temri_Durg	Durg	21	47	0	81	52	0	Mahanadi	1970	1995	REVENUE
172	Thanod	Raipur	21	4	0	81	49	0	Mahanadi	1974	2013	W.R.D

S. No.	Station Name	District	Latitude			Longitude			Basin	Data Available		Agency
										From	To	
173	Chhuriya	Rajnandgaon	21	0	30	80	38	0	Mahanadi	1998	2013	REVENUE
174	Kurud	Dhamtari	20	50	0	81	43	0	Mahanadi	1972	2013	REVENUE
175	Manpur	Rajnadgaon	20	22	50	80	43	50	Godawari	1987	2013	REVENUE
176	Saleh Bhatti	Rajnadgaon	20	14	30	80	28	50	Godawari	1982	1990	W.R.D
177	Antagarh	Kanker	20	5	31	81	5	7	Godavari	1977	2013	REVENUE
178	Bhanupratappur	Kanker	20	19	0	81	5	0	Godavari	1960	2013	REVENUE
179	Bhopal Patnam	Bijapur	18	52	0	80	23	0	Godavari	1960	2011	REVENUE
180	Bijapur	Bijapur	18	47	0	80	49	0	Godavari	1960	2011	REVENUE
181	Dantewada	Dantewada	18	53	0	81	21	0	Godavari	1960	2011	REVENUE
182	Jagdalpur	Bastar	19	5	0	82	2	0	Godavari	1960	2013	IMD
183	Keskal	Kondagoan	20	5	0	81	36	0	Godavari	1981	2005	REVENUE
184	Kondagoan	Kondagoan	19	36	0	81	39	0	Godavari	1960	2013	REVENUE
185	Konta	Sukma	17	48	0	81	23	0	Godavari	1960	2011	REVENUE
186	Narayanpur	Narayanpur	19	43	0	81	15	0	Godavari	1960	2011	REVENUE
187	Pakhanjor	Kanker	20	2	6	80	37	52	Godavari	1980	2013	REVENUE
188	Sukma	Sukma	18	23	0	81	40	0	Godavari	1960	2011	REVENUE
189	Ambikapur	Surguja	23	7	0	83	11	30	Ganga	1958	2012	REVENUE
190	Kusmi	Balrampur	23	17	0	83	54	30	Ganga	1958	2012	REVENUE
191	Lundra	Sarguja	23	7	15	83	26	0	Ganga	2008	2011	REVENUE
192	Mainpath	Surguja	22	49	57	83	19	50	Ganga	2009	2012	REVENUE
193	Odagi	Surajpur	23	28	34	82	48	22	Ganga	2009	2012	REVENUE
194	Shankargarh	Balrampur	23	18	0	83	36	0	Ganga	2008	2012	REVENUE
195	Surajpur	Surguja	23	13	0	82	52	0	Ganga	1975	2012	REVENUE
196	Udaypur	Surguja	22	55	33	82	58	3	Ganga	2009	2012	REVENUE
197	Wadrafnagar	Balrampur	23	44	21	83	13	46	Ganga	2009	2012	REVENUE

S. No.	Station Name	District	Latitude			Longitude			Basin	Data Available		Agency
										From	To	
198	Balrampur	Balrampur	23	38	0	83	37	0	Ganga	2009	2012	REVENUE
199	Pratappur	Surajpur	23	29	10	83	12	30	Ganga	2009	2012	REVENUE
200	Ramanujganj	Surajpur	23	48	30	83	42	12	Ganga	1975	2012	REVENUE
201	Raipur	Raipur	21	13	0	81	40	0	Mahanadi			IMD
202	Mahasamund	Mahasamund	21	6	0	82	6	0	Mahanadi			IMD
203	Dhamtari	Dhamtari	20	42	0	81	34	0	Mahanadi			IMD
204	Durg	Durg	20	40	0	81	29	0	Mahanadi			IMD
205	Rajnandgoan	Rajnandgoan	21	5	0	81	2	0	Mahanadi			IMD
206	Kabirdham	Kabirdham	22	13	0	81	15	0	Mahanadi			IMD
207	KankerNorth Bastar	Kanker	20	15	0	81	30	0	Mahanadi			IMD
208	Bilaspur	Bilaspur	22	5	0	82	8	56	Mahanadi			IMD
209	Janjgir_Champa	Janjgir	21	59	0	82	34	0	Mahanadi			IMD
210	Korba	Korba	22	36	15	82	36	0	Mahanadi			IMD
211	Baikunthpur	Koria	23	15	15	82	33	45	Mahanadi			IMD
212	Raigarh	Raigarh	21	53	0	83	24	0	Mahanadi			IMD
213	JaspurNagar	Jaspur	22	53	0	84	8	0	Mahanadi			IMD
214	Jagdalpur	Bastar	19	5	0	82	2	0	Godawari			IMD
215	Narayanpur	Narayanpur	19	43	0	81	15	0	Godawari			IMD
216	Dantewada	Dantewada	18	53	0	81	21	0	Godawari			IMD
217	Bijapur	Bijapur	18	47	0	80	49	0	Godawari			IMD
218	Ambikapur	Sarguja	23	7	5	83	11	0	Ganga			IMD
219	Andhiyarkore_Hamp	Durg	21	47	0	81	36	30	Mahanadi			CWC
220	Bamnidhi_Hasdeo	Janjgir_Champa	21	53	39	82	43	12	Mahanadi			CWC
221	Bangodam_Hasdeo	Korba	22	34	0	82	35	0	Mahanadi			CWC
222	Baronda_Pairi	Raipur	20	55	6	81	52	56	Mahanadi			CWC

S. No.	Station Name	District	Latitude			Longitude			Basin	Data Available		Agency
										From	To	
223	Basantpur_Mahanadi	Janjgir_Champa	21	43	18	82	47	27	Mahanadi			CWC
224	Gatora_Arpa	Bilaspur	21	2	4	82	13	34	Mahanadi			CWC
225	Jondhara_Seonath	Bilaspur	21	43	0	82	20	34	Mahanadi			CWC
226	Korba_Hasdeo	Korba	22	23	0	82	41	30	Mahanadi			CWC
227	Kotni_Seonath	Bilaspur	22	7	52	81	14	19	Mahanadi			CWC
228	Kurubhata_Mand	Raigarh	21	59	15	83	12	15	Mahanadi			CWC
229	Manendragarh_Hasdeo	Koriya	23	12	10	82	12	54	Mahanadi			CWC
230	Patharidih_Kharun	Raipur	21	20	28	81	35	48	Mahanadi			CWC
231	Rajim_Mahanadi	Raipur	20	58	0	81	52	30	Mahanadi			CWC
232	Rampur_Jonk	Mahasamund	21	39	0	82	31	0	Mahanadi			CWC
233	Sankara_Jonk	Mahasamund	21	16	0	82	31	0	Mahanadi			CWC
234	Seorinarayan_Mahanadi	Bilaspur	21	43	0	82	35	30	Mahanadi			CWC
235	Simga_ Seonath	Raipur	21	13	2	81	41	36	Mahanadi			CWC
236	Ambabal_Narangi	Bastar	19	7	0	81	47	20	Godawari			CWC
237	Cheribeda_Baroda	Kondagoan	19	38	23	81	29	7	Godawari			CWC
238	Chindnar_Indravati	Dantewara	19	5	0	81	18	0	Godawari			CWC
239	Jagadalpur_Indravati	Bastar	19	6	30	82	1	30	Godawari			CWC
240	Pathagudem_Indravati	Dantewara	18	49	0	80	21	0	Godawari			CWC
241	Tumnar_Dantewada	Dantewara	19	0	30	81	14	20	Godawari			CWC


GOVT.OF CHHATTISGARH
HYDROLOGY PROJECT
FULL CLIMATIC NETWORK
Balrampur
Koria
Surajpur
Sarguja
Jashpur
Korba
Bilaspur
Mungeli
Kawardha
Raigarh
Sakari_Bilaspur
Janjgir-Champa
Bemetara
Baloda bazar
Raipur
Durg
Mahasamund
Rajnandgaon
Balod
Gariyaband
Dhamtari
Mahanadi_Sarangpal
Kanker
Kondagaon
Narayanpur
Bastar
Bijapur
Dantewada
Sukma
Legend
Full Climatic Station
River
CG_Basin
<>
River Basin
Mahanadi
Godavari
Ganges
Brahamni
Narmada

List of Full Climatic Station (F.C.S.)

Annexure: A3

S.No	Station Name	District	Tahsil	Latitude	Longitude	Topo Sheet No	Data Available	
							From	To
1	Sakari-Bilaspur(FCS)	Bilaspur	Bilaspur	22°07'00"	82°06'00"	64J/04	2003	2013
2	Sarangpal-Kanker(FCS)	Kanker	Kanker	20°17'00"	81°32'00"	64H/07	2008	2013

SECRECY – UNDERTAKING

Name in full with Designation:

I do hereby undertake to abide by the following conditions in respect of Hydrological Data supplied.

1. The Hydrological data pertaining to the Chhattishgarh state collected from the office of the Deputy Director Hydrometeorology Division No.- 4, Raipur Chhattisgarh. To office letter No:.....dated from the..... will be used strictly for the said officials purpose for which the data has been asked for.

2. The data will not be supplied to any Governmental/Non-Governmental or public sector undertaking without the prior concurrence/fresh permission of the of Water Resources Department, Chhattishgarh.

3. The said data being of classified nature will be handled strictly in accordance with the stipulated instructions in regard to observance of secrecy by Government of India from time to time.

4. The data will not be published without the prior permission of Water Resources Department, Chhattisgarh.

5. Any inferences drawn based on these data be the sole responsibility of users.

Signature of the officer of the rank of Chief Engineer or above

Dated:

Name of in full with Designation:
Department:
Office

Signature attested

Name & Designation of the Officer authorised to collect the data

GENERAL HYDROLOGIACAL DATA REQUEST FORMAT

1. Name of the User agency:
2. Purpose and objective:
3. Name of the River (s) and site:
4. Type of the data required:
   (Gauge, Discharge, Sediment,
   Water Quality and Rain fall)
   (a) Monsoon
   (b) Non-Monsoon
5. **Period for which the data is required**
   (From.....to.....)
   (c) Monsoon
   (d) Non-Monsoon
6. **Periodicity**
   (Annual/Monthly/10-daily)
7. Minimum data requirement:

SIGNATURE:

Name and Designation:

(Not below the rank of Chief Engineer):

Office Seal:

Authorised officer to collect data:

(Name & Designation)

Attested Signature of the

authorised Officer :

List of Data Dissemination

Annexure : C

S. No.	Date	Data user & Address	Purpose of Data Acquire
1	*2*	*3*	*4*
1	26/04/2003	Executive Engineer, W.R.D. Division, Janjgir-Champa	Water Resources Project
2	30/04/2003	Executive Engineer M.R.P. Dam Divn.II, Rudri Dhamtari	Hydrology Revision (P.H.D. Gariyaband)
3	11/05/2003	Executive Engineer W.R.D. Divn., Kota, Bilaspur	Arpa Projet
4	17/06/2003	Executive Engineer M.R.P. Phace- II Divn., Raipur	Rajiv Gandhi Diversion work(Samoda)
5	02/04/2004	Mr. J. K. Diwan Dy. Team Leader, ADB PPTA Project, State Data Centre, Raipur	C.I.D.P. (ADB) Irrigation Projet
6	07/05/2004	Miss Priti Nag, Engg. College student Raipur	P.G.Course
7	12/05/2004	Mr. J. K. Diwan Dy. Team Leader, ADB PPTA Project, State Data Centre, Raipur	C.I.D.P. (ADB) Irrigation Project
8	08/06/2004	Mr. Pankaj Agrawal, for ABN Ispat Powers Pvt. Ltd., Raipur	Power Plant
9	15/06/2004	Mr. Pankaj Agrawal, for ABN Ispat Powers pvt. Ltd., 6, Samta Colony, Raipur	Hydel Power Proj. in Chhattisgarh
10	18/06/2004	Executive Engineer W.R.D. Div., Raipur	Irrigation Works
11	28/07/2004	Dr. A. Mukharjee , Asstt. Hydro Geohydrologist, CGWB, NCCR, Raipur	Hydrological Report of Raigarh Distt.
12	31/07/2004	S.D.O., Canal Sub. Div. No. 2, Dongargaon	Ghumari Nalla, Khatutoal & Sukha Nalla Barraage
13	18/08/2004	Asstt. Hydrologist, CGWB, Raipur	Prepration of G.W. management report
14	19/08/2004	Mr. M. K. Jain NIH Roorkee	Project Report on Amelioration of Modeling under H.P.-II
15	02/09/2004	Executive Engineer, Kelo Project Survey Division, Raigarh	Project Report of Kelo (Indira Sargar) Project
16	03/09/2004	Power Grid Corporation Durg	Preparation of Sub Station
17	10/09/2004	S.D.O., W.R.D. Sub. Div. Deobhog, Raipur	Water Resources Project
18	16/09/2004	Director, CGWB Raipur Chhattisgarh	Hydrological studies
19	05/10/2004	Executive Engineer, M.R.P. Disnet Div. No.3, Tilda	CSEB Thermal Power Station near Simga

S. No.	Date	Data user & Address	Purpose of Data Acquire
20	26/10/2004	Executive Engineer., W.R.D. Div., Mahasamund	Irrigation Works
21	17/11/2004	Mr. Pankaj Agrawal, for ABN Ispat Powers Pvt. Ltd., Raipur	Survey & Project Report
22	17/03/2005	Senior Scientist /SF/ RRSSC/ISRO, Cazri Campus, Jodhpur	Water loging & sedimination project of CWC
23	13/04/2005	S.D.O., Karra Nalla, Kabhirdham	Flood Forecasting
24	02/05/2005	S.D.O., N.H. Sub. Div. No. 2, Raipur	Bridge Designing
25	21/06/2005	Executive Engineer, P.H.E. Div. , Raipur	Water supply scheme in Bhatapara
26	07/07/2005	DGM (TS) NTPC Western Region HQ. Mumbai	M/w Power Station at Lara
27	18/11/2005	Power Grid Corp., Kumhari, Durg	Designing of Tower
28	29/12/2005	Regional Director, CGWB, Raipur	Project Report
29	29/12/2005	Director, Shivalik power & steel pvt. Ltd. Rajendra Nagar, Raipur	Power plant
30	06/02/2006	M.M. Sub. Div. No.1, CWC, Raipur	Project Report
31	13/02/2006	Executive Engineer, W.R.D. Div., Kondagaon	Irrigation Works
32	13/02/2006	Executive Engineer, W.R.D. Div., Janjgir-Champa	Industrial purpose
33	28/02/2006	Mr. Pankaj Agrawal, for ABN Ispat Powers Pvt. Ltd., , Raipur	Industrial purpose
34	24/05/2006	Center for science & Enviornment	Study of environment quality in CG
35	26/05/2006	CREDA, Raipur	Mini Hydel Project
36	19/06/2006	Executive Engineer, W.R.D., Baraj, Dongargaon	Ghumariya nalla project
37	18/10/2006	Executive Engineer, Kelo Project Survey Div., Raigarh	Study of Hydrology for Kelo Proj.
38	25/11/2006	CREDA, Raipur	Hydro project
39	31/01/2007	MBPCL, Raipur	Hydel Plant
40	08/02/2007	CREDA, Raipur	Official Power Project

S. No.	Date	Data user & Address	Purpose of Data Acquire
41	25/04/2007	CREDA, Raipur	Official Power Project
42	25/06/2007	Wardha Power Company Pvt. Ltd., Hydrabad	Power Project
43	10/08/2007	Sigma Resources Development Consultants Pvt. Ltd., Ranchi	Power Project
44	27/11/2007	P.N. Power Project pvt. Ltd., Lajpatnagar, New Delhi 110024	Power Project
45	22/12/2007	J. K. Laxmi, Cement Ltd., Bahudur Shah Jafar Marg, New Delhi	Cement Industry
46	31/01/2007	Manager (TS) Talaipali Coal Mining Project, 56 Gajanand Puram, Kotra Road, Raigarh	Power Project
47	04/04/2008	The Associate Professor Department of Civil Engineer, Bhilai Institutional of Technology, Durg	Project Purpose
48	31/01/2008	Wapcos Delhi, (Through The E.E., MRP Phase-II Work, Divn., Raipur)	Water Resources Master Plan
49	02/02/2008	Project Director, CIDP, ADB, Chhattisgarh Raipur	Water Resources Project
50	20/3/2008	SDO, PWD (Bridge Construction) Sub Division, Raipur	Bridge Designing
51	04/04/2008	HOD of Civil Engineering, NIT Raipur	Project Purpose
52	22/04/2008	Thakare Consultancy services, structures Design & Consultant, Raipur	Project Design
53	05/09/2008	BODHI, Cell WRD, E-in-C, Raipur	Water Resources Project
54	14/08/2008	CSEB, Raipur Shri S.K.Maitra Junior Constrtact CSEB, Raipur	C.S.E.B. Project
55	14/08/2008	M/s J. K. Lakshmi, Cement Limited, Bhilai	Cement Plant Project Work
56	22/08/2008	THE E.E., Kharkhara Mohadipat Project Division, Durg	Water Resources Project Mohad.
57	09/02/2008	AICRP on GWU Dept., of Soil & Water Engg. Agricultural Rngineer IGAU, Raipur	Project Purpose
58	31/10/2008	General Manager (Project) BSBK Private Limited, BSBK House Nandani Road, Bhilai 490011	Power Project
59	11/03/2008	General Manager (Project) BSBK Private Limited, BSBK House Nandani Road, Bhilai 490011	Power Project
60	27/10/2008	Miss Shivlee Chakaraborty M. Tech (SWC) III Sem. Allahabad Agricultural Institute Deemed University, (UP)	Project Purpose
61	14/11/2008	Miss Shivlee Chakaraborty M. Tech (SWC) IIIsem. Allahabad Agricultural Institute Deemed University, (UP)	Project Purpose

S. No.	Date	Data user & Address	Purpose of Data Acquire
62	29/01/2009	The Manager, Secon Private Limited (Project)	Planning Work
63	13/02/2009	The Manager (Admi.) Mainpat Green Energy Pvt. Ltd., Hyderabad (A.P.)	Power Project
64	13/02/2009	The Manager (Admi.) Mainpat Green Energy Pvt. Ltd., Hyderabad (A.P.)	Power Project
65	13/02/2009	The Manager (Admi.) Pholpad Green Energy Pvt. Ltd., Hyderabad (A.P.)	Power Project
66	13/02/2009	The Manager (Admi.) North East Hydro Energy Pvt. Ltd., Hyderbad (AP)	Power Project
67	16/03/2009	The Executive Engineer, W.R.Division, Raipur	Water Resources Project
68	31/03/2009	The Professor (Civil Engg.) NIT, Raipur	Research work
69	04/08/2009	The Bhagavati Arc Lab Ltd., M-22, Opposite united 7 Hospital Sect.1, Avanti Vihar, Raipur	Environment Study for CSIDC
70	22/04/2009	The Executive Engineer, Kharkhara Mohadipat Project Division, Dureg	Water Resources Project
71	05/07/2009	The Executive Engineer, M.R.P. Phase-II Workds Division, Raipur	Data for W.R. Project
72	19/05/2009	The Executive Engineer, M.R.P. Phase-II Workds Division, Raipur	Data for W.R. Project
73	20/05/2009	The Professor (Civil Engg.) NIT, Raipur	Project Purpose
74	23/05/2009	The Managing Director AASMA Marketing Schefee School, Mungeli Naka, Bilaspur	NMDC Project
75	25/05/2009	The C.O. Edition, Environment Energyfoundation (NGO) 28 college Rooad Chubey Colony, Raipur	N.G.O. Project, Nandghat
76	07/01/2009	The C.O. Edition, Environment Energyfoundation (NGO) 28 college Rooad Chubey Colony, Raipur	N.G.O. Project, Arang
77	17/08/2009	The Canal Deputy Collector W.M.Divn No.2, Raipur	Data for W.R. Project
78	20/08/2009	The Laxmi Civil Engineering Services Pvt.Ltd Raipur	Project Work, Gariyaband
79	28/08/2009	The Manager Vijeta Construction Company Raipur	Road Project Work,
80	14/09/2009	The Executive Engineer Kharkhara Mohadipat Project Divn.Durg	Water Resources Project
81	25/09/2009	The Chief Engineer Minimata Hasdeo Bango Project Bilaspur	Water Resources Project
82	23/10/2009	The Executive Engineer Maniyari W.R. Divn.Mungali Distt Bilaspur	Water Resources Project

S. No.	Date	Data user & Address	Purpose of Data Acquire
83	06/11/2009	The General Manager Commercial Shri Bajrang Ispat Ltd Raipur	Power Plant
84	27/11/2009	The Asst. General Manager AES Chhattisgarh Energy Pvt. Ltd Raipur	For Power Plant
85	11/12/2009	The Managing Director Chhattisgarh Energy Consortium(India) Ltd Hyderabad	For Power Plant
86	17/12/2009	To Mr S.K.Tiwari Student M.Tech.IIT Khadakpur (W.B.)	Research work
87	17/12/2009	To Mr Vedvyas Dhruw Student B.Tech.NIT Raipur	Research work
88	24/12/2009	The Executive Engineer K.M. Divn.Durg	Water Resources Project
89	30/12/2009	To Mr R.K.Sahu Dean I.G.K.V.Raipur	Research work
90	07/01/2010	To Project Director Katya Power Project Hyderabad	Power Plant
91	19/01/2010	To Mrs Archana Choudary H.O.D. Civil Indore M.P.	Research work
92	20/01/2010	The Executive Engineer Kharang W.R. Divn.Bilaspur	Water Resources Project
93	01/02/2010	To Project Director Modern green Energy Project Hyderabad	Power Plant
94	01/02/2010	To Project Director Mainpat green Energy Project Hyderabad	Power Plant
95	02/02/2010	To Project Director Green Energy Project Hyderabad	Power Plant
96	04/03/2010	The Executive Engineer K.M.Project Divn.Durg Distt.Durg	Water Resources Project
97	15/03/2010	To Mr S.K.Bhaduri Conslt. Jindal Power Ltd Tamnar Distt.Raigarh	Power Plant
98	22/03/2010	The Aasma Markiting Pvt.ltd .Bilaspur	Project work
99	26/03/2010	To Mr Asish Pandey Prof. IIT Roorkee	Project work
100	01/04/2010	To MrShiv Singh Student BTech I.G.K.V.Raipur	Project work
101	09/04/2010	Mr Pritosh Pandey (Business Head) IFFCO TOKIO INSU.Co.Raipur	Agriculture Insurance Work
102	26/04/2010	Mr Pritosh Pandey (Business Head) IFFCO TOKIO INSU.Co.Raipur	Agriculture Insurance Work
103	26/04/2010	Mr Pritosh Pandey (Business Head) IFFCO TOKIO INSU.Co.Raipur	Agriculture Insurance Work

S. No.	Date	Data user & Address	Purpose of Data Acquire
104	27/04/2010	Mr V.B.saligram Engineer Associate .Bhopal	Project work
105	28/04/2010	The Executive Engineer Maniyari W.R. Divn.Mungali Distt.Mungali	Water Resources Project
106	17/06/2010	To Miss Kumud S. Meshram IGKU Raipur	Project work
107	18/06/2010	Mr Pritosh Pandey (Business Head) IFFCO TOKIO INSU.Co.Raipur	Agriculture Insurance Work
108	18/06/2010	Mr Pritosh Pandey (Business Head) IFFCO TOKIO INSU.Co.Raipur	Agriculture Insurance Work
109	23/07/2010	To, TheRegional Director Central Ground Board Raipur	Ground Water Project
110	02/08/2010	The Executive EngineerM.R.P. Phase II Divn.Raipur	Water Resources Project
111	03/09/2010	The Mr Ayodha Das Manikpuri , Lanco Solar Pvt.Ltd. Raipur	Power Project
112	26/10/2010	The EngineerIn Chief W.R. Deptt. Raipur	Water Resources Project Govt. Of Orrisa
113	26/10/2010	Mr Nitin Verma (Business Head) IFFCO TOKIO INSU.Co. Raipur	Agriculture Insurance Work
114	08/11/2010	The Project Manager Savitri Power Project Hyderabad (A.P.)	Power Project
115	30/12/2010	The Executive EngineerM.R.P.Dam Divn.No.II Rudri	Water Resources Project
116	05/02/2011	To,Shri R.K.Sahu Dean IGAU Raipur	Agriculture Insurance Work
117	05/02/2011	The Executive Engineer Maniyari W.R. Divn.Bemetara Distt. Durg	Water Resources Project
118	0702/2011	To,Shri S.K.Verma Senior Sc"C" C.G.W.B Raipur	Project work
119	10/03/2011	To The S.E. , W R & GWSC Raipur	Water Resources
120	14/03/2011	To The Assistant Professor Deptt of Civil engineering NIT Raipur	Project work
121	17/03/2011	Mr Nitin Verma (Business Head) IFFCO TOKIO INSU.Co.Raipur	Agriculture Insurance Work
122	18/03/2011	Mr Nitin Verma (Business Head) IFFCO TOKIO INSU.Co.Raipur	Agriculture Insurance Work
123	29/03/2011	The Executive Engineer MRP Phase II Works Divn.Raipur	Water Resources Project
124	31/03/2011	To Mrs Shiulee Chakraborty Research Scholar WRD&M IIT Roorkee	Project work

S. No.	Date	Data user & Address	Purpose of Data Acquire
125	13/04/2011	The Executive Engineer W.R. Divn. Bilaspur	Water Resources
126	03/05/2011	The Director Space GeoTech Natural Resources Management Bangalore	Project work
127	14/06/2011	The Director Space GeoTech Natural Resources Management Bangalore	Project work
128	14/06/2011	The Additional Director Police STF Raipur	Police Deptt.Work
129	05/07/2011	The Executive Engineer K.M. Divn.Durg	Water Resources Project
130	17/08/2011	Shri M.L. Kansal Professor IIT roorkee	Project work
131	23/08/2011	To,Shri R.K.Roy Senior Sc"C" C.G.W.B Raipur	Project work
132	02/09/2011	The Executive Engineer Mini Mata bango Canal Divn.No.2 champa janjgir	Water Resources Project
133	22/09/2011	To, The Deputy Commissioner Planning, Municipal Corporation Raipur	Planning of Drainage System
134	01/12/2011	The General Manager Mainpat Green Energy Pvt. Ltd., Hyderabad (A.P.)	Power Project
135	19/12/2011	To, Dr A.K.Pali ,Professor, Deptt. Of Soil & Water Energy IGAU ,Raipur	Project work
136	26/12/2011	The G.M. Cum Project Director National Highway Authorty Of India State Office C.G. Raipur	National Highway Road Work
137	20/01/2012	The Head of Department Civil Engineering N .I.T . Raipur	Project Work For M Tech
138	02/02/2012	The Head of Department Civil Engineering N .I.T . Raipur	Project Work For M Tech
139	02/02/2012	The Resource Scintest Chhattisgarh Council of Sc.& Technology Raipur	Reserch Planning for Claimat Chang
140	14/02/2012	The Associate Professor Deptt. of Soil & Water Engineering I.G.A. University Raipur	Reserch Planning for Durg Distt.
141	06/03/2012	The Ku Sanyogita Chandrakar Research Student (Geography) Pt.R.S.U. University Raipur	Reserch Work Pallari block
142	26/03/2012	The Dr M.P.tripathi Professor Deptt. of Soil & Water Engineering I.G.A. University Raipur	Reserch Planning forRaipur Mahasamund Dhamtari
143	26/03/2012	The Head Department Of Civil Engineering N.I.T. Raipur	Reserch Planning for Kharun Sub Basin
144	28/03/2012	The Shri Vijay Kumar , H.O.D. Water Resources Department , DHI(India) Water & Enviroment Pvt.ltd.	Mahanadi Basin planning Work
145	12/04/2012	The Executive Directror LANCO Amarkantak Power Ltd distt.Korba	Power Project planning Work

S. No.	Date	Data user & Address	Purpose of Data Acquire
146	20/04/2012	The Executive Engineer W.R. Divn.Jaspur distt Jaspur	Water Resources Project
147	21/05/2012	The Executive Engineer P.H.E. Divn.Baikunthpur Distt Korya	Water Supply Scheme in Baikunthpur
148	19/07/2012	The Project Director Resource Scintest Chhattisgarh Council of Sc.& Technology Raipur	Reserch Planning for Claimet Change
149	06/08/2012	The Shri Shyam Bidi Leaves Merchant Bilaspur Distt Bilaspur	Godown Project work
150	08/08/2012	The Executive Engineer W.M. Division No.1 Raipur Distt Raipur	Flood Protection Project work
151	22/08/2012	The Professor Department of Civil Engg. IIT, Kharagpur(W.B.)	Reserch Planning for Kharun Sub Basin
152	13/09/2012	The Arihant Builders & Supplires, Dindayal puram Housing Board Colony Dhamtari (C.G.)	Building Project work
153	14/09/2012	The Mahatamil Mining & Thermal Energy Ltd. Corporate office Gurgoan 122 016 New Delhi	Power Project planning Work
154	14/09/2012	The Mahatamil Mining & Thermal Energy Ltd. Corporate office Gurgoan 122 016 New Delhi	Power Project planning Work
155	25/09/2012	The Executive Engineer W.R. Division Bemetara Distt Bemetara	Water Resources Project Work
156	01/10/2012	The Executive Engineer Kharang W.R. Division Bilaspur Distt Bilaspur	Water Resources Project Work
157	30/10/2012	The Deputy General manager LEA Associates Sout Asia Pvt.Ltd.Raipur	Project Work
158	01/12/2012	The Executive Engineer W.R. Division Rajnandgoan Distt Rajnandgoan	Water Resources Project Work
159	20/12/2012	Dr Sudhindra Nath Panda Professor Department of Civil Engg. IIT, Kharagpur(W.B.)	Reserch Planning for KharunSub Basin
160	20/12/2012	The Executive Engineer W.R. Divn Raipur Distt Raipur	Water Resources Project
161	11/01/2013	The Head Department Of Civil Engineering N.I.T. Raipur	Reserch Planning Work For Flood ,Mahanadi Rajim
162	14/01/2013	The Executive Engineer W.R. Divn Bemetara Distt Bemetara	Water Resources Project
163	01/02/2013	The Executive Engineer P.H.E. Divn Dantewada Distt Dantewada	Public Helth Engineering Project
164	11/02/2013	Mr Purushottam Agrawal A.E.O/o The Chief Engineer MGB Raipur	Water Resources Project
165	05/04/2013	M/S PVDS Construction Raipur	For Construction Work
166	06/04/2013	Mr R.K.Jha D.G.M.Mines Godawari Power & Ispat Ltd. Raipur	Mines Project Planning Work

S. No.	Date	Data user & Address	Purpose of Data Acquire
167	10/05/2013	The Executive Engineer W.R. Divn Mahasamund Distt Mahasamund	Water Resources Project
168	10/06/2013	M/s Katya Power Pvt. Ltd. Hyderabad	Project Planning Work
169	04/07/2013	The Executive Engineer W.R. Divn Kawardha Distt Kabirdham	Water Resources Project
170	08/07/2013	The Executive Engineer W.R. Divn Bemetara Distt Bemetara	Mines Project Planning Work
171	09/07/2013	The Regional Director CGWB Raipur	Project Planning Work for Ground Water
172	08/10/2013	The Baba Him Industry , Village jamrav, Tah Patan distt Durg	Project Planning Work
173	18/10/2013	Mr R.K.Jaisawal Scientist C NIH Bhopal	Reserch Planning Work
174	24/10/2013	The Professor (H.O.D.) Civil Engineering Depatment N.I.T. Raipur	Reserch Planning Work
175	01/11/2013	Mr Ravi Galkate Scientist E NIH Bhopal	Reserch Planning Work
176	02/12/2013	The Assistant engineer P.H.E. Sub Division Kondagoan (Bastar)	Reserch Planning Work

HISTORY SHEET

Water Year : 2013-2014

Site	**: Seonath_ Nandghat**		**Code**	**:**	**NANDGHAT_018**
State	: Chhattisgarh		District		Raipur
Basin	: Mahanadi		Independent River	:	Mahanadi
Tributary	: Seonath		Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Seonath
Division	: DDPC,Raipur		Sub-Division	:	SDDPC,Raipur
Drainage Area	: 19600 Sq. Km.		Bank	:	
Latitude	: 21°46'10"		Longitude	:	81°48'43"
Zero of Gauge (m)	: 235 (m.s.l) 235 (m.s.l)		01/01/2000 01/01/2011	-	31/12/2010 -
	Opening Date		Closing Date		
Gauge	: 01/12/1988				
Discharge	: 01/12/1988				
Sediment	:				
Water Quality	: 01/07/2000				

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
2001-2002	3373	244.350	22/08/2001	0.100	236.590	01/06/2001
2002-2003	2915	242.780	18/08/2002	0.000	235.000	22/05/2003
2003-2004	4725	246.630	30/08/2003	0.845	236.770	22/05/2004
2004-2005	2723	242.950	30/07/2004	0.654	236.550	02/05/2005
2005-2006	9106	249.700	17/09/2005	0.826	236.560	11/06/2005
2006-2007	7849	248.250	15/08/2006	0.765	236.650	10/05/2007
2007-2008	6861	248.050	02/07/2007	2.017	236.740	03/06/2007
2008-2009	3653	244.300	20/09/2008	0.143	236.670	18/03/2009
2009-2010	3305	244.450	17/07/2009	0.163	236.820	20/03/2010
2010-2011	2318	244.800	09/09/2010	0.574	236.810	23/04/2011
2011-2012	7346	242.520	10/09/2011	0.082	236.810	28/04/2012
2012-2013	3027	245.400	07/09/2012	8.000	237.130	09/12/2012

Stage-Dischage Data for the period 2013 - 2014

Station Name : Seonath_ Nandghat (NANDGHAT_018) **Division : DDPC,Raipur**

Local River : Seonath **Sub-Division : SDDPC,Raipur**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1			238.600	211.2	246.800	3983	240.650	670.0 *	239.620	401.8	239.400	354.0
2			238.210	153.7	247.900	5902	240.330	611.0	240.350	574.5	239.250	340.0
3			238.020	119.8	248.300	6647	240.250	566.2	241.050	776.5	239.050	290.0 *
4			238.050	123.5	247.150	5000 *	240.200	544.2	242.220	1251	238.900	267.1
5			238.150	104.5	241.200	870.7	240.100	526.8	242.420	1335	238.650	221.2
6			238.800	245.5	241.170	821.9	239.850	467.2	241.750	1000 *	238.550	203.0
7			239.150	308.1 *	241.700	1025	239.650	441.8	241.900	1092	238.350	176.2
8			238.650	221.2	241.900	1110	239.550	410.0 *	241.300	913.4	238.200	152.2
9			238.400	180.5	241.220	898.9	239.350	340.9	241.100	799.9	238.050	123.6
10			239.150	308.1	241.050	763.0	239.150	302.9	240.950	738.0	237.900	92.00 *
11			239.550	388.0	240.650	640.0 *	238.900	261.3	240.900	706.3	237.860	88.77
12			240.000	520.4	240.200	530.8	238.700	227.3	242.200	1263	237.850	87.74
13			241.000	812.6	240.320	608.5	238.550	203.1	241.900	1092 *	237.820	86.03
14			241.100	800.9 *	240.450	615.0	238.420	183.2	241.350	933.2	237.750	71.70
15			240.350	615.0	240.450	615.0 *	238.400	179.5 *	240.800	649.0	237.700	68.54
16			241.000	812.6	239.950	479.2	238.400	179.5	240.300	550.4	237.700	68.54
17			241.150	818.5	240.120	546.8	238.750	234.7	240.000	523.4	237.680	55.00 *
18	237.600	50.27	240.300	556.3	240.850	780.0 *	239.420	348.5	239.800	461.3	237.660	53.98
19	238.200	152.5	240.800	688.4	243.350	1753	239.600	425.9	239.600	398.5	237.600	50.12 *
20	238.000	117.6	240.650	653.8	244.500	2496	240.300	591.8	239.500	370.0 *	237.600	50.12
21	237.800	84.25	241.200	825.0 *	244.000	2163	241.080	782.6	239.400	353.4	237.570	47.49
22	237.650	54.52	240.470	600.3	242.600	1385	241.600	900.0 *	239.300	341.0	237.550	45.38
23	237.650	54.52 *	240.200	534.8	242.900	1518	241.700	1007	239.320	344.3	237.550	45.38
24	237.750	78.35	242.200	1317	242.400	1312	240.950	738.8	239.400	353.9	237.540	43.00 *
25	237.750	78.42	241.800	1045	241.450	950.0 *	240.250	554.5	239.350	348.3	237.500	41.75
26	237.800	84.15	241.100	800.9	240.750	671.1	239.950	489.5	239.300	341.7	237.440	39.32
27	238.350	176.0	243.900	1934	240.180	527.5	239.800	451.1	239.550	380.0 *	237.400	38.84
28	239.700	422.7	244.750	2500 *	240.950	815.9	239.500	393.3	240.750	620.6	237.390	38.32
29	239.400	353.5	242.150	1182	242.550	1387	239.350	340.9 *	240.400	583.8	237.380	37.17
30	239.000	250.0 *	240.900	773.9	242.700	1439	239.300	335.4	239.900	471.0	237.370	35.32
31			243.600	1729	241.400	929.8			239.620	402.0		
Ten-Daily Mean												
I Ten-Daily			238.518	197.6	243.839	2702	239.908	488.1	241.266	888.2	238.630	221.9
II Ten-Daily	237.933	106.8	240.590	666.6	241.084	906.4	238.944	283.5	240.635	694.7	237.722	68.05
III Ten-Daily	238.285	163.6	242.025	1204	241.989	1191	240.348	599.3	239.663	412.7	237.469	41.20
Monthly												
Min.	237.600	50.27	238.020	104.5	239.950	479.2	238.400	179.5	239.300	341.0	237.370	35.32
Max.	239.700	422.7	244.750	2500	248.300	6647	241.700	1007	242.420	1335	239.400	354.0
Mean	238.204	150.5	240.431	706	242.294	1587	239.733	457	240.494	657.1	237.940	110.4

Annual Runoff in MCM = 9625 Annual Runoff in mm = 491

Peak Observed Discharge = 6647 cumecs on 03/08/2013 Corres. Water Level :248.3 m

Lowest Observed Discharge = 29.43 cumecs on 17/12/2013 Corres. Water Level :237.31 m

236.810

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff

HISTORY SHEET

			Water Year	:	**2013-2014**
Site	:	**Mahanadi_ Sarangpal**	**Code**	:	**SARNGPAL_003**
State	:	Chhattisgarh	District		Kanker
Basin	:	Mahanadi	Independent River	:	Mahanadi
Tributary	:	Mahanadi	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Mahanadi
Division	:	DDPC,Raipur	Sub-Division	:	SDDPC,Raipur
Drainage Area	:	2530 Sq. Km.	Bank	:	
Latitude	:	20°17'49"	Longitude	:	81°32'19"
Zero of Gauge (m)	:	375 (m.s.l) 375 (m.s.l)	01/01/2000 02/01/2006	-	01/01/2006 -
		Opening Date	Closing Date		
Gauge	:	01/07/1999			
Discharge	:	01/07/1999			
Sediment	:				
Water Quality	:				

Climatic Data - Daily

Station Code : FCS_KANKER
Station Name : Sarangpal-Kanker
Local River/Basin :
Sub-Division : SDDPC, Raipur

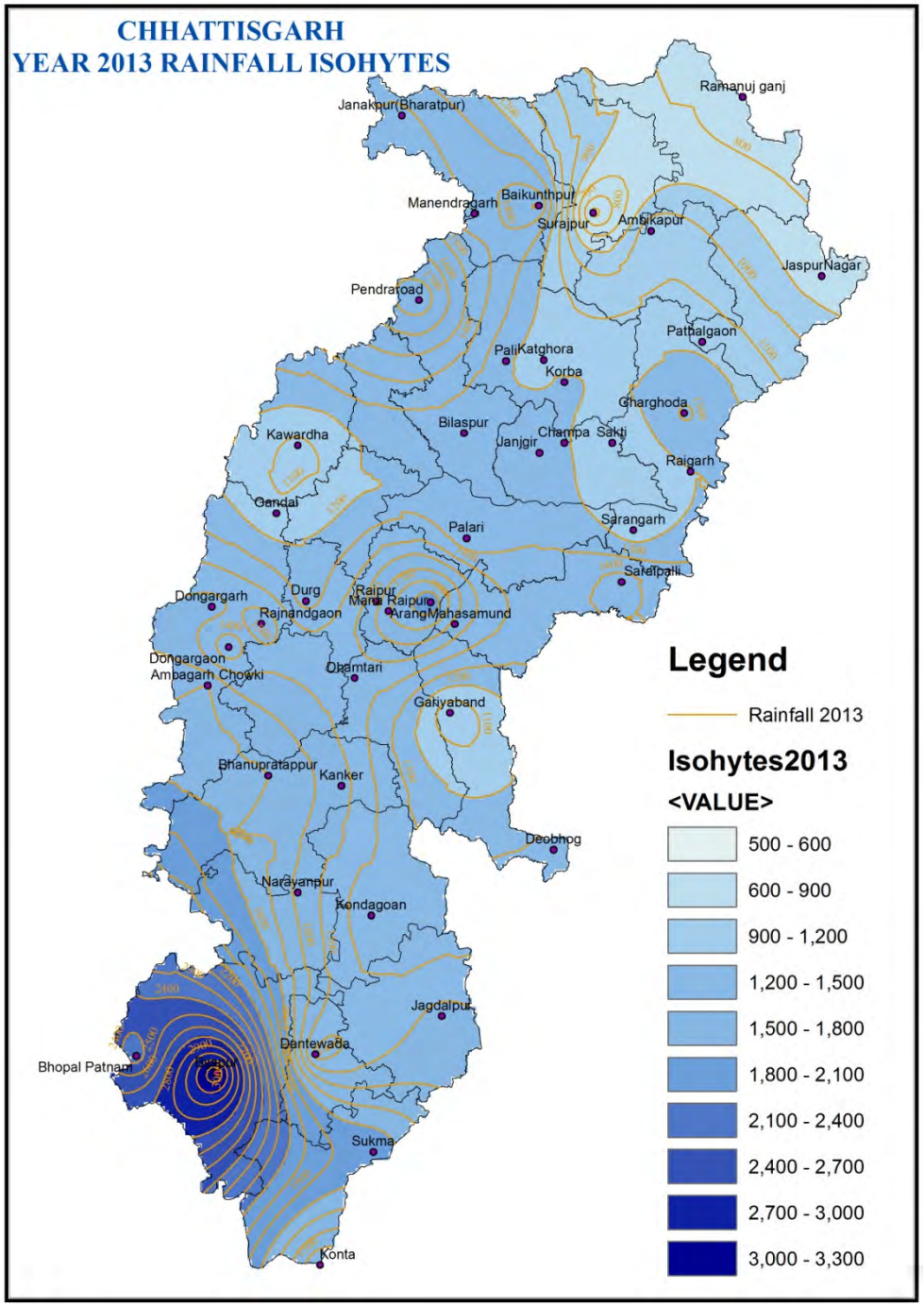
- 0.0 .N.A.

June, 2013

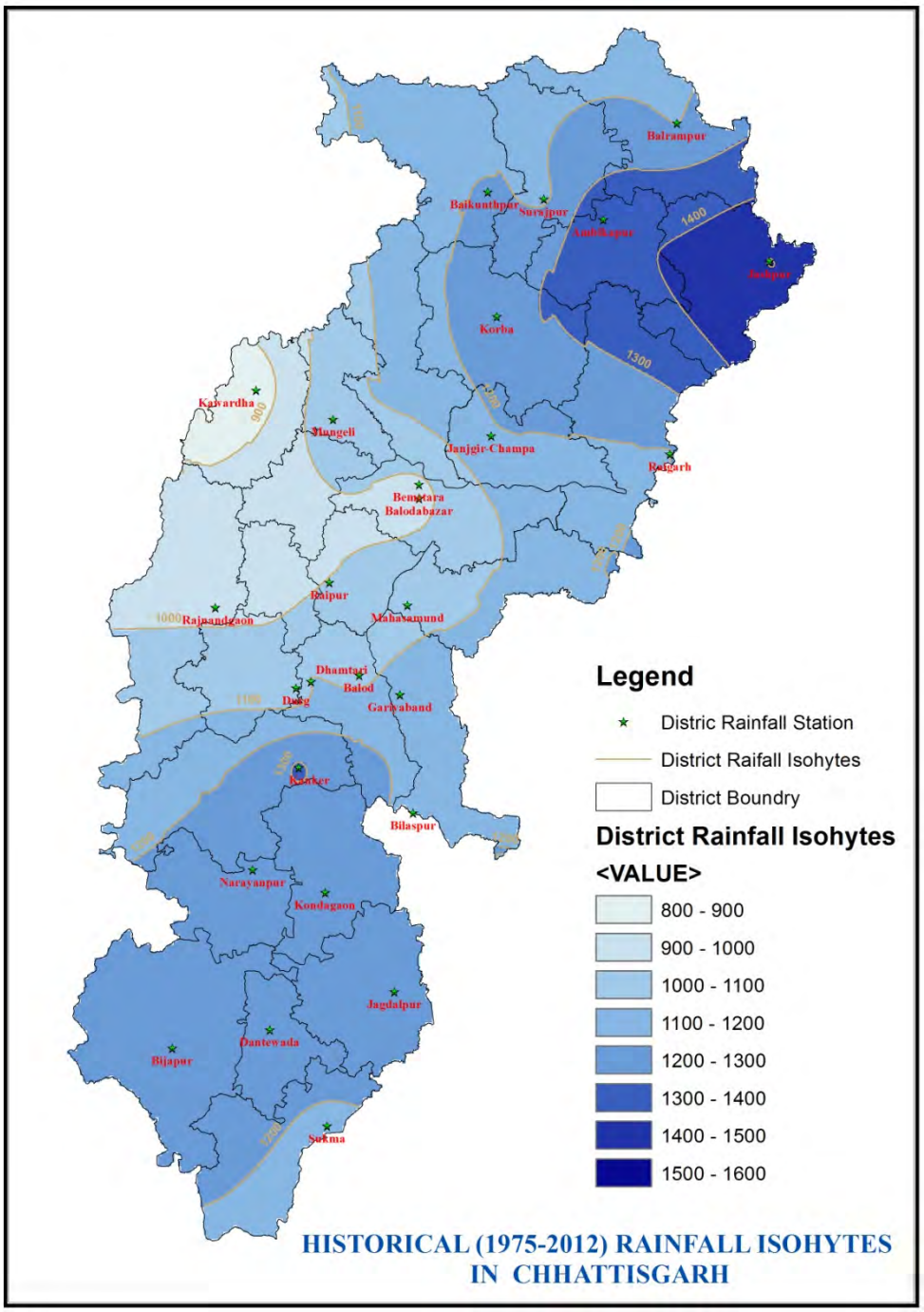
Day	Absolute Pressure (m.s.l) (mb)	Min. At. Temp (°C)	Max. At. Temp (°C)	Dry Bulb Temp. (°C)	Wet Bulb Temp. (°C)	Relative Humidity (%)	Inst. Wind Speed (kms/hr)	Av. Wind Speed (kms/hr)	Wind Direction (16 pts)	Rainfall (mm)	Pan Evaporation (mm)	Temp - Pan Water (°C)
1	..	29.0	39.6	33.0	26.4	53.0	8.0	7.0	SSW	-	10.6	..
2	..	28.6	38.2	33.0	26.0	55.0	8.0	6.0	SSE	-	8.8	..
3	..	26.4	38.4	32.2	26.0	59.0	6.0	4.0	W	-	9.0	..
4	..	24.0	39.0	29.4	24.4	65.0	8.0	6.0	WNW	3.2	7.2	..
5	..	27.0	37.4	34.0	27.4	58.0	6.0	3.0	S	-	8.0	..
6	..	25.6	39.2	31.0	25.0	60.0	8.0	6.0	SSE	-	10.0	..
7	..	21.2	36.6	23.0	22.0	91.0	10.0	6.0	S	29.2	13.2	..
8	..	21.0	32.6	26.0	24.2	85.0	6.0	4.0	WSW	1.0	4.0	..
9	..	24.8	34.6	29.2	24.6	67.0	8.0	5.0	W	-	8.8	..
10	..	24.6	35.2	27.4	24.4	77.0	10.0	8.0	WSW	1.0	7.0	..
11	..	23.0	32.2	24.8	23.8	91.0	6.0	5.0	W	16.2	3.8	..
12	..	24.0	32.0	27.0	26.0	92.0	6.0	4.0	ENE	10.0	3.0	..
13	..	22.0	30.0	25.0	24.0	92.0	8.0	6.0	ESE	55.2	2.2	..
14	..	23.0	28.0	25.0	24.0	92.0	8.0	4.0	SSE	65.0	1.0	..
15	..	24.0	26.0	26.0	25.0	92.0	4.0	3.0	N	42.6	1.0	..
16	..	24.0	27.0	27.4	23.8	73.0	8.0	6.0	WSW	-	2.4	..
17	..	25.4	29.8	30.0	24.0	59.0	6.0	5.0	SW	-	5.0	..
18	..	26.0	34.0	31.0	24.4	56.0	8.0	5.0	WSW	-	7.8	..
19	..	26.0	32.0	30.0	25.0	65.0	6.0	5.0	SSW	-	6.5	..
20	..	26.4	33.2	30.4	25.2	64.0	10.0	5.0	W	-	7.0	..
21	..	27.4	34.6	29.4	25.2	70.0	8.0	7.0	SW	-	8.0	..
22	..	21.0	34.6	26.4	24.4	84.0	12.0	7.0	WNW	42.6	10.0	..
23	..	23.8	30.2	26.0	24.4	87.0	10.0	6.0	WSW	9.0	3.0	..
24	..	23.6	28.6	25.2	24.0	90.0	12.0	7.0	W	20.0	2.0	..
25	..	24.4	26.2	24.2	23.2	91.0	8.0	6.0	WSW	17.0	1.2	..
26	..	23.0	26.4	25.0	23.6	88.0	10.0	7.0	SSW	41.0	1.0	..
27	..	23.6	26.2	25.4	24.0	88.0	12.0	9.0	WSW	2.0	.6	..
28	..	22.2	27.6	27.4	23.2	69.0	10.0	8.0	W	7.6	4.0	..
29	..	24.0	26.2	25.4	24.0	88.0	10.0	9.0	WSW	-	4.0	..
30	..	23.0	30.4	25.4	23.0	81.0	12.0	10.0	WSW	2.0	3.4	..
Average	..	24.4	32.2	27.8	24.5	76.1	8.4	6.0		..	..	..
Total	..	..	..	..	..	..	..	..		364.6	163.5	..

Kharun-Amdi GD site water Quality Sample

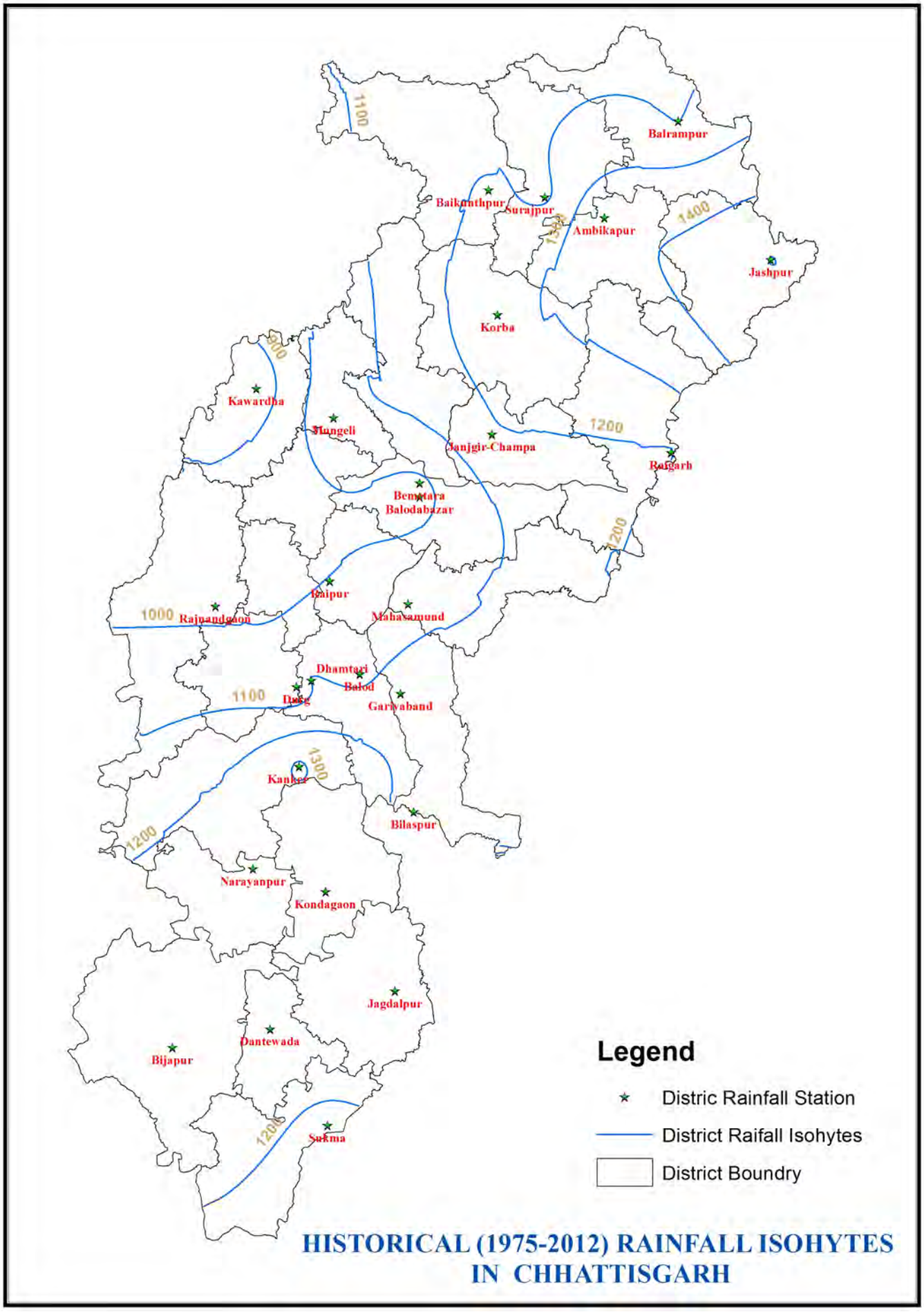
S. No.	1	2	3	4	5
Date of Sample Collection	23/08/2012	10/09/2012	27/07/2013	05/08/2013	01/10/2013
pH	7.8	8.0	7.5	7.9	7.8
EC micro mho/cm	208	178	194	215	204
TDS mg/l	133	114	124	138	131
Pri. Alkalinity mg/l	0	0	0	0	0
Total Alkalinity mg/l	100	92	76	80	112
Total Hardness mg/l	80	96	76	80	84
Ca++ Hardness mg/l	60.11	48.09	56.11	60.11	68.13
Ca++ mg/l	24.05	19.24	22.44	24.05	27.25
Mg++ mg/l	4.83	11.64	4.83	4.83	3.86
Na+ mg/l	13.6	8.3	6.8	6.2	9.1
K+ mg/l	1.3	2.1	1.4	1.1	1.2
Chloride mg/l	14.18	8.51	8.51	14.18	8.51
Carbonate mg/l	0	0	0	0	0
Bicarbonate mg/l	122.00	112.24	92.72	97.60	136.64



Rainfall Isohytes year 2013



Historical (1975-2012) Average Rainfall Isohytes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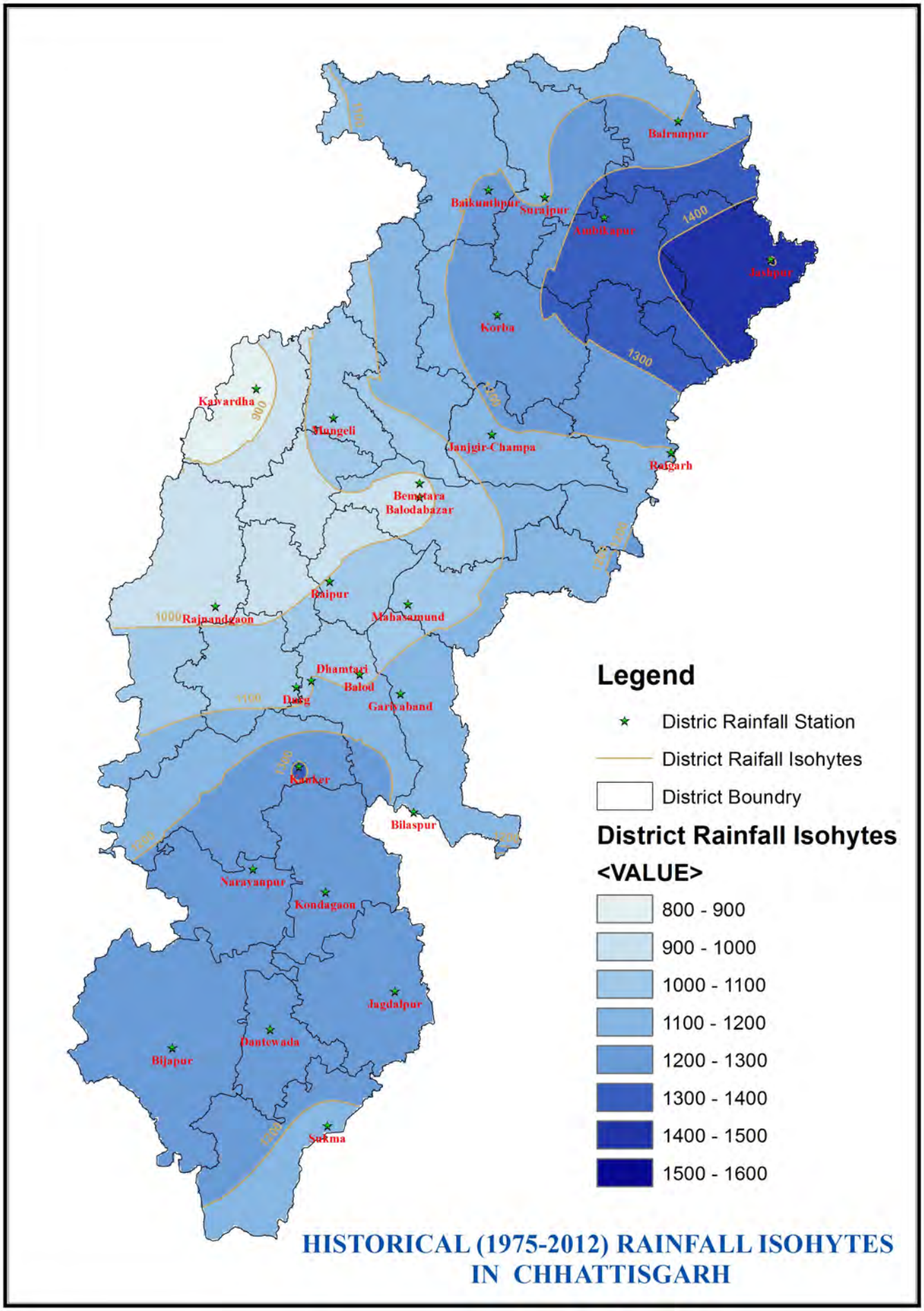
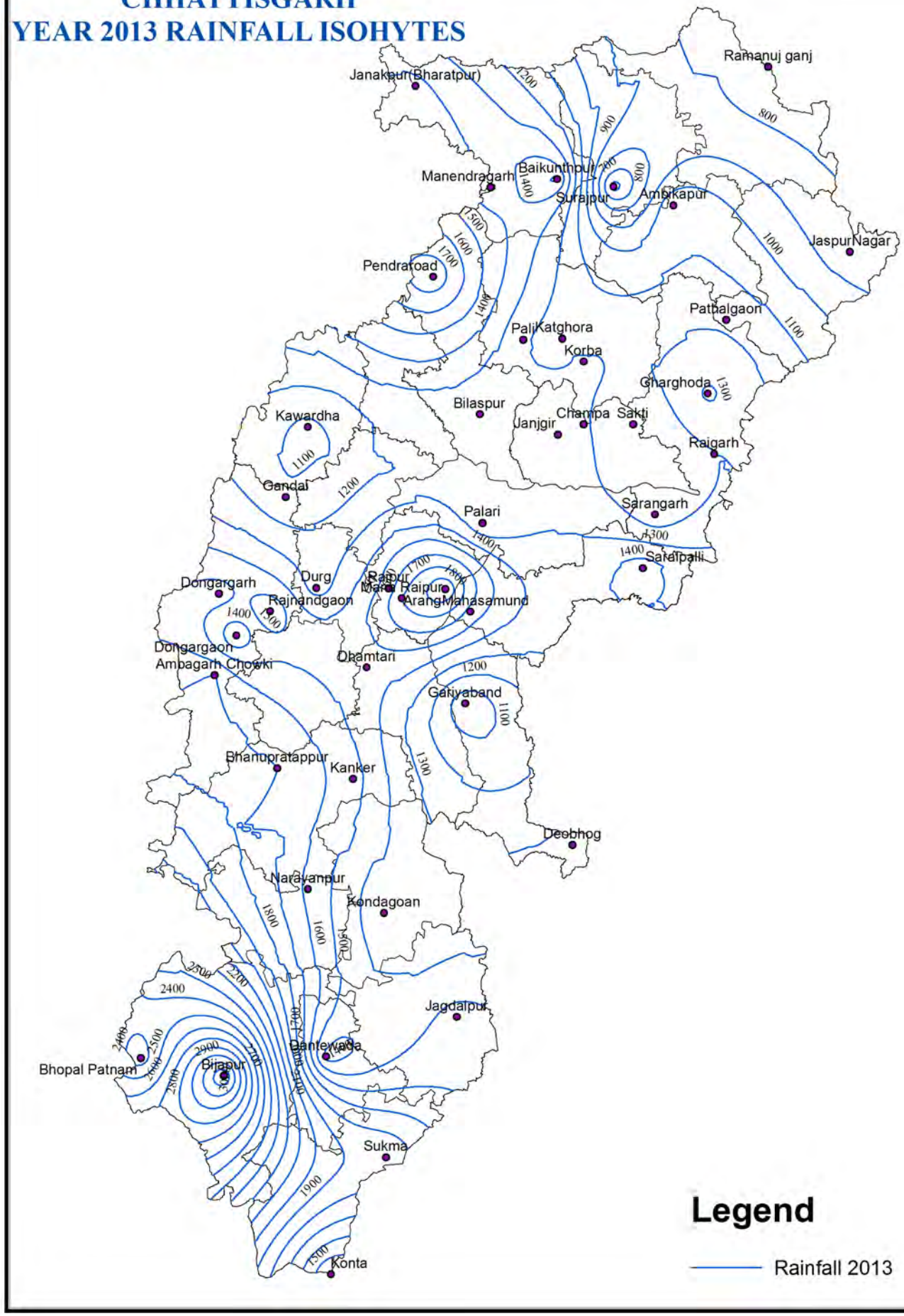
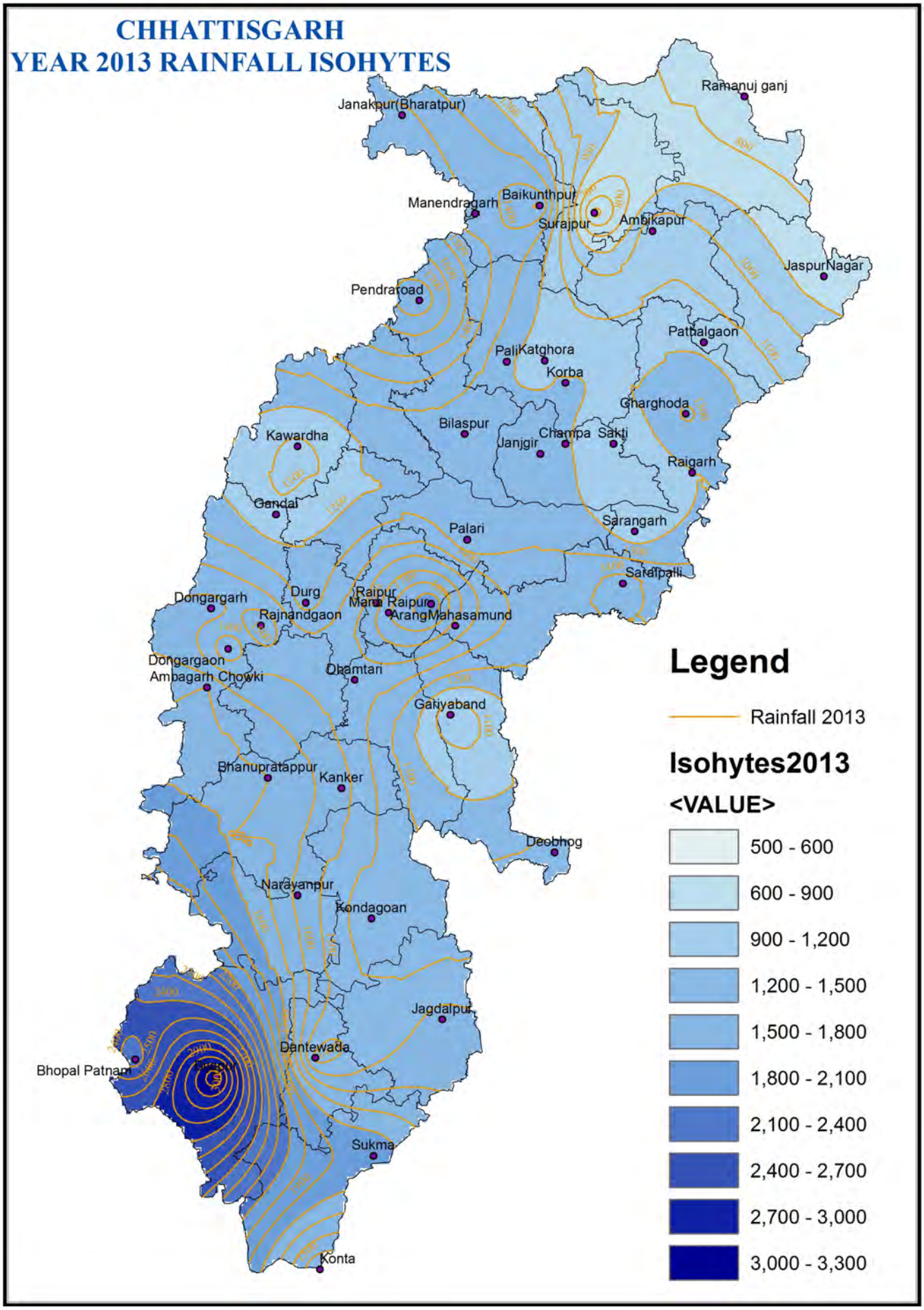
Balrampur
Baikunthpur
Surajpur
Ambikapur
1400
1300
Jashpur
Korba
1300
Kawardha
Mungeli
Janjgir-Champa
1200
Raigarh
Bemetara
Balodabazar
1200
Raipur
1000
Rajnandgaon
Mahasamund
Dhamtari
Balod
1100
Durg
Gariyaband
1300
Kanker
Bilaspur
1200
Narayanpur
Kondagaon
Jagdalpur
Dantewada
Bijapur
1200
Sukma
Legend
Distric Rainfall Station
District Raifall Isohytes
District Boundry
HISTORICAL (1975-2012) RAINFALL ISOHYTES
IN CHHATTISGARH


Balrampur
Baikunthpur
Surajpur
Ambikapur
Jashpur
Korba
Kawardha
Mungeli
Janjgir-Champa
Raigarh
Bemetara
Balodabazar
Raipur
Rajnandgaon
Mahasamund
Dhamtari
Balod
Durg
Gariyaband
Kanker
Bilaspur
Narayanpur
Kondagaon
Jagdalpur
Dantewada
Bijapur
Sukma
900
1000
1100
1200
1300
1400
Legend
Distric Rainfall Station
District Raifall Isohytes
District Boundry
District Rainfall Isohytes
<VALUE>
800 - 900
900 - 1000
1000 - 1100
1100 - 1200
1200 - 1300
1300 - 1400
1400 - 1500
1500 - 1600
HISTORICAL (1975-2012) RAINFALL ISOHYTES
IN CHHATTISGARH

CHHATTISGARH
YEAR 2013 RAINFALL ISOHYTES




CHHATTISGARH
YEAR 2013 RAINFALL ISOHYTES
Janakpur(Bharatpur)
Ramanuj ganj
Manendragarh
Baikunthpur
Surajpur
Ambikapur
JaspurNagar
Pendraroad
Pathalgaon
PaliKatghora
Korba
Gharghoda
Bilaspur
Champa
Sakti
Janjgir
Raigarh
Kawardha
Gandai
Sarangarh
Palari
Saraipalli
Dongargarh
Durg
Raipur
Mana Raipur
ArangMahasamund
Rajnandgaon
Dongargaon
Ambagarh Chowki
Dhamtari
Gariyaband
Bhanupratappur
Kanker
Deobhog
Narayanpur
Kondagoan
Jagdalpur
Dantewada
Bhopal Patnam
Sukma
Konta
Legend
Rainfall 2013
Isohytes2013
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500 - 600
600 - 900
900 - 1,200
1,200 - 1,500
1,500 - 1,800
1,800 - 2,100
2,100 - 2,400
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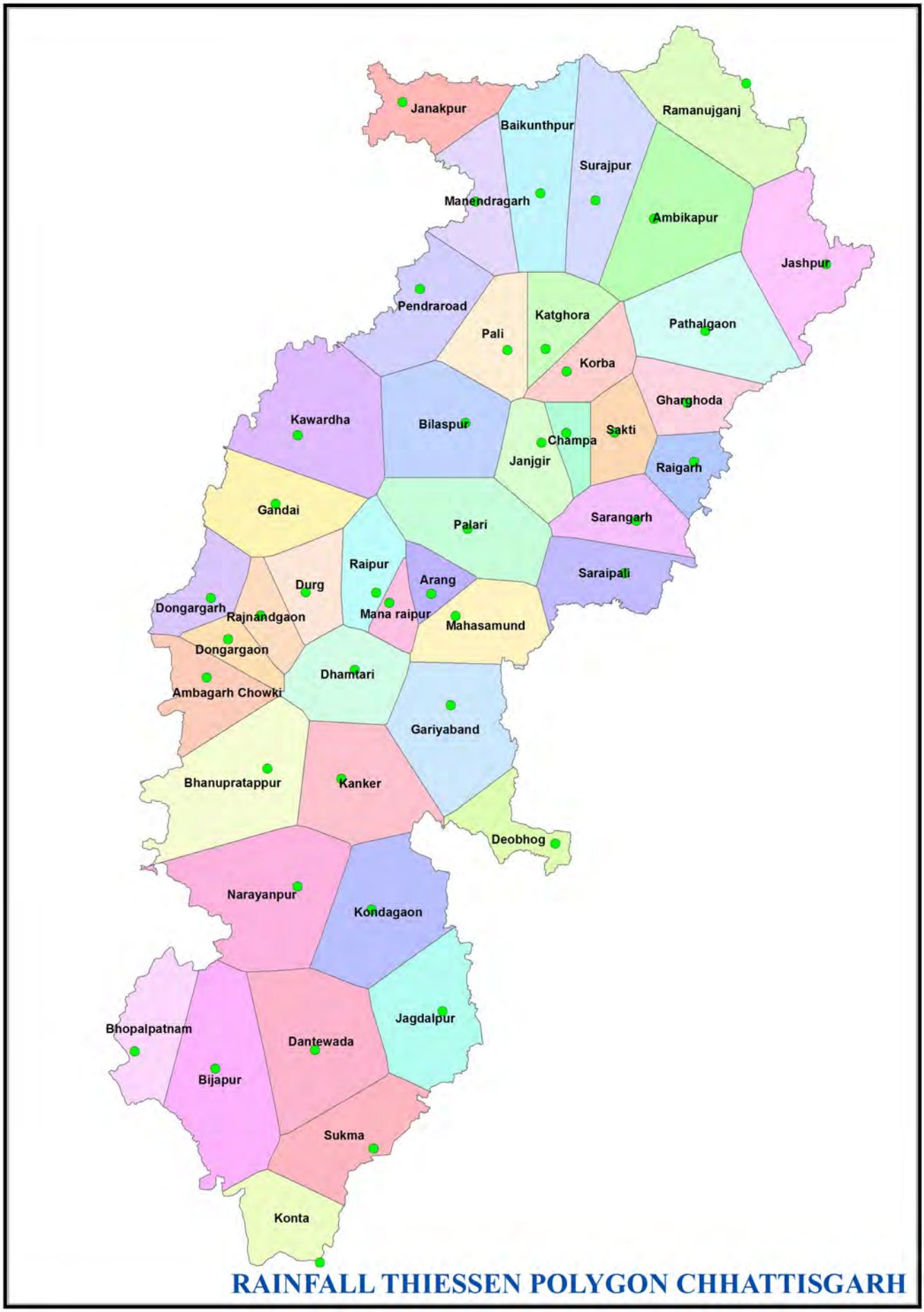
2,700 - 3,000
3,000 - 3,300



RAINFALL THIESSEN POLYGON CHHATTISGARH

वर्षा के जल से सदा, मिटे धरा की प्यास।

वर्षा जल वरदान, धरती का श्रृंगार॥

बिन वर्षा जलती धरा, होता हा-हा कार॥

जल / Water

अधं बलं जलं च आहुः
प्रणेतव्य विच क्षणैः।

(महाभारत)

“Water is a mere blind force- though tremendous. It has to be guided by proper discrimination”