



# भूमि जल संसाधन छत्तीसगढ़

## DYNAMIC GROUND WATER RESOURCES OF CHHATTISGARH 2024

केंद्रीय भूमिजल बोर्ड ,  
उत्तर मध्य छत्तीसगढ़ क्षेत्र, रायपुर  
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जल संसाधन विभाग  
छत्तीसगढ़ शासन

रायपुर  
2024

# **DYNAMIC GROUND WATER RESOURCES OF CHHATTISGARH, 2024**



**Central Ground Water Board  
North Central Chhattisgarh Region  
Department of Water Resources,  
River Development & Ganga Rejuvenation  
Ministry of Jal Shakti  
Government of India**

**Raipur  
2024**



**FOREWORD**

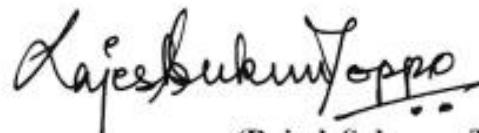
Groundwater is not only a necessity for the human society but also an important catalyst for the economic and social advancement for the state of Chhattisgarh. In view of its ubiquitous presence, varied distribution and abstraction structures being under the direct control of the users, ground water becomes preferred source for meeting the water demand of various sectors. It also plays a crucial role, however often an overlooked role in sustaining wetlands and other ecosystem. A fundamental step in valuing groundwater is recognizing and quantifying its worth both when extracted from the ground and when left in place- its total economic values.

As per the national water policy, the development of groundwater resources is to be limited to utilization of the replenishable groundwater resources. Precise assessment of replenishable groundwater resources and its development in terms of area which can be irrigated in the framework of our land availability, cropping pattern etc. is therefore a key to our plans to develop groundwater resources for various uses in this state. In view of the rapidly increasing urban industrial and agriculture water demand, assessment of groundwater resources with best possible accuracy is a fundamental importance for planning the resource use on scientific and economic consideration.

The estimation of groundwater resources for all the 146 blocks of the state have been jointly carried out by the State Groundwater Survey, Govt. of Chhattisgarh and Central Ground Water Board, Govt. of India as per the prevailing methodology and guidelines set by the groundwater estimation committee 'GEC 15' of Govt. of India. In the assessment, the administrative block was taken as unit of assessment and command & non-command area in block was taken as subunit. The overall stage of ground water extraction of the state is 47.32% with 21 blocks falling under Semi-Critical and 5 blocks under Critical category in Chhattisgarh.

I put forward a word of accolade for the untiring efforts put by the officers of State Groundwater Survey, Govt. of Chhattisgarh and the Central Ground Water Board, Govt. of India in bringing out this report.

I am sure that this report will be of immense use to the administrators and planners of the state for ensuring appropriate strategy for development and management of groundwater resources in Chhattisgarh.

  
(Rajesh Sukumar Toppo)

## **ACKNOWLEDGEMENT**

I would like to express my sincere gratitude to Chairman, Central Ground Water Board, Ministry of Jal Shakti, Govt. of India for giving an opportunity to estimate the Ground Water Resource as on March 2024 for the state of Chhattisgarh.

I express my sincere thanks to Member (East) and Member (South), Central Ground Water Board, Ministry of Jal Shakti, Govt. of India for his valuable suggestions at the time of resource estimation.

I am deeply thankful to Dr. Prabir K. Naik, Regional Director, Central Ground Water Board, North Central Chhattisgarh Region, Raipur for his valuable guidance at the time for assessment of Dynamic Ground Water Resources (as on March 2024) of Chhattisgarh state.

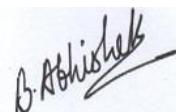
I am very much thankful to Shri I A Siddiqi, Suptd. Engineer for his co-operation and suggestions for resource assessment of the state. I would like to express my deepest thanks to Shri A.K. Shukla, Senior Geo-Hydrologist, (Divisional Ground Water Survey, Unit 8, Raipur) and N. Meshram, Senior Geo-Hydrologist (Divisional Ground Water Survey, Unit 9, Bilaspur) and their respective team for their valuable contribution in collection of data and resource assessment.

I would like to express my deepest thanks to Ms. Gurpreet Kaur (Scientist-B) for his consistent effort in data validation, analysis and preparation of this report. I also would like to express my thanks to Shri Sangam Samal (Scientist- B) of CGWB NCCR for their sincere effort throughout the assessment. I am also thankful to Shri Rajnikant Sharma (Scientist-D) for the help rendered in quality tagging of assessment units.

I am also thankful to Shri A K Sinha (Sc-D), Smt Priyanka B Sonbarse (Sc-C), Shri Sidhanta K Sahu (Sc-C) and Ms Sweta Mohanty (A-Hg) and Shri Uddeshya Kumar (Sc-C) for their valuable inputs during assessment. I am also thankful to Technical Section, CGWA, RODC and Chemical Section of CGWB NCCR Raipur along with departments and district offices of Govt. of Chhattisgarh for providing requisite data for assessment of groundwater resource.

We feel immensely thankful to members of State Level Ground Water Resource Re-Estimation Committee for their valuable suggestions and kind co-operation during Ground Water Resource Estimation as on March 2024.

The report processing and publication section for issuance of the report is also duly acknowledged.



**B Abhishek**  
(Scientist 'C')  
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## प्रस्तावना

वर्तमान परिवेश में भूजल विभिन्न आवश्यकताओं को पूरा करने के लिए जल का एक महत्वपूर्ण स्रोत है। हालाँकि, अनियंत्रित उपयोग के परिणामस्वरूप जल स्तर में कमी आई है, विशेष रूप से कठोर चट्टानों में, जहाँ संसाधन सीमित हैं और वास्तव में मानसून की अनियमितताओं का खतरा है। भूजल की स्थिरता, भूजल की उपलब्धता और निष्कर्षण की स्थिति पर निर्भर है।

छत्तीसगढ़ राज्य सिंचाई और औद्योगिक गतिविधियों के क्षेत्र में तेजी से विकास की प्रक्रिया में है और भूजल राज्य की विकासात्मक गतिविधियों में महत्वपूर्ण स्थान रखता है। हालाँकि, भूजल एक पुनःपूर्ति योग्य संसाधन है, लेकिन भूजल पर अत्यधिक निर्भरता, बार-बार पड़ने वाले सूखे, विविध मानसून पैटर्न आदि के कारण ऐसी स्थिति पैदा हो रही है, जहाँ राज्य के कई ब्लॉकों को क्रिटिकल से लोकर सेमी क्रिटिकल श्रेणी में वर्गीकृत किया गया है।

विभिन्न उपयोगों के लिए उपलब्ध भूजल संसाधनों की सटीक मात्रा निर्धारित करने और जल आपूर्ति कार्यक्रमों के विकास के साथ-साथ खाद्य सुरक्षा सुनिश्चित करने की विवेकपूर्ण योजना बनाने के लिए, समय-समय पर भूजल संसाधनों का आकलन करने की आवश्यकता है। इसे ध्यान में रखते हुए, केंद्रीय भूजल बोर्ड और राज्य भूजल विभाग ने GEC'15 पद्धति के आधार पर छत्तीसगढ़ के गतिशील भूजल संसाधनों का आकलन करने का कार्य किया। संसाधन की गणना IN-GRES सॉफ्टवेयर की मदद से की जाती है जो कि आईआईटी-हैदराबाद के सहयोग से केंद्रीय भूजल बोर्ड द्वारा विकसित वेब-आधारित एप्लिकेशन है।

"छत्तीसगढ़ के गतिशील भूजल संसाधन" (मार्च 2024 तक) पर रिपोर्ट केंद्रीय भूजल बोर्ड और राज्य भूजल सर्वेक्षण, जल संसाधन विभाग, छत्तीसगढ़ सरकार के संयुक्त प्रयासों का परिणाम है और उम्मीद है कि यह राज्य में भूजल विकास और योजना का आधार बनेगी। यह रिपोर्ट छत्तीसगढ़ के भूजल संसाधनों का आकलन प्रस्तुत करती है जिसकी गणना "भूजल संसाधन आकलन समिति 2015" द्वारा अनुशंसित पद्धति के आधार पर तार्किक और वैज्ञानिक दृष्टिकोण से की गई है। रिपोर्ट बताती है कि 146 ब्लॉकों में से 5 ब्लॉक क्रिटिकल हैं, 21 ब्लॉक "सेमी-क्रिटिकल" श्रेणी में आते हैं और शेष 120 ब्लॉक "सुरक्षित" श्रेणी में आते हैं। प्राप्त आंकड़े बहुत यथार्थवादी हैं, हालांकि भविष्य में उपयोग और सिंचाई क्षमता के लिए उपलब्ध भूजल संसाधन और परिणामी भूजल की मात्रा के संबंध में कार्यप्रणाली में सुधार और जानकारी के उन्नयन की गुंजाइश हमेशा बनी रहती है।

राज्य भूजल सर्वेक्षण, जल संसाधन विभाग, छत्तीसगढ़ सरकार के सभी अधिकारियों के प्रति गहरी कृतज्ञता व्यक्त की जाती है जो किसी न किसी स्तर पर इस कार्य से जुड़े थे। छत्तीसगढ़ के गतिशील भूजल संसाधन पर रिपोर्ट तैयार करने के साथ-साथ परिणामों के सत्यापन और इनपुट डेटा के संकलन के लिए केंद्रीय भूजल बोर्ड के श्री बी अभिषेक (वैज्ञानिक 'सी' और नोडल अधिकारी) एवं अन्य टीम के सदस्यों द्वारा किया गया अथक प्रयास प्रशंसनीय है।

मुझे आशा है कि, यह रिपोर्ट राज्य में भूजल की योजना और विकास में लगी सभी उपयोगकर्ता एजेंसियों के लिए उपयोगी होगी।

(डॉ. प्रबीर कु. नाइक)  
सदस्य सचिव (SLC) एवं  
केंद्रीय निदेशक, केंद्रीय भूजल बोर्ड, रायपुर

## PREFACE

Ground Water has emerged as important source of water to meet the different requirements. However, uncontrolled use has resulted in depletion of water levels, more so in hard rocks, where the resource is limited and indeed prone to vagaries of monsoon. The sustainability of ground water is dependent upon ground water availability and prevailing development status.

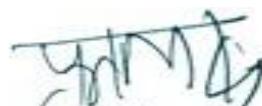
The state of Chhattisgarh is in the process of an accelerated development in the fields of irrigation and industrial activities and ground water occupies a key position in the developmental activities of the state. Although, ground water is a replenishable resource, over dependence on ground water, recurrent droughts, varied monsoon pattern etc., are leading to a situation where in several blocks of the state have been categorized as critical to Semi- critical.

In order to precisely quantify the ground water resources available for various uses and judiciously plan the development of water supply programs as well as ensuring food security, there is a need for assessing the ground water resources periodically. Keeping this in view, Central Ground Water Board and State Ground Water Department took up the task of estimating the Dynamic Ground Water Resources of Chhattisgarh based on GEC'15 methodology. Resource computed with the help of IN-GRES Software which is Web-based Application developed by CGWB in collaboration with IIT-Hyderabad.

The report on “Dynamic Ground Water Resources of Chhattisgarh” (As on March 2024) is the outcome of the combined efforts of CGWB and State Ground Water Survey, Water Resources Department, Government of Chhattisgarh and is expected to form the basis for ground water development and planning in the state. This report presents the assessment of ground water resources of Chhattisgarh which have been computed with a logical and scientific approach based on methodology recommended by the “Ground Water Resource Estimation Committee 2015”. The report indicates that out of 146 blocks, 5 blocks are Critical, 21 blocks are falling under the “Semi-Critical” category and the remaining 120 blocks falls under “safe”. The figures arrived at are very realistic, however, there is always a scope for improvement in methodology and up-gradation of information regarding the quantum of ground water resource and resultant ground water available for future use and irrigation potential.

A deep sense of gratitude is expressed to all the state Officers of State Ground Water Survey, Water Resources Department, Government of Chhattisgarh who was associated with this work at one stage or the other. A lot of effort was put in by the Shri B. Abhishek (Scientist ‘C’ & Nodal Officer) and other team members of Central Ground Water Board for compilation of data, validation and assessment along with preparation of report on ‘Dynamic Ground Water Resource of Chhattisgarh (As on March’ 2024) in the present form is appreciable.

I hope that, this report will be useful to all the user agencies engaged in planning and development of ground water in the state.



**(Dr Prabir K. Naik)**  
Member Secretary (SLC) &  
Regional Director CGWB, NCCR,  
Raipur

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## **DYNAMIC GROUND WATER RESOURCES OF CHHATTISGARH, 2024**

### **AT A GLANCE**

1.	Total Annual Ground Water Recharge	: 14.18 BCM
2.	Annual Extractable Ground Water Resources	: 12.92 BCM
3.	Annual Ground Water Extraction	: 6.12 BCM
4.	Stage of Ground Water Extraction	: 47.32 %

### **CATEGORIZATION OF ASSESSMENT UNITS**

(Blocks)

Sl.No	Category	Number of Assessment Units		Recharge worthy Area		Annual Extractable Ground Water Resource	
		Number	%	in lakh sq. km	%	(in bcm)	%
1	Safe	120	82.19	0.89	83.78	10.13	78.38
2	Semi Critical	21	14.39	0.14	13.28	2.33	18.06
3	Critical	5	3.42	0.03	2.94	0.46	3.56
4	Over-Exploited	NA	NA	NA	NA	NA	NA
5	Saline	NA	NA	NA	NA	NA	NA
	<b>TOTAL</b>	<b>146</b>	<b>100</b>	<b>1.06</b>	<b>100</b>	<b>12.92</b>	<b>100</b>

## **EXECUTIVE SUMMARY**

Ground Water Resource Assessment is carried out at periodical intervals jointly by State Ground Water Departments and Central Ground Water Board under the guidance of the respective State Level Committee on Ground Water Assessment at State Levels and under the overall supervision of the Central Level Expert Group (CLEG). Such joint exercises have been taken up earlier in 1980, 1995, 2004, 2009, 2011, 2013, 2017, 2020, 2022, and 2023. From the year 2022, the exercise is being carried out annually. The assessment involves computation of dynamic ground water resources or Annual Extractable Ground Water Resource, Total Current Annual Ground Water Extraction (utilization) and the percentage of utilization with respect to annual extractable resources (stage of Ground Water Extraction). The assessment units (Talukas/blocks/mandals) are categorized based on Stage of Ground Water Extraction, which are then validated with long-term water level trends. The assessment prior to that of year 2017 were carried out following Ground Water Estimation Committee (GEC) 97 Methodology, whereas from 2017 onwards assessment are based on norms and guidelines of the GEC 2015 Methodology.

The main source of replenishable ground water resources is recharge from rainfall, which contributes to nearly 61.51 % of the total annual ground water recharge.

Over 83% of the annual rainfall is received in the four rainy months for June to September only thereby leading to large variations on temporal scale. Rainfall is the main source of ground water recharge in the state. However, distribution of rainfall has a slight variation both in space and time. The southern areas of Chhattisgarh receives maximum rainfall often greater than 1500 mm whereas in the central and northern Chhattisgarh the average rainfall ranges from 1000 to 1500 mm.

Type of rock formations and their storage and transmission characteristics have a significant influence on ground water recharge. Porous formations such as the alluvial formations along few km radius of the major river generally have high specific yields and are good repositories of ground water. Ground water occurrence in the fissured formations occupying 99.97% of the geographical area of the Chhattisgarh, on the other hand, is mostly limited to the weathered, jointed and fractured portions of the rocks.

In the present assessment, the total annual groundwater recharge in the state has been assessed as 14.18 bcm. Keeping an allocation for natural discharge, the annual extractable ground water resource has been assessed as 12.92 bcm. The annual groundwater extraction (as in 2024) is 6.11 bcm. The average stage of groundwater extraction for the state as a whole works out to be about 47.32 %. Out of 146 assessment units (blocks), 5 units (3.42 %) as ‘Critical’, 21 units (14.38 %) have been categorized as ‘Semi-critical’ and 120 units (82.19 %) as ‘Safe’ categories of assessment units. There are no ‘Over-exploited’ and ‘Saline’ categories of assessment units. Out of 106078.71 sq km recharge worthy area of the State, 3119.06 sq km (2.94 %) area are under ‘Critical’, 14090.19 sq km (13.28 %) under ‘Semi-critical’, 88869.46 sq km (83.78 %) under ‘Safe’ categories of assessment units. Out of total 13186.48 mcm annual extractable ground water resources of the State, 460.4 mcm (3.52 %) under ‘Critical’, 2334.88 mcm (18.06 %) under ‘Semi-critical’ and 10132.06 mcm (78.38 %) are under ‘Safe’ categories of assessment units.

In comparison to Dynamic Ground Water Resource Assessment 2023, the total annual ground water recharge has decreased marginally from 13.34 bcm to 14.18 bcm, The change is attributed mainly to change in recharge from ‘Other Sources’ specially reduction in return flow from irrigation. Accordingly, the annual extractable ground water resources has also increased marginally from 12.18 to 12.92 bcm. The ground water extraction has marginally increased from 5.74 bcm to 6.11 bcm. The overall stage of groundwater extraction has marginally increased from 47.17 % to 47.32 %.

## CHAPTER - 1

### 1.0 INTRODUCTION

Groundwater is the backbone of India's agriculture and drinking water security in urban and rural areas. Nearly 90% of rural domestic water use is based on groundwater while 70% of water used in agriculture is pumped from aquifers. Ground water is an important source for meeting the water requirements for development of the state. Ground water is annually replenishable resource, but its availability is non-uniform in space and time. Hence, the sustainable development of ground water resources warrants precise quantitative assessment based on the reasonably valid scientific principles. Technically, dynamic ground water refers to the quantity of ground water available in the zone of water level fluctuation, which is active recharge zone and replenished annually. In addition to the dynamic ground water resource, there exists a huge groundwater reservoir in the deeper zones below the active recharge zone and in the confined aquifers. The demand for ground water irrigation is increased more than 6 times in last decade. The majority of ground water exploitation is confined in the shallow aquifer only. Hence, the development of shallow aquifers plays an important role, therefore correct assessment of dynamic ground water resources becomes significant for a planned agricultural growth.

Chhattisgarh is known as the state of 'Rice bowl', and 'Power hub' of the country, Chhattisgarh state is basically a backward and agrarian state, and it is abundantly endowed with natural resources and has a thick forest cover (about 44.8% of the total geographical area). The state extends from  $17^{\circ} 47'$  to  $24^{\circ} 6'$  North Latitudes and  $80^{\circ} 15'$  to  $84^{\circ} 24'$  East Longitudes in the central part of India. It has an area of about 135191 Sq. Km thus forming the 10<sup>th</sup> largest state of India with 4.12% of the country's area. Chhattisgarh is bounded by the states of Orissa in the east, Uttar Pradesh in the north, Jharkhand in the northeast, Andhra Pradesh in the south, Maharashtra in the south west and Madhya Pradesh in the north western part. The State has been divided into 33 districts and 146 blocks (Figure-1). The population of state as per census 2011 is 25540196 with a population density of 189 persons per sq.km area. Out of total population, 79.9 % is rural. The present report is an outcome of the concerted efforts made by the Central Ground Water Board, North Central Chhattisgarh Region, Raipur and the State Ground Water Survey, Water Resources Department, Govt of Chhattisgarh to bring out the status of dynamic ground water resources of the State based on the methodology recommended by Ground Water Resources Estimation Committee, 2015 (GEC-2015).

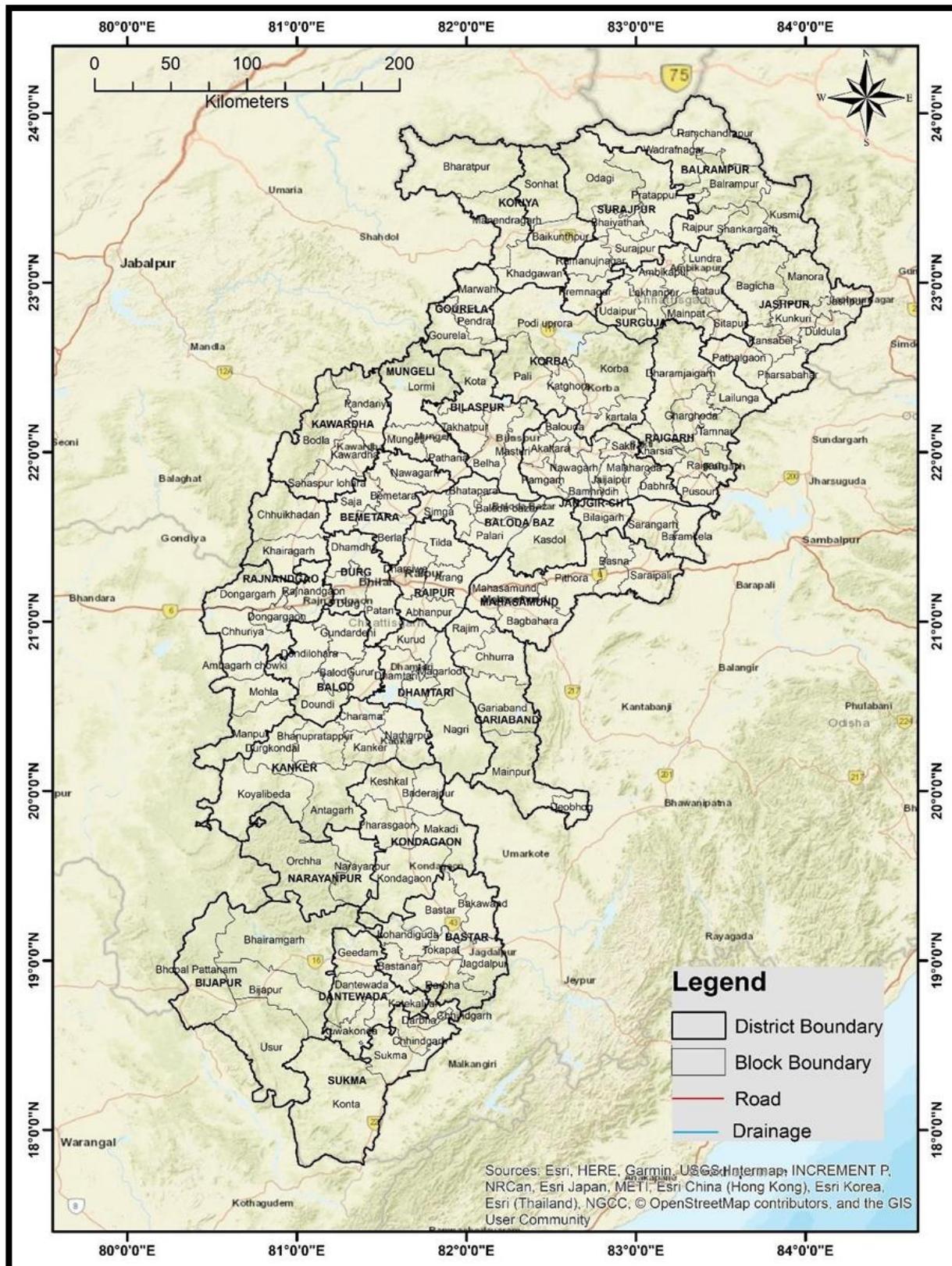


Figure 1 Administrative Divisions of Chhattisgarh

**a) Background for re-estimating the ground water resources of the state**

First attempt to estimate the ground water resources of the country was made in the year 1979. A Committee known as Ground Water Over-exploitation Committee was constituted by Agriculture Refinance and Development Corporation (ARDC) of Govt. of India. Based on the methodology and norms recommended by the above Committee, ground water resources of the country were assessed. Subsequently, the necessity was felt to refine the methodologies and the “Ground Water Estimation Committee (GEC)” headed by the Chairman, CGWB came into existence. Based on the detailed surveys and studies by the various offices and projects of CGWB, the Committee recommended a revised methodology in 1984 (GEC’84) for estimation of ground water resources. In 1997, the Ground Water Estimation Committee reviewed the previous studies and work done in various states and suggested a modified methodology in 1997 (GEC’97) for computation of ground water resources. Again in 2015, the Ministry of Water Resources, River Development & Ganga Rejuvenation, Government of India, constituted a committee headed by Chairman, CGWB to review and revise the Ground Water Resource Estimation Methodology 1997 (GEC-97) and suggested a modified methodology GEC-2015. Subsequently, a few modifications have been made in the methodology as per the recommendations of the R&D Advisory Committee.

The first ground water resource of Chhattisgarh after it's carved out of erstwhile Madhya Pradesh, was estimated for the year 2001-02 based on the revised methodology (GEC’97). These estimations were carried out jointly by Central Ground Water Board, NCCR, Raipur and State Ground Water Survey, Raipur. After approval by the State Level Committee and the recommendations of the standing Committee on R&D Advisory Committee, New Delhi, the final report was released during the year 2005. As per the guidelines of the Central Ground Water Board, Faridabad, the ground water resource has been estimated for the base year 2008-09, 2010-11, 2012-13, 2016-17, 2020-21, 2021-22, 2022-23 and 2023-24. This report has been prepared for the base year 2023-24 and resource has been assessed as on March'2024 by Central Ground Water Board in association with State Ground Water Survey, Water Resources Department, Govt. of Chhattisgarh. The report has been prepared as per the format provided by Central Headquarter, Central Ground Water Board, Ministry of Water Resources, Faridabad.

**b) Constitution of state-level ground water resources estimation committee**

Water Resources Department, Govt of Chhattisgarh has constituted a Permanent State Level Committee vide letter no. F-9-21/2023/1/5 dated 06.07.2023 for Ground Water Resources Assessment for the state of Chhattisgarh as on March 2024 (Annexure-1) for assessment of annual replenishable ground

water resource of Chhattisgarh for the reference year March, 2024 and to estimate status of utilization of the annual replenishable ground water resources as on 31<sup>st</sup> March 2024 of Chhattisgarh State.

The composition of the committee is as follows:

1. Secretary, Water Resources Department, Govt. of Chhattisgarh	-	Chairman
2. Engineer-in-Chief, Water Resources Department, Govt. of Chhattisgarh	-	Member
3. Engineer-in-Chief, PHE Department, Govt. of Chhattisgarh	-	Member
4. Chief Engineer, Mahanadi Godavari Basin, WRD, Govt. of Chhattisgarh	-	Member
5. Director, Department of Agriculture, Govt. of Chhattisgarh	-	Member
6. Director, Department of Industries, Govt. of Chhattisgarh	-	Member
7. Chief General Manager NABARD, Nava Raipur, Atal Nagar	-	Member
8. Director, Economics & Statistics Department, Nava Raipur, Atal Nagar	-	Member
9. Regional Director, CGWB, NCCR, Raipur	-	Member Secretary

**c) Proceedings of the resource estimation and outcome of various meetings**

Ground water resources assessment for reference year 2024 have been carried out jointly by Ground Water Survey, Water Resource Departments, Raipur, Govt. of Chhattisgarh and Central Ground Water Board, North Central Chhattisgarh Region, Raipur under the supervision of State Level Committees in accordance with the GEC.

The first meeting (Annexure II, Minutes of Meeting) of the Permanent State Level Committee (SLC) for Ground Water Resources Assessment (GWRA) 2024 for Chhattisgarh State was held in office of Secretary, Water Resources, Mahanadi Bhawan, Govt of Chhattisgarh dated 19.04.2024 under chairmanship of Shri Rajesh Sukumar Toppo, Secretary, Water Resource Department, Govt. of Chhattisgarh. Second meeting of SLC for approval of “Dynamic Ground Water Resources of Chhattisgarh” (As on March 2024) held on dated 11 September 2024 (Annexure III, Minutes of Meeting) under Chairmanship of Shri Rajesh Sukumar Toppo (IAS & Secretary WRD, Govt. of Chhattisgarh). All the members of SLC appreciated the work carried out by CGWB and State Ground Water Department and finally committee approved the report.



$R_{TP}$  - Recharge from Tanks & Ponds  
 $R_{WCS}$  - Recharge from water conservation structures  
VF - Vertical flow across the aquifer system  
LF - Lateral flow along the aquifer system (through flow)  
GE - Ground Water Extraction  
T - Transpiration  
E - Evaporation  
B - Base flow

Due to lack of data for all the components in most of the assessment units, at present the water budget has been assessed based on major components only, taking into consideration certain reasonable assumptions. The estimation has been carried out using lumped parameter estimation approach keeping in mind that data from many more sources if available may be used for refining the assessment.

### **2.1.1.1. Rainfall Recharge**

Ground water recharge has been estimated on ground water level fluctuation and specific yield approach since this method considers the response of ground water levels to ground water input and output components. In units or subareas where adequate data on ground water level fluctuations are not available, ground water recharge is estimated using rainfall infiltration factor method only. The rainfall recharge during non-monsoon season has been estimated using rainfall infiltration factor method only.

#### **2.1.1.1.1. Ground Water Level Fluctuation Method**

The ground water level fluctuation method is used for assessment of rainfall recharge in the monsoon season. The ground water balance equation in non-command areas is given by

$$\Delta S = R_{RF} + R_{STR} + R_{SWI} + R_{GWI} + R_{TP} + R_{WCS} \pm VF \pm LF - GE - T - E - B \dots \dots \dots \dots \dots \dots \dots \quad (3)$$

Where,

$\Delta S$  - Change in storage  
 $R_{RF}$  - Rainfall recharge  
 $R_{STR}$  - Recharge from stream channels  
 $R_{SWI}$  - Recharge from surface water irrigation  
 $R_{GWI}$  - Recharge from ground water irrigation  
 $R_{TP}$  - Recharge from Tanks & Ponds  
 $R_{WCS}$  - Recharge from water conservation structures









<b>Sl. No.</b>	<b>Source</b>	<b>Estimation Formula</b>	<b>Parameters</b>
1	Recharge from Canals	$R_C = WA \times SF \times Days$	$R_C$ = Recharge from Canals $WA$ = Wetted Area $SF$ = Seepage Factor Days = Number of Canal Running Days
2	Recharge from Surface Water Irrigation	$R_{SWI} = AD \times Days \times RFF$	$R_{SWI}$ = Recharge due to applied surface water irrigation $AD$ = Average Discharge Days = Number of days water is discharged to the Fields $RFF$ = Return Flow Factor
3	Recharge from Ground Water Irrigation	$R_{GWI} = GE_{IRR} \times RFF$	$R_{GWI}$ = Recharge due to applied ground water irrigation $GE_{IRR}$ = Ground Water Extraction for Irrigation $RFF$ = Return Flow Factor
4	Recharge due to Tanks & Ponds	$R_{TP} = AWSA \times N \times RF$	$R_{TP}$ = Recharge due to Tanks & Ponds $AWSA$ = Average Water Spread Area $N$ = Number of days Water is available in the Tank/Pond $RF$ = Recharge Factor
5	Recharge due to Water Conservation Structures	$R_{WCS} = GS \times RF$	$R_{WCS}$ = Recharge due to Water Conservation Structures $GS$ = Gross Storage = Storage Capacity multiplied by number of fillings. $RF$ = Recharge Factor

### 2.1.1.3. Evaporation and Transpiration

Evaporation is estimated for the aquifer in the assessment unit if water levels in the aquifer are within the capillary zone. For areas with water levels within 1.0mbgl, evaporation is estimated using the

evaporation rates available for other adjoining areas. If depth to water level is more than 1.0mbgl, the evaporation losses from the aquifer is taken as zero.

Transpiration through vegetation has been estimated if water levels in the aquifer are within the maximum root zone of the local vegetation. If water levels are within 3.5mbgl, transpiration is estimated using the transpiration rates available for other areas. If it is greater than 3.5m bgl, the transpiration has been taken as zero.

#### **2.1.1.4. Recharge During Monsoon Season**

The sum of normalized monsoon rainfall recharge and the recharge from other sources and lateral and vertical flows into & out of the sub unit and stream inflows & outflows during monsoon season is the total recharge/ accumulation during monsoon season for the sub unit. Similarly, this is to be computed for all the sub units available in the assessment unit.

#### **2.1.1.5. Recharge During Non-Monsoon Season**

The rainfall recharge during non-monsoon season is estimated using rainfall infiltration factor Method only when the non-monsoon season rainfall is more than 10% of normal annual rainfall. The sum of non-monsoon rainfall recharge and the recharge from other sources and lateral and vertical flows into & out of the sub unit and stream inflows & outflows during non-monsoon season is the total recharge/ accumulation during non-monsoon season for the sub unit. Similarly, this is to be computed for all the sub units available in the assessment unit.

#### **2.1.1.6. Total Annual Ground Water Recharge**

The sum of the recharge/ accumulations during monsoon and non-monsoon seasons is the total annual ground water recharge/ accumulations for the sub unit. Similarly, this is computed for all the sub units available in the assessment unit.

#### **2.1.1.7. Annual Extractable Ground Water Resource (EGR)**

The Annual Extractable Ground Water Resource (EGR) is computed by deducting the Total Annual Natural Discharge from Total Annual Ground Water Recharge.

In the water level fluctuation method, a significant portion of base flow is already accounted for by taking the post monsoon water level one month after the end of rainfall. The base flow in the remaining non-monsoon period is likely to be small, especially in hard rock areas. In the assessment units, where river stage data are not available and neither the detailed data for quantitative assessment of the natural





The existing gross ground water extraction for all uses refers to the total of existing gross ground water extraction for irrigation and all other purposes. The stage of ground water extraction should be obtained separately for command areas, non-command areas and poor ground water quality areas.

#### **2.1.1.10. Validation of Stage of Ground Water Extraction**

The assessment based on the stage of ground water extraction has inherent uncertainties. In view of this, it is desirable to validate the ‘Stage of Ground Water Extraction’ with long term trend of ground water levels.

Long term Water Level trends are prepared for a minimum period of 10 years for both pre-monsoon and post-monsoon period. If the ground water resource assessment and the trend of long term water levels contradict each other, this anomalous situation requires a review of the ground water resource computation, as well as the reliability of water level data. The mismatch conditions are enumerated below.

<b>SOGWE</b>	<b>Ground Water Level Trend</b>	<b>Remarks</b>
$\leq 70\%$	Significant decline in trend in both pre-monsoon and post-monsoon	Not acceptable and needs reassessment
$> 100\%$	No significant decline in both pre-monsoon and post-monsoon long term trend	Not acceptable and needs reassessment

#### **2.1.1.11. Categorisation of Assessment Unit**

##### **2.1.1.11.1. Categorisation of Assessment Unit Based on Quantity**

The categorisation based on status of ground water quantity is defined by Stage of Ground Water Extraction as given below:

<b>Stage of Ground Water Extraction</b>	<b>Category</b>
$\leq 70\%$	Safe
$> 70\% \text{ and } \leq 90\%$	Semi-critical
$> 90\% \text{ and } \leq 100\%$	Critical
$> 100\%$	Over Exploited

##### **2.1.1.11.2. Categorisation of Assessment Unit Based on Quality**

As it is not possible to categorize the assessment units in terms of the extent of quality hazard, based on the available water quality monitoring mechanism and database on ground water quality, the Committee recommends that each assessment unit, in addition to the Quantity based categorization (safe, semi-critical, critical and over-exploited) should bear a quality hazard identifier. If any of the three quality



discharge of the springs. Spring discharges multiplied with time in days of each season will give the quantum of spring resources available during that season.

$$\text{Potential ground water resource due to springs} = Q \times \text{No. of days} \dots \dots \dots \dots \dots \dots \dots \quad (20)$$

Where,

$Q$  = Spring Discharge

No of days = No of days spring yields.

#### 2.1.14.2.Potential Resource in Waterlogged and Shallow Water Table Areas

In the area where the ground water level is less than 5m below ground level or in waterlogged areas, the resources up to 5m below ground level are potential and would be available for development in addition to the annual recharge in the area. The computation of potential resource to ground water reservoir in shallow water table areas has been done by adopting the following equation:

$$\text{Potential groundwater resource in shallow water table areas}$$

$$= (5 - D) \times A \times S_Y \dots \dots \dots \dots \dots \quad (21)$$

Where,

D = Depth to water table below ground surface in pre-monsoon period in shallow aquifers.

A = Area of shallow water table zone.

$S_Y$  = Specific Yield

#### 2.1.14.3.Potential Resource in Flood Prone Areas

Ground water recharge from a flood plain is mainly the function of the following parameters-

- Areal extent of flood plain
- Retention period of flood
- Type of sub-soil strata and silt charge in the river water which gets deposited and controls seepage

Since collection of data on all these factors is time taking and difficult, in the meantime, the potential resource from flood plain may be estimated on the same norms as for ponds, tanks and lakes. This has been calculated over the water spread area and only for the retention period using the following formula.

$$\text{Potential groundwater resource in Flood Prone Areas}$$

$$= 1.4 \times N \times \frac{A}{1000} \dots \dots \dots \dots \dots \dots \quad (22)$$

Where,

N = No. of Days Water is Retained in the Area

A = Flood Prone Area

#### **2.1.1.15. Apportioning of Ground Water Assessment from Watershed to Development Unit**

Where the assessment unit is a watershed, there is a need to convert the ground water assessment in terms of an administrative unit such as block/ taluka/ mandal. This has been done as follows.

A block may comprise of one or more watersheds, in part or full. First, the ground water assessment in the subareas, command, non-command and poor ground water quality areas of the watershed has been converted into depth unit (mm), by dividing the annual recharge by the respective area. The contribution of this subarea of the watershed to the block, is now calculated by multiplying this depth with the area in the block occupied by this sub-area.

The total ground water resource of the block has been presented separately for each type of sub-area, namely for command areas, non-command areas and poor ground water quality areas, as in the case of the individual watersheds.

### **2.2 GROUND WATER ASSESSMENT IN URBAN AREAS**

The Assessment of Ground Water Resources in urban areas is similar to that of rural areas. Because of the availability of draft data and slightly different infiltration process and recharge due to other sources, the following few points are to be considered.

- Even though the data on existing ground water abstraction structures are available, accuracy is somewhat doubtful and individuals cannot even enumerate the well census in urban areas. Hence the difference of the actual demand and the supply by surface water sources as the withdrawal from the ground water resources has been considered for the assessment.
- The urban areas are sometimes concrete jungles and rainfall infiltration is not equal to that of rural areas unless and until special measures are taken in the construction of roads and pavements. Hence, 30% of the rainfall infiltration factor has been taken into consideration for urban areas as an adhoc arrangement till field studies in these areas are done and documented field studies are available.
- Because of the water supply schemes, there are many pipelines available in the urban areas and the seepages from these channels or pipes are huge in some areas. Hence this component has been included in the other resources and the recharge has also been considered. The percent losses have

been collected from the individual water supply agencies, 50% of which has been considered as recharge to the ground water system.

- In the urban areas in India, normally, there is no separate channels either open or sub surface for the drainage and flash floods. These channels also recharge to some extent the ground water reservoir. As on today, there is no documented field study to assess the recharge. The seepages from the sewerages, which normally contaminate the ground water resources with nitrate also contribute to the quantity of resources and hence same percent as in the case of water supply pipes has been taken as norm for the recharge on the quantity of sewerage when there is sub surface drainage system. If estimated flash flood data is available, the same percent has been used on the quantum of flash floods to estimate the recharge from the flash floods.
- Urban areas with population more than 10 lakhs, has been considered as urban assessment unit while assessing the dynamic ground water resources.

## 2.3 GROUND WATER ASSESSMENT IN WATER LEVEL DEPLETION ZONES

There are areas where ground water level shows a decline even in the monsoon season. The reasons for this may be any one of the following: (a) There is a genuine depletion in the ground water regime, with ground water extraction and natural ground water discharge in the monsoon season (outflow from the region and base flow) exceeding the recharge. (b) There may be an error in water level data due to inadequacy of observation wells.

If it is concluded that the water level data is erroneous, recharge assessment has been made based on rainfall infiltration factor method. If, on the other hand, water level data is assessed as reliable, the ground water level fluctuation method has been applied for recharge estimation. As  $\Delta S$  in equation 3& 4 is negative, the estimated recharge will be less than the gross ground water extraction in the monsoon season. It must be noted that this recharge is the gross recharge minus the natural discharges in the monsoon season. The immediate conclusion from such an assessment in water depletion zones is that the area falls under the over-exploited category which requires micro level study.

## 2.4 NORMS HAS BEEN USED IN THE ASSESSMENT

### Specific Yield

Recently under Aquifer Mapping Project, Central Ground Water Board has classified all the aquifers into 14 Principal Aquifers which in turn were divided into 42 Major Aquifers. Hence, it is required to assign

Specific Yield values to all these aquifer units. The values recommended in the **Table - I** has been followed in the present assessments, unless sufficient data based on field studies are available to justify the minimum, maximum or other intermediate values

Table 1 Norms Recommended for Specific Yield

Sl. No.	Principal Aquifer	Major Aquifers		Age	Recomm ended (%)	Minimum (%)	Maximum (%)
		Code	Name				
1	Alluvium	AL01	Younger Alluvium (Clay/Silt/Sand/ Calcareous concretions)	Quaternary	10	8	12
2	Alluvium	AL02	Pebble / Gravel/ Bazada/ Kandi	Quaternary	16	12	20
3	Alluvium	AL03	Older Alluvium (Silt/Sand/Gravel/Lithomargi c clay)	Quaternary	6	4	8
4	Alluvium	AL04	Aeolian Alluvium (Silt/ Sand)	Quaternary	16	12	20
5	Alluvium	AL05	Coastal Alluvium (Sand/Silt/Clay)	Quaternary	10	8	12
6	Alluvium	AL06	Valley Fills	Quaternary	16	12	20
7	Alluvium	AL07	Glacial Deposits	Quaternary	16	12	20
8	Laterite	LT01	Laterite / Ferruginous concretions	Quaternary	2.5	2	3
9	Basalt	BS01	Basic Rocks (Basalt) - Weathered, Vesicular or Jointed	Mesozoic to Cenozoic	2	1	3
10	Basalt	BS01	Basic Rocks (Basalt) - Massive Poorly Jointed	Mesozoic to Cenozoic	0.35	0.2	0.5
11	Basalt	BS02	Ultra Basic - Weathered, Vesicular or Jointed	Mesozoic to Cenozoic	2	1	3
12	Basalt	BS02	Ultra Basic - Massive Poorly Jointed	Mesozoic to Cenozoic	0.35	0.2	0.5
13	Sandstone	ST01	Sandstone/Conglomerate	Upper Paleozoic to Cenozoic	3	1	5
14	Sandstone	ST02	Sandstone with Shale	Upper Paleozoic to Cenozoic	3	1	5
15	Sandstone	ST03	Sandstone with shale/ coal beds	Upper Paleozoic to Cenozoic	3	1	5
16	Sandstone	ST04	Sandstone with Clay	Upper Paleozoic	3	1	5

Sl. No.	Principal Aquifer	Major Aquifers		Age	Recommended (%)	Minimum (%)	Maximum (%)
		Code	Name				
				to Cenozoic			
17	Sandstone	ST05	Sandstone/Conglomerate	Proterozoic to Cenozoic	3	1	5
18	Sandstone	ST06	Sandstone with Shale	Proterozoic to Cenozoic	3	1	5
19	Shale	SH01	Shale with limestone	Upper Paleozoic to Cenozoic	1.5	1	2
20	Shale	SH02	Shale with Sandstone	Upper Paleozoic to Cenozoic	1.5	1	2
21	Shale	SH03	Shale, limestone and sandstone	Upper Paleozoic to Cenozoic	1.5	1	2
22	Shale	SH04	Shale	Upper Paleozoic to Cenozoic	1.5	1	2
23	Shale	SH05	Shale/Shale with Sandstone	Proterozoic to Cenozoic	1.5	1	2
24	Shale	SH06	Shale with Limestone	Proterozoic to Cenozoic	1.5	1	2
25	Limestone	LS01	Miliolitic Limestone	Quaternary	2	1	3
26	Limestone	LS01	Karstified Miliolitic Limestone	Quaternary	10	5	15
27	Limestone	LS02	Limestone / Dolomite	Upper Paleozoic to Cenozoic	2	1	3
28	Limestone	LS02	Karstified Limestone / Dolomite	Upper Paleozoic to Cenozoic	10	5	15
29	Limestone	LS03	Limestone/Dolomite	Proterozoic	2	1	3
30	Limestone	LS03	Karstified Limestone/Dolomite	Proterozoic	10	5	15
31	Limestone	LS04	Limestone with Shale	Proterozoic	2	1	3
32	Limestone	LS04	Karstified Limestone with Shale	Proterozoic	10	5	15

Sl. No.	Principal Aquifer	Major Aquifers		Age	Recommended (%)	Minimum (%)	Maximum (%)
		Code	Name				
33	Limestone	LS05	Marble	Azoic to Proterozoic	2	1	3
34	Limestone	LS05	Karstified Marble	Azoic to Proterozoic	10	5	15
35	Granite	GR01	Acidic Rocks (Granite,Syenite, Rhyolite etc.) - Weathered , Jointed	Mesozoic to Cenozoic	1.5	1	2
36	Granite	GR01	Acidic Rocks (Granite,Syenite, Rhyolite etc.)-Massive or Poorly Fractured	Mesozoic to Cenozoic	0.35	0.2	0.5
37	Granite	GR02	Acidic Rocks (Pegmatite, Granite, Syenite, Rhyolite etc.) - Weathered, Jointed	Proterozoic to Cenozoic	3	2	4
38	Granite	GR02	Acidic Rocks (Pegmatite, Granite, Syenite, Rhyolite etc.) - Massive, Poorly Fractured	Proterozoic to Cenozoic	0.35	0.2	0.5
39	Schist	SC01	Schist - Weathered, Jointed	Azoic to Proterozoic	1.5	1	2
40	Schist	SC01	Schist - Massive, Poorly Fractured	Azoic to Proterozoic	0.35	0.2	0.5
41	Schist	SC02	Phyllite	Azoic to Proterozoic	1.5	1	2
42	Schist	SC03	Slate	Azoic to Proterozoic	1.5	1	2
43	Quartzite	QZ01	Quartzite - Weathered, Jointed	Proterozoic to Cenozoic	1.5	1	2
44	Quartzite	QZ01	Quartzite - Massive, Poorly Fractured	Proterozoic to Cenozoic	0.3	0.2	0.4
45	Quartzite	QZ02	Quartzite - Weathered, Jointed	Azoic to Proterozoic	1.5	1	2
46	Quartzite	QZ02	Quartzite- Massive, Poorly Fractured	Azoic to Proterozoic	0.3	0.2	0.4
47	Charnockite	CK01	Charnockite - Weathered, Jointed	Azoic	3	2	4
48	Charnockite	CK01	Charnockite - Massive, Poorly Fractured	Azoic	0.3	0.2	0.4
49	Khondalite	KH01	Khondalites, Granulites - Weathered, Jointed	Azoic	1.5	1	2
50	Khondalite	KH01	Khondalites, Granulites - Mssive, Poorly Fractured	Azoic	0.3	0.2	0.4
51	Banded Gneissic Complex	BG01	Banded Gneissic Complex - Weathered, Jointed	Azoic	1.5	1	2

Sl. No.	Principal Aquifer	Major Aquifers		Age	Recommended (%)	Minimum (%)	Maximum (%)
		Code	Name				
52	Banded Gneissic Complex	BG01	Banded Gneissic Complex - Massive, Poorly Fractured	Azoic	0.3	0.2	0.4
53	Gneiss	GN01	Undifferentiated metasedimentaries/ Undifferentiated metamorphic - Weathered, Jointed	Azoic to Proterozoic	1.5	1	2
54	Gneiss	GN01	Undifferentiated metasedimentaries/ Undifferentiated metamorphic - Massive, Poorly Fractured	Azoic to Proterozoic	0.3	0.2	0.4
55	Gneiss	GN02	Gneiss -Weathered, Jointed	Azoic to Proterozoic	3	2	4
56	Gneiss	GN02	Gneiss-Massive, Poorly Fractured	Azoic to Proterozoic	0.3	0.2	0.4
57	Gneiss	GN03	Migmatitic Gneiss - Weathered, Jointed	Azoic	1.5	1	2
58	Gneiss	GN03	Migmatitic Gneiss - Massive, Poorly Fractured	Azoic	0.3	0.2	0.4
59	Intrusive	IN01	Basic Rocks (Dolerite, Anorthosite etc.) - Weathered, Jointed	Proterozoic to Cenozoic	2	1	3
60	Intrusive	IN01	Basic Rocks (Dolerite, Anorthosite etc.) - Massive, Poorly Fractured	Proterozoic to Cenozoic	0.35	0.2	0.5
61	Intrusive	IN02	Ultrabasics (Epidiorite, Granophyre etc.) - Weathered, Jointed	Proterozoic to Cenozoic	2	1	3
62	Intrusive	IN02	Ultrabasics (Epidiorite, Granophyre etc.) - Massive, Poorly Fractured	Proterozoic to Cenozoic	0.35	0.2	0.5

### Rainfall Infiltration Factor

The values mentioned in **Table-2** has been used in the present assessment. The recommended Rainfall Infiltration Factor has been used for assessment, unless sufficient data based on field studies are available to justify the minimum, maximum or other intermediate values.

**Table 2 Norms Recommended for Rainfall Infiltration Factor**

Sl. No.	Principal Aquifer	Major Aquifers		Age	Recomm ended (%)	Minimum (%)	Maximum (%)
		Code	Name				
1	Alluvium	AL01	Younger Alluvium (Clay/Silt/Sand/ Calcareous concretions)	Quaternary	22	20	24
2	Alluvium	AL02	Pebble / Gravel/ Bazada/ Kandi	Quaternary	22	20	24
3	Alluvium	AL03	Older Alluvium (Silt/Sand/Gravel/Lithomargic clay)	Quaternary	22	20	24
4	Alluvium	AL04	Aeolian Alluvium (Silt/ Sand)	Quaternary	22	20	24
5	Alluvium	AL05	Coastal Alluvium (Sand/Silt/Clay) -East Coast	Quaternary	16	14	18
5	Alluvium	AL05	Coastal Alluvium (Sand/Silt/Clay) - West Coast	Quaternary	10	8	12
6	Alluvium	AL06	Valley Fills	Quaternary	22	20	24
7	Alluvium	AL07	Glacial Deposits	Quaternary	22	20	24
8	Laterite	LT01	Laterite / Ferruginous concretions	Quaternary	7	6	8
9	Basalt	BS01	Basic Rocks (Basalt) - Vesicular or Jointed	Mesozoic to Cenozoic	13	12	14
9	Basalt	BS01	Basic Rocks (Basalt) - Weathered	Mesozoic to Cenozoic	7	6	8
10	Basalt	BS01	Basic Rocks (Basalt) - Massive Poorly Jointed	Mesozoic to Cenozoic	2	1	3
11	Basalt	BS02	Ultra Basic - Vesicular or Jointed	Mesozoic to Cenozoic	13	12	14
11	Basalt	BS02	Ultra Basic - Weathered	Mesozoic to Cenozoic	7	6	8
12	Basalt	BS02	Ultra Basic - Massive Poorly Jointed	Mesozoic to Cenozoic	2	1	3
13	Sandstone	ST01	Sandstone/Conglomerate	Upper Paleozoic to Cenozoic	12	10	14
14	Sandstone	ST02	Sandstone with Shale	Upper Paleozoic to Cenozoic	12	10	14
15	Sandstone	ST03	Sandstone with shale/ coal beds	Upper Paleozoic	12	10	14

Sl. No.	Principal Aquifer	Major Aquifers		Age	Recommended (%)	Minimum (%)	Maximum (%)
		Code	Name				
				to Cenozoic			
16	Sandstone	ST04	Sandstone with Clay	Upper Paleozoic to Cenozoic	12	10	14
17	Sandstone	ST05	Sandstone/Conglomerate	Proterozoic to Cenozoic	6	5	7
18	Sandstone	ST06	Sandstone with Shale	Proterozoic to Cenozoic	6	5	7
19	Shale	SH01	Shale with limestone	Upper Paleozoic to Cenozoic	4	3	5
20	Shale	SH02	Shale with Sandstone	Upper Paleozoic to Cenozoic	4	3	5
21	Shale	SH03	Shale, limestone and sandstone	Upper Paleozoic to Cenozoic	4	3	5
22	Shale	SH04	Shale	Upper Paleozoic to Cenozoic	4	3	5
23	Shale	SH05	Shale/Shale with Sandstone	Proterozoic to Cenozoic	4	3	5
24	Shale	SH06	Shale with Limestone	Proterozoic to Cenozoic	4	3	5
25	Limestone	LS01	Miliolitic Limestone	Quaternary	6	5	7
27	Limestone	LS02	Limestone / Dolomite	Upper Paleozoic to Cenozoic	6	5	7
29	Limestone	LS03	Limestone/Dolomite	Proterozoic	6	5	7
31	Limestone	LS04	Limestone with Shale	Proterozoic	6	5	7
33	Limestone	LS05	Marble	Azoic to Proterozoic	6	5	7
35	Granite	GR01	Acidic Rocks (Granite,Syenite, Rhyolite etc.) - Weathered , Jointed	Mesozoic to Cenozoic	7	5	9

Sl. No.	Principal Aquifer	Major Aquifers		Age	Recommended (%)	Minimum (%)	Maximum (%)
		Code	Name				
36	Granite	GR01	Acidic Rocks (Granite, Syenite, Rhyolite etc.)-Massive or Poorly Fractured	Mesozoic to Cenozoic	2	1	3
37	Granite	GR02	Acidic Rocks (Pegmatite, Granite, Syenite, Rhyolite etc.) - Weathered, Jointed	Proterozoic to Cenozoic	11	10	12
38	Granite	GR02	Acidic Rocks (Pegmatite, Granite, Syenite, Rhyolite etc.) - Massive, Poorly Fractured	Proterozoic to Cenozoic	2	1	3
39	Schist	SC01	Schist - Weathered, Jointed	Azoic to Proterozoic	7	5	9
40	Schist	SC01	Schist - Massive, Poorly Fractured	Azoic to Proterozoic	2	1	3
41	Schist	SC02	Phyllite	Azoic to Proterozoic	4	3	5
42	Schist	SC03	Slate	Azoic to Proterozoic	4	3	5
43	Quartzite	QZ01	Quartzite - Weathered, Jointed	Proterozoic to Cenozoic	6	5	7
44	Quartzite	QZ01	Quartzite - Massive, Poorly Fractured	Proterozoic to Cenozoic	2	1	3
45	Quartzite	QZ02	Quartzite - Weathered, Jointed	Azoic to Proterozoic	6	5	7
46	Quartzite	QZ02	Quartzite- Massive, Poorly Fractured	Azoic to Proterozoic	2	1	3
47	Charnockite	CK01	Charnockite - Weathered, Jointed	Azoic	5	4	6
48	Charnockite	CK01	Charnockite - Massive, Poorly Fractured	Azoic	2	1	3
49	Khondalite	KH01	Khondalites, Granulites - Weathered, Jointed	Azoic	7	5	9
50	Khondalite	KH01	Khondalites, Granulites - Massive, Poorly Fractured	Azoic	2	1	3
51	Banded Gneissic Complex	BG01	Banded Gneissic Complex - Weathered, Jointed	Azoic	7	5	9
52	Banded Gneissic Complex	BG01	Banded Gneissic Complex - Massive, Poorly Fractured	Azoic	2	1	3
53	Gneiss	GN01	Undifferentiated metasedimentaries/ Undifferentiated metamorphic - Weathered, Jointed	Azoic to Proterozoic	7	5	9

Sl. No.	Principal Aquifer	Major Aquifers		Age	Recommended (%)	Minimum (%)	Maximum (%)
		Code	Name				
54	Gneiss	GN01	Undifferentiated metasedimentaries/ Undifferentiated metamorphic - Massive, Poorly Fractured	Azoic to Proterozoic	2	1	3
55	Gneiss	GN02	Gneiss -Weathered, Jointed	Azoic to Proterozoic	11	10	12
56	Gneiss	GN02	Gneiss-Massive, Poorly Fractured	Azoic to Proterozoic	2	1	3
57	Gneiss	GN03	Migmatitic Gneiss - Weathered, Jointed	Azoic	7	5	9
58	Gneiss	GN03	Migmatitic Gneiss - Massive, Poorly Fractured	Azoic	2	1	3
59	Intrusive	IN01	Basic Rocks (Dolerite, Anorthosite etc.) - Weathered, Jointed	Proterozoic to Cenozoic	7	6	8
60	Intrusive	IN01	Basic Rocks (Dolerite, Anorthosite etc.) - Massive, Poorly Fractured	Proterozoic to Cenozoic	2	1	3
61	Intrusive	IN02	Ulta Basics (Epidiorite, Granophyre etc.) - Weathered, Jointed	Proterozoic to Cenozoic	7	6	8
62	Intrusive	IN02	Ulta Basics (Epidiorite, Granophyre etc.) - Massive, Poorly Fractured	Proterozoic to Cenozoic	2	1	3

### Norms for Canal Recharge

The Norms suggested in *Table-3* has been used for estimating the recharge from Canals, where sufficient data based on field studies are not available.

*Table 3 Norms Recommended for Recharge due to Canals*

Formation	Canal Seepage factor ham/day/million square meters of wetted area		
	Recommended	Minimum	Maximum
Unlined canals in normal soils with some clay content along with sand	17.5	15	20
Unlined canals in sandy soil with some silt content	27.5	25	30
Lined canals in normal soils with some clay content along with sand	3.5	3	4
Lined canals in sandy soil with some silt content	5.5	5	6
All canals in hard rock area	3.5	3	4

## **2.1.2. Norms for Recharge Due to Irrigation**

The Recommended Norms are presented in **Table-4**.

*Table 4 Norms Recommended for Recharge from Irrigation*

DTW m bgl	Ground Water		Surface Water	
	Paddy	Non-paddy	Paddy	Non-paddy
≤ 10	45.0	25.0	50.0	30.0
11	43.3	23.7	48.3	28.7
12	40.4	22.1	45.1	26.8
13	37.7	20.6	42.1	25.0
14	35.2	19.2	39.3	23.3
15	32.9	17.9	36.7	21.7
16	30.7	16.7	34.3	20.3
17	28.7	15.6	32.0	18.9
18	26.8	14.6	29.9	17.6
19	25.0	13.6	27.9	16.4
20	23.3	12.7	26.0	15.3
21	21.7	11.9	24.3	14.3
22	20.3	11.1	22.7	13.3
23	18.9	10.4	21.2	12.4
24	17.6	9.7	19.8	11.6
≥ 25	20.0	5.0	25.0	10.0

## **Norms for Recharge due to Tanks & Ponds**

As the data on the field studies for computing recharge from Tanks & Ponds are very limited, for Seepage from Tanks & Ponds has been used as 1.4 mm / day in the present assessment.

## **Norms for Recharge due to Water Conservation Structures**

The data on the field studies for computing recharge from Water Conservation Structures are very limited, hence, the norm recommended by GEC-2015 for the seepage from Water Conservation Structures is 40% of gross storage during a year which means 20% during monsoon season and 20% during non-monsoon Season is adopted.

## **Unit Draft**

The methodology recommends to use well census method for computing the ground water draft. The norm used for computing ground water draft is the unit draft. The unit draft can be computed by field studies. This method involves selecting representative abstraction structure and calculating the discharge from that particular type of structure and collecting the information on how many hours of pumping is being done

in various seasons and number of such days during each season. The Unit Draft during a particular season is computed using the following equation:

$$\begin{aligned} \text{Unit Draft} &= \text{Discharge in } m^3/\text{hr} \times \text{No. of pumping hours in a day} \\ &\times \text{No. of days} \dots \dots \dots (29) \end{aligned}$$

But the procedure that is being followed for computing unit draft does not have any normalization procedure. Normally, if the year in which one collects the draft data in the field is an excess rainfall year, the abstraction from ground water will be less. Similarly, if the year of the computation of unit draft is a drought year the unit draft will be high. Hence, there is a requirement to devise a methodology that can be used for the normalization of unit draft figures. The following are the two simple techniques, which are followed for normalization of Unit Draft. Areas where, unit draft values for one rainfall cycle are available for at least 10 years second method shown in equation 31 is followed or else the first method shown in equation 30 has been used.

$$\text{Normalised Unit Draft} = \frac{\text{Unit Draft} \times \text{Rainfall for the year}}{\text{Normal Rainfall}} \dots (30)$$

$$\text{Normalised Unit Draft} = \frac{\sum_{i=1}^n \text{Unit Draft}_i}{\text{Number of Years}} \dots (31)$$

## 2.5 INDIA -GROUNDWATER RESOURCE ESTIMATION SYSTEM (IN-GRES)

“INDIA-GROUNDWATER RESOURCE ESTIMATION SYSTEM (IN-GRES) is a Software/Web-based Application developed by CGWB in collaboration with IIT-Hyderabad. It provides common and standardized platform for Ground Water Resource Estimation for the entire country and its pan-India operationalization (Central and State Governments). The system takes ‘Data Input’ through Excel as well as Forms, compute various ground water components (recharge, extraction etc.) and classify assessment units into appropriate categories (safe, semi-critical, critical and over-exploited). The Software uses GEC 2015 Methodology for estimation and calculation of Groundwater resources. It allows for unique and homogeneous representation of groundwater fluxes as well as categories for all the assessment units (AU) of the country.

**URL of IN-GRES** → <http://ingres.iith.ac.in>

## CHAPTER - 3

### 3.0 RAINFALL

#### Normal Rainfall of the State/ UT

About 90% of the annual rainfall occurs during the south west monsoon periods from June to September. August is the雨iest month. The normal annual rainfall for the Region has been estimated as 1351 mm. The normal monsoon rainfall is 1201 mm. The rainfall decreases as we move from South-East to North-West. The normal rainfall varies with highest 1481 in Bastar district to lowest 1112 mm in Rajnandgaon district.

#### District Wise Normal Rainfall of the State/UT

*Table 5 District Wise Normal Rainfall of Chhattisgarh*

District	Monsoon Normal Rainfall (mm)	Non- Monsoon Normal Rainfall (mm)	Normal Annual Rainfall
BALOD	1018.0	104.9	1122.9
BALODA BAZAR	1243.7	160.5	1404.3
BALRAMPUR	1179.0	138.0	1317.0
BASTAR	1154.2	208.4	1362.6
BEMETARA	1018.0	104.9	1122.9
BIJAPUR	1369.0	159.1	1528.1
BILASPUR	984.2	124.3	1108.5
DANTEWADA	1178.1	149.8	1327.9
DHAMTARI	1286.7	98.6	1385.3
DURG	1018.0	104.9	1122.9
GARIABAND	1286.7	98.6	1385.3
GOURELA-PENDRA-MARWAHI	1067.8	162.0	1229.8
JANGIR-CHAMPA	1234.0	152.0	1386.0
JASHPUR	1307.5	180.0	1487.5
KABIRDHAM	962.0	183.8	1145.8
KANKER	1221.0	173.1	1394.1
KHAIRAGARH- CHHUIKHADAN_GANDAI	1076.0	132.7	1208.7
KONDAGAON	1154.0	208.4	1362.4
KORBA	1234.0	158.0	1392.0
KOREA	1179.0	138.0	1317.0
MAHASAMUND	1283.6	120.9	1404.4
MANENDRAGARH- CHIRMIRI_BHARATPUR	1179.0	138.0	1317.0
MOHLA- MANPUR_AMBAGARHCHOWKI	1076.0	132.7	1208.7
MUNGELI	1234.0	117.0	1351.0

NARAYANPUR	1227.0	177.1	1404.1
RAIGARH	1307.0	159.0	1466.0
RAIPUR	1264.6	112.3	1376.9
RAJNANDGAON	1076.0	132.7	1208.7
SAKTI	1234.0	152.0	1386.0
SARANGARH-BILAIRAGH	1257.7	170.3	1428.0
SUKMA	1270.7	133.0	1403.7
SURAJPUR	1110.1	123.5	1233.6
SURGUJA	1217.3	139.1	1356.3

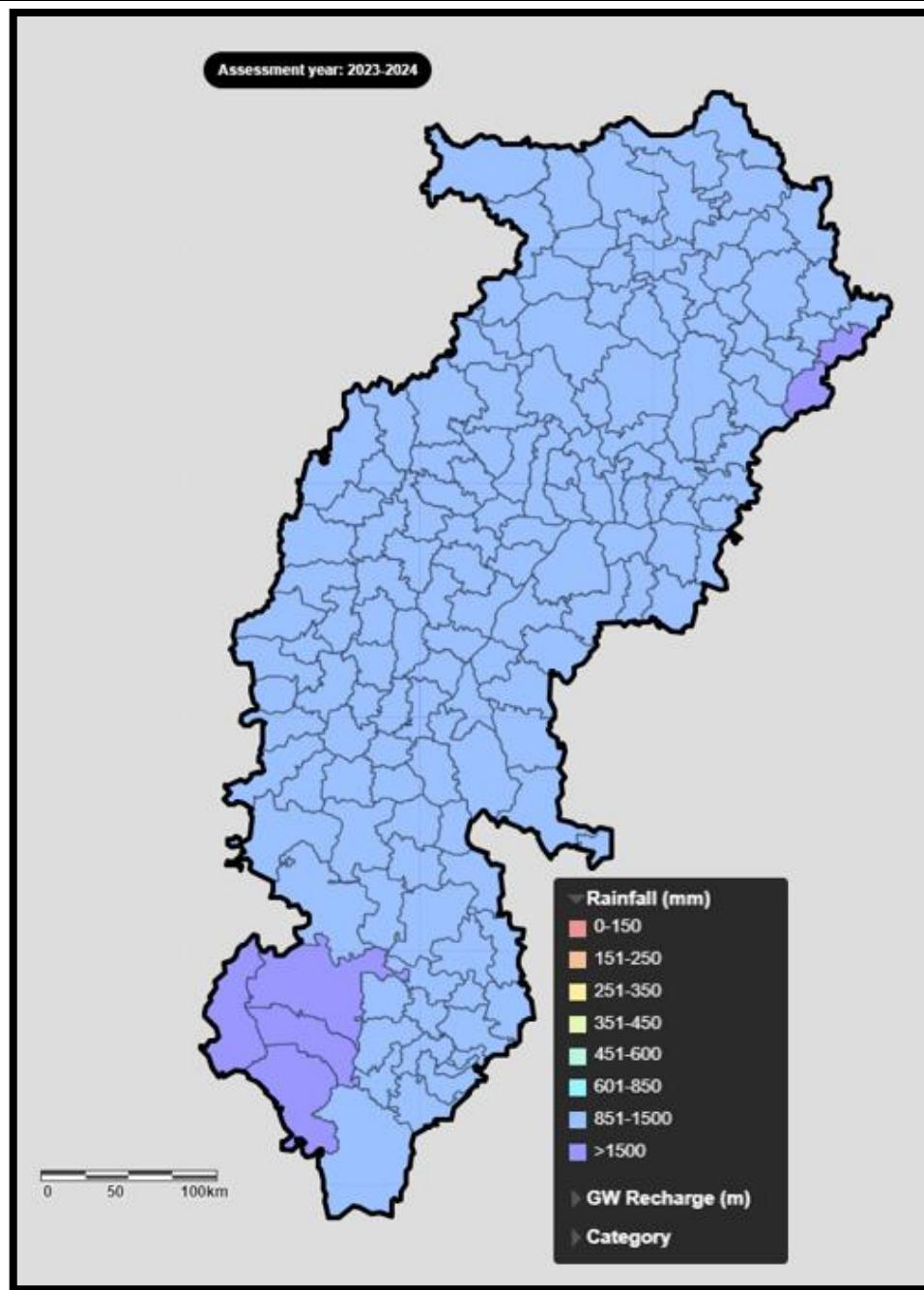


Figure 2 Annual Normal Rainfall in mm

*Table 6 Rainfall during the Calendar Year 2023 for the State/UT and District Wise*

S.No	STATE/ UT	DISTRICT	Rainfall (mm)		
			Monsoon	Non-Monsoon	Total
1	CHHATTISGARH	BALOD	1137.66	497.02	1634.67
2	CHHATTISGARH	BALODA BAZAR	1232.22	198.86	1431.08
3	CHHATTISGARH	BALRAMPUR	968.72	241.85	1210.57
4	CHHATTISGARH	BASTAR	1063.34	306.79	1370.13
5	CHHATTISGARH	BEMETARA	1560.28	342.25	1902.53
6	CHHATTISGARH	BIJAPUR	1479.34	258.38	1737.71
7	CHHATTISGARH	BILASPUR	1292.80	181.08	1473.88
8	CHHATTISGARH	DANTEWADA	1522.34	335.74	1858.07
9	CHHATTISGARH	DHAMTARI	988.73	140.63	1129.35
10	CHHATTISGARH	DURG	1352.43	583.20	1935.63
11	CHHATTISGARH	GARIABAND	1016.66	188.36	1205.02
12	CHHATTISGARH	GOURELA-PENDRA-MARWAHI	986.84	173.44	1160.28
13	CHHATTISGARH	JANGIR-CHAMPA	1227.70	135.98	1363.68
14	CHHATTISGARH	JASHPUR	867.69	110.46	978.15
15	CHHATTISGARH	KABIRDHAM	997.00	172.80	1169.80
16	CHHATTISGARH	KANKER	1032.10	172.61	1204.71
17	CHHATTISGARH	KHAIRAGARH-CHUIKHADAN_GANDAI	962.34	155.04	1117.37
18	CHHATTISGARH	KONDAGAON	988.83	383.61	1372.44
19	CHHATTISGARH	KORBA	1058.02	504.32	1562.34
20	CHHATTISGARH	KOREA	900.30	170.25	1070.55
21	CHHATTISGARH	MAHASAMUND	1137.47	174.87	1312.34
22	CHHATTISGARH	MANENDRAGARH-CHIRMI_BHARATPUR	905.37	101.13	1006.50
23	CHHATTISGARH	MOHLA-MANPUR_AMBAGARHCHO WKI	1106.75	158.24	1264.99
24	CHHATTISGARH	MUNGELI	1303.77	138.03	1441.80
25	CHHATTISGARH	NARAYANPUR	1089.28	217.39	1306.67
26	CHHATTISGARH	RAIGARH	1189.83	143.59	1333.41
27	CHHATTISGARH	RAIPUR	937.93	83.25	1021.18
28	CHHATTISGARH	RAJNANDGAON	1132.46	159.49	1291.95
29	CHHATTISGARH	SAKTI	1018.20	83.08	1101.28
30	CHHATTISGARH	SARANGARH-BILAIRAGH	1113.12	122.00	1235.11
31	CHHATTISGARH	SUKMA	1207.59	378.78	1586.38
32	CHHATTISGARH	SURAJPUR	766.13	199.55	965.68
33	CHHATTISGARH	SURGUJA	498.63	105.13	603.76

*Table 7 Rainfall during Ground Water Assessment Year 2023-24 for the State/UT and District wise*

District	Rainfall (mm)
BALOD	1122.9
BALODA BAZAR	1396.6
BALRAMPUR	1317
BASTAR	1368.9
BEMETARA	1122.9
BIJAPUR	1528.1
BILASPUR	1114.46
DANTEWADA	1327.9
DHAMTARI	1385.3
DURG	1122.9
GARIABAND	1385.3
GOURELA-PENDRA-MARWAHI	1229.8
JANGIR-CHAMPA	1386
JASHPUR	1480.03
KABIRDHAM	1117
KANKER	1397.50
KHAIRAGARH-CHHUIKHADAN_GANDAI	1208.7
KONDAGAON	1362.4
KORBA	1392
KOREA	1317
MAHASAMUND	1406.2
MANENDRAGARH-CHIRMIRI_BHARATPUR	1317
MOHLA-MANPUR_AMBAGARHCHOWKI	1208.7
MUNGELI	1351
NARAYANPUR	1404.1
RAIGARH	1466
RAIPUR	1376.3
RAJNANDGAON	1208.7
SAKTI	1386
SARANGARH-BILAIRAGH	1418.4
SUKMA	1403.8
SURAJPUR	1241.8
SURGUJA	1369.1

## **CHAPTER - 4**

### **4.0 HYDROGEOLOGICAL SETUP OF CHHATTISGARH STATE**

The state is underlain by various rock types of different geological ages from Pre-Cambrianto Recent age. These include the Archaean Crystalline, Precambrian Sedimentaries, Gondwanas, Deccan Traps and Unconsolidated Sediments (Figure-2). There exists a huge diversity in the distribution of groundwater in the state due to the varied hydrogeological characters of the rock types, which ultimately forms the aquifers. To understand the regional hydrogeological behavior of Chhattisgarh State, the complex hydrogeological setup has been classified into two groups based on their characters viz. Fissured Formations and Porous Formations.

### **DESCRIPTION OF ROCK TYPES**

#### **POROUS FORMATION**

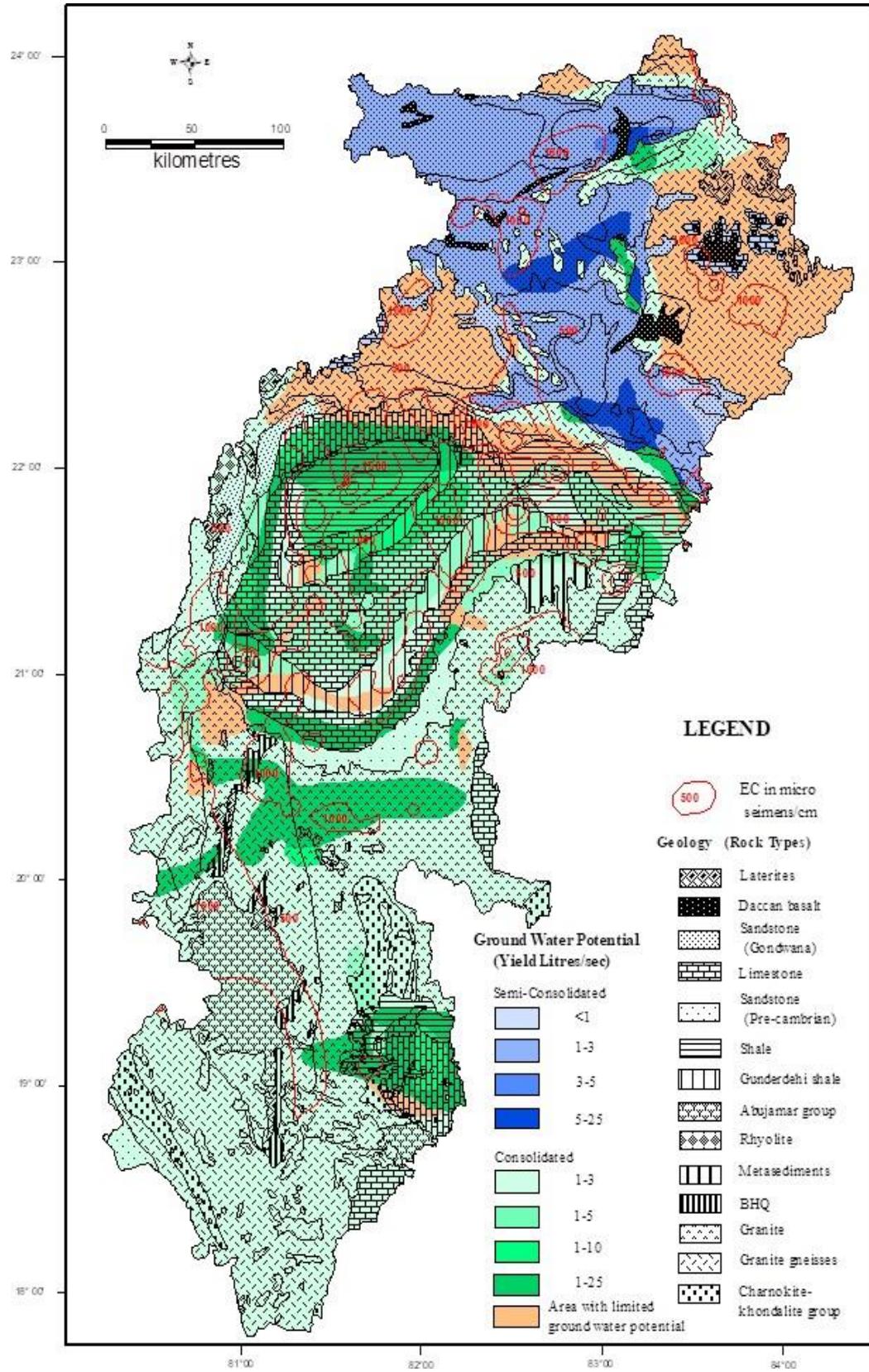
Porous formations have been further subdivided into unconsolidated and Semi- consolidated formations.

#### **UNCONSOLIDATED FORMATION**

Unconsolidated formations of Quaternary age include alluvium, clay, silt, and laterite etc. Quaternary alluvium forms thin unconfined aquifers with maximum thickness up to 40 m bgl. Extent of such formation is very much limited to 338 sq. km. which is 0.44 % area of the state, butthey form potential aquifers in localized areas. They occur in several isolated patches mainly alongmajor river courses like Mahanadi, Arpa, Hasdeo, Seonath, Kharun, Mand, Kelo etc. These aquifers have good potential for ground water yield and are being developed through dug wells, shallow bore wells and filter point wells. Potential alluvial aquifer, which is highly developed, found in Bilaspur and Janjgir–Champa district. Laterites also occur in detached patches over various rock types. Wells tapping laterite profile can be seen mostly on traps in Surguja and Jashpur districts. Ground water occurs in these rocks in phreatic condition and is restricted up to the upper level of the lithomargic clays. Ground water in this province is developed mainly throughdug wells. Laterite aquifers are having moderately good yield.

#### **SEMI-CONSOLIDATED FORMATION**

The rocks belonging to Gondwana Super Group are found mostly in Raigarh, Korba, Surguja and Koriya districts. A small part is also found in Bilaspur and Kawardha districts. They cover nearly 12 % of area in the state.



These consist mainly of sandstone, shale, clay, siltstone and coal seams. The Gondwana sandstones have primary and occasional secondary porosity. They form thick and extensive unconfined to confined aquifers down to 300 m bgl. Groundwater, sometimes, occurs under flowing conditions in localised belts. The Barakar sandstones, which occupy the largest part within Gondwana area, are good productive aquifers with discharge ranges from 1 to 10 lps. Thick shale and clay beds of Barakar formation act as confining layer. At places high groundwater temperature even up to 50° C have been recorded. Ground water development in these formations is through dug wells as well as through bore wells and tube wells.

### **FISSURED FORMATIONS (CONSOLIDATED FORMATIONS)**

The consolidated formations occupy nearly 87% of the area of the State. The occurrence of ground water in these rocks is largely controlled by fracture patterns and brittleness developed in them due to various tectonic activities or due to solution cavities formed by fluid activities. From the hydrogeological point of view the fissured rocks (having fractures) are broadly divided into three types, viz. Igneous and metamorphic, and carbonate rocks, Volcanic rocks and consolidated sedimentary rocks excluding carbonate rocks and Carbonate rocks.

The various rock formations with distinctive hydrogeological characteristics act as different aquifer systems of various dimensions. The various major rock formations of India can be broadly categorized into 14 Principal Aquifer Systems based on their broad hydrogeological properties. A brief account of the Principal Aquifer Systems is discussed in the following paragraphs. The principal Aquifer systems as identified by Central Ground Water Board are shown in Figure-4. The Principal Aquifers are further divided into 42 Major Aquifers (Table-4) depending on their distinctive hydrological characteristics and their spatial distribution.

### **DESCRIPTION OF HYDROGEOLOGICAL UNITS**

The hydrogeological framework of Chhattisgarh state consists both fracture and porous aquifer media. Based on the prevailing porosity type, the rocks of the state have been divided into two broad types (1) hard rocks and (2) soft rocks. Both these types of rocks were further subdivided into groups to simplify the complex geological classification for the purpose of study of ground water behavior. The distribution of hydrogeological units is presented in Table-3 and hydro-geological map of Chhattisgarh is presented in Figure-2.

**Table 8 Distribution of Hydrogeological Units in Chhattisgarh**

Geological Age		Rock Formations	Districts/ Hydrogeological Characters
<b>Consolidated Formations:</b>			
Upper Cretaceous to Eocene	Deccan traps	Basalts, Dolerites and acidic derivatives of Basaltic magma	Jashpur, Surguja, Kawardha, Bilaspur
Pre Cambrian (Proterozoics)	Chhattisgarh Super Group, Indravati Group, Khariyar Group, Sukma Group and Pakhal Group  Dongargarh Supergroup (Abhujmar Group, Chilpi group, Dongargarh and Kanker Granites, Nandgaon Group)	<ul style="list-style-type: none"> <li>❖ Consolidated sandstones</li> <li>❖ Shales</li> <li>❖ Limestones and Dolomites</li>   <li>❖ Granites</li> <li>❖ Schists and Phyllites</li> <li>❖ Arkose and Conglomerate</li> <li>❖ Rhyolites and Andesites</li> </ul>	Raipur, Durg, Dhamtari, Janjgir-Champa, Bilaspur, Mahasamund, Rajnandgaon, Raigarh, Kawardha, Korba, Bastar, Dantewada  Karstified and Cavernous, Limestones, Recrystallised fractured dolomites and fractured Shales forms the unconfined to confined aquifers.  Bastar, Kanker, Raipur, Mahasamund, Dhamtari, Rajnandgaon, Kawardha, Durg, Bilaspur, Raigarh, Surguja, Dantewada  Unconfined shallow aquifer
Archaeans	Bengpal / Amgaon Group Peninsular Gneiss and unclassified basement	Granites, Gneiss and Metasediment Charnockites and Khondalites	Dantewada, Bastar, Kanker, Raipur, Raigarh, Bilaspur, Mahasamund, Rajnandgaon, Surguja, Jashpur, Kawardha, Champa, Korba, Durg, Koriya  Unconfined shallow aquifer
<b>Semi-consolidated formation:</b>			
Carboniferous to Cretaceous	Gondwana Supergroup	Pebbles and boulders Sandstones Shales Coal Seams	Raigarh, Surguja, Koriya, Korba Unconfined to confined aquifers
<b>Unconsolidated formation:</b>			
Quaternary	Alluvium and Laterites	Sand, Silt and Gravels Laterites	All over the State along major drainages. In isolated patches. Unconfined aquifers.

### **Hard rock**

Rocks having secondary porosity- much dominated over primary porosity are grouped under hard rock category. The rock type and their distribution along with their broad characteristics are

Basement Crystallines, Plutonic-Volcanic and Meta Sedimentary- Precambrian Sedimentary rocks and Deccan Volcanics.

### **Soft Rocks**

Rocks having primary porosity much dominated over secondary porosity are grouped under soft rock category. Semi Consolidated Sedimentary and Unconsolidated Sedimentary rocks.

## **AQUIFER SYSTEMS OF CHHATTISGARH**

### **Alluvial Aquifers**

The unconsolidated Quaternary sediments comprising Recent Alluvium and Older Alluvium, forming by and large the major Alluvial Aquifers. These sediments are essentially composed of clays, silts, sands, pebbles, Kanker etc. found around Dhamtari- along Mahanadi, Bilaspur- along Arpa, Gandai- along Surhi, Jagdalpur- along Indravati, Bamnidih- along of Hasdeo, Dongargaon- along Seonath and Khairagarh- along Amner. The maximum thickness of the alluvium is found as 30 m in Bilaspur and 70m in Dhamtari area. In addition to the Annual Replenishable Ground Water Resources in the zone of Water Level Fluctuation (Dynamic GroundWater Resource), a huge ground water reserve occurs below the zone of fluctuation in unconfined aquifers and as well as in the deeper confined aquifers. This formation consists of sand, silt, clay and pebbles. Ground water occurs in phreatic to semi-confined condition. Water level in this area varies between 2 and 20 m. Though isolated, shallow and small, these aquifers have good potential for ground water yield and development through dug wells, shallow bore wells and filter point wells.

The dug wells in Bilaspur urban area can yield between 4.5 and 19 lps & the safe yield for large diameter dug wells in alluvium is between 4 and 6 lps (345 and 518 m<sup>3</sup>/day). Laterites also occur in detached patches over various rock types. Ground water occurs in these rocks in phreatic condition, which is restricted up to the upper level of the lithomargic clays. Ground water in this province is developed mainly through dug wells, where discharge is found up to 2 lps. The depth of dug wells in laterites in Surguja district ranges from 4 to 5 m and yield 0.46 to 0.70 lps (40-60 m<sup>3</sup>/day)

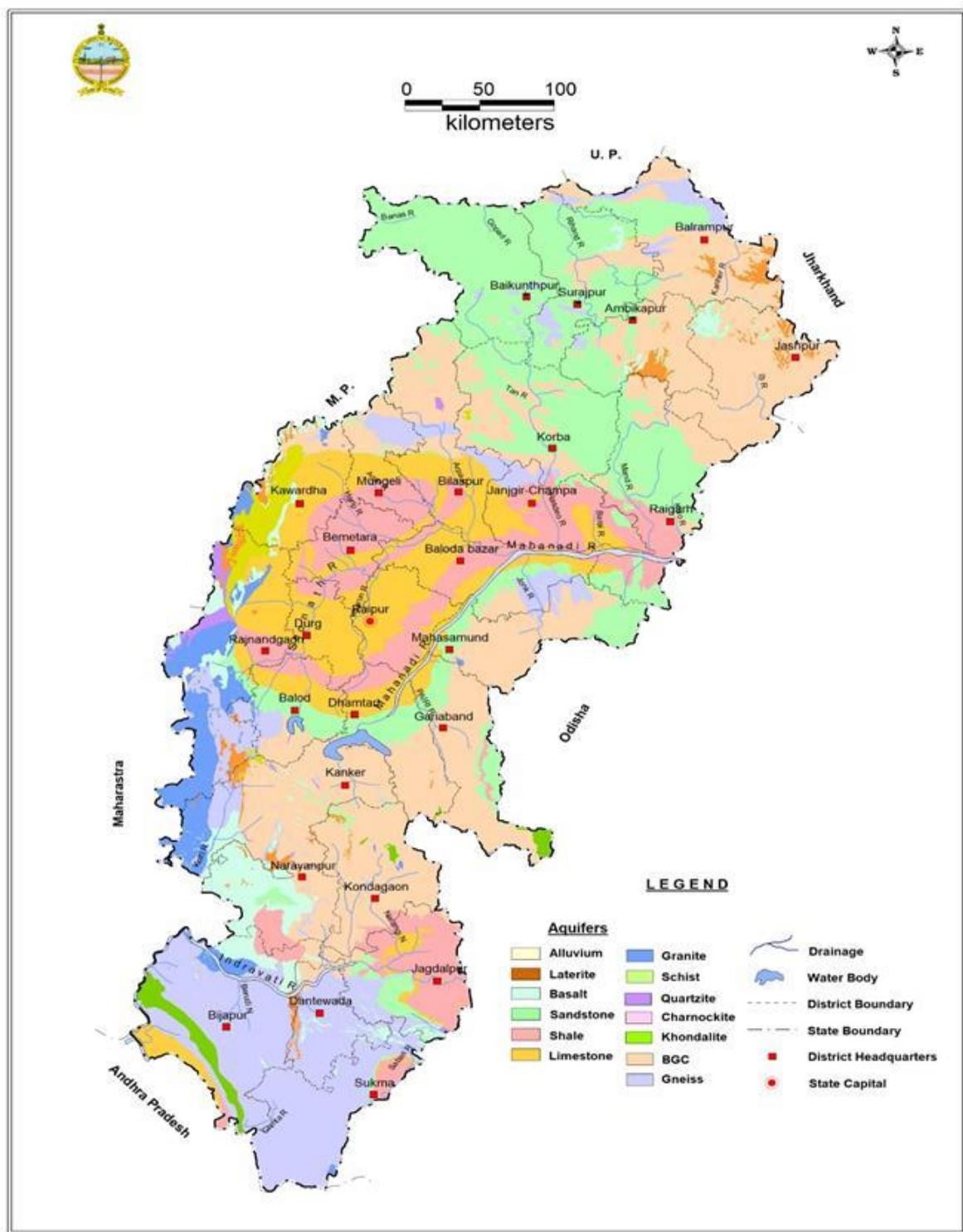


Figure 4 Aquifer system of Chhattisgarh

*Table 9 Aquifer System of Chhattisgarh*

SlNo	Principal Aquifer Code	Principal Aquifer Name	Major aquifer and Colour Code	Major Aquifer Name	Area Covered(Sq km)	%
1	AL	Alluvium	AL01	Fluvial Alluvium (Clay/Silt/Sand/ Calcareous concretions)	40.41	0.03
2	LT	Laterite	LT01	Laterite / Ferruginous concretions	1989.47	1.47
3	BS	Basalt	BS01	Basic Rocks (Basalt)	875.47	0.65
4			BS02	Ultra-Basic	4514.5	3.33
5	ST	Sandstone	ST02	Sandstone with Shale	10727.4	7.91
6			ST03	Sandstone with Shale/ Coal beds	9137.84	6.74
7			ST05	Sandstone/Conglomerate	7257.58	5.35
8			ST06	Sandstone with Shale	854.03	0.63
9	SH	Shale	SH03	Shale, Limestone and Sandstone	860.69	0.63
10			SH05	Shale/Shale with Sandstone	5374.75	3.96
11			SH06	Shale with Limestone	9792.08	7.22
12	LS	Limestone	LS03	Limestone/Dolomite	13651.1	10.07
13			LS04	Limestone with Shale	2910.47	2.15
14	GR	Granite	GR02	Acidic Rocks (Pegmatite, Granite, Syenite, Rhyolite, etc.)	4453	3.28
15	SC	Schist	SC02	Phyllite	1551.04	1.14
16			SC03	Slate	39.55	0.03
17	QZ	Quartzite	QZ01	Quartzite	569.07	0.42
18	CK	Charnokite	CK01	Charnockite	1198	0.88
19	KH	Khondalite	KH01	Khondalite	12	0.01
20	BG	Banded Gneissic Complex(BGC)	BG01	Banded Gneissic Complex (BGC)	39716.6	29.29
21	GN	Gneiss	GN01	Undifferentiated metasedimentary/ Undifferentiated metamorphic	6570.55	4.85
22			GN02	Gneiss	13500.4	9.96

### **Laterite Aquifer**

Laterites are formed due to leaching (chemical weathering) of parent sedimentary rocks (sandstones, clays, limestones); metamorphic rocks (schists, gneisses, migmatites) and igneous rocks (granites, basalts, gabbros, peridotites) under hot and humid climatic conditions. Laterites rich in iron and aluminium contents are the most widespread and extensively developed aquifer especially in Jashpur District, Kumhari area in Durg district, Mainpat and Bodal Daldali area of Surguja- Kawardha districts in Chhattisgarh. Laterite forms potential aquifers along valleys and topographic lows where thick saturated zone sustain large diameter open wells for domestic and irrigation use.

### **Sandstone and Shale Aquifer**

The sandstone and shale generally belong to the group of rocks ranging in age from Carboniferous to Mio-Pliocene forms this aquifer. These aquifers are found in Raigarh, Sarguja, Surajpur, Koriya, Janjgir-Champa and Korba. The terrestrial freshwater deposits belonging to Gondwana System and the Tertiary deposits along the west and east coast of the peninsular region are included under this category. The Gondwana sandstones form highly potential aquifers locally. Elsewhere, they have moderate potential and in places they yield meagre supplies. The Gondwana sandstones is the most extensive and productive aquifers.

The Gondwana Super Group and Lameta Group of rocks consist of sandstone, shale, clay, siltstone and coal. They possess both primary and secondary porosity, where primary porosity dominates over secondary porosity. Ground water occurs in both phreatic and semi-confined to confined conditions. Shallow aquifers are phreatic to semi-confined whereas deeper aquifers are generally confined, many time giving rises to flowing artesian wells. These rocks have good potential aquifer system (except the Talchir formation), ground water development in this area is still moderate and exploitation is restricted to the upper aquifers (within 120m). Dug wells tapping the Lametas in Surguja district have yield upto 0.80 lps (70 m<sup>3</sup>/day). the specific capacity ranges between 50-150 lpm/m of drawdown, hydraulic conductivity varies between 10-25 m/d and specific yield is from 10-15%

### **Limestone Aquifer**

The consolidated sedimentary rocks include carbonate rocks such as limestone, dolomite and marble. Limestone is the dominating rock type among the carbonate rocks, which is widely

distributed in Bastar, Raipur, Durg, Dhamtari, Janjgir-Champa, Mahasamund, Rajnandgaon, Raigarh, Kawardha, Bilaspur, Korba and Dantewad. In the carbonate rocks the secondary porosity like fractures and solution cavities form the aquifer. Consolidated sedimentary rocks of Chhattisgarh Supergroup, Indravati, Sukma, Khariar and Pakhal Groups consist of limestone/dolomites apart from other major litho-units such as conglomerates, sandstones, shale, slates and quartzite form this principal aquifer. These are Unconfined to semi-confined aquifer, developed by dug /dug cum bore wells.

The rocks of Chhattisgarh Super Group, which are sedimentary rocks of marine origin consists of arenaceous-argillaceous-calcareous rocks and are dominated by limestone/ dolomites and calcareous shale and ortho-quartzite. The limestone is more ground water productive. The ortho- quartzites and shale are poor aquifers. The weathered zone is restricted to upper 30 m depth. The ground water in these formations occurs under water table, semi-confined and confined conditions. The weathered and cavernous part of the formation constitutes the good potential aquifers in the area. The transmissivity value of Maniyari formation is varying from 100 to 600 m<sup>2</sup>/day. The Charmuria and Chandi formation having Transmissivity value ranging from 5 to 400 m<sup>2</sup>/day. The storativity is poor to moderate as calculated, ranges from  $1.19 \times 10^{-2}$  to  $9.72 \times 10^{-4}$ , field permeability ranges from 4 to 65 m/day. The specific capacity for the bore wells ranges from 0.0002 to 1.39 m<sup>3</sup>/min/m drawdown.

### **Basalt aquifers**

Basalt is the basic volcanic rock which forms alternate layers of compact and vesicular beds of lava flows as seen in isolated patches in Koriya, Surguja, Jashpur, Kawardha and Bilaspur districts, generally occupying the hill tops. The groundwater occurrence in the basalts are controlled by nature and extent of weathering, presence of vesicles and lava tubes, thickness, number of flows and the nature of inter-trappean layers. The basalts have usually medium to low permeability. Groundwater occurrence in the Deccan Traps is controlled by the contrasting water bearing properties of different flow units, thus, resulted in multiple aquifer system, at places. The water bearing zones are the weathered and fractured zones.

This consists of basaltic lava flows and each flow is separated from other flow by intertrappean orred boles. The vesicular top parts of various flows and inter flow red boles form the aquifer alongwith weathered and fractured zones. The area is being developed through construction of dug wells and shallow bore wells fitted with hand pumps and have limited discharge. In general,

the weathered part of trap is converted to Laterites and can yield substantial water to the dug wells. The Laterites of Jashpur area can yield up to 2 lps ( $173 \text{ m}^3/\text{day}$ ) discharge. In some areas the control of dolerite dykes on occurrence of ground water was observed. Wells located on the upstream side of these dykes and also on tectonic lineaments gave better yields.

### **Crystalline Aquifers**

The crystalline hard rock aquifers such as granite, gneisses and high grade metamorphic charnockite and khondalite constitute moderate to good repository of ground water. Hard rocks generally neither receive nor transmit water, due to negligible or limited primary porosity. However, these may form good aquifers if weathered and/or have good secondary porosity in the form of faults, fractures, joints, bedding planes, and solution cavities. The crystalline rocks also form the aquifers with weathered zone or the fracture system. The weathered mantle cover and associated secondary porosity do not occur uniformly but are rather localised phenomena. The weathered zone is underlain by semi-weathered saprolite zone followed by fractured and massive rock. These aquifers distributed in Dantewara, Sukma and Bijapur, Bastar, Narayanpur, Kondagaon, Kanker, Rajnandgaon, Durg, Kawardha, Bilaspur, Janjgir-Champa, Mahasamund, Korba, Jashpur, Balrampur, Surguja, Koriya and parts of Raigarh districts.

In these aquifers, ground water occurs under phreatic condition in the weathered mantle cover and under semi-confined to confined state in underlying fissured, fractured, and jointed hard rock. The volume of ground water stored under semi-confined condition within the body of the hard rock is much lower than the storage in the overlying phreatic aquifer which is often much greater. Hydraulically connected fissures and fractures underlying weathered mantle cover generally serves as a permeable conduit feeding the deeper wells. Ground water flow rarely occurs across the topographical water divides so far as the unconfined aquifer is concerned and each basin or sub-basin can be treated as a separate hydro geological unit for planning the development of ground water resources.

The dug wells in the area have yield in the range of 0.23 to 2.30 lps. The bore wells have drill timedischarge generally below 3 lps & specific capacity ranges from 20-200 lpm/m drawdown. These aquifers have low Transmissivity in the range of 1 to  $55 \text{ m}^2/\text{day}$  (having less Storativity). The specific capacity for the open dug wells of BHQ and Gneisses in Durg district varies from  $1.37 \times 10^{-2}$  to  $7.86 \times 10^{-3} \text{ m}^3/\text{min}/\text{m}$  drawdown. Hydraulic conductivity is generally less than 1 m/d and specific yield less than 5%.

Plutonic-Volcanic meta-sedimentary group constitutes of granites, acid and basic volcanics and Proterozoic meta-sedimentaries. Ground water in this rock mainly occurs in phreatic to semiconfined condition. These aquifer groups have better potential than the basement crystallines. The bore wells in the province can yield upto 5 lps ( $432 \text{ m}^3/\text{day}$ ) with general discharge up to 3 lps. The Transmissivity ranges between 2 and  $150 \text{ m}^2/\text{day}$ , which is good in comparison with other aquifers of the state.

## **CHAPTER - 5**

### **5.0 GROUND WATER LEVEL SCENARIO IN CHHATTISGARH**

#### **5.1 Groundwater Level Scenario (2023)**

##### **Groundwater level data of pre-monsoon 2023**

In general, the depth to water level ranges of 0 to 2 m bgl is observed in approximately 2.24 % of the wells, 2 to 5 m bgl is observed in approximately 32.24% of the wells and depth to water level range up to 10 m bgl is observed in 52.44% of the wells in the state. Deeper water levels ranging between 10 - 20 and 20 - 40 m bgl occur respectively in 12.34% and 0.714% of the observation wells only in parts of Bilaspur, Durg, Janjgir Champa Dhamtari, Mahasamund, Raigarh districts. The deepest water level of 25.31m bgl was monitored in Sikharipalli, Pithora observation well of Mahasamund district.

22 numbers of wells (approximately 2.24% of the monitored wells) in the state are showing water levels between 0 - 2 m bgl in almost all the districts of Chhattisgarh State. Water levels in the range of 2 - 5 m bgl are recorded in about 316 of the observation wells monitored. The highest percentages of wells in this range are in Raipur (63.44%), Dhamtari (56.25m bgl) Durg (45.45%), Kanker (57.14%), Mahasamund (25.81%), Rajnandgaon (32.31 %), Bastar (25.93%) and Janjgir champa (29.41%) districts. Nearly, 32.24% of observation wells are exhibiting water level in the range of 2 – 5 m bgl in most of the districts of the state.

##### **Groundwater level data for post-monsoon 2023**

The depth to water level range up to 2 m bgl is observed in approximately 17.57% of wells, water level range up to 5 m bgl is observed in approximately 58.30% of the wells and depth to water level range up to 10 m bgl is observed in approximately 22.61% of the wells in the state. Deeper water levels ranging between 10 and 20 m bgl occur only in 1.26% of the observation wells and mostly in parts of Surguja Raigarh, Kanker Durg and Kawardha districts. The deepest water level of 50 mbgl was monitored in Ganiyari new observation well of Bilaspur district.

164 numbers of wells (approximately 17.57% of the monitored wells) in the state are showing water levels between 0-2 m bgl in almost all the districts of Chhattisgarh State. Water levels in the range of 2-5 m bgl are recorded in about 544 (58.30%) of the observation wells monitored. The highest percentages of wells in this range are in Korba (61.11%), Kanker (57.14%), Koriya (70.83%), Jashpur (58.23%), Janjgir-champa (56.25%), and Sarguja (61.11%) districts. Nearly 22.61% of observation wells are exhibiting water level in the range of 5-10 mbgl in most of

the districts of the state.

## **5.2 Fluctuation of Groundwater Level:**

### **Comparison of Pre-monsoon 2023 to Pre-monsoon 2022**

When compared to water level in May 2022, nearly 43.30% of the observation wells are showing rise in water level in May 2023. Rise of water level in the range of 0-2 m is observed in 31.59% of the wells distributed in all the districts. Rise of water level in the range of 2-4 m is observed in 78.89 % of the wells distributed in almost all the districts except Kanker and Jashpur districts. Rise of water level by more than 4 m is also observed in 17.20% of the monitored wells in Bilaspur, Dhamtari, Durg, Janjgir-Champa, Korba, Koriya, Mahasamund, Raigarh, Raipur and Surguja districts. Rise of more than 4 % is observed in 12.01% of wells. Fall of water level is recorded in nearly 51.23% of the monitored wells. Fall of water level in the range of 0-2 m, 2-4 m and more than 4 m are observed in 13.95%, 7.86% and 84.51% of the monitored wells, respectively in the state.

### **Comparison of November 2023 to November 2022**

When compared to water level in November 2022, nearly 31.64% of the observation wells are showing rise in water level in November 2023. Rise of water level in the range of 0-2 m is observed in 88.64% of the wells distributed in almost all the districts. Rise of water level in the range of 2-4 m is observed in 8.42% distributed in almost all the districts except in Bastar, Kanker, Kawardha, Koriya and Raipur. Rise of water level by more than 4 m is observed 2.93 % of the monitored wells except in Bastar, Bilaspur, Dhamtari, Janjgir – champa, Jashpur, Kanker, Kawardhaand Rajnandgaon. Fall of water level is recorded in nearly 66.43% of the monitored wells. Fall of water level in the range of 0-2 m, 2-4 m and more than 4 m are observed in 82.30%, 12.02% and 5.67% of the monitored wells, respectively in the State.

### **Comparison of Pre-Monsoon 2023 with decadal mean of Pre-Monsoon (2013 to 2022)**

When compared to the decadal mean water level (May 2013 to May 2022), 52.54% of observation wells are showing a fall in water level in May 2023. Out of the wells monitored, 72.40% of the wells are showing a fall up to 2 m and 21.412% between 2 to 4 m except in Kanker and Kawardha districts. 6.181% of the monitored wells are showing a fall in water level of more than 4 m. Fall of water level as compared to the decadal mean by more than 4m is observed in all districts except Kanker, Kawardha and Koriya districts. Nearly, 67.35% of monitored wells are showing a rise in the water level, mostly in the range of 0-2 meters (About 23.74% of the monitored wells are

showing a rise in the range of 2-4 meter whereas 7.762% of the monitored wells are showing a rise of > 4 m in all districts except in Bastar and Mahasamund districts.

#### **Comparison of Post-Monsoon 2023 with decadal mean of Post-Monsoon (2013 to 2022)**

When compared to the decadal mean water level (November 2013 to November 2022), 67.35% of monitored wells are showing a rise in the water level, mostly in the range of 0-2. About 23.744% of the monitored wells are showing a rise in the range of 2-4 meters except in Bastar and Kanker districts, whereas 8.9% of the monitored wells are showing a rise of more than 4 m in Bastar, Bilaspur, Dhamtari, Janjgir – Champa, Jashpur, Kanker, Kawardha Koriya, Mahasamund, Raigarh, Raipur and Rajnandgaon districts. Out of 444 wells showing fall in water level nearly 51.62% of observation wells are showing a fall in water level in November 2023. Out of the wells monitored, out of no of wells showing falling water level 83.11% of the wells are showing a fall up to 2 m. About 12.83% between 2 to 4 meters except in Kawardha districts and 4.054% of the monitored wells are showing a fall in water level of more than 4 m restricted only in Janjgir – champa, Jashpur, Koriya, Rajnandgaon and Raigarh districts.

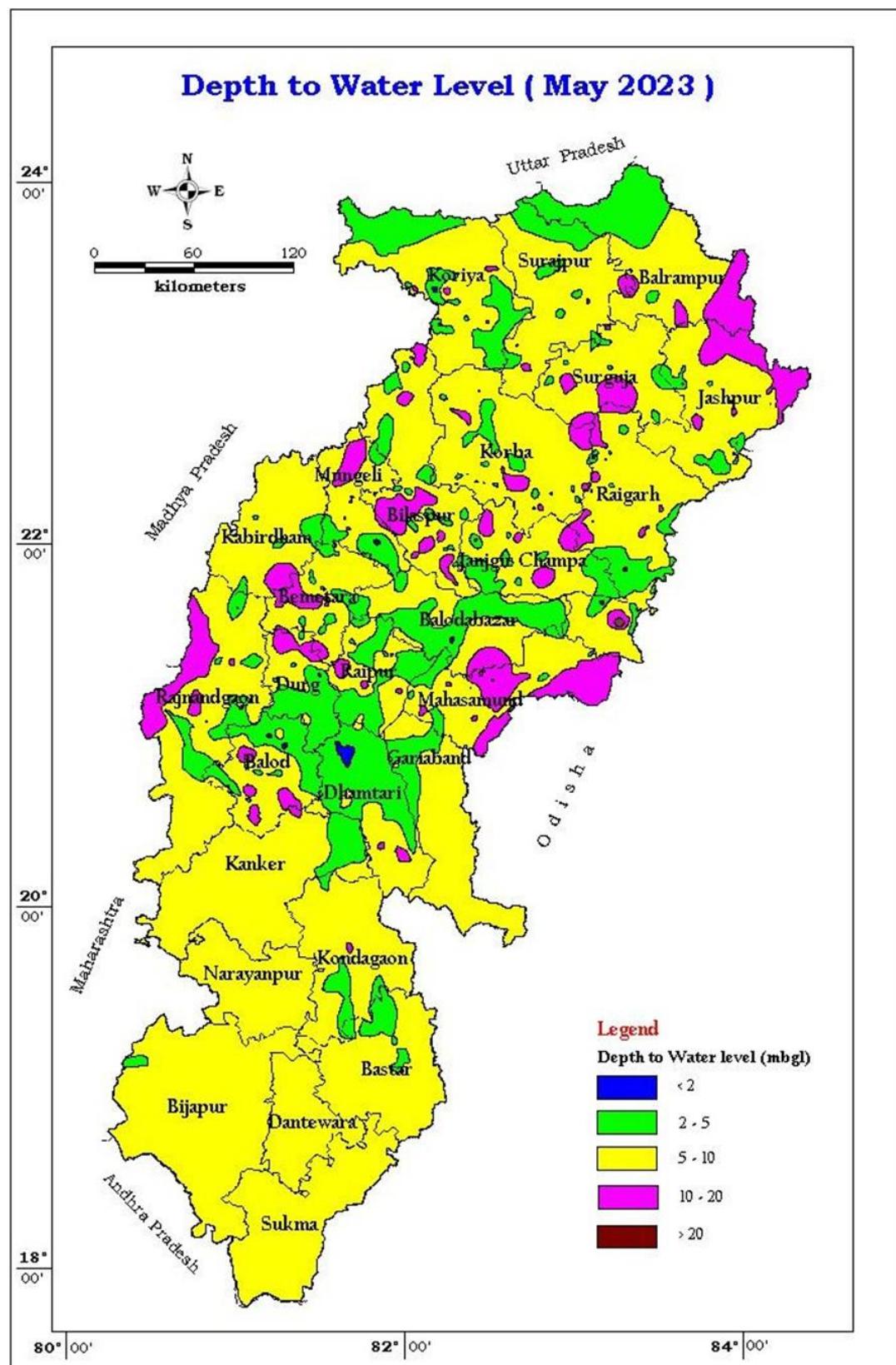


Figure 5 Depth to Water Level Map of the State/UT Pre-Monsoon 2023

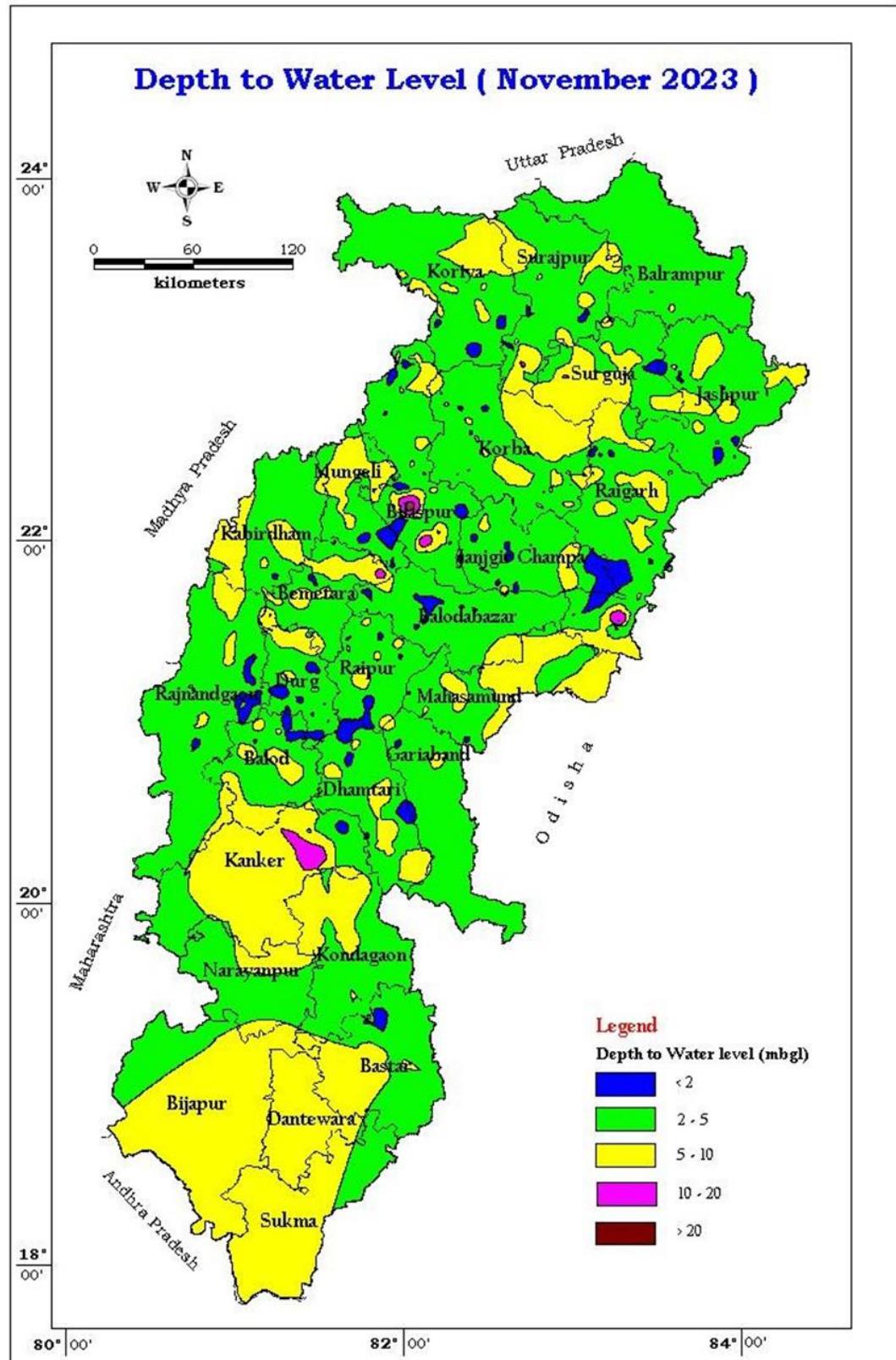


Figure 6 Depth to Water Level Map of the State/UT Post-Monsoon 2023

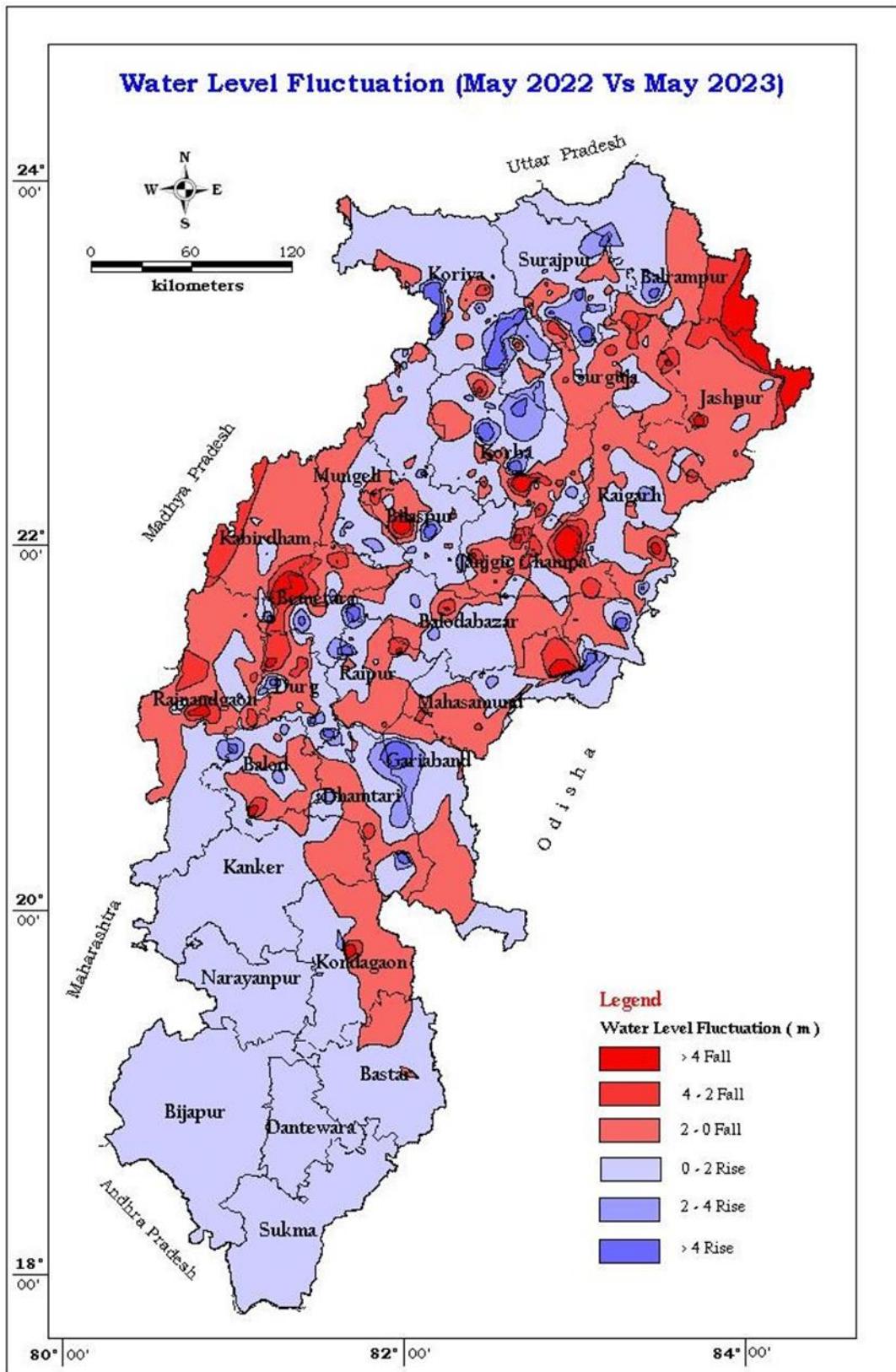


Figure 7 Groundwater Level Fluctuation: Pre-monsoon 2022 compared to Pre-monsoon 2023

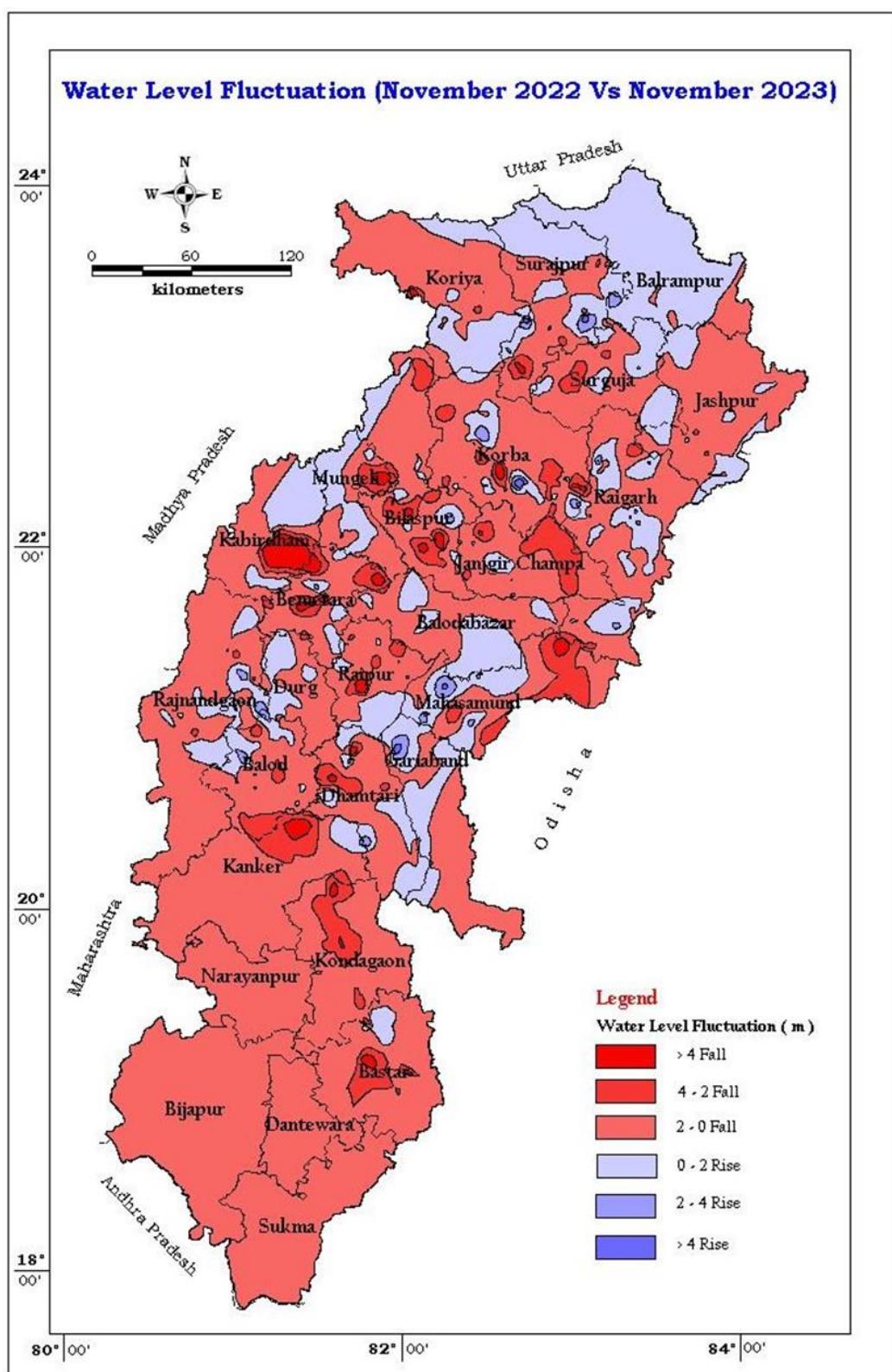


Figure 8 Groundwater Level Fluctuation: November 2022 compared to November 2023

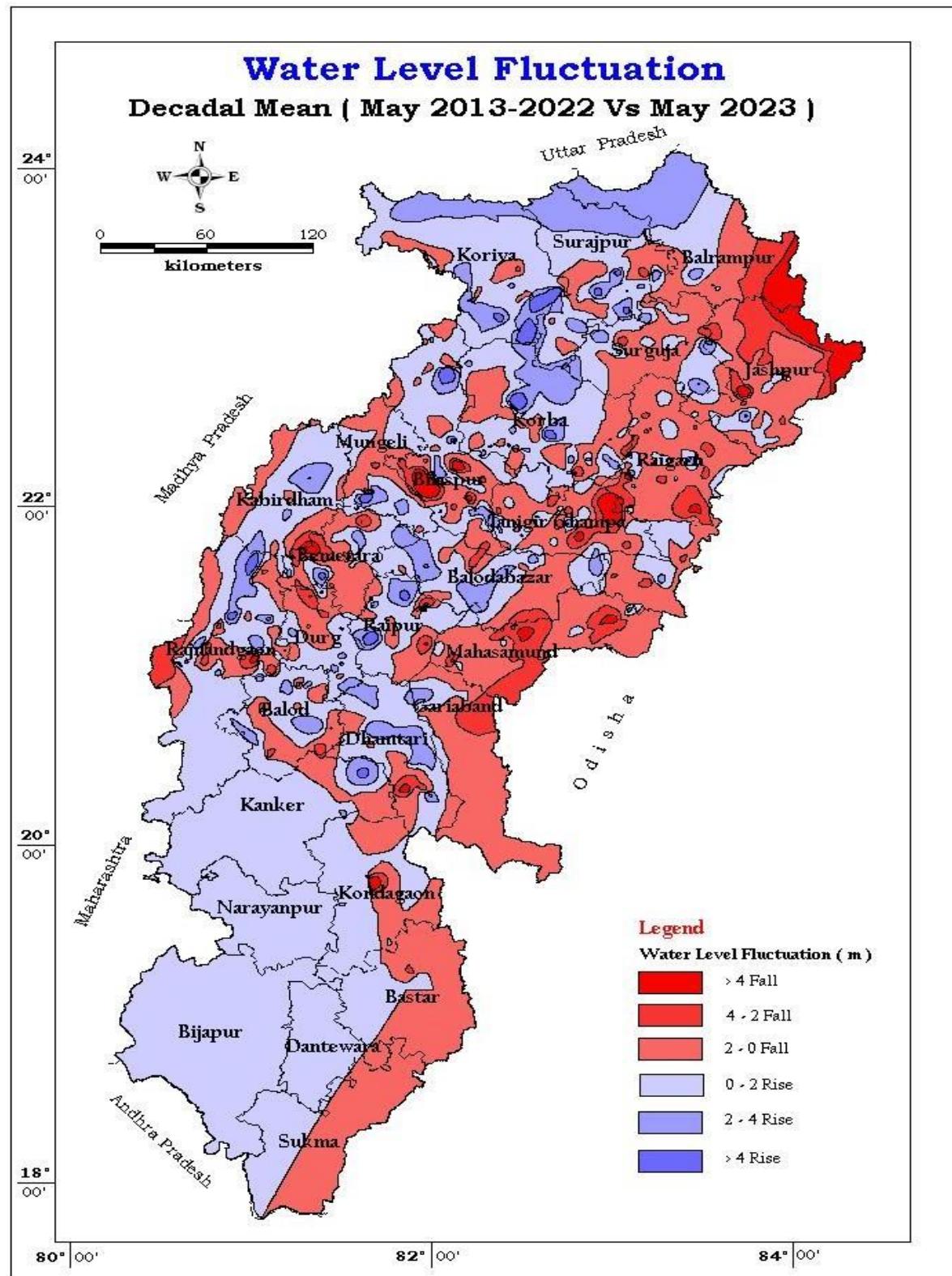


Figure 9 Decadal water level fluctuation with mean Pre-Monsoon (2013 to 2022) and Pre-Monsoon 2023

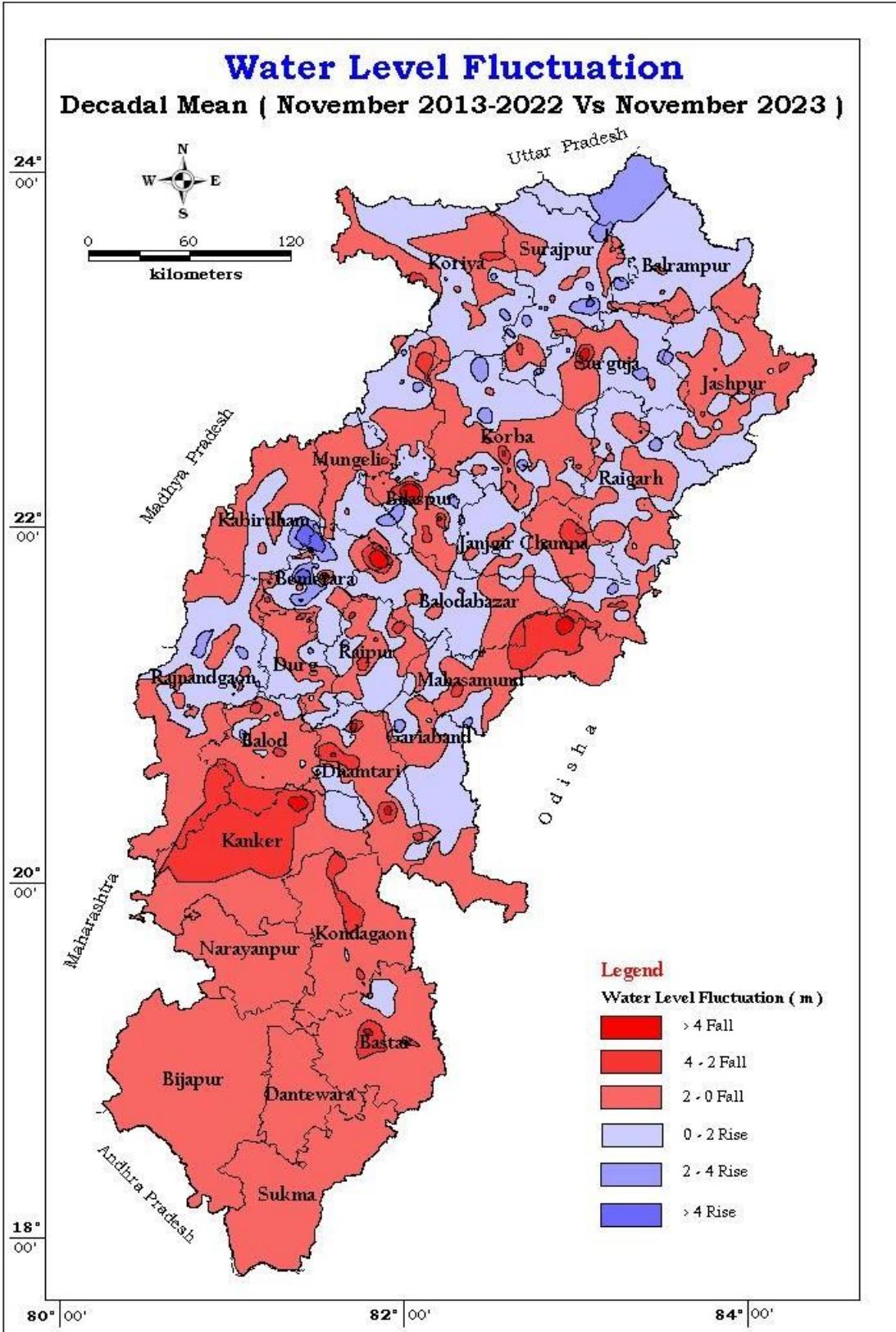


Figure 10 Decadal water level fluctuation with mean Post-Monsoon (2013 to 2022) and Post-Monsoon 2023

## CHAPTER 6

### 6.0 GROUND WATER RESOURCES OF THE STATE/UT

#### 6.1. ANNUAL GROUND WATER RECHARGE

Total Annual Ground Water Recharge is 14.18 bcm and Natural Discharge during Non-Monsoon Period is 1.25 bcm.

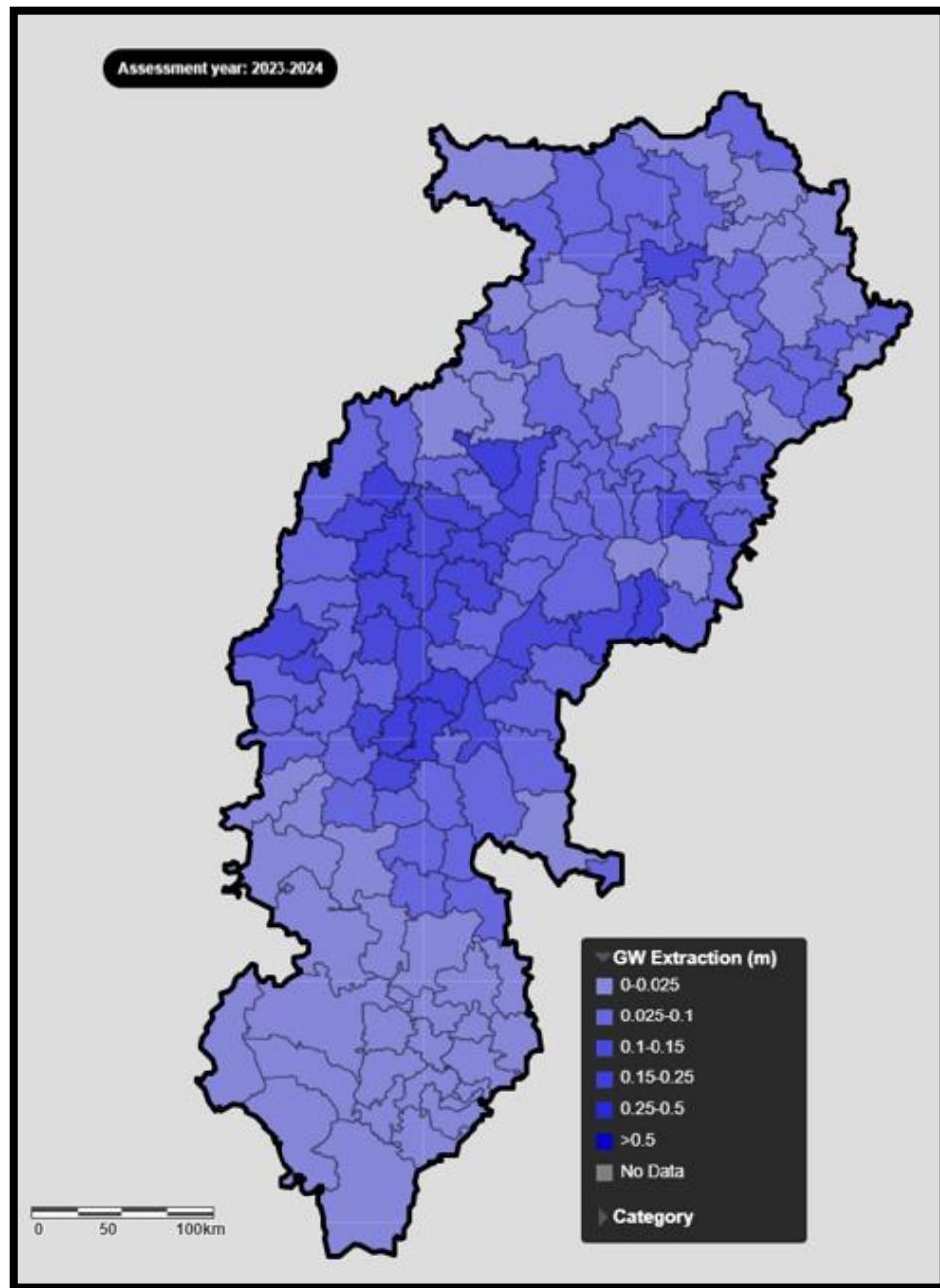


Figure 11 Annual Groundwater Recharge Unit Map

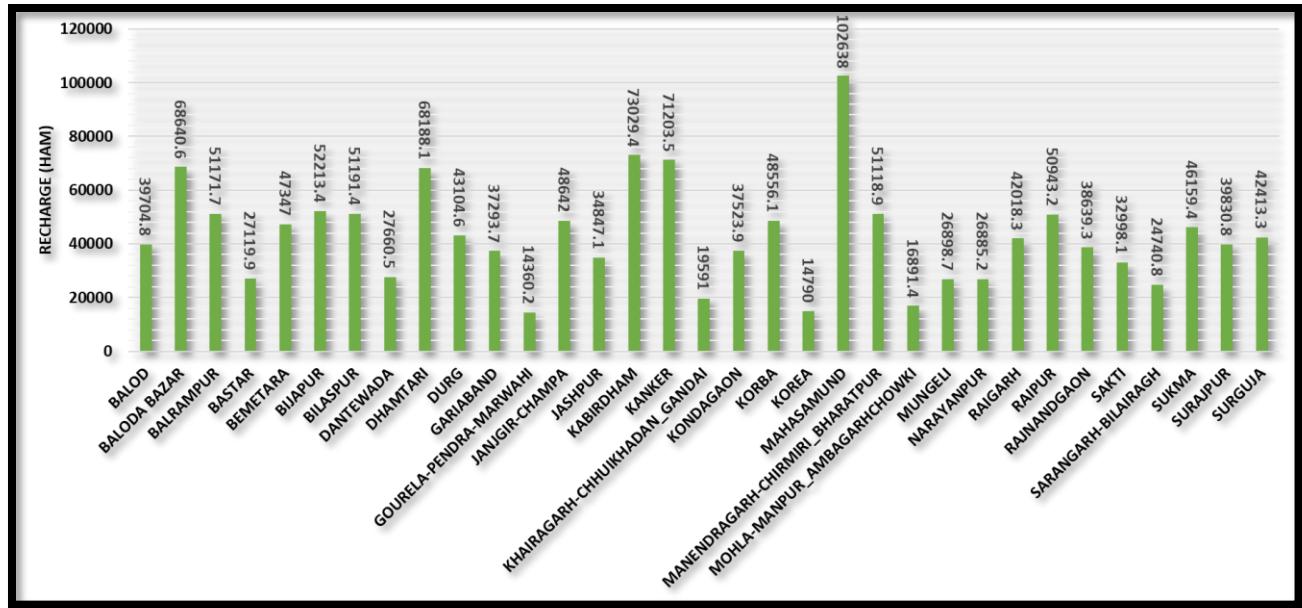


Figure 12 District wise Total Annual ground Water Recharge 2024

## 6.2.ANNUAL EXTRACTABLE GROUND WATER RESOURCES

The Annual Extractable GroundWater Resource of the state is 12.92 bcm.

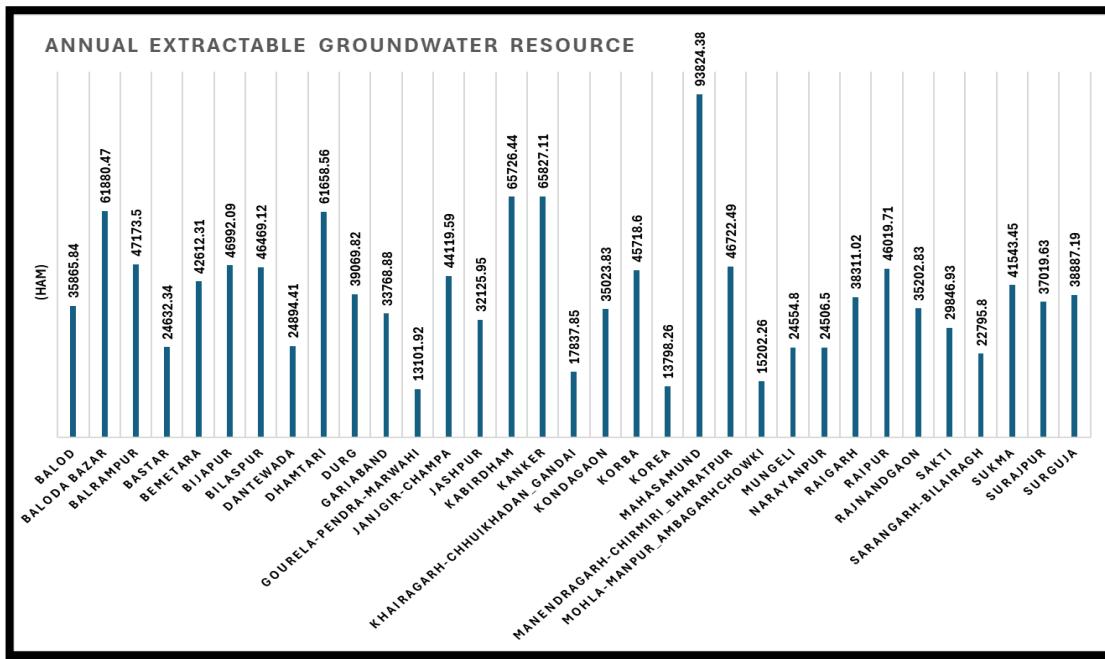


Figure 13 Annual Extractable Ground Water Resource.

### 6.3.ANUAL TOTAL GROUND WATER EXTRACTION

The existing groundwater extraction for all uses in the state is 6.11 bcm with Mahasamund district having the highest extraction of ground water (56616.87 Ham) and Narayanpur district having the lowest (1797.25 Ham) ground water extraction. Mahasamund is one of the most developed district in the state in terms of Agricultural production and dependence on ground water is very high in the district. Comparison of ground water extraction for various uses reveals that extraction for irrigation accounts for morethan 86 % of the total ground water extraction, whereas extraction for domestic purposes accountsfor 12 % and for Industrial purposes is 2 % of the total ground water extraction in the state.

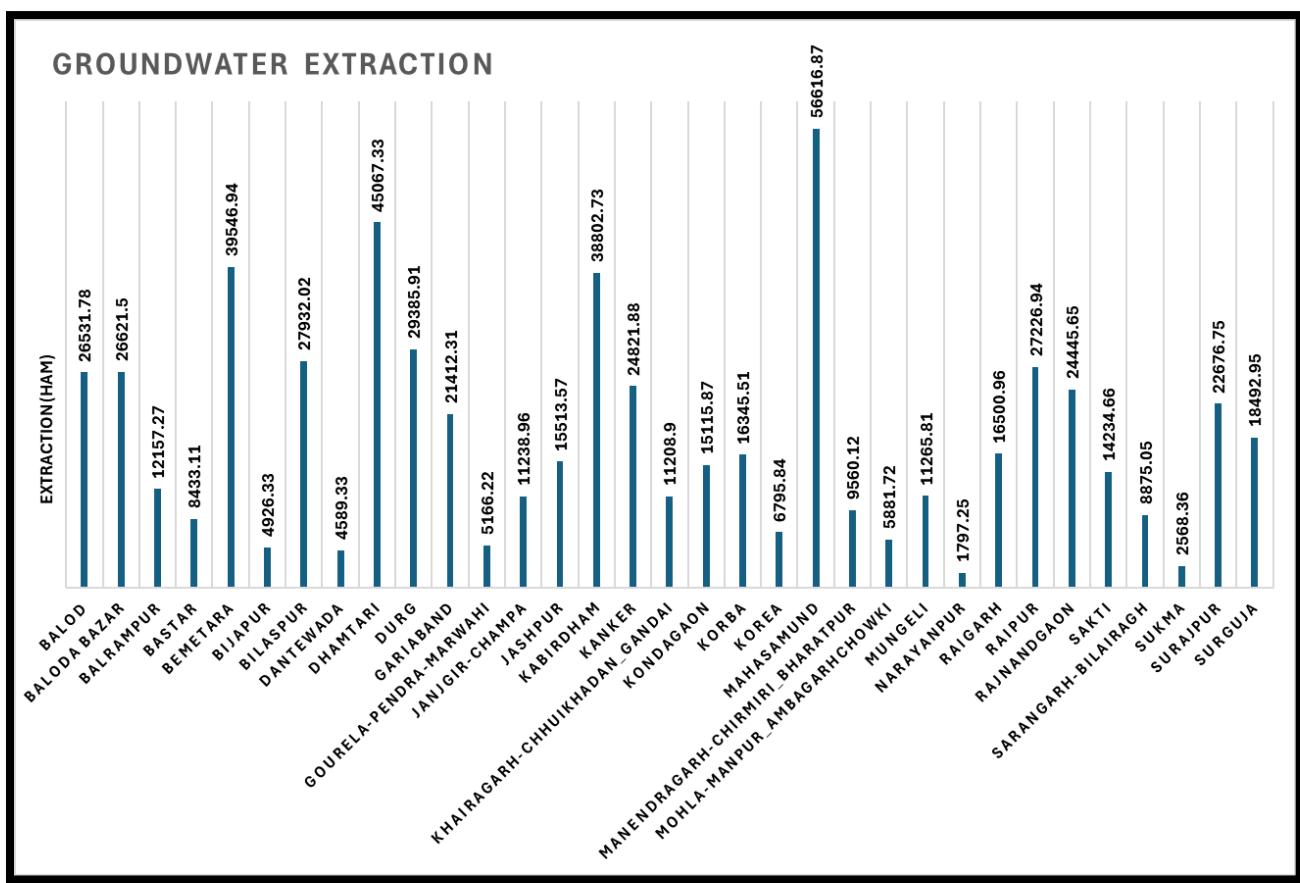


Figure 14 District wise Groundwater Extraction

#### 6.4. STAGE OF GROUND WATER EXTRACTION

Stage of groundwater extraction of Chhattisgarh state as on March-2024 is 47.32%, which is low as compared to the national extraction of 59.26% (as on March-2023). Four districts in the state namely Balod, Bametra, Dhamtari, Durg, have stage of development more than 70% i.e. 73.98%, 92.81%, 73.09%, 75.21% respectively. The Nawagarh block of Bemetara district reached at highest ground water extraction of 97.03% and Bemetara district shows highest ground water extracted district i.e. 92.81 % in state. Sukma district has lowest stage of ground development of less than 6.18%. Out of 146 blocks, 120 blocks are safe and only 26 blocks have attained stages of development more than 70%. The state as a whole has a stage of extraction of 47.32 % only.

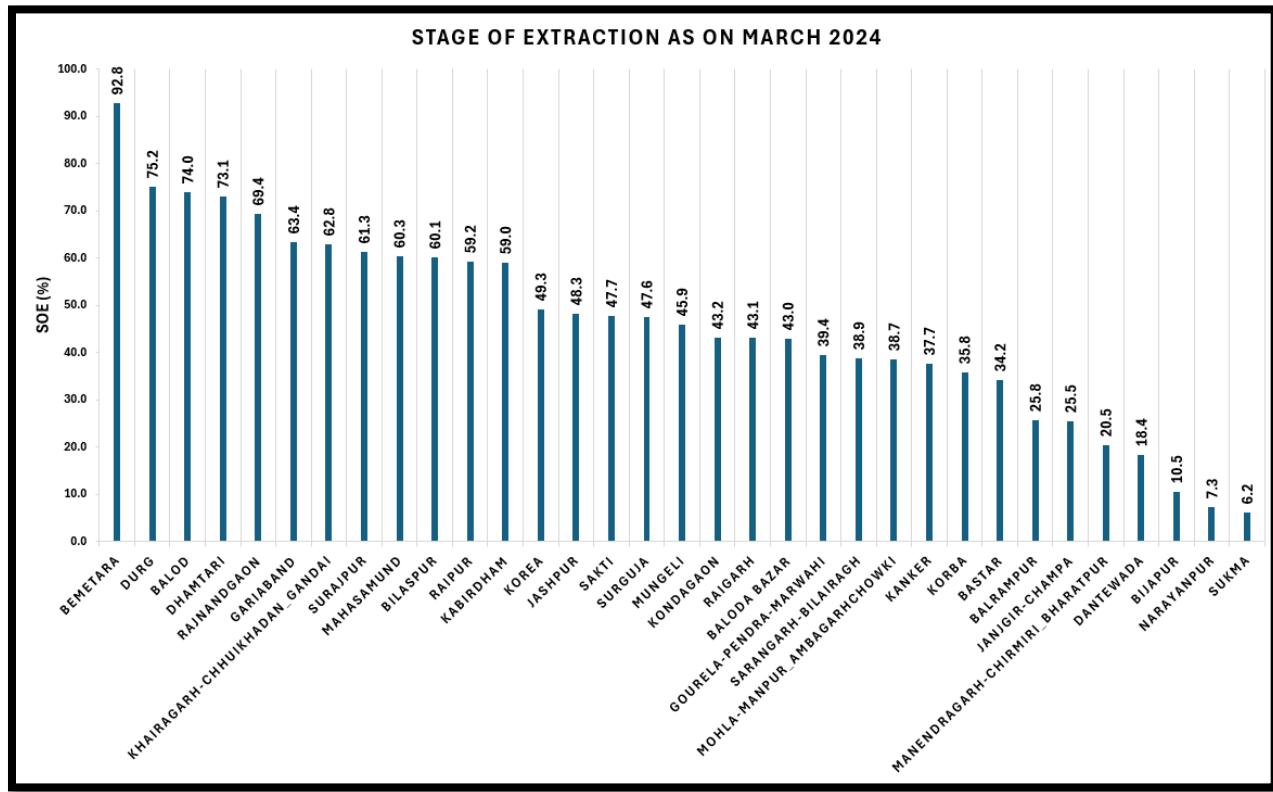


Figure 15 Graph depicting district wise stage of extraction.

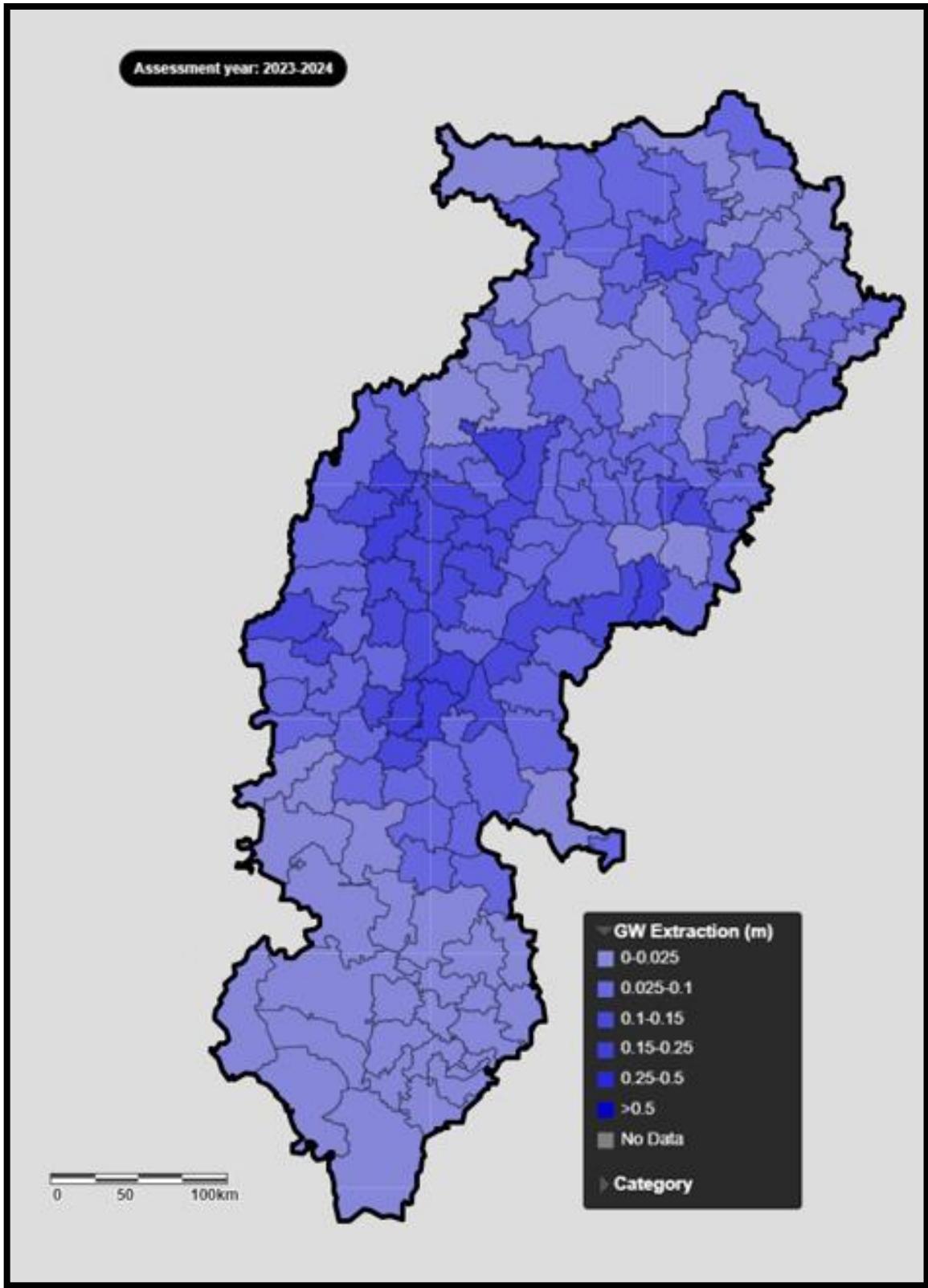


Figure 16 Annual Groundwater Extraction Unit Map

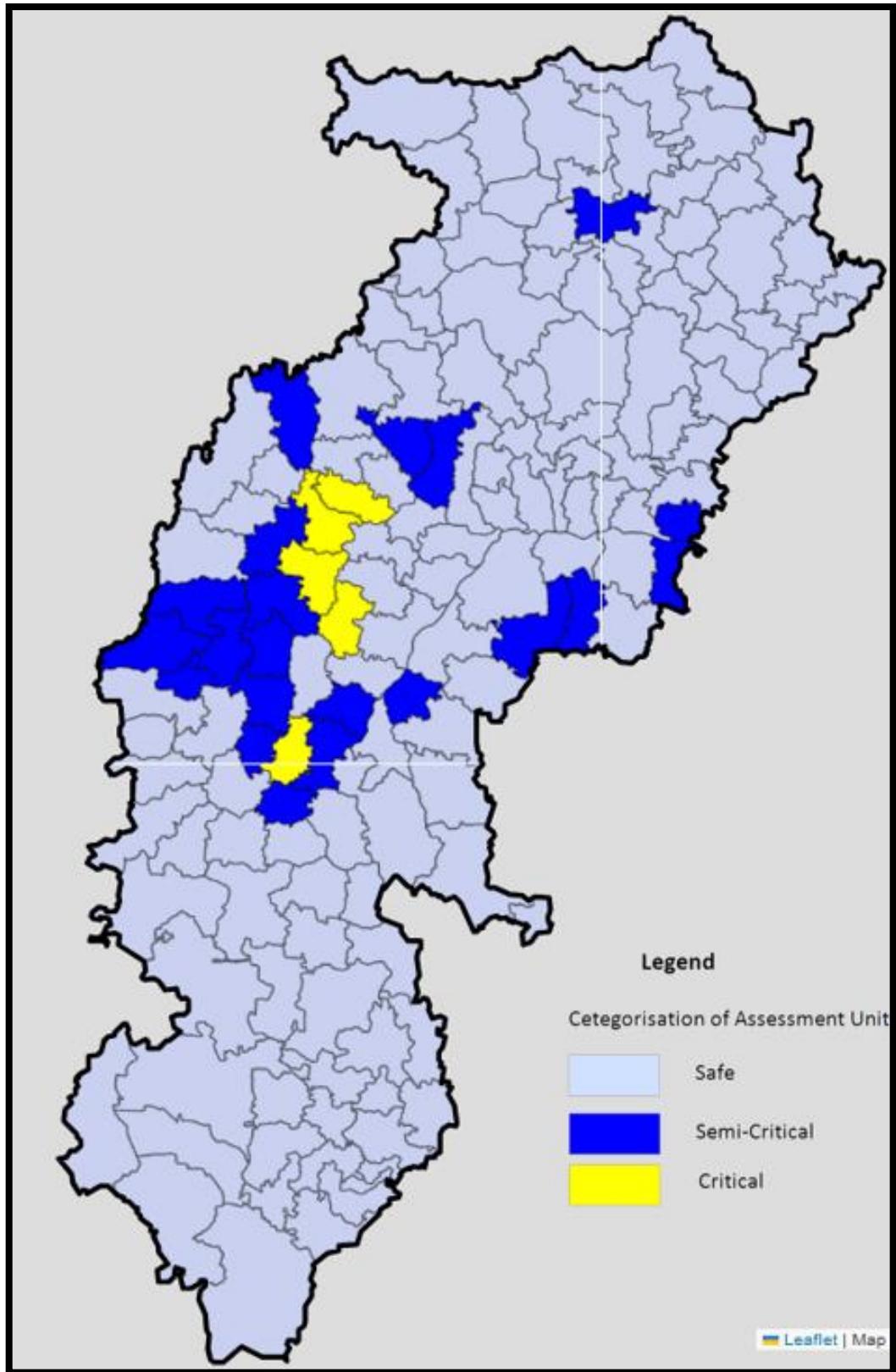


Figure 17 Categorization of assessment unit as on March, 2024

## **6.5. CATEGORIZATION OF ASSESSMENT UNITS**

Out of 146 assessment units (blocks), 5 units (3.42 %) as 'Critical', 22 units (14.38 %) have been categorized as 'Semi-critical' and 120 units (82.19 %) as 'Safe' categories of assessment units. There are no 'Over-exploited' and 'Saline' categories of assessment units. Out of 106078.71 sq km recharge worthy area of the State, 3119.06 sq km (2.94 %) area are under 'Critical', 14090.19 sq km (13.28 %) under 'Semi- critical', 88869.46 sq km (83.78 %) under 'Safe' categories of assessment units. Out of total 13186.48 mcm annual extractable ground water resources of the State, 464.26 mcm (3.52 %) under 'Critical', 2413.61 mcm (18.3 %) under 'Semi-critical' and 10308.62 mcm (78.18 %) are under 'Safe' categories of assessment units. (Annexure 3, Figure-7). There are no 'Over-exploited' and 'Saline' categories of assessment units. Critical and Semi-critical blocks are distributed in Balod, Bemetara, Bilaspur, Dhamtari, Durg, Gariaband, Kabirdham, Kanker, Mahasamund, Raigarh, Raipur, Rajnandgaon, Sarangarh-Bilaigarh and Surajpur districts. Rest all subunits have been categorized as safe from groundwater extraction point of view.

## **6.6. COMPARISON WITH PREVIOUS ASSESSMENT**

The comparison with the previous assessment year reveals some changes in the categorization of assessment units. In the previous year, out of 146 blocks, 120 blocks were categorized as 'Safe', 21 blocks as 'Semi-critical', and 5 blocks as 'Critical'. In the current assessment year, out of 146 blocks, 121 blocks are categorized as 'Safe', 20 blocks as 'Semi-critical', and 5 blocks as 'Critical'.

## **CHAPTER - 7**

### **7.0 CONCLUSIONS**

The report on Dynamic Groundwater Resources of Chhattisgarh, 2024, signifies a critical milestone in understanding and managing the state's water resources amidst rising pressures from agricultural, industrial, and domestic needs. This comprehensive assessment, collaboratively executed by the State Groundwater Survey and the Central Ground Water Board, underscores the vital importance of sustainable water management practices in addressing the challenges posed by overexploitation and variable monsoon patterns.

Notably, the analysis highlights a mix of critical, semi-critical, and safe blocks, indicating a complex and varied groundwater scenario across Chhattisgarh. This nuanced understanding is crucial for crafting targeted policies that not only address areas of acute shortage but also prevent future overexploitation in currently safe zones. Furthermore, the report's recommendations for enhancing groundwater recharge, such as the implementation of artificial recharge structures and the promotion of water conservation practices, reflect a proactive approach to resource management. This strategic direction, coupled with the continued monitoring and assessment of groundwater levels, will provide a robust framework for ensuring the long-term sustainability of Chhattisgarh's groundwater resources.

*Annexure 1 Ground water resources availability, utilization and stage of extraction (as in 2024)*

DYNAMIC GROUND WATER RESOURCES OF INDIA, 2024															
INDIA															
S.N O	States / Union Territories	Ground Water Recharge				Total Natura l Discha rges	Annual Extract able Grou nd Water Resour ce	Current Annual Ground Water Extraction				Annua l GW Alloca tion for Domes tic use as on 2025	Net Grou n d Water Availab ility for future use	Stage of Ground Water Extractio n(%)	
		Monsoon Season		Non-Monsoon Season				Irriga tion	Indust rial	Dome stic	Total				
		Recha rge from rainfa ll	Recha rge from other Sourc es	Recha rge from Rainf all	Recha rge from other Sourc es	Total Annu al Grou nd Wate r Recha rge									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	CHHATTIS GARH	8.57	3.43	0.15	2.03	14.18	1.26	12.93	5.21	0.14	0.77	6.1 2	0.84	6.82	47.32
	Total(bcm)	8.57	3.43	0.15	2.03	14.18	1.26	12.93	5.21	0.14	0.77	6.1 2	0.84	6.82	47.32

*Annexure 2 District-wise ground water resources availability, utilization and stage of extraction (as in 2024)*

DYNAMIC GROUND WATER RESOURCES OF INDIA, 2024																	
CHHATTISGARH																	
S. NO	Name of District	Ground Water Recharge					Total Annual Discha- rge s	Annual Extract- able Groun- d Water Resour- ce	Current Annual Ground Water Extraction				Annual 1 GW Alloc- ation for Domestic use as on 2025	Net Groun- d Water Availa- bility for future use	Stage of Ground Water Extractio- n(%)		
		Monsoon Season		Non-Monsoon Season		Total Annual Ground Water Rechar- ge			Irriga- tion	Indus- trial	Dome- stic	Total					
		Recha- rge from rainfa- ll	Recha- rge from other Sourc- es	Recha- rge from Rainf- all	Recha- rge from other Sourc- es												
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
1	BALOD	16827 .95	15473 .6	0 9	7403.2 84	39704. 1	3839.0 4	35865.8 76	24199. 72.58	2259. 42	2653 1.78	2356.2 2	9598.22	73.98			
2	BALODA BAZAR	25659 .93	36010 .49	412.2 4	6557.9 8	68640. 64	6760.1 7	61880.4 7	20954. 05	1145.1 1	4522. 3	2662 1.5	5644.1 9	34581	43.02		
3	BALRAMPUR	46086 .19	2343. 06	309.0 7	2433.3 6	51171. 68	3998.1 7	47173.5 29	10072. 9.99	2074. 99	1215 7.27	2200.6 5	34890.5 6	25.77			
4	BASTAR	22040 .82	1313. 81	1758. 77	2006.5 3	27119. 93	2487.5 9	24632.3 4	6061.6 1	72.29 22	2299. 11	8433. 3	2400.3 2	16098.1	34.24		
5	BEMETARA	18175 .02	16782 .78	0 23	12389. 03	47347. 2	4734.7 1	42612.3 55	36869. 12	212.3 2465.	3954 6.94	2889.5 2	4366.86	92.81			
6	BIJAPUR	49859 .36	762.7 7	214.8 8	1376.4 3	52213. 44	5221.3 5	46992.0 9	4243.8 4	1.91 680.5	4926. 9	711.88 33	42034.4 7	10.48			
7	BILASPUR	21989 .71	16860 .67	426.6 2	11914. 36	51191. 36	4722.2 4	46469.1 2	21566. 19	664.59 5701.	2793 27	6529.1 2.02	19980.2	60.11			
8	DANTEWADA	25283 .02	630.4 4	342.8 5	1404.1 5	27660. 46	2766.0 5	24894.4 1	3652.0 9	158.45 778.7	4589. 9	820 33	20263.8 7	18.44			
9	DHAMTARI	20986 .49	28926 .68	0 95	18274. 12	68188. 7	6529.5 6	61658.5 68	42872. 78.99	2115. 66	4506 7.33	2180.0 5	16526.8 4	73.09			
10	DURG	14510 .5	19764 .1	0 2	8830.0 62	43104. 24	4034.8 3	39069.8 2	24015. 02	408.38 4962.	2938 5.91	5135.1 9	10672.7 8	75.21			
11	GARIABAND	22766 .79	8496. 39	0 2	6030.5 7	37293. 2	3524.8 2	33768.8 8	19665. 59	17.24 1729.	2141 48	1877.5 2.31	12208.5 5	63.41			
12	GOURELA-PENDRA- MARWAHI	11297 .19	1275. 67	545.1 5	1242.2 3	14360. 24	1258.3 3	13101.9 2	4016.6 8	1.62 1147.	5166. 91	1324.5 22	7759.07	39.43			
13	JANGIR-CHAMPA	12350 .45	20831 .76	153.0 4	15306. 79	48642. 04	4522.4 4	44119.5 9	8143.8 5	231.79 81	2863. 21	1123 8.96	3060.1 7	32683.7 6	25.47		
14	JASHPUR	27453 .62	2804. 53	873.1 1	3715.8 8	34847. 14	2721.1 8	32125.9 5	13239. 81	29.64 2244.	1551 1	2320.4 3.57	16536.9 7	48.29			
15	KABIRDHAM	32690 .31	29684 .9	1408. 77	9245.4 38	73029. 4	7302.9 4	65726.4 32	36151. 32	75.18 2576.	3880 21	2837.2 2.73	27631.6 8	59.04			

16	KANKER	55430 .65	4915. 27	2224. 16	8633.4 1	71203. 49	5376.3 8	65827.1 1	22734. 24	30.55	2057. 07	2482 1.88	2150.0 7	40912.2 5	37.71
17	KHAIRAGARH-CHHUIKHADAN_GANDAI	9010. 98	7608. 23	98.12	2873.7	19591. 03	1753.1 8	17837.8 5	10111. 42	11.82	1085. 67	1120 8.9	1161.5 8	6553.04	62.84
18	KONDAGAON	30505 .36	2723. 03	2064. 15	2231.3 5	37523. 89	2500.0 6	35023.8 3	13506. 65	21.75	1587. 46	1511 5.87	1658.7 8	20053.2 5	43.16
19	KORBA	37675 .69	4693. 11	676.8 1	5510.4 6	48556. 07	2837.4 7	45718.6 7	10260. 7	2438.7 8	3646. 02	1634 5.51	3879.2 1	29139.9	35.75
20	KOREA	9543. 17	3323. 71	53.15	1869.9 5	14789. 98	991.72	13798.2 6	5742.2 5	390.63	662.9 6	6795. 84	683.63	6981.76	49.25
21	MAHASAMUND	47011 .09	38521 .02	325.6	16779. 85	102637 .64	8813.2 6	93824.3 8	53575. 12	124.18	2917. 58	5661 6.87	3077.9 5	37047.1 4	60.34
22	MANENDRAGARH-CHIRMIRI_BHARAT PUR	47273 .19	1891. 66	244.3	1709.7 4	51118. 89	4396.4	46722.4 9	7737.7 1	720.69	1101. 72	9560. 12	1136.1 6	37127.9 4	20.46
23	MOHLA-MANPUR_AMBAGA RHCHOWKI	12357 .67	1879. 34	144.2	2510.1 1	16891. 41	1689.1 5	15202.2 6	5107.4 8	31.5	742.7 6	5881. 72	767.82	9295.49	38.69
24	MUNGELI	9680. 27	12373 .58	0	4844.8 3	26898. 68	2343.8 8	24554.8 7	9315.5 7	30.68	1919. 55	1126 5.81	2236.9 8	12971.5 6	45.88
25	NARAYANPUR	25101 .06	457.9 2	772.7 9	553.46	26885. 23	2378.7 3	24506.5	1393.8 7	10.65	392.7 2	1797. 25	412.02	22689.9 6	7.33
26	RAIGARH	35392 .31	2788. 33	408.5 3	3429.1 4	42018. 31	3707.2 8	38311.0 2	10689. 7	2666.4 1	3144. 87	1650 0.96	3302.2 8	21652.6 5	43.07
27	RAIPUR	19715 .92	23406 .18	42.18	7778.9 4	50943. 22	4923.5 1	46019.7 1	17943. 08	1896.5 2	7387. 33	2722 6.94	8179.6 9	19060.3	59.16
28	RAJNANDGAON	20156 .4	9704. 94	236.5 5	8541.3 7	38639. 26	3436.4 3	35202.8 3	20995. 43	228.59	3221. 6	2444 5.65	4080.6 3	9898.15	69.44
29	SAKTI	9148. 9	10717 .41	101.6 9	13030. 06	32998. 06	3151.1 3	29846.9 3	12286. 55	8.87	1939. 26	1423 4.66	2086.4 7	15465.0 6	47.69
30	SARANGARH-BILAIRAGH	14175 .82	6923. 33	361.1 5	3280.4 6	24740. 76	1944.9 6	22795.8 9	6980.9 9	45.46	1848. 62	8875. 05	2028 7	13741.3	38.93
31	SUKMA	44267 .11	915.5 9	0	976.69	46159. 39	4615.9 4	41543.4 5	1945.3 4	1.6	621.4 1	2568. 36	636.6 9	38959.8 9	6.18
32	SURAJPUR	28568 .63	4629. 44	217.2 8	6415.4 7	39830. 82	2811.1 9	37019.6 3	19533. 56	955.05	2188. 08	2267 6.75	2298.0 5	14232.9 1	61.26
33	SURGUJA	34167 .83	3443. 26	885.7 9	3916.4 3	42413. 31	3526.1 2	38887.1 9	15102. 93	1059.2 3	2330. 79	1849 2.95	2436.0 1	20303.6 4	47.56
	Total(Ham)	85715 9.4	34287 7	15301 .12	20301 6.54	141835 4.06	125620 .17	129273 3.88	52068 6.92	13853. 01	77216 .35	6117 56.4	84499. 02	681919. 18	47.32
	Total(Bcm)	8.57	3.43	0.15	2.03	14.18	1.26	12.93	5.21	0.14	0.77	6.12	0.84	6.82	47.32

*Annexure III (A)*

*Annexure 3 Categorization of blocks/ mandals/ taluks in India (as in 2024) for Chhattisgarh.*

S.No	States / Union Territories	Total No. of Assessed Units	Safe		Semi-Critical		Critical		Over-Exploited		Saline	
			Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%
1	CHHATTISGARH	146	120	82.19	21	14.38	5	3.42	-	-	-	-
	Total	146	120	82.19	21	14.38	5	3.42	-	-	-	-
	Grand Total	146	120	82.19	21	14.38	5	3.42	-	-	-	-

*Annexure 4 District Wise Categorization of blocks/ mandals/ taluks for Chhattisgarh. (as in 2024)*

DYNAMIC GROUND WATER RESOURCES OF INDIA, 2024												
CHHATTISGARH												
S.No	Name of District	Total No. of Assessed Units	Safe		Semi-Critical		Critical		Over-Exploited		Saline	
			No	%	No.	%	No.	%	No.	%	No.	%
1	KANKER	7	6	85.71	1	14.29	-	-	-	-	-	-
2	DANTEWADA	4	4	100.0	-	-	-	-	-	-	-	-
3	BALRAMPUR	6	6	100.0	-	-	-	-	-	-	-	-
4	SURAJPUR	6	5	83.33	1	16.67	-	-	-	-	-	-
5	KHAIRAGARH-CHHUIKHADAN_GANDAI	2	1	50.0	1	50.0	-	-	-	-	-	-
6	BILASPUR	4	2	50.0	2	50.0	-	-	-	-	-	-
7	GARIABAND	5	4	80.0	1	20.0	-	-	-	-	-	-
8	BIJAPUR	4	4	100.0	-	-	-	-	-	-	-	-
9	BASTAR	7	7	100.0	-	-	-	-	-	-	-	-
10	BALODA BAZAR	5	5	100.0	-	-	-	-	-	-	-	-
11	SUKMA	3	3	100.0	-	-	-	-	-	-	-	-
12	KOREA	2	2	100.0	-	-	-	-	-	-	-	-

13	GOURELA-PENDRA-MARWAHI	3	3	100.0	-	-	-	-	-	-	-	-	-
14	KONDAGAON	5	5	100.0	-	-	-	-	-	-	-	-	-
15	DURG	3	1	33.33	2	66.67	-	-	-	-	-	-	-
16	JANJGIR-CHAMPA	5	5	100.0	-	-	-	-	-	-	-	-	-
17	MAHASAMUND	5	3	60.0	2	40.0	-	-	-	-	-	-	-
18	NARAYANPUR	2	2	100.0	-	-	-	-	-	-	-	-	-
19	BEMETARA	4	-	-	1	25.0	3	75.0	-	-	-	-	-
20	DHAMTARI	4	2	50.0	2	50.0	-	-	-	-	-	-	-
21	JASHPUR	8	8	100.0	-	-	-	-	-	-	-	-	-
22	KABIRDHAM	4	3	75.0	1	25.0	-	-	-	-	-	-	-
23	KORBA	5	5	100.0	-	-	-	-	-	-	-	-	-
24	BALOD	5	2	40.0	2	40.0	1	20.0	-	-	-	-	-
25	MUNGELI	3	3	100.0	-	-	-	-	-	-	-	-	-
26	RAIGARH	7	6	85.71	1	14.29	-	-	-	-	-	-	-
27	RAIPUR	4	3	75.0	-	-	1	25.0	-	-	-	-	-
28	RAJNANDGAON	4	1	25.0	3	75.0	-	-	-	-	-	-	-
29	SURGUJA	7	7	100.0	-	-	-	-	-	-	-	-	-
30	MANENDRAGARH-CHIRMIRI_BHARATPUR	3	3	100.0	-	-	-	-	-	-	-	-	-
31	MOHLA-MANPUR_AMBAGARHCHOWKI	3	3	100.0	-	-	-	-	-	-	-	-	-
32	SAKTI	4	4	100.0	-	-	-	-	-	-	-	-	-
33	SARANGARH-BILAIRAGH	3	2	66.67	1	33.33	-	-	-	-	-	-	-
	Total	146	120	82.19	21	14.38	5	3.42	-	-	-	-	-

**Annexure III (C)***Annexure 5 Annual Extractable Ground Water Resource of Assessment Units under Different Category for Chhattisgarh.**(as in 2024)*

ANNUAL EXTRACTABLE RESOURCE OF ASSESSMENT UNITS UNDER DIFFERENT CATEGORIES, 2024												
S.No	State/Union Territories	Total Annual Extractable Resource of Assessed Units (in mcm)	Safe		Semi-Critical		Critical		Over-Exploited		Saline	
			Total Annual Extractable Resource (in mcm)	%	Total Annual Extractable Resource (in mcm)	%	Total Annual Extractable Resource (in mcm)	%	Total Annual Extractable Resource (in mcm)	%	Total Annual Extractable Resource (in mcm)	%
1	CHHATTISGARH	12927.34	10132.06	78.38	2334.88	18.06	460.4	3.56	-	-	-	-
	Total	12927.34	10132.06	78.38	2334.88	18.06	460.4	3.56	-	-	-	-
	Grand Total	12927.34	10132.06	78.38	2334.88	18.06	460.4	3.56	-	-	-	-

### Annexure- III (D)

*Annexure 6 District Wise Annual Extractable Ground Water Resource of Assessment Units under Different Category for Chhattisgarh. (as in 2024)*

DYNAMIC GROUND WATER RESOURCES OF INDIA, 2024												
CHHATTISGARH												
S.N o	Name of District	Total Annual Extractab le Resource of Assessed Units (in mcm)	Safe		Semi-Critical		Critical		Over- Exploited		Saline	
			Total Annual Extractab le Resource (in mcm)	%	Total Annual Extractab le Resource (in mcm)	%	Total Annual Extractab le Resource (in mcm)	%	Total Annual Extractab le Resource (in mcm)	%	Total Annual Extractab le Resource (in mcm)	%
1	KANKER	658.27	573.2	87.0 8	85.07	12.9 2	-	-	-	-	-	-
2	DANTEWADA	248.94	248.94	100	-	-	-	-	-	-	-	-
3	BALRAMPUR	471.74	471.74	100	-	-	-	-	-	-	-	-
4	SURAJPUR	370.2	275.32	74.3 7	94.88	25.6 3	-	-	-	-	-	-
5	KHAIRAGARH- CHHUIKHADAN_GANDAI	178.38	84.76	47.5 2	93.62	52.4 8	-	-	-	-	-	-
6	BILASPUR	464.69	173.96	37.4 4	290.73	62.5 6	-	-	-	-	-	-
7	GARIABAND	337.69	251.8	74.5 6	85.89	25.4 4	-	-	-	-	-	-
8	BIJAPUR	469.92	469.92	100	-	-	-	-	-	-	-	-
9	BASTAR	246.32	246.32	100	-	-	-	-	-	-	-	-
10	BALODA BAZAR	618.8	618.8	100	-	-	-	-	-	-	-	-
11	SUKMA	415.43	415.43	100	-	-	-	-	-	-	-	-
12	KOREA	137.98	137.98	100	-	-	-	-	-	-	-	-
13	GOURELA-PENDRA- MARWAHI	131.02	131.02	100	-	-	-	-	-	-	-	-
14	KONDAGAON	350.24	350.24	100	-	-	-	-	-	-	-	-
15	DURG	390.7	135.23	34.6 1	255.47	65.3 9	-	-	-	-	-	-
16	JANGIR-CHAMPA	441.2	441.2	100	-	-	-	-	-	-	-	-

17	MAHASAMUND	938.24	619.2	66	319.04	34	-	-	-	-	-	-	-
18	NARAYANPUR	245.06	245.06	100	-	-	-	-	-	-	-	-	-
19	BEMETARA	426.12	-	-	124.29	29.1 7	301.83	70.8 3	-	-	-	-	-
20	DHAMTARI	616.59	231.91	37.6 1	384.68	62.3 9	-	-	-	-	-	-	-
21	JASHPUR	321.26	321.26	100	-	-	-	-	-	-	-	-	-
22	KABIRDHAM	657.26	550.65	83.7 8	106.61	16.2 2	-	-	-	-	-	-	-
23	KORBA	457.19	457.19	100	-	-	-	-	-	-	-	-	-
24	BALOD	358.66	150.06	41.8 4	134.6	37.5 3	74	20.6 3	-	-	-	-	-
25	MUNGELI	245.55	245.55	100	-	-	-	-	-	-	-	-	-
26	RAIGARH	383.11	341.47	89.1 3	41.64	10.8 7	-	-	-	-	-	-	-
27	RAIPUR	460.2	375.63	81.6 2	-	-	84.57	18.3 8	-	-	-	-	-
28	RAJNANDGAON	352.03	101.09	28.7 2	250.94	71.2 8	-	-	-	-	-	-	-
29	SURGUJA	388.87	388.87	100	-	-	-	-	-	-	-	-	-
30	MANENDRAGARH-CHIRMIRI_BHARATPUR	467.22	467.22	100	-	-	-	-	-	-	-	-	-
31	MOHLA-MANPUR_AMBAGARHCHO WKI	152.02	152.02	100	-	-	-	-	-	-	-	-	-
32	SAKTI	298.47	298.47	100	-	-	-	-	-	-	-	-	-
33	SARANGARH-BILAIRAGH	227.96	160.55	70.4 3	67.41	29.5 7	-	-	-	-	-	-	-
	Total	12927.34	10132.06	78.3 8	2334.88	18.0 6	460.4	3.56	-	-			
	Grand Total	12927.34	10132.06	78.3 8	2334.88	18.0 6	460.4	3.56	-	-			

**Annexure- III (E)**

*Annexure 7 Recharge Worthy Area of Assessment unit under Different Category for Chhattisgarh. (as in 2024)*

AREA OF ASSESSMENT UNITS UNDER DIFFERENT CATEGORIES IN INDIA (2024)												
S.No	States / Union Territories	Total Geographical Area of Assessed Units (in sq km)	Recharge Worthy Area (in sq km)	Safe		Semi-Critical		Critical		Over-Exploited		Saline
				Recharge Worthy Area in sq km	%	Recharge Worthy Area in sq km	%	Recharge Worthy Area in sq km	%	Recharge Worthy Area in sq km	%	Recharge Worthy Area in sq km
1	CHHATTISGARH	135191.53	106078.71	88869.46	83.78	14090.19	13.28	3119.06	2.94	-	-	-
	Total	135191.53	106078.71	88869.46	83.78	14090.19	13.28	3119.06	2.94	-	-	-
	Grand Total	135191.53	106078.71	88869.46	83.78	14090.19	13.28	3119.06	2.94	-	-	-

**Annexure III (F)**

*Annexure 8 District Wise Recharge Worthy Area of Assessment unit under Different Category for Chhattisgarh. (as in 2024)*

DYNAMIC GROUND WATER RESOURCES OF INDIA, 2024												
CHHATTISGARH												
S.No	Name of District	Total Recharge Worthy Area of Assessed Units (in sq.km)	Safe		Semi-Critical		Critical		Over- Exploited		Saline	
			Recharge Worthy Area of Assessed Units (in sq.km)	%	Recharg e Worthy Area of Assessed Units (in sq.km)	%	Recharge Worthy Area of Assessed Units (in sq.km)	%	Recharg e Worthy Area of Assessed Units (in sq.km)	%	Recharg e Worthy Area of Assessed Units (in sq.km)	%
1	KANKER	6260.36	5805.01	92.73	455.35	7.27	-	-	-	-	-	-
2	DANTEWADA	3118.66	3118.66	100.0	-	-	-	-	-	-	-	-
3	BALRAMPUR	5661.31	5661.31	100.0	-	-	-	-	-	-	-	-
4	SURAJPUR	2637.88	2073.14	78.59	564.74	21.41	-	-	-	-	-	-
5	KHAIRAGARH- CHHUIKHADAN_ GANDAI	1490.38	689.15	46.24	801.23	53.76	-	-	-	-	-	-
6	BILASPUR	3175.95	1572.65	49.52	1603.3	50.48	-	-	-	-	-	-
7	GARIABAND	2631.4	2036.1	77.38	595.3	22.62	-	-	-	-	-	-
8	BIJAPUR	4377.29	4377.29	100.0	-	-	-	-	-	-	-	-
9	BASTAR	3835.33	3835.33	100.0	-	-	-	-	-	-	-	-
10	BALODA BAZAR	4067.48	4067.48	100.0	-	-	-	-	-	-	-	-
11	SUKMA	5211.99	5211.99	100.0	-	-	-	-	-	-	-	-
12	KOREA	726.47	726.47	100.0	-	-	-	-	-	-	-	-
13	GOURELA-PENDRA- MARWAHI	1651.23	1651.23	100.0	-	-	-	-	-	-	-	-
14	KONDAGAON	3722.41	3722.41	100.0	-	-	-	-	-	-	-	-
15	DURG	2319.99	762.33	32.86	1557.66	67.14	-	-	-	-	-	-
16	JANGIR-CHAMPA	2152.58	2152.58	100.0	-	-	-	-	-	-	-	-
17	MAHASAMUND	4597.2	3142.2	68.35	1455.0	31.65	-	-	-	-	-	-
18	NARAYANPUR	3510.43	3510.43	100.0	-	-	-	-	-	-	-	-

19	BEMETARA	2854.81	-	-	724.86	25.39	2129.95	74 .6 1	-	-	-	-	-
20	DHAMTARI	2487.06	1215.81	48.89	1271.25	51.11	-	-	-	-	-	-	-
21	JASHPUR	4510.05	4510.05	100.0	-	-	-	-	-	-	-	-	-
22	KABIRDHAM	4239.63	3123.17	73.67	1116.46	26.33	-	-	-	-	-	-	-
23	KORBA	4314.3	4314.3	100.0	-	-	-	-	-	-	-	-	-
24	BALOD	2614.7	1292.95	49.45	984.95	37.67	336.8	12 .8 8	-	-	-	-	-
25	MUNGELI	1639.42	1639.42	100.0	-	-	-	-	-	-	-	-	-
26	RAIGARH	3859.19	3348.89	86.78	510.3	13.22	-	-	-	-	-	-	-
27	RAIPUR	2891.98	2239.67	77.44	-	-	652.31	22 .5 6	-	-	-	-	-
28	RAJNANDGAON	2597.32	747.87	28.79	1849.45	71.21	-	-	-	-	-	-	-
29	SURGUJA	4254.42	4254.42	100.0	-	-	-	-	-	-	-	-	-
30	MANENDRAGARH-CHIRMI BHARATPUR	3298.4	3298.4	100.0	-	-	-	-	-	-	-	-	-
31	MOHLA-MANPUR_AMBAGARH CHOWKI	1548.82	1548.82	100.0	-	-	-	-	-	-	-	-	-
32	SAKTI	1543.89	1543.89	100.0	-	-	-	-	-	-	-	-	-
33	SARANGARH-BILAIRAGH	2276.38	1676.04	73.63	600.34	26.37	-	-	-	-	-	-	-
	Total	106078.71	88869.46	83.78	14090.19	13.28	3119.06	2. 94	-	-	-	-	-

**Annexure IV (A)***Annexure 9 Categorization of Over Exploited, Critical and Semi Critical blocks/ mandals/ taluks (as in 2024)*

CATEGORISATION OF ASSESSMENT UNIT, 2024							
CHHATTISGARH							
S.NO	Name of District	S.NO	Name of Semi-Critical Assessment Units	S.NO	Name of Critical Assessment Units	S.NO	Name of Over-Exploited Assessment Units
1	BALOD	1	BALOD	1	GURUR		
		2	GUNDERDEHI				
2	BEMETARA	1	SAJA	1	NAWAGARH		
				2	BEMETARA		
				3	BERLA		
3	BILASPUR	1	TAKHATPUR				
		2	BELHA				
4	DHAMTARI	1	DHAMTARI				
		2	KURUD				
5	DURG	1	DURG				
		2	DHAMDHA				
6	GARIABAND	1	RAJIM/FINGESHWAR				
7	KABIRDHAM	1	PANDARIYA				
8	KANKER	1	CHARAMA				

9	KHAIRAGARH-CHHUIKHADAN_GANDAI	1	KHAIRAGARH			
10	MAHASAMUND	1	BASNA			
		2	PITHORA			
11	RAIGARH	1	PUSAUR			
12	RAIPUR			1	DHARSIWA	
13	RAJNANDGAON	1	RAJNANDGAON			
		2	DONGARGAON			
		3	DONGARGARH			
14	SARANGARH-BILAIRAGH	1	BARAMKELA			
15	SURAJPUR	1	SURAJPUR			

**Annexure IV (B)***Annexure 10 Quality problems in Assessment units (as in 2024)*

QUALITY PROBLEMS IN ASSESSMENT UNITS, 2024							
CHHATISGARH							
S. No	Name of District	S. No	Name of Assessment Units affected by Fluoride	S. No	Name of Assessment Units affected by Arsenic	S. No	Name of Assessment Units affected by Salinity
1	Balrampur	1	Balrampur				
2	Gariaband	1	Chhura				
		2	Deobhog				
		3	Gariaband				
3	Gourela-Pendra- Marwahi	1	Marwahi				
4	Jashpur	1	Bagicha				
		2	Kunkuri				
		3	Pharsabahar				
5	Korea	1	Kartala				
		2	Katghora				
		3	Korba				
		4	Pali				
6	Mahasamund	1	Bagbahara				
7	Mohla-Manpur- Ambagarhchowki			1	Ambagarh Chowki		

8	Raigarh	1	Dharamjaigarh				
		2	Lailunga				
		3	Tamnar				
9	Sarangarh-Bilairagh	1	Sarangarh				
10	Surajpur	1	Pratappur				
		2	Premnagar				
		3	Ramanujnagar				

#### **ABSTRACT**

<b>Total No. of Assessed Units</b>	<b>Number of Assessment Unit affected by Fluoride</b>	<b>Number of Assessment Unit affected by Arsenic</b>	<b>Number of Assessment Unit affected by Salinity</b>
<b>146</b>	<b>20</b>	<b>1</b>	<b>0</b>

**Annexure V (A)**

*Annexure 11 Summary of Assessment units improved or deteriorated from 2023 to 2024 assessment*

**State-Wise Summary of Assessment Units Improved Or Deteriorated From 2023 To 2024 Assessment**

S.No	Name of States / Union Territories	Number of Assessment Units Improved	Number of Assessment Units Deteriorated	Number of Assessment Units With No Change
1	CHHATTISGARH	2	1	143

**Annexure V (B)**

*Annexure 12 Comparison of categorization of assessment units (2023 to 2024)*

**COMPARISON OF CATEGORIZATION OF ASSESSMENT UNITS (2023 AND 2024 )**

**CHHATTISGARH**

S.No	Name of District	Name of Assessment Unit	Stage of Ground Water Extraction (%)2023	Categorization in2023	Name of District	Name of Assessment Unit	Stage of Ground Water Extraction (%)2024	Categorization in2024	Remark
1	MAHASAMUND	PITHORA	62.58	safe	MAHASAMUND	PITHORA	74.80	semi critical	Deteriorated
2	KORBA	KATGHORA	74.48	semi critical	KORBA	KATGHORA	63.55	safe	Improved
3	RAIGARH	TAMNAR	71.72	semi critical	RAIGARH	TAMNAR	61.58	safe	Improved

## Annexure VI

### Annexure 13 Assessment Unit Wise Report (Attribute Table Recharge)

S. N o	District	Assessment Unit Name	Total Geographical Area	Rec harg e Worthy Area	Rec harg e from Rain fall-MO N	Rec harg e from Other Sour ces-MO N	Rec harg e from Rain fall-NM	Rec harg e from Other Sour ces-NM	Total Annual Grou nd Wate r (Ham ) Rech arge	Total Natural Disch arges (Ha m)	Annual Extra ctable Grou nd Wate r Reso urce (Ham )	Total Extr action (Ha m)	Annual GW Alloc ation for Domestic Use as on 2025 (Ha m)	Net Grou nd Wate r Avail ability for future use (Ham )	Stage of Grou nd Wate r Extr action (%)	Categorization (OE/Critical/Semi critical/Safe)
1.	KANKER	ANTAGAR H	79632	7803 9	6164 .85	266. 49	133. 31	256. 06	6820. 71	682.0	6138. 64	1456. 19	226.7 0	4672. 04	23.72	safe
2.	KANKER	CHARAMA	50595	4553 5	5359 .45	1531 .22	77.7 8	2484 .30	9452. 75	945.2	8507. 48	6172. 68	289.3 4	2325. 62	72.56	semi critical
3.	KANKER	BHANUPR ATAPUR	91366	8953 9	8948 .21	258. 51	152. 95	569. 34	9929. 01	510.0	9418. 95	2624. 37	265.3 6	6784. 56	27.86	safe
4.	KANKER	NARHARP UR	73758	7302 0	5796 .04	1019 .76	521. 80	2031 .33	9368. 93	522.7	8846. 4	5269. 19	317.6 67	3561. 3	59.57	safe
5.	KANKER	KOYALIBE DA	204312	1981 83	1556 2.38	1303 .9	1096 .23	1339 .45	1930 1.96	1083.	18218 .73	3790. 52	502.7 7	14403 .02	20.81	safe
6.	KANKER	KANKER	81071	8026 0	6340 .29	336. 59	137. 10	1496 .17	8310. 15	831.0	7479. 1	4109. 14	371.0 27	3352. 9	54.94	safe
7.	KANKER	DURGUKO NDAL	62714	6146 0	7259 .43	198. 8	104. 99	456. 76	8019. 98	802.0	7217. 0	1399. 98	177.1 18	5812. 8	19.38	safe
8.	DANTEWADA	DANTEWA DA	177296	1604 53	1231 3.31	203. 65	166. 98	563. 67	1324 7.61	1324.	11922 .77	1834. 84	238.9 35	10085 .9	15.39	safe
9.	DANTEWADA	GEEDAM	58628	5511 0	4262 .33	222. 33	57.8 0	424. 36	4966. 82	496.6	4470. 8	1402. 14	296.5 42	3036. 3	31.37	safe
10.	DANTEWADA	KATEKAL YAN	48800	4392 0	4764 91	70.4 8	64.6 1	161. 33	5061. 33	506.1	4555. 20	529.0 2	115.6 0	4022. 58	11.61	safe
11.	DANTEWADA	KUAKOND A	56326	5238 3	3942 .47	133. 98	53.4 6	254. 79	4384. 70	438.4	3946. 23	823.5 4	168.8 8	3119. 72	20.87	safe
12.	BALRAMPUR	WADRAFN AGAR	136594	1050 98	1292 4.16	407. 4	67.7 9	329. 53	1372 8.88	705.7	13023 .8	2126. 10	491.9 86	10866 .47	16.33	safe
13.	BALRAMPUR	SHANKAR GARH	90038	6364 5	4631 .11	216. 76	34.5 8	240. 63	5123. 08	512.3	4610. 2	1230. 76	199.3 07	3373. 5	26.68	safe
14.	BALRAMPUR	BALRAMP UR	108416	8241 6	4811 .12	421. 39	35.8 9	354. 85	5623. 25	562.3	5060. 91	1880. 12	337.6 8	3160. 32	37.15	safe

15	BALRAMPUR	RAJPUR	100066	89540	7517.03	432.47	56.52	509.28	8515.30	851.53	7663.77	2136.15	330.47	5508.40	27.87	safe
16	BALRAMPUR	RAMCHAN DRAPUR	127833	105873	7397.96	584.34	55.63	711.66	8749.59	874.96	7874.63	3427.95	531.43	4410.57	43.53	safe
17	BALRAMPUR	KUSMI	150973	119559	8804.81	280.7	58.66	287.41	9431.58	491.25	8940.33	1356.12	309.76	7571.79	15.17	safe
18	SURAJPUR	PREMNAGAR	29198	27892	2490.86	528.69	0.00	667.38	3686.93	190.67	3496.26	1685.34	196.27	1799.80	48.20	safe
19	SURAJPUR	ODGI	47104	37389	3591.69	564.35	0.00	724.14	4880.18	267.45	4612.73	2484.89	267.05	2111.42	53.87	safe
20	SURAJPUR	BHAIYATHAN	43360	42608	5342.21	844.24	0.00	1005.95	7192.40	406.11	6786.29	3183.43	369.94	3588.21	46.91	safe
21	SURAJPUR	PRATAPPUR	60461	60013	6061.49	855.64	0.00	913.05	7830.18	783.03	7047.15	4205.21	456.08	2814.93	59.67	safe
22	SURAJPUR	RAMANUJ NAGAR	41063	39412	4262.8	1031.18	217.28	698.84	6210.10	621.01	5589.09	3641.03	349.25	1932.07	65.15	safe
23	SURAJPUR	SURAJPUR	57534	56474	6819.58	805.34	0.00	2406.11	1003.103	542.92	9488.11	7476.85	659.46	1986.48	78.80	semi_critical
24	KHAIRAGARH- CHHUIKHADAN GANDAI	CHHUIKHADAN	75464	68915	3588.55	4150.11	41.25	1408.82	9188.73	712.96	8475.77	3998.77	569.12	4436.24	47.18	safe
25	KHAIRAGARH- CHHUIKHADAN GANDAI	KHAIRAGARH	81095	80123	5422.43	3458.12	56.87	1464.88	1040.230	1040.22	9362.08	7210.13	592.46	2116.80	77.01	semi_critical
26	BILASPUR	MASTURI	73920	73920	3923.79	1114.48	250.01	797.78	6086.06	608.60	5477.46	2604.67	1291.43	2656.61	47.55	safe
27	BILASPUR	TAKHATPUR	72440	72440	4574.6	8204.58	0.00	6290.39	1906.957	1906.96	17162.61	1265.1.73	1115.41	6656.43	73.72	semi_critical
28	BILASPUR	KOTA	116598	83345	6844.85	3700.91	0.00	2255.98	1280.1.74	883.27	11918.47	2842.16	732.96	9027.34	23.85	safe
29	BILASPUR	BELHA	87890	87890	6646.47	3840.7	176.61	2570.21	1323.3.99	1323.41	11910.58	9833.46	3389.32	1639.82	82.56	semi_critical
30	GARIABAND	CHHURA	111127	44880	3102.5	1619.9	0.00	1278.70	6001.10	417.96	5583.14	3584.72	325.31	1985.72	64.21	safe
31	GARIABAND	DEOBHOG	39129	30000	2401.57	773.19	0.00	703.84	3878.60	365.44	3513.16	1898.53	283.29	1598.20	54.04	safe
32	GARIABAND	GARIABAND	154517	80280	6885.33	2163.37	0.00	1366.45	1041.5.15	1041.52	9373.63	5676.64	258.05	3687.99	60.56	safe
33	GARIABAND	RAJIM/FIN GESHWAR	59530	59530	4921.24	2510.94	0.00	2111.49	9543.67	954.37	8589.30	6891.90	466.50	1681.13	80.24	semi_critical
34	GARIABAND	MAINPUR	217963	48450	5456.15	1428.99	0.00	570.04	7455.18	745.53	6709.65	3360.52	544.40	3255.46	50.08	safe
35	BIJAPUR	USOOR	174535	111983	13703.7	154.98	59.06	189.71	1410.7.45	1410.75	12696.70	633.20	136.07	12061.77	4.99	safe
36	BIJAPUR	BIJAPUR	114011	86778	10515.44	166.26	45.32	386.65	1111.3.67	1111.37	10002.30	2045.81	165.11	7954.36	20.45	safe

37	BIJAPUR	BHOPALP ATTNAM	144418	9259 8	9042 .22	252. 95	38.9 7	449. 50	9783. 64	978.3 7	8805. 27	1248. 38	136.8 4	7551. 56	14.18	safe
38	BIJAPUR	BHAIRAM GARH	228284	1463 70	1659 8	188. 58	71.5 3	350. 57	1720. 8.68	1720. 86	15487 .82	998.9 4	273.8 6	14466 .78	6.45	safe
39	BASTAR	BASTANA R	59987	4788 8	3108 .9	81.3 7	275. 40	77.6 9	3543. 36	354.3 4	3189. 02	322.6 1	123.0 0	2863. 44	10.12	safe
40	BASTAR	BAKAWA ND	106455	6813 4	3619 .89	261. 27	302. 09	558. 38	4741. 63	249.7 5	4491. 88	2318. 08	426.0 4	2154. 68	51.61	safe
41	BASTAR	BASTAR	125149	8902 7	4120 .23	419. 11	363. 51	741. 65	5644. 50	564.4 5	5080. 05	2485. 56	468.3 2	2573. 03	48.93	safe
42	BASTAR	DARBHA	98449	3407 7	2109 .05	58.1 1	186. 84	39.5 5	2393. 55	239.3 5	2154. 20	389.2 8	215.4 3	1757. 40	18.07	safe
43	BASTAR	JAGDALP UR	101017	5017 0	3672 .46	208. 32	217. 08	235. 57	4333. 43	433.3 5	3900. 08	1585. 76	737.4 3	2282. 22	40.66	safe
44	BASTAR	LOHANDI GUDA	79793	5795 1	3068 .21	107. 42	271. 03	100. 29	3546. 95	354.7 0	3192. 25	526.2 5	211.9 7	2657. 34	16.49	safe
45	BASTAR	TOKAPAL	42148	3628 6	2342 .08	178. 21	142. 82	253. 40	2916. 51	291.6 5	2624. 86	805.5 7	218.1 4	1810. 01	30.69	safe
46	BALODA BAZAR	SIMGA	61506	6150 6	5136 .58	8828 .6	37.5 7	1840 .28	1584 3.03	1584. 29	14258 .74	7927. 39	1360. 26	6323. 60	55.60	safe
47	BALODA BAZAR	BALODA BAZAR	62320	6232 0	3771 .66	8304 .68	188. 25	1054 .39	1331 8.98	1331. 89	11987 .09	5262. 47	1407. 89	6587. 07	43.90	safe
48	BALODA BAZAR	BHATAPA RA	47115	4711 5	3230 .53	7974 .79	156. 90	1645 .64	1300 7.86	1300. 80	11707 .06	5270. 96	868.0 4	6307. 38	45.02	safe
49	BALODA BAZAR	KASDOL	176339	1763 39	9774 .11	3461 .81	0.00 0.06	1163 8.98	1439 89	1439. 09	12959 38	5779. 09	768.0 5	7095. 79	44.60	safe
50	BALODA BAZAR	PALARI	59468	5946 8	3747 .05	7440 .61	29.5 2	854. 61	1207 1.79	1103. 30	10968 .49	2381. 30	1239. 95	8267. 16	21.71	safe
51	SUKMA	CHHINDG ARH	84871	7992 1	8357 .99	303. 12	0.00 0.00	335. 98	8997. 09	899.7 2	8097. 37	1216. 85	212.9 4	6873. 81	15.03	safe
52	SUKMA	KONTA	382059	3504 79	2853 0.11	400. 23	0.00 0.00	352. 15	2928 2.49	2928. 25	26354 .24	616.4 6	236.5 2	25736 .77	2.34	safe
53	SUKMA	SUKMA	96649	9079 9	7379 .01	212. 24	0.00 0.00	288. 56	7879. 81	787.9 7	7091. 84	735.0 5	187.1 4	6349. 31	10.36	safe
54	KOREA	BAIKUNT HPUR	56221	4354 7	5401 .34	1659 .49	31.2 4	1185 .15	8277. 22	545.1 7	7732. 05	4679. 36	538.4 4	3040. 30	60.52	safe
55	KOREA	SONHAT	35471	2910 0	4141 .83	1664 .22	21.9 1	684. 80	6512. 76	446.5 5	6066. 21	2116. 48	145.1 9	3941. 46	34.89	safe
56	GOURELA- PENDRA- MARWAHI	PENDRA	34921	3492 1	3024 .3	399. 97	122. 64	520. 47	4067. 38	229.0 2	3838. 36	2287. 06	320.2 3	1515. 30	59.58	safe
57	GOURELA- PENDRA- MARWAHI	MARWAHI	100972	7954 7	4738 .54	361. 59	244. 62	368. 58	5713. 33	571.3 5	5141. 99	1648. 54	504.2 3	3409. 04	32.06	safe

58	GOURELA-PENDRA-MARWAHI	GAURELA	94846	50655	3534.35	514.11	177.89	353.18	4579.53	457.96	4121.57	1230.62	500.07	2834.73	29.86	safe
59	BALOD	GURUR	41128	33680	2391.07	4269.41	0.00	1561.94	8222.42	822.25	7400.17	6931.07	388.90	816.94	93.66	critical
60	BALOD	GUNDERD EHI	68070	68070	4165.75	3999.93	0.00	1918.68	1008.436	1008.44	9075.93	6482.95	603.03	2562.66	71.43	semi_critical
61	BALOD	DOUNDI	52919	40963	2384.28	1538.34	0.00	720.83	4643.45	332.85	4310.60	2795.27	436.26	1502.57	64.85	safe
62	BALOD	DOUNDI LOHARA	88332	88332	5661.23	4006.19	0.00	2216.45	1188.394	1188.40	10695.54	6620.70	554.61	4052.21	61.90	safe
63	BALOD	BALOD	30425	30425	2225.55	1659.73	0.00	985.39	4870.67	487.07	4383.60	3701.79	373.42	663.84	84.45	semi_critical
64	MOHLA-MANPUR_AMB AGARHCHOWKI	MOHLA	70301	50408	3237.1	514.97	49.80	773.70	4575.57	457.56	4118.01	1842.87	233.60	2267.57	44.75	safe
65	MOHLA-MANPUR_AMB AGARHCHOWKI	MANPUR	113950	57041	5805.56	473.97	59.92	577.74	6917.19	691.72	6225.47	1463.66	239.55	4753.74	23.51	safe
66	MOHLA-MANPUR_AMB AGARHCHOWKI	AMBAGAR H CHOWKI	54747	47433	3315.01	890.4	34.57	1158.67	5398.65	539.87	4858.78	2575.19	294.67	2274.18	53.00	safe
67	SURGUJA	UDAIPUR	141730	125630	1003.215	393.81	423.10	498.56	1134.762	583.09	10764.53	3529.42	226.37	7224.55	32.79	safe
68	SURGUJA	SITAPUR	50099	48167	3810.58	429.46	22.16	454.27	4716.47	471.65	4244.82	2444.31	258.76	1792.82	57.58	safe
69	SURGUJA	MAINPAT	67179	35076	2575.97	180.52	10.16	113.60	2880.95	288.06	2592.54	897.12	211.78	1687.26	34.60	safe
70	SURGUJA	AMBIKAP UR	67632	57665	4494.08	1018.31	194.21	1121.17	6827.77	682.78	6144.99	3913.36	862.94	2190.75	63.68	safe
71	SURGUJA	BATAULI	40173	32460	2558.91	327.41	0.00	606.66	3492.98	185.76	3307.22	2142.39	194.06	1172.02	64.78	safe
72	SURGUJA	LAKHANP UR	78008	64699	5912.72	487.66	236.16	745.87	7382.41	738.23	6644.18	2887.55	342.55	3741.04	43.46	safe
73	SURGUJA	LUNDRA	74294	61745	4783.42	606.09	0.00	375.95	5765.46	576.55	5188.91	2678.80	339.55	2495.20	51.63	safe
74	MAHASAMUND	BAGBAHARA	117600	96920	1177.6.5	1178.3.82	0.00	4049.58	2760.9.90	2760.98	24848.92	1088.2.22	602.72	13928.79	43.79	safe
75	MAHASAMUND	BASNA	64300	64300	6508.62	4294.99	0.00	3229.06	1403.2.67	924.74	13107.93	1153.8.42	475.16	1554.32	88.03	semi_critical
76	MAHASAMUND	MAHASA MUND	116700	116700	1296.7.69	9852.66	0.00	3766.25	2658.5.94	2054.83	24531.11	1301.3.31	799.43	11477.62	53.05	safe
77	MAHASAMUND	PITHORA	97100	81200	9876.33	6969.66	0.00	4038.79	2088.4.78	2088.48	18796.30	1405.9.32	577.67	4713.04	74.80	semi_critical
78	MAHASAMUND	SARAIPAL I	100600	100600	5881.95	5620.55	325.68	1696.17	1352.4.35	984.23	12540.12	7123.60	622.97	5373.37	56.81	safe

79	SAKTI	SAKTI	65230	3423 1	2002 .19	1341 .07	22.1 1	1723 .09	5088. 46	508.8 5	4579. 61	2227. 59	557.6 2	2316. 70	48.64	safe
80	SAKTI	DABHARA	42064	4206 4	2501 .54	2049 .83	27.7 3	2865 .25	7444. 35	595.7 5	6848. 60	4277. 31	488.7 6	2546. 51	62.46	safe
81	SAKTI	JAIJAIPUR	44026	4402 6	2581 .37	4947 .06	28.8 9	5452 .31	1300 9.63	1300. 96	11708 .67	4250. 64	554.7 3	7409. 68	36.30	safe
82	SAKTI	MALKHAR ODA	34068	3406 8	2063 .8	2379 .45	22.9 6	2989 .41	7455. 62	745.5 7	6710. 05	3479. 12	485.3 6	3192. 17	51.85	safe
83	DHAMTARI	DHAMTAR I	67883	6788 3	5927 .83	9043 .84	0.00	7296 .28	2226 7.95	2226. 80	20041 .15	1535 9.23	774.7 6	4661. 53	76.64	semi_critical
84	DHAMTARI	KURUD	59242	5924 2	4535 .62	9974 .48	0.00	5963 .79	2047 3.89	2047. 39	18426 .50	1432 1.29	598.1 6	4085. 72	77.72	semi_critical
85	DHAMTARI	MAGARLO D	88191	8819 1	7101 .72	5857 .44	0.00	2488 .73	1544 7.89	1255. 54	14192 .35	9358. 85	336.5 0	4821. 01	65.94	safe
86	DHAMTARI	NAGRI	192877	3339 0	3421 .32	4050 .92	0.00	2526 .15	9998. 39	999.8 4	8998. 56	6027. 96	470.6 3	2958. 58	66.99	safe
87	NARAYANPUR	ORCHHA	497551	2486 11	1944 9.95	22.8 2	547. 29	21.6 4	2004 1.70	2004. 17	18037 .53	297.4 7	100.3 5	17735 .36	1.65	safe
88	NARAYANPUR	NARAYAN PUR	193765	1024 32	5651 .11	435. 1	225. 50	531. 82	6843. 53	374.5 6	6468. 97	1499. 78	311.6 7	4954. 60	23.18	safe
89	KABIRDHAM	SAHASPU R LOHARA	97520	9628 2	8289 .08	1085 .25	356. 70	1816 .78	2131 2.81	2131. 28	19181 .53	1147 8.82	596.1 8	7623. 65	59.84	safe
90	KABIRDHAM	PANDARI YA	121778	1116 46	8085 .98	1783 .66	343. 14	1633 .22	1184 6.00	1184. 60	10661 .40	9282. 64	852.5 0	1309. 49	87.07	semi_critical
91	KABIRDHAM	KAWARD HA	53143	5314 3	5768 .87	9073 .16	250. 54	3306 .22	1839 8.79	1839. 88	16558 .91	1104 7.07	797.1 8	6409. 27	66.71	safe
92	KABIRDHAM	BODLA	172264	1628 92	1054 6.38	7977 .83	458. 39	2489 .18	2147 1.78	2147. 18	19324 .60	6994. 20	591.3 6	12289 .27	36.19	safe
93	MANENDRAGA RH- CHIRMIRI_BHA RATPUR	MANENDR AGARH	46383	3191 4	4354 .97	575. 51	22.8 1	427. 09	5380. 38	322.3 2	5058. 06	2129. 63	419.4 8	2916. 57	42.10	safe
94	MANENDRAGA RH- CHIRMIRI_BHA RATPUR	KHADGA WAN	229601	7173 9	9226 .44	901. 04	52.6 0	792. 46	1097 2.54	597.4 8	10375 .06	4455. 98	447.9 1	5912. 58	42.95	safe
95	MANENDRAGA RH- CHIRMIRI_BHA RATPUR	BHARATP UR	230094	2261 87	3369 1.78	415. 11	168. 89	490. 19	3476 5.97	3476. 60	31289 .37	2974. 51	268.7 7	28298 .79	9.51	safe
96	RAIGARH	TAMNAR	46900	2380 0	3877 .5	370. 96	34.5 3	370. 34	4653. 33	465.3 2	4188. 00	2578. 99	281.0 6	1595. 90	61.58	safe
97	RAIGARH	RAIGARH	94272	7884 1	6292 .04	484. 59	83.2 0	481. 06	7340. 89	734.0 9	6606. 80	2890. 49	1009. 45	3657. 01	43.75	safe
98	RAIGARH	PUSAUR	51030	5103 0	3188 .67	547. 67	28.6 0	861. 50	4626. 44	462.6 4	4163. 80	3609. 99	424.0 2	528.9 0	86.70	semi_critical

99	RAIGARH	LAILUNG A	91035	7511 5	6651 .9	374. 57	69.3 0	344. 00	7439. 77	406.0 9	7033. 68	1097. 01	357.9 0	5924. 36	15.60	safe
10	RAIGARH	KHARSIY A	40079	3144 9	2988 .69	313. 85	28.3 9	447. 87	3778. 80	221.2 3	3557. 57	1795. 56	426.1 3	1745. 43	50.47	safe
10	RAIGARH	DHARAMJ AIGARH	153769	9574 9	9177 .59	463. 34	121. 81	588. 48	1035. 1.22	1035. 12	9316. 10	2916. 81	571.3 5	6378. 93	31.31	safe
10	RAIGARH	GHARGHO DA	43304	2993 5	3215 .92	233. 35	42.7 0	335. 89	3827. 86	382.7 9	3445. 07	1612. 11	232.3 7	1822. 12	46.79	safe
10	RAIPUR	ABHANPU R	60398	6039 8	2990 .74	6608. 08	0.00	2036. 44	1163. 5.26	1163. 53	10471. 73	4609. 10	903.9 9	5762. 58	44.01	safe
10	RAIPUR	ARANG	90039	9003 9	4684 .63	5846. 75	0.00	1556. 11	1208. 7.49	1037. 94	11049. .55	5713. 36	1055. 17	5248. 79	51.71	safe
10	RAIPUR	DHARSIW A	65231	6523 1	5851 .91	2826. 65	0.00	717. 57	9396. 13	939.6 1	8456. 52	7907. 67	5524. 03	1034. 34	93.51	critical
10	RAIPUR	TILDA	73530	7353 0	6188 .64	8124. 7	42.1 8	3468. 82	1782. 4.34	1782. 43	16041. .91	8996. 81	696.5 0	7014. 59	56.08	safe
10	KORBA	KORBA	204001	8825 6	7933 .91	559. 42	142. 03	449. 66	9085. 02	474.5 4	8610. 48	3110. 36	1218. 49	5432. 00	36.12	safe
10	KORBA	KATGHOR A	47181	4711 6	5287 .21	708. 52	75.7 3	607. 81	6679. 27	667.9 3	6011. 34	3820. 19	1066. 77	2116. 00	63.55	safe
10	KORBA	PODI UPRORA	234881	1316 34	1052 6.13	2325 .76	212. 83	2768. 88	1583. 3.60	798.8 2	15034. .78	2153. 87	548.6 7	12853. .60	14.33	safe
11	KORBA	PALI	150482	9920 1	7284 .65	628. 07	133. 53	1021. 60	9067. 85	472.6 5	8595. 20	4379. 50	620.6 6	4174. 41	50.95	safe
11	KORBA	KARTALA	77999	6522 3	6643 .79	471. 34	112. 69	662. 51	7890. 33	423.5 3	7466. 80	2881. 59	424.6 2	4563. 89	38.59	safe
11	MUNGELI	LORMI	162240	5114 6	4315 .97	6391. 92	0.00	1952. 46	1266. 0.35	1148. 08	11512. .27	3758. 93	457.8 9	7712. 55	32.65	safe
11	MUNGELI	PATHARIA	51464	5146 4	2336 .25	3291. 27	0.00	1570. 51	7198. 03	491.7 7	6706. 26	3957. 39	879.4 6	2564. 02	59.01	safe
11	MUNGELI	MUNGELI	61332	6133 2	3028 .05	2690. 39	0.00	1321. 86	7040. 30	704.0 3	6336. 27	3549. 49	899.6 3	2694. 99	56.02	safe
11	SARANGARH-BILAIRAGH	BILAIGAR H	92692	9269 2	5940 .81	5289. 73	54.0 8	658. 38	1194. 3.00	1194. 31	10748. .69	1786. 31	838.3 7	8867. 15	16.62	safe
11	SARANGARH-BILAIRAGH	BARAMEKELA	78134	6003 4	4337 .27	670. 38	49.7 2	2080. 33	7137. 70	396.8 8	6740. 82	5183. 88	556.4 2	1495. 36	76.90	semi_critical
11	SARANGARH-BILAIRAGH	SARANGA RH	85112	7491 2	3897 .74	963. 22	257. 35	541. 75	5660. 06	353.7 7	5306. 29	1904. 86	633.2 1	3378. 86	35.90	safe
11	RAJNANDGAON	DONGARG AON	41249	4073 6	2915 .77	2138. 6	30.9 4	1221. 44	6306. 75	630.6 7	5676. 08	4853. 97	407.9 8	799.6 0	85.52	semi_critical
11	RAJNANDGAON	CHHURIY A	80214	7478 7	5260 .75	3316. 36	78.3 8	2576. 95	1123. 2.44	1123. 24	10109. 20	4178. 17	532.9 9	5901. 61	41.33	safe
12	RAJNANDGAON	DONGARG ARH	76732	6996 4	6083 .22	2810. 86	65.3 0	2733. 69	1169. 3.07	741.8 2	10951. 25	8162. 70	618.0 4	2758. 98	74.54	semi_critical

12	RAJNANDGAON	RAJNAND GAON	74265	74245	5896 .66	1439 .12	61.9 3	2009 .29	9407. 00	940.7 0	8466. 30	7250. 81	2521. 62	437.9 6	85.64	semi_critical
12	KONDAGAON	BADERAJPUR	47376	46676	3148 .07	493. 82	235. 77	279. 61	4157. 27	207.8 7	3949. 40	2336. 43	234.1 7	1821. 95	59.16	safe
12	KONDAGAON	KESHKAL	74916	73004	5827 .45	522. 04	474. 12	512. 64	7336. 25	392.0 7	6944. 18	3207. 51	258.8 6	3727. 43	46.19	safe
12	KONDAGAON	KONDAGAON	139297	132097	9645 .34	402. 23	571. 93	416. 38	1103. 5.88	1103. 58	9932. 30	2378. 13	601.9 7	7524. 13	23.94	safe
12	KONDAGAON	PHARASGAON	67581	65881	6322 .68	736. 32	427. 85	510. 85	7997. 70	446.7 0	7551. 00	3389. 52	277.1 7	4150. 57	44.89	safe
12	KONDAGAON	MAKDI	56857	54583	5561 .82	568. 62	354. 48	511. 87	6996. 79	349.8 4	6646. 95	3804. 28	286.6 1	2829. 17	57.23	safe
12	JANJGIR-CHAMPA	AKALTARA	39699	39699	2652 .68	3351. 8	31.8 6	2265. 29	8301. 63	722.1 3	7579. 50	2074. 03	538.1 1	5474. 94	27.36	safe
12	JANJGIR-CHAMPA	BAMHANI DIH	34334	34334	1966 .09	4092. 39	22.4 8	4092. 11	1017. 3.07	1017. 31	9155. 76	2435. 39	678.0 9	6676. 71	26.60	safe
12	JANJGIR-CHAMPA	JANJGIR (NAWAGA RH)	60361	60361	2700 .69	7253. 7	34.9 9	4334. .37	1432. 3.75	1432. 38	12891. .37	2664. 38	1008. 27	10156. .07	20.67	safe
13	JANJGIR-CHAMPA	PAMGARH	44533	44533	2332 .26	4894. 68	28.9 1	2934. .02	1018. 9.87	957.8 1	9232. 05	2013. 07	495.0 2	7193. 39	21.81	safe
13	JANJGIR-CHAMPA	BALODA	58631	36331	2698 .73	1239. 19	34.8 0	1681. .00	5653. 72	392.8 1	5260. 91	2052. 09	340.6 8	3182. 65	39.01	safe
13	JASHPUR	MANORA	89049	56129	3252 .52	212. 22	109. 54	325. 48	3899. 76	389.9 7	3509. 79	1087. 79	159.9 2	2417. 41	30.99	safe
13	JASHPUR	JASHPUR	58986	44936	2693 .43	179. 52	70.4 0	445. 75	3389. 10	172.4 1	3216. 69	2131. 38	287.8 2	1073. 34	66.26	safe
13	JASHPUR	KANSABEL	50715	39155	2606 .54	258. 43	85.7 9	400. 87	3351. 63	173.3 0	3178. 33	1792. 07	196.4 1	1381. 64	56.38	safe
13	JASHPUR	KUNKURI	55737	47537	2232 .02	371. 25	74.3 9	468. 18	3145. 84	314.5 8	2831. 25	1624. 67	253.0 6	1200. 07	57.38	safe
13	JASHPUR	PATHALGAON	79200	57040	3725 .51	697. 24	124. 97	847. 23	5394. 95	539.5 0	4855. 45	2922. 31	538.6 5	1912. 79	60.19	safe
13	JASHPUR	PHARSABAHAR	79650	63350	5559 .99	386. 49	142. 54	533. 72	6622. 74	662.2 7	5960. 47	2167. 58	275.5 9	3786. 79	36.37	safe
13	JASHPUR	DULDULA	51364	31968	1616 .08	101. 07	39.4 7	219. 15	1975. 77	100.6 6	1875. 11	985.3 2	131.8 1	886.4 0	52.55	safe
13	JASHPUR	BAGICHA	181040	110890	5767 .53	598. 31	226. 01	475. 50	7067. 35	368.4 9	6698. 86	2802. 45	477.2 1	3878. 55	41.83	safe
14	DURG	DHAMDHAA	88249	88249	6137 .39	5892. 88	0.00	4114. .04	1614. 4.31	1614. 43	14529. 88	1220. 2.54	826.9 1	2283. 72	83.98	semi_critical
14	DURG	DURG	67517	67517	4226 .1	5141. 42	0.00	2567. .66	1193. 5.18	917.8 6	11017. .32	9374. 99	3372. 77	2707. 50	85.09	semi_critical
14	DURG	PATAN	76233	76233	4147 .01	8729. .8	0.00	2148. .32	1502. 5.13	1502. 51	13522. .62	7808. 38	935.5 1	5681. 56	57.74	safe

14	BEMETARA	BEMETARA	72779	72779	4293	5177	0.00	3709	1318	1318.	11862	1077	883.0	2242.	90.82	critical
14	BEMETARA	BERLA	77718	77718	5870	3506	0.00	3261	1263	1263.	11374	1099	674.7	657.4	96.70	critical
14	BEMETARA	NAWAGA RH	62498	62498	3430	2305	0.00	1982	7717.	771.8	6946.	6739.	907.1	34.69	97.03	critical
14	BEMETARA	SAJA	72486	72486	4581	5792	0.00	3436	1381	1381.	12429	1103	424.5	1432.	88.79	semi_critical
									1418	1256	12927	6117	8449	68191	47.32	
									354.0	20.17	33.88	56.40	9.02	9.18		

*Annexure 14 Assessment Unit wise Extraction*

S.N o	District	Assessment Unit Name	Irrigation Use (Ham)	Industria l Use (Ham)	Domesti c Use (Ham)	Total Extractio n (Ham)	Stage of Ground Water Extractio n (%)	Categorization (OE/Critical/Semicritical/Safe )
1.	KANKER	ANTAGARH	1239.75	0.15	216.30	1456.19	23.72	safe
2.	KANKER	CHARAMA	5889.38	3.15	280.14	6172.68	72.56	semi_critical
3.	KANKER	BHANUPRATAPUR	2357.16	11.87	255.34	2624.37	27.86	safe
4.	KANKER	NARHARPUR	4964.35	2.22	303.10	5269.67	59.57	safe
5.	KANKER	KOYALIBEDA	3309.92	3.02	477.58	3790.52	20.81	safe
6.	KANKER	KANKER	3751.05	4.09	354.13	4109.27	54.94	safe
7.	KANKER	DURGUKONDAL	1222.63	6.06	170.49	1399.18	19.38	safe
8.	DANTEWADA	DANTEWADA	1443.57	154.83	235.95	1834.35	15.39	safe
9.	DANTEWADA	GEEDAM	1135.43	2.06	264.93	1402.42	31.37	safe
10.	DANTEWADA	KATEKALYAN	416.86	0.15	112.00	529.02	11.61	safe
11.	DANTEWADA	KUAKONDA	656.23	1.41	165.91	823.54	20.87	safe
12.	BALRAMPUR	WADRAFNAGAR	1663.27	1.40	462.19	2126.86	16.33	safe
13.	BALRAMPUR	SHANKARGARH	1038.21	0.18	191.67	1230.07	26.68	safe
14.	BALRAMPUR	BALRAMPUR	1562.40	0.51	317.21	1880.12	37.15	safe
15.	BALRAMPUR	RAJPUR	1820.03	4.87	311.25	2136.15	27.87	safe
16.	BALRAMPUR	RAMCHANDRAPUR	2930.53	2.10	495.32	3427.95	43.53	safe
17.	BALRAMPUR	KUSMI	1057.85	0.92	297.34	1356.12	15.17	safe
18.	SURAJPUR	PREMNAGAR	1499.89	0.29	185.15	1685.34	48.20	safe
19.	SURAJPUR	ODGI	2233.84	0.41	250.63	2484.89	53.87	safe

20.	SURAJPUR	BHAIYATHAN	2659.06	169.07	355.29	3183.43	46.91	safe
21.	SURAJPUR	PRATAPPUR	3549.23	226.88	429.07	4205.21	59.67	safe
22.	SURAJPUR	RAMANUJNAGAR	3206.91	100.85	333.26	3641.03	65.15	safe
23.	SURAJPUR	SURAJPUR	6384.63	457.54	634.68	7476.85	78.80	semi_critical
24.	KHAIRAGARH-CHHUIKHADAN_GANDAI	CHHUIKHADAN	3467.68	2.75	528.36	3998.77	47.18	safe
25.	KHAIRAGARH-CHHUIKHADAN_GANDAI	KHAIRAGARH	6643.75	9.07	557.31	7210.13	77.01	semi_critical
26.	BILASPUR	MASTURI	1277.12	252.30	1075.25	2604.67	47.55	safe
27.	BILASPUR	TAKHATPUR	11526.82	134.91	990.02	12651.73	73.72	semi_critical
28.	BILASPUR	KOTA	2120.36	37.82	683.99	2842.16	23.85	safe
29.	BILASPUR	BELHA	6641.88	239.56	2952.02	9833.46	82.56	semi_critical
30.	GARIABAND	CHHURA	3269.65	2.46	312.61	3584.72	64.21	safe
31.	GARIABAND	DEOBHOG	1630.67	1.01	266.86	1898.53	54.04	safe
32.	GARIABAND	GARIABAND	5422.96	4.64	249.05	5676.64	60.56	safe
33.	GARIABAND	RAJIM/FINGESHWA R	6432.63	9.03	450.23	6891.90	80.24	semi_critical
34.	GARIABAND	MAINPUR	2909.68	0.12	450.73	3360.52	50.08	safe
35.	BIJAPUR	USOOR	498.09	0.77	134.34	633.20	4.99	safe
36.	BIJAPUR	BIJAPUR	1882.49	0.33	162.98	2045.81	20.45	safe
37.	BIJAPUR	BHOPALPATTNAM	1116.75	0.14	131.51	1248.38	14.18	safe
38.	BIJAPUR	BHAIRAMGARH	746.51	0.68	251.76	998.94	6.45	safe
39.	BASTAR	BASTANAR	202.10	0.48	120.03	322.61	10.12	safe
40.	BASTAR	BAKAWAND	1905.70	5.48	406.92	2318.08	51.61	safe
41.	BASTAR	BASTAR	2031.27	7.44	446.86	2485.56	48.93	safe
42.	BASTAR	DARBHA	179.17	2.19	207.91	389.28	18.07	safe
43.	BASTAR	JAGDALPUR	831.97	48.46	705.33	1585.76	40.66	safe
44.	BASTAR	LOHANDIGUDA	320.76	2.19	203.31	526.25	16.49	safe
45.	BASTAR	TOKAPAL	590.66	6.05	208.86	805.57	30.69	safe
46.	BALODA BAZAR	SIMGA	6079.87	723.14	1124.37	7927.39	55.60	safe
47.	BALODA BAZAR	BALODA BAZAR	3850.72	357.19	1054.57	5262.47	43.90	safe
48.	BALODA BAZAR	BHATAPARA	4498.14	33.49	739.32	5270.96	45.02	safe
49.	BALODA BAZAR	KASDOL	5089.58	5.66	684.13	5779.38	44.60	safe
50.	BALODA BAZAR	PALARI	1435.74	25.64	919.92	2381.30	21.71	safe
51.	SUKMA	CHHINDGARH	1010.39	0.23	206.23	1216.85	15.03	safe
52.	SUKMA	KONTA	380.62	0.33	235.51	616.46	2.34	safe
53.	SUKMA	SUKMA	554.33	1.05	179.66	735.05	10.36	safe

54.	KOREA	BAIKUNTHPUR	3762.68	390.63	526.05	4679.36	60.52	safe
55.	KOREA	SONHAT	1979.57	0.00	136.92	2116.48	34.89	safe
56.	GOURELA-PENDRA-MARWAHI	PENDRA	2002.82	0.00	284.23	2287.06	59.58	safe
57.	GOURELA-PENDRA-MARWAHI	MARWAHI	1228.17	0.54	419.82	1648.54	32.06	safe
58.	GOURELA-PENDRA-MARWAHI	GAURELA	785.69	1.08	443.85	1230.62	29.86	safe
59.	BALOD	GURUR	6536.81	18.48	375.77	6931.07	93.66	critical
60.	BALOD	GUNDERDEHI	5890.33	19.90	572.71	6482.95	71.43	semi_critical
61.	BALOD	DOUNDI	2352.71	19.05	423.50	2795.27	64.85	safe
62.	BALOD	DOUNDI LOHARA	6081.40	7.32	531.98	6620.70	61.90	safe
63.	BALOD	BALOD	3338.50	7.83	355.45	3701.79	84.45	semi_critical
64.	MOHLA-MANPUR_AMBAGARHCHOWK I	MOHLA	1607.57	9.27	226.03	1842.87	44.75	safe
65.	MOHLA-MANPUR_AMBAGARHCHOWK I	MANPUR	1211.71	20.49	231.47	1463.66	23.51	safe
66.	MOHLA-MANPUR_AMBAGARHCHOWK I	AMBAGARH CHOWKI	2288.20	1.74	285.26	2575.19	53.00	safe
67.	SURGUJA	UDAIPUR	2505.14	808.47	215.81	3529.42	32.79	safe
68.	SURGUJA	SITAPUR	2191.98	1.26	251.07	2444.31	57.58	safe
69.	SURGUJA	MAINPAT	686.00	7.50	203.62	897.12	34.60	safe
70.	SURGUJA	AMBIKAPUR	3069.85	21.44	822.06	3913.36	63.68	safe
71.	SURGUJA	BATAULI	1955.22	0.54	186.63	2142.39	64.78	safe
72.	SURGUJA	LAKHANPUR	2351.47	209.12	326.96	2887.55	43.46	safe
73.	SURGUJA	LUNDRA	2343.27	10.89	324.64	2678.80	51.63	safe
74.	MAHASAMUND	BAGBAHARA	10301.32	16.08	564.81	10882.22	43.79	safe
75.	MAHASAMUND	BASNA	11070.02	8.42	459.97	11538.42	88.03	semi_critical
76.	MAHASAMUND	MAHASAMUND	12165.44	88.62	759.25	13013.31	53.05	safe
77.	MAHASAMUND	PITHORA	13499.49	6.11	553.73	14059.32	74.80	semi_critical
78.	MAHASAMUND	SARAIPALI	6538.85	4.94	579.82	7123.60	56.81	safe
79.	SAKTI	SAKTI	1703.94	1.36	522.30	2227.59	48.64	safe
80.	SAKTI	DABHARA	3812.30	1.03	463.98	4277.31	62.46	safe
81.	SAKTI	JAIJAIPUR	3738.53	5.73	506.38	4250.64	36.30	safe
82.	SAKTI	MALKHARODA	3031.78	0.75	446.60	3479.12	51.85	safe
83.	DHAMTARI	DHAMTARI	14567.42	37.43	754.37	15359.23	76.64	semi_critical
84.	DHAMTARI	KURUD	13710.62	32.00	578.67	14321.29	77.72	semi_critical
85.	DHAMTARI	MAGARLOD	9029.97	4.87	324.01	9358.85	65.94	safe

86.	DHAMTARI	NAGRI	5564.67	4.69	458.61	6027.96	66.99	safe
87.	NARAYANPUR	ORCHHA	201.82	0.00	95.65	297.47	1.65	safe
88.	NARAYANPUR	NARAYANPUR	1192.05	10.65	297.07	1499.78	23.18	safe
89.	KABIRDHAM	SAHASPUR LOHARA	10955.80	5.89	517.12	11478.82	59.84	safe
90.	KABIRDHAM	PANDARIYA	8492.96	6.46	783.23	9282.64	87.07	semi_critical
91.	KABIRDHAM	KAWARDHA	10310.14	11.30	725.63	11047.07	66.71	safe
92.	KABIRDHAM	BODLA	6392.42	51.54	550.23	6994.20	36.19	safe
93.	MANENDRAGARH-CHIRMI BHARATPUR	MANENDRAGARH	1435.29	286.73	407.62	2129.63	42.10	safe
94.	MANENDRAGARH-CHIRMI BHARATPUR	KHADGAWAN	3580.67	433.90	441.41	4455.98	42.95	safe
95.	MANENDRAGARH-CHIRMI BHARATPUR	BHARATPUR	2721.75	0.06	252.70	2974.51	9.51	safe
96.	RAIGARH	TAMNAR	644.43	1666.61	267.95	2578.99	61.58	safe
97.	RAIGARH	RAIGARH	1755.67	184.66	950.15	2890.49	43.75	safe
98.	RAIGARH	PUSAUR	3160.48	50.41	399.11	3609.99	86.70	semi_critical
99.	RAIGARH	LAILUNGA	748.43	3.00	345.59	1097.01	15.60	safe
100.	RAIGARH	KHARSIYA	1234.20	151.81	409.55	1795.56	50.47	safe
101.	RAIGARH	DHARAMJAIGARH	2139.77	226.06	550.99	2916.81	31.31	safe
102.	RAIGARH	GHARGHODA	1006.71	383.87	221.53	1612.11	46.79	safe
103.	RAIPUR	ABHANPUR	3705.09	100.07	803.94	4609.10	44.01	safe
104.	RAIPUR	ARANG	4304.66	440.93	967.77	5713.36	51.71	safe
105.	RAIPUR	DHARSIWA	2365.13	592.92	4949.63	7907.67	93.51	critical
106.	RAIPUR	TILDA	7568.20	762.61	665.99	8996.81	56.08	safe
107.	KORBA	KORBA	1571.71	388.29	1150.37	3110.36	36.12	safe
108.	KORBA	KATGHORA	1217.38	1611.20	991.62	3820.19	63.55	safe
109.	KORBA	PODI UPRORA	1307.07	325.44	521.36	2153.87	14.33	safe
110.	KORBA	PALI	3708.12	92.00	579.37	4379.50	50.95	safe
111.	KORBA	KARTALA	2456.43	21.86	403.30	2881.59	38.59	safe
112.	MUNGELI	LORMI	3341.48	0.35	417.10	3758.93	32.65	safe
113.	MUNGELI	PATHARIA	3236.64	26.13	694.61	3957.39	59.01	safe
114.	MUNGELI	MUNGELI	2737.45	4.20	807.84	3549.49	56.02	safe
115.	SARANGARH-BILAIRAGH	BILAIGARH	1034.85	8.33	743.14	1786.31	16.62	safe
116.	SARANGARH-BILAIRAGH	BARAMKELA	4678.28	10.76	494.84	5183.88	76.90	semi_critical
117.	SARANGARH-BILAIRAGH	SARANGARH	1267.86	26.36	610.64	1904.86	35.90	safe
118.	RAJNANDGAON	DONGARGAON	4422.17	46.32	385.47	4853.97	85.52	semi_critical
119.	RAJNANDGAON	CHHURIYA	3666.43	8.16	503.57	4178.17	41.33	safe

120.	RAJNANDGAON	DONGARGARH	7566.20	8.01	588.47	8162.70	74.54	semi_critical
121.	RAJNANDGAON	RAJNANDGAON	5340.63	166.09	1744.09	7250.81	85.64	semi_critical
122.	KONDAGAON	BADERAJPUR	2109.03	0.84	226.55	2336.43	59.16	safe
123.	KONDAGAON	KESHKAL	2955.57	2.33	249.62	3207.51	46.19	safe
124.	KONDAGAON	KONDAGAON	1788.36	17.84	571.93	2378.13	23.94	safe
125.	KONDAGAON	PHARASGAON	3122.55	0.72	266.25	3389.52	44.89	safe
126.	KONDAGAON	MAKDI	3531.14	0.03	273.11	3804.28	57.23	safe
127.	JANGIR-CHAMPA	AKALTARA	1431.27	135.17	507.58	2074.03	27.36	safe
128.	JANGIR-CHAMPA	BAMHANIDIH	1785.38	15.58	634.43	2435.39	26.60	safe
129.	JANGIR-CHAMPA	JANGIR (NAWAGARH)	1726.89	0.15	937.35	2664.38	20.67	safe
130.	JANGIR-CHAMPA	PAMGARH	1541.67	1.97	469.43	2013.07	21.81	safe
131.	JANGIR-CHAMPA	BALODA	1658.63	78.93	314.51	2052.09	39.01	safe
132.	JASHPUR	MANORA	932.32	0.15	155.33	1087.79	30.99	safe
133.	JASHPUR	JASHPUR	1853.60	2.90	274.88	2131.38	66.26	safe
134.	JASHPUR	KANSABEL	1598.31	1.95	191.79	1792.07	56.38	safe
135.	JASHPUR	KUNKURI	1374.40	3.71	246.55	1624.67	57.38	safe
136.	JASHPUR	PATHALGAON	2388.71	15.29	518.30	2922.31	60.19	safe
137.	JASHPUR	PHARSABAHAR	1895.39	2.70	269.49	2167.58	36.37	safe
138.	JASHPUR	DULDULA	855.54	1.38	128.42	985.32	52.55	safe
139.	JASHPUR	BAGICHA	2341.53	1.56	459.35	2802.45	41.83	safe
140.	DURG	DHAMDHA	11264.45	154.80	783.29	12202.54	83.98	semi_critical
141.	DURG	DURG	5879.63	218.95	3276.39	9374.99	85.09	semi_critical
142.	DURG	PATAN	6870.93	34.63	902.83	7808.38	57.74	safe
143.	BEMETARA	BEMETARA	10000.38	21.97	750.41	10772.75	90.82	critical
144.	BEMETARA	BERLA	10263.25	134.60	601.44	10999.28	96.70	critical
145.	BEMETARA	NAWAGARH	5955.68	48.67	735.32	6739.67	97.03	critical
146.	BEMETARA	SAJA	10650.25	7.06	377.95	11035.24	88.79	semi_critical
			520686.9 2	13853.01	77216.35	611756.40	47.32	

*Annexure 15 SLC Approval and Minutes of meetings*

छत्तीसगढ़ शासन  
जल संसाधन विभाग  
“मंत्रालय”  
महानदी अवब, नवा रायपुर अटल नगर,  
जिला-रायपुर (छ.ग.)

क्र.....1704/एफ-1-66/31/एस-2/GW/2010, अटल नगर, दिनांक 29/04/2024  
प्रति,

सदस्य सचिव (SLC)  
सह क्षेत्रीय निदेशक,  
केन्द्रीय भूमि जल बोर्ड,  
भारत सरकार, जल शक्ति मंत्रालय,  
उत्तर मध्य छत्तीसगढ़ क्षेत्र,  
द्वितीय तल, एल.के.कॉर्पोरेट एवं  
लौजिस्टिक पार्क, धमतरी रोड,  
झूमरतराई, रायपुर-492015

विषय :— अध्यक्ष (SLC) सह सचिव महोदय जल संसाधन विभाग की अध्यक्षता में दिनांक 19 अप्रैल, 2024 को सम्पन्न Ground Water Resources Assessment for Chhattisgarh State-2024 की बैठक का कार्यवाही विवरण।

संदर्भ:— आपका ई—मेल दिनांक 24.04.2024.

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विषयांतर्गत संदर्भित ई—मेल के द्वारा प्राप्त अध्यक्ष (SLC) सह सचिव महोदय जल संसाधन विभाग की अध्यक्षता में दिनांक 19 अप्रैल, 2024 को सम्पन्न Ground Water Resources Assessment for Chhattisgarh State-2024 की बैठक का सचिव द्वारा अनुमोदित कार्यवाही विवरण आवश्यक कार्यवाही हेतु प्रेषित है। कृपया उक्त विवरण आपके कार्यालय से जारी करते हुए समिति के सभी सम्मानीय सदस्यों को उपलब्ध कराने का अनुरोध है।

सहपत्र :—उपरोक्तानुसार।

*(Signature)*  
विद्वेष कर्तव्यालय अधिकारी  
जल संसाधन विभाग  
मंत्रालय, अटल नगर

## **MINUTES OF THE MEETING OF THE STATE LEVEL COMMITTEE FOR GROUND WATER RESOURCE ASSESSMENT 2024.**

**Held on 19. 04. 2024.**

A meeting of the State Level Committee (SLC) for Ground Water Resources Assessment 'Dynamic Ground Water Resources of Chhattisgarh, 2024' was held in the office of the Secretary, Water Resources Department, Government of Chhattisgarh on 19<sup>th</sup> April, 2024 at 1:00 pm. The meeting was chaired by Secretary, Water Resources Department, Government of Chhattisgarh. The meeting was attended by representatives from Central Ground Water Board (CGWB), Water Resources Department, Department of Agriculture, Directorate of Industries, National Bank for Agriculture and Rural Development (NABARD), Public Health Engineering Department and Directorate of Economics and Statistics. The list of members who attended the meeting is appended in Annexure-I. The major outcomes of the meeting are given below.

At the outset, Secretary, Water Resources and the Chairman of the State Level Committee for estimation of Ground Water Resources, welcomed all the members and requested the Regional Director, CGWB to give a brief introduction and objectives of the meeting for the assessment of ground water resources of Chhattisgarh state.

1. Dr. Prabir K. Naik, Regional Director, Central Ground Water Board, NCCR, Raipur as the member secretary for the committee gave a brief introduction with importance of the ground water resource estimation and objectives of the meeting for the assessment of ground water resources of Chhattisgarh state followed by the release of the GWRA report for the year 2023 by the SLC members. Subsequently, with the permission of Chair, he handed over the session to Shri Uddesha Kumar, Scientist C, CGWB for presenting the timeline for the Ground Water Resources Assessment in Chhattisgarh state for the year 2024.
2. Shri Uddesha Kumar presented the timeline and major activities to be carried out by the members of Ground Water Resource Assessment Cell (GWRAC) for the year 2024. Given the timeline stipulating the SLC approval of the Ground Water Resources by 15th August, 2024, it is essential to conduct data collection preferably by June, 2024 to facilitate sufficient time for thorough data validation. A brief discussion was held on the draft pattern of the state. He further emphasized on the availability and refinement of data. The committee collectively decided to estimate the actual number of borewells in urban and rural areas. The household consumers may also be considered for draft estimation in urban areas.

3. A detailed discussion was held on the availability of shapefiles of command and non-command areas. It was decided that a shapefile and the list of villages in the command area should be provided for actual comparison of irrigation wells between command and non-command areas. WRD, Chhattisgarh has the data of the major and medium canal command areas and the Secretary, WRD advised to share the data with CGWB. The committee also advised to collect the number of irrigation wells village wise from Zila Panchayat/ Janpad Panchayat.
4. Secretary, WRD further emphasized on data collection of the actual number of borewells from CSPDCL and CREDA for resource estimation. Data from CSPDCL related to energy consumption of irrigation wells may also be collected. Further, it was suggested to collect the block – wise data of the water conservation structures along with their dimensions from the respective departments/ Jal Shakti Kendras.
5. Dr. M. L. Agrawal, EnC, PHED emphasized on the drinking water source sustainability due to decline in the depth to ground water level. He advised for the mapping of command and non – command areas in 1:10000 scale for proper land and water resources management.
6. Regional Director, CGWB discussed the composition of GWRAC with the committee members constituting officers from CGWB and State Ground Water department. It was decided that Superintending Engineer, Water Resources & Ground Water Circle will be the state level Nodal Officer supported by SGH, WRD. Further, it was discussed to constitute a district level Ground Water Resource Assessment cell. SE, Water Survey Circle highlighted the shortage of officers/ geo hydrologists in the state department.

Chairman of the committee directed all the members to take necessary measures for timely completion of Ground Water Resources Assessment 2024.

The meeting ended with thanks to the chair.

(Approved by Chairman-SLC cum Secretary, WRD), *GOCG*

*6*  
**Officer on Special Duty  
Water Resources Department,  
Mantralaya, Naya Raipur**

*QF*

**Annexure - 1**

**List of Members participated in the first meeting of the State Level Committee for Ground Water Resources Assessment for Chhattisgarh, held on 19/04/2024.**

<b>Sl. No.</b>	<b>Name</b>	<b>Designation and department</b>
1.	Shri Rajesh Sukumar Toppo	IAS, Special Secretary, Water Resources Department, Govt. of Chhattisgarh & Chairman of the Committee
2.	Shri Indrajeet Uikey	Engineer-In-Chief, Water Resources Department, Govt. of Chhattisgarh
3.	Dr. Prabir K. Naik	Regional Director, North Central Chhattisgarh Region, Raipur
4.	Dr. M. L. Agrawal	Engineer-In-Chief, Public Health Engineering Department
5.	Shri K. S. Guroower	Chief Engineer, Water Resources Department
6.	Shri Mukesh Santoshi	Chief Engineer, MGB, Water Resources Department
7.	Shri N. Buliwal	Joint Director, Directorate of Economics and Statistics
8.	Shri S. K. Tikam	Superintending Engineer, Water Resources & Ground Water Circle
9.	Dr. Satish Goswami	Statistical Officer, Directorate of Economics and Statistics
10.	Shri Saurabh Singh	Assistant Manager, NABARD
11.	Shri Satram S. Paikra	Assistant Director, Department of Agriculture
12.	Shri Lokpal Khandekar	Assistant Director, Directorate of Industries
13.	Shri Mitesh Dage	Assistant Director, Directorate of Industries
14.	Shri Champat Dewangan	EE, Water Resources Department, Govt. of Chhattisgarh
15.	Shri Uddeshya Kumar	Scientists-C, NCCR
16.	Shri B. Abhishek	Scientists-C, NCCR
17.	Shri Lokesh Manhar	AGH, Water Resources Department, Govt. of Chhattisgarh
18.	Ms. Sweta Mohanty	AHG, NCCR

भारत सरकार  
जल शक्ति मंत्रालय  
जल संसाधन, नदी विकास और  
गंगा संरक्षण विभाग  
केंद्रीय भूमि जल बोर्ड  
उच्च मध्य छत्तीसगढ़ क्षेत्र  
दूसरी मंजिल, एल कॉर्पोरेटस  
और लॉजिस्टिक पार्क,  
धमतरी रोड, दुमरतराई  
रायपुर - 492015



**महत्वपूर्ण (Email/ Speed Post)**

Govt. of India  
Ministry Jal Shakti  
Department of Water Resources,  
River Development and Ganga Rejuvenation  
Central Ground Water Board,  
North Central Chhattisgarh Region,  
2<sup>nd</sup> Floor, L K Towers  
Dhamtari Road, Dumartarai  
Raipur – 492015  
Email: rdnccr-cgwb@nic.in  
No. 82/CGWB/NCCR/21-22/ — ३५

30 APR 2024

प्रति,

- प्रमुख अभियंता, जल संसाधन विभाग, शिवनाथ भवन, सेक्टर-19, अटल नगर-नवा रायपुर
- प्रमुख अभियंता, लोक स्वास्थ्य यात्रिकी विभाग, मंत्रालय, महानदी भवन, नवा रायपुर- अटल नगर
- संचालक, कृषि विभाग, कृषक भवन, सेक्टर-19, नॉर्थ ब्लॉक, नवा रायपुर- अटल नगर
- मुख्य अभियंता, महानदी गोदावरी कछार, जल संसाधन विभाग, रायपुर
- संचालक, उद्योग विभाग, प्रथम तल, उद्योग भवन, रिंग रोड नं.-1 के पीछे, तेलीबांधा, रायपुर
- मुख्य महाप्रबंधक नाबार्ड, छत्तीसगढ़ केंद्रीय कार्यालय, अनन्य भवन, प्लॉट -01, सेक्टर-24, सेन्ट्रल बैंक के पीछे, नवा रायपुर-अटल नगर
- संचालक, योजना एवं आर्थिक सांस्थिकी विभाग, इन्द्रावती भवन, नवा रायपुर- अटल नगर

**विषय:- STATE LEVEL COMMITTEE (SLC) FOR GROUND WATER RESOURCES ASSESSMENT (GWRA) 2024 की आयोजित बैठक दिनांक 19.04.2024 का कार्यवाही विवरण।**

उपरोक्त विषयांतर्गत STATE LEVEL COMMITTEE (SLC) FOR GROUND WATER RESOURCES ASSESSMENT (GWRA) 2024 की आयोजित बैठक दिनांक 19.04.2024 का अध्यक्ष -SLC सह सचिव, छत्तीसगढ़ शासन, जल संसाधन विभाग महोदय द्वारा अनुमोदित कार्यवाही विवरण जानकारी एवं आवश्यक कार्यवाही हेतु संलग्न प्रेषित है।

सहपत्र उपरोक्तानुसार। :-

*प्रबीर कुमार नायक  
30/04/24*

(डा. प्रबीर कु. नायक)  
सदस्य सचिव (SLC)  
सह क्षेत्रीय निदेशक, केंद्रीय भूमि जल बोर्ड

प्रतिलिपि:

- विशेष कर्तव्यस्थ अधिकारी, जल संसाधन विभाग, छ.ग. शासन मंत्रालय, महानदी भवन, नवा रायपुर-अटल नगर को पत्र संख्या 1704/एफ-1-66/31/ एस-2/GW/2010 दिनांक 29.04.2024 के सन्दर्भ में सादर सूचनार्थ प्रेषित।

*प्रबीर कुमार नायक  
30/04/24*

(डा. प्रबीर कु. नायक)  
सदस्य सचिव (SLC)  
सह क्षेत्रीय निदेशक, केंद्रीय भूमि जल बोर्ड

## महत्वपूर्ण

चत्तीसगढ़ शासन  
जल संसाधन विभाग  
मंत्रालय

महानदी भवन, नवा रायपुर—अटल नगर

क्र.—एफ—1—66/31/एस—2/GW/2010/३९१२ नवा रायपुर, दिनांक ०४/०९/२०२४

10

प्रति,

सदस्य सचिव (SLC),

सह क्षेत्रीय निदेशक, केन्द्रीय भूमिजल बोर्ड,  
भारत सरकार, जल शक्ति मंत्रालय,  
उत्त मध्य छत्तीसगढ़ क्षेत्र,  
द्वितीय तल, एल.के. कॉर्पोरेट एवं  
लॉजिस्टिक पार्क, धमतरी रोड,  
झुमरतराई, रायपुर—492015

**विषय:— Minutes of the Meeting of the State Level Committee for Approval of Ground Water Resources as on March-2024 Held on 11-09-2024.**

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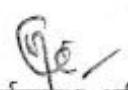
उपरोक्त विषयांतर्गत STATE LEVEL COMMITTEE (SLC) FOR GROUND WATER RESOURCES ASSESSMENT (GWRA) 2024 की आयोजित बैठक दिनांक 11.09.2024 का अध्यक्ष—SLC सह सचिव, छत्तीसगढ़ शासन, जल संसाधन विभाग महोदय द्वारा अनुमोदित कार्यवाही विवरण आवश्यक कार्यवाही हेतु संलग्न प्रेषित है।

कृपया उक्त कार्यवाही विवरण समिति के सभी सदस्यों को प्रेषित करने का कष्ट करेंगे।

सहपत्र :— उपरोक्तानुसार।

(मूलतः)

०/८

  
 विशेष कर्तव्यस्थ अधिकारी  
 जल संसाधन विभाग  
 मंत्रालय, अटल नगर

## **MINUTES OF THE MEETING OF THE STATE LEVEL COMMITTEE FOR APPROVAL OF GROUND WATER RESOURCES AS ON MARCH-2024.**

**Held on 11/09/2024**

A meeting of the State Level Committee for re-estimation of Ground Water Resources (SLC) for approval of ‘Dynamic Ground Water Resources of Chhattisgarh as on March 2024’ was held in the office of the Secretary, Water Resources Department, Govt of Chhattisgarh, Mantralaya, Mahanadi Bhawan, Naya Raipur on 11<sup>th</sup> September 2024 at 12:30 hours. The meeting was chaired by Secretary, Water Resources, Govt. of Chhattisgarh. The meeting was attended by representatives from Central Ground Water Board (CGWB), Water Resources Department, Ground Water Survey, Department of Agriculture and National Bank for Agriculture and Rural Development (NABARD), Public Health Engineering Department, Panchayat and Rural Development Department, Directorate of Economics and Statistics, MGNREGAS, Department of Industries and State Watershed Management Agency. The list of members attended the meeting is appended in Annexure-I. The major outcomes of the meeting are given below.

At the outset, Ms. Sweta Mohanty welcomed the Chairman and all the members of the State Level Committee for re-estimation of Ground Water Resources and requested Dr. Prabir. K Naik Regional Director, CGWB to give welcome address and a brief introduction on objectives of the meeting for the re-assessment of ground water resources of Chhattisgarh state.

1. Dr. Prabir K. Naik, Regional Director of Central Ground Water Board (CGWB), North Central Chhattisgarh Region, Raipur, being the Member Secretary of the committee, provided a concise introduction emphasizing the significance of ground water resource estimation. He also outlined the objectives of the meeting, which focused on the assessment of ground water resources in Chhattisgarh state. Following the directive of the Secretary and Chairman of CGWB from a previous meeting, the District Ground water Information Booklet for Dhamtari was formally released. The Secretary of Water Resources commended CGWB for their expeditious efforts in producing the booklet in Hindi. Subsequently, with the Chair’s approval, the session was handed over to Shri. B. Abhishek, Scientist C, CGWB.

2. Shri. B. Abhishek presented an overview of the current ground water scenario in Chhattisgarh state, based on the data compiled up to March 2024. Shri B. Abhishek informed that every year the ground water resources of Chhattisgarh state are re-estimated as per methodology suggested. The recent estimations have been carried out by CGWB and State Ground Water Survey taking 2023-24 as the base year and the new methodology adopted is GEC '2015'. In the assessments, the administrative block was taken as unit of assessment and command & non-command area in block was taken as subunit. The Total Annual Ground Water Recharge of the State has been assessed as 14.18 BCM and Annual Extractable Ground Water Resource is 12.93 BCM. The Total Current Annual Ground Water Extraction is 6.12 BCM and Stage of Ground Water Extraction is 47.32 % with 21 blocks falling under Semi-Critical and 5 blocks under Critical category in Chhattisgarh. He also explained the comparative scenario of Dynamic Ground Resources of Chhattisgarh from 2017 to 2024.
3. Secretary, Water Resources & the Chairman of the Committee enquired about the comparison of results of GWRA-2024 with the nation average in 2023. The total Stage of Ground water Extraction in the country as on March 2023 was 59.26%. As per GWRA - 2023, the groundwater draft at National level was 87% for agriculture, 11% for domestic and 2% for industrial use. When compared to the GWRA -2024 of Chhattisgarh state it approximately shows similar results where agriculture sector accounts for 86%, domestic use accounts for 12% and while industrial use represents 2%. Whereas Rainfall recharge was 60% of the total recharge (Monsoon season: 54%, Non-monsoon season: 6%) at National level in 2023 agriculture sector accounts for 87%, domestic use accounts for 11% and while industrial use represents 2%. and the remaining 40% (Monsoon season: 19%, Non-monsoon season: 21%) is from 'Other sources' viz. canal seepage, return flow from irrigation, recharge from tanks, ponds and water conservation structures taken together. While at state level in 2024, the rainfall recharge is 61.51% and recharge from other sources is 38.49%.
4. The Chairman, also disused about the number of irrigation abstraction structures in the state as per available data which is 4,79,000 which also includes 1,16,638 Solar Pumps issued under Sourya Sujla Yojna. Later the Secretary, Water Resources invited opinion

from all members of the committee on estimation carried out. In response, Dr M. L. Agarwal, ENC PHED informed that the PHED experienced with sustainability and scarcity of ground water in rural water supply for domestic uses and tube wells are getting dry during the lean/Summer period due to enormous ground water withdrawal for irrigation purposes near the same tubewells. A brief discussion was held on the drying up of well despite increase in total annual ground water recharge from 13.34 BCM in 2023 to 14.18 BCM in 2024. The additional increase in the recharge was attributed to an increase in the number of irrigation wells resulted in the increase of total extraction. The increase in return flow thus generated by increase in ground water irrigation area is responsible for the comparative increased ground water recharge. The monsoon and non-monsoon ground water utilized in irrigation in the problematic area is approximately 42 % and 58 %. However, in the monsoon this 42% draft is compensated through recharges from rainfall and other sources which accounts for 85% of the total recharge. In the non-monsoon during the Rabi Season the scenario reverses with draft being 58% and recharges accounts for 15% resulting into deepening and drying up of borewells located at the top of the watershed during the period of March to June. This issue can only be managed through developing canal networks in rabi cropped areas near the river where the same cropping pattern has been practiced from a prolonged duration. While in districts like Mahasamund and Bemetara where the cropping is uniform along the whole district farm ponds and surface water irrigation can be developed.

5. Later Shri B. Abhishek, through Land-Sat imageries displayed the spatial distribution of Rabi Paddy area within the state. The electricity consumption pattern for Rabi, Kharif and Zaid cropping season for the year 2023-2024 was also discussed to understand the agriculture draft pattern of all the districts. Then a brief discussion was carried out for efficient use of water in agriculture. The Secretary, Water Resources insisted CGWB to carry out the analysis for per hectare crop water requirement for Paddy. The interim findings of the NAQUIM 2.0 studies carried out at Kunkuri block of Jashpur district were also shared with the committee.

6. All the members of State Level Committee for Re-estimation of Ground Water Resources of Chhattisgarh as on March 2024 has appreciated the work carried out by State Ground Water Department, Govt. of Chhattisgarh & Central Ground Water Board, Govt. of India for bringing out there port on "*Dynamic Ground Water Resources of Chhattisgarh as on March 2024*" which will be helpful for proper development and management of ground water resources in the state of Chhattisgarh and finally GWRA-2024 was approved by the State Level Committee.

The meeting ended with thanks to the chair.



**Sh. Rajesh Sukumar Toppo**  
Secretary, Water Resources, Govt. of CG  
& Chairman of the Committee

**Annexure-1**

**List of Members participated in the meeting of the State Level Committee for Approval of  
Ground Water Resources Assessment (as on March 2023) for Chhattisgarh, held  
on 18/01/2024.**

<b>Sl. No.</b>	<b>Name</b>	<b>Designation and department</b>
1	Sh. Rajesh Sukumar Toppo	IAS, Secretary, Water Resources Department, Govt. of Chhattisgarh & Chairman of the Committee
2	Dr. Prabir K. Naik	Regional Director (CHWB, North Central Chhattisgarh Region, Raipur) & Member Secretary, SLC
3	Sh. Indrajeet Uikey	Engineer-In-Chief, Water Resources Department, Govt. of Chhattisgarh
4	Dr. M. L. Agarwal	Engineer-In-Chief, Public Health Engineering Department Chhattisgarh.
5	S. Jegadasan	IFS, CEO, Chhattisgarh State Watershed Management Agency.
6	Sh. Ram Sagar	Chief Engineer, RES Panchayat and Rural Development.
7	Sh. S. K. Tikam	Chief Engineer, Water Resources Department.
8	Sh. Vinay Gupta	S.E., MGNREGS.
9	Sh. I. A. Siddiqi	S.E., Water Resources Department, Chhattisgarh.
10	Dr. Satish Goswami	DIRECTORATE OF ECONOMICS AND STATISTICS
11	Sh. Lokpal Khandekar	Assistant Director, Department of Commerce and Industries.
12	Sh. Saurabh Singh	Assistant Manager, NABARD
13	Sh. R.L. Dhurandhar	Joint Director, Department of Agriculture
14	Sh. D. N. Gidronia	OSD, Water Resource Department
15	Sh. A.K. Shukla	Senior Hydrogeologist, Water Resources Department,
16	Sh. B. Abhishek	Scientist-C, CGWB, NCCR
17	Sh. Pramod Kumar Sahu	Scientist-B, CGWB, NCCR
18	Sh. Suvam P dash	AHG, CGWB, NCCR
19	Ms. Sweta Mohanty	AHG, CGWB, NCCR
20	Sh. Sarboday Barik	AHG, CGWB, NCCR

**“ मायो मौष धीहि ऊं सीधाम्नोः घास्त्रो राजस्तो दरुण नो मुंच । ”**

(अर्थात् हे राजन, आप अपने राज्य के स्थानों में जल और वनस्पतियों को हानि न पहुँचाओ, ऐसा उद्यम करो जिससे हम सभी को जल एवं वनस्पतियाँ सत्त रूप से प्राप्त होती रहे । )

– यजुर्वेद 6/22



**क्षेत्रीय निदेशक**

केंद्रीय भूमि जल बोर्ड, उत्तर मध्य छत्तीसगढ़ क्षेत्र,  
द्वितीय तल, एल. के. कॉर्पोरेट टावर्स,  
धमतरी रोड, छूमरतराई, रायपुर (छत्तीसगढ़)- 492015  
मेल: rdnccr-cgwb@nic.in