

Hydrogeological Study of Rajnandgaon District Chhattisgarh

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Abstract

Rajnandgaon district is situated in the western part of newly created Chhattisgarh state, the district lies between latitude 20°70- 22°29 North latitude and 80°23 to 81°29 East longitude covering an area of 8172.33 sq.kms. Physiographically, the district can be divided into three parts. (i) Hilly part of the west, (ii) Southern plateau and (iii) Plain region of the eastern part. The total irrigated area during monsoon and non monsoon period is about 94275.87 ha in Rajnandgaon district and out of this the gross surface water irrigated area is about 71102.24 ha which is the 75.15% of the total irrigated area and ground water gross irrigated area is about 23173.63 ha (24.85%). This means that the surface water irrigation facilities in the district are fairly good as compared to other districts of Chhattisgarh state.

Systematic Hydrogeological studies were taken up in 2018-19 to generate a scientific data base for planning and successful implementation of ground water development and management. Geophysical studies were also carried out to supplement Hydrogeological findings.

The total ground water recharge from all the sources is 45130.11 ham. The net ground water is 42873.59 ham. Existing gross ground water draft for all purposes is 23105.24 ham out of which 20584.80 ham is for irrigation and 2520.44 ham is for domestic and industrial water supply. The stage of the ground water development in the district is 53.89%. The Rajnandgaon block 72.64% has the highest stage of ground water development followed by the Khairagarh (67.68%) and the Dongargaon (66.94%) blocks. Rajnandgaon block has been categorized as semi-critical and all other blocks are safe for future groundwater development as per ground water resource estimation 2019.

Introduction

Rajnandgaon district comprises sub-tropical climate, characterized by extreme summer and extreme winter. The cold season is delightful while it is unpleasantly hot in the summer season. The summer extends from March to May. The general slope of the district is towards east. All the rivers of the district flow in eastern direction. Seonath is the most important river. The important tributaries of the river are Amner, Jonk, Ghumriya, Pairi Zura and Hanf. Nearly 71.8 percent area of the district falls under Mahanadi river basin. The river Seonath which is a tributary of Mahanadi, originates near village Kotgul, Garh-Chiroli district (Maharashtra) on the border of Chowki block and is the principal river of this district and is a fifth order river.

There are mainly 4 soil types in the study area. The formations soil in an area depends on parent material, topography, geomorphology, geology, degree of weathering and biological activity.

Hydrogeological Studies

The groundwater occurs under water table condition in laterite and alluvium and weathered mantle and semi confined to confined conditions in fracture crystalline rocks and sedimentary at depth. The ground water development in the study area is mainly through dug wells and tube wells. In the case of weathered crystalline the depth and intensity of weathering control the occurrence and movement of groundwater but at deeper levels in hard crystalline rocks controlling factor are occurrence of fractures and joints below the weathered zone and lineaments. It is observed that occurrence of shallow fractures are more common in case of granite. It is also observed that wells located in the topographic low areas are generally having better yield.

Charmuria Formation occurring in parts of Dongargaon, Dongargarh, Khairagarh and Chhuhikhadaon blocks is the most prolific aquifer. Gunderdehi Formation, which occupies the central and southern part of the Rajnandgaon

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and, some part of Dongargarh block acts as an aquiclude. The aquifer parameters like Transmissivity, Storativity and Specific Capacity determined for various formation based on pumping test results. The interpretation of the results shows that the Transmissivity, Storativity and Specific capacity are ranges from 0.4 to 922.9 m²/day, 9X10⁻⁷ to 2.5X10⁻⁵ and 2.85 to 173.55 lpm/m respectively. It is observed that Charmuria limestone has the highest value of Transmissivity and sp. Capacity which may be due to the having good aquifer in this formation. The Gunserdehi formation and Andesite rocks are having lowest value of trasmissivity may be due to not having good potential aquifer system. The other formation like Chandi, Charmuria, Chilpi, Dongargarh are having moderately potential aquifer system as the Transmissivity is of moderate range. It is also observed that at some places which are located in favourable condition in these formation are yield good amount of water.

Ground Water Resources

The total ground water recharge from all the sources is 44180.37 ham. The net ground water is 41764.32 ham. Existing gross ground water draft for all purposes is 21487.98 ham out of which 19953.87 ham is for irrigation and 1534.11 ham is for domestic and industrial water supply. The stage of the ground water development in the district is 53.89%. The Rajnandgaon block (72.64%) has the highest stage of ground water development followed by the Khairagarh (67.68%) and the Dongargaon (66.94%) blocks. Rajnandgaon block has been categorized as semi-critical and all other blocks are safe for future groundwater development as per ground water resource estimation 2019.

On basis of Hydrogeological behaviour of the various formations of the district an attempt has been made to highlight the the propect for future ground water development in the district in suitable areas. The area covered by alluvium along the major rivers and streams, Seonath, Amner, Surhi, Lumiti, Moti and Kotri Nala is suitable for filter point wells or shallow bore wells. The area of Chhuhikhandan, Khairagarh, Dongargarh, Rajnandgaon Dongargaon & Chhuria covered by limestone and sandstones is suitable for construction of bore wells of 150 m depth by DTH rigs. However, at some places because of repeated cavernous zones and fractures the construction of bore wells is very difficult bu DTH rig. At such places combination rig is need to be deployed for construction of gravel packed bore wells with proper screen assembly. The areas covered by granites, rhyolites and meta sediments in western hilly and pleatu tracts of the district are suitable for large diameter dug wells dug cum bore wells and shallow tube wells of 60 to 75 m depth for tapping weathered residuum and shallow fractured zones. In rhyolite areas at few places along the lineaments and shear zones, deep fractures beyond 60 m depth are encountered which can be tapped by construction of bore wells of 100 to 140 m deep wells by DTH rig.

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