Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
April to June 2026, E-Journal, Vol. I, Issue LIV (54), ISO 9001:2015 - E2024049304 (QMS)

Water Resources and Utilization for Development in Janjgir-Champa District: A Geographical Analysis

Dr. Kajal Moitra* Dibyendu Bhattacharjee**

***Professor and Head (Social Science) Dr. C.V.Raman University, Kargi Road, Kota, Bilaspur (C.G.) INDIA**
****Ph.D. Scholar (Geography) Dept. of Social Science, Dr. C.V.Raman University, Kargi Road, Kota, Bilaspur (C.G.) INDIA**

Abstract: Water is one of the most important natural resources for agricultural production, economic development, domestic consumption and ecological sustainability. The availability and efficient utilization of water resources play a significant role in determining the pace and pattern of regional development. Janjgir–Champa district of Chhattisgarh possesses considerable surface and groundwater resources, which provide an important foundation for agricultural and socio-economic development. The district is particularly significant for rice and other food-grain production, and irrigation development has been strongly influenced by the Hasdeo-Bango irrigation system. The district administration identifies the Hasdeo-Bango project as a life-supporting canal system for the district.

The present study examines the availability, utilization and developmental significance of water resources in Janjgir–Champa district. The study focuses on surface water, groundwater, irrigation systems, agricultural utilization, domestic use, fisheries and other emerging uses of water. It also analyses major challenges such as seasonal variability of rainfall, inefficient water utilization, groundwater dependence, deterioration of traditional water bodies, irrigation losses and increasing pressure on water resources. The study suggests integrated water-resource management, rainwater harvesting, groundwater recharge, modernization of irrigation infrastructure, efficient irrigation techniques and community participation as important strategies for sustainable development.

Keywords: Water Resources, Irrigation, Groundwater, Surface Water, Agricultural Development, Sustainable Development, Janjgir–Champa.

Introduction - Water is an indispensable natural resource and forms the basis of human life, agriculture, industry and ecological systems. The availability of water influences the spatial organization of settlements, agricultural activities, industrial development and the overall socio-economic structure of a region. In predominantly agricultural regions such as Janjgir–Champa, water availability has a particularly strong relationship with agricultural productivity, cropping intensity and rural livelihoods.

Janjgir–Champa is located in the central part of Chhattisgarh and occupies an important position in the state's agricultural economy. The district administration describes it as a major food-grain producing district and identifies the Hasdeo-Bango project as an important irrigation lifeline.

The water resources of the district comprise rivers, canals, reservoirs, ponds, tanks and groundwater. Among these, canal irrigation has a particularly important role in agricultural development. Recent spatial research on the district also indicates that canal irrigation is the dominant irrigation source, while groundwater and ponds supplement irrigation, particularly where canal water is insufficient.

Thus, water resources are not merely physical resources in Janjgir–Champa; they constitute an important geographical foundation for agricultural development, employment generation, food security and rural transformation.

Review of Literature

Several studies have emphasized the relationship between water resources, irrigation and regional development.

Studies on Chhattisgarh's groundwater characteristics indicate that groundwater occurs under unconfined to semi-confined conditions in different geological formations. The geological diversity of the state produces considerable spatial variation in groundwater occurrence and availability. Research focusing on Janjgir–Champa has highlighted the importance of irrigation in determining agricultural patterns. A recent spatial analysis using Sentinel-2 imagery examined the relationship between cropping intensity and canal proximity and reported the major role of the Hasdeo-Bango canal network in agricultural irrigation.

Research concerning agricultural conditions in Janjgir–Champa also emphasizes the importance of irrigation for reducing dependence on monsoon rainfall and supporting

rabi cultivation.

The available literature therefore demonstrates that water resources have a direct relationship with agricultural productivity and regional development. However, there remains scope for a comprehensive geographical analysis integrating water availability, utilization, irrigation, agriculture and sustainable management at the district level. The present study attempts to address this gap.

Objectives of the Study: The major objectives of the study are:

1. To examine the major sources and spatial distribution of water resources in Janjgir–Champa district.
2. To analyse the utilization pattern of surface and groundwater resources.
3. To examine the role of irrigation in agricultural development.
4. To assess the contribution of water resources to socio-economic development.
5. To identify major problems associated with water-resource utilization.
6. To suggest suitable measures for sustainable and integrated water-resource management.

Study Area: Janjgir–Champa district is situated in the central part of Chhattisgarh. According to the district administration, the district covers approximately 2,37,599 hectares and has an important agricultural economy.

The geographical characteristics of the district favour agricultural activities, while its river and canal systems provide opportunities for irrigation development. The district receives most of its rainfall during the monsoon season, creating considerable seasonal variation in water availability. Available agricultural statistics report annual rainfall of around 1,286.2 mm in 2024–25, illustrating the substantial monsoon contribution to the district's water budget.

Major Water Resources: The important water resources include:

1. Hasdeo River system
2. Hasdeo-Bango irrigation system
3. Mahanadi and associated drainage systems
4. Canals
5. Reservoirs
6. Ponds and tanks
7. Dug wells
8. Tube wells and bore wells
9. Rainwater

The Hasdeo-Bango canal system is particularly important because it transfers and distributes water to agricultural areas of the district.

Methodology: The study is based on both primary and secondary sources of information.

Secondary Data: Secondary information may be collected from:

1. District Census Handbook
2. District Statistical Handbook
3. Department of Water Resources, Chhattisgarh
4. Central Ground Water Board
5. Department of Agriculture
6. District Administration, Janjgir–Champa
7. India Meteorological Department
8. Satellite imagery and GIS databases
9. Published research papers and government reports.

The district administration provides access to official information from the District Water Resources and Irrigation offices, which can be used for further empirical analysis.

Primary Data: Primary information may be obtained through:

1. Household surveys
2. Farmer interviews
3. Field observation
4. Village-level schedules
5. Interviews with irrigation officials
6. GPS-based field observations.

GIS and remote-sensing techniques can be used to examine the spatial relationship between irrigation infrastructure, agricultural land and water bodies.

Availability of Water Resources

Surface Water: Surface water constitutes one of the most important components of the district's water resources. Rivers, canals, ponds and reservoirs provide water for agriculture, domestic requirements, fisheries and livestock. However, surface-water availability is strongly seasonal. A major proportion of annual rainfall occurs during the monsoon season. Consequently, large quantities of water may be available during the rainy season while shortages develop during the summer.

This seasonal imbalance makes storage, conservation and efficient distribution essential for sustainable development.

Groundwater: Groundwater is an important supplementary source for domestic consumption and irrigation. Wells and bore wells are particularly significant in areas where canal irrigation is unavailable or inadequate.

Groundwater can increase agricultural reliability by providing irrigation during dry periods. However, uncontrolled extraction may create long-term sustainability problems. Therefore, groundwater use needs to be integrated with recharge measures and surface-water management.

Canal Water: Canal irrigation is one of the most significant components of agricultural water utilization in Janjgir–Champa. The Hasdeo-Bango irrigation system provides an important source of irrigation water and has contributed to the expansion and stabilization of agricultural activities.

The canal network has enabled farmers to reduce dependence on rainfall and has facilitated cultivation beyond the monsoon season.

Utilization of Water Resource: Water resources in Janjgir–Champa are utilized for multiple purposes.

Sector	Major Water Source	Major Use
Agriculture	Canals, groundwater,ponds	Irrigation
Domestic	Groundwater, surface water	Drinking and household use
Livestock	Ponds, wells, groundwater	Drinking water
Fisheries	Ponds, reservoirs	Fish production
Industry	Surface water and groundwater	Processing and production
Environment	Rivers, ponds, wetlands	Ecological maintenance

Among these uses, agriculture is the dominant user because of the district's predominantly agricultural economy.

Role of Water Resources in Agricultural Development: Agriculture is the most important sector influenced by water availability. Irrigation enables farmers to maintain crop production despite variations in monsoon rainfall.

The availability of canal water has contributed to:

1. Expansion of irrigated agriculture
2. Increased cropping intensity
3. Greater stability of crop production
4. Expansion of rabi cultivation
5. Reduction in drought vulnerability
6. Increased agricultural employment
7. Improved farm income
8. Greater food security.

Rice remains a particularly important crop, while wheat, pulses, oilseeds and other crops can be cultivated during the rabi and summer seasons where irrigation facilities permit.

Recent research also indicates that cropping intensity in Janjgir–Champa has a spatial relationship with canal proximity, demonstrating the importance of irrigation infrastructure in agricultural geography.

Water Resources and Socio-Economic Development: Water availability produces multiplier effects throughout the regional economy.

Agricultural Income: Reliable irrigation reduces crop failure and increases production, thereby improving agricultural income.

Employment: Irrigated agriculture creates employment not only in cultivation but also in transport, marketing, storage and agro-processing.

Fisheries: Ponds, reservoirs and other water bodies provide opportunities for fisheries and supplementary rural income.

Livestock Development: Availability of water supports cattle, buffalo, goats and other livestock, strengthening mixed farming systems.

Rural Development: Improved water availability contributes to better living conditions and supports rural settlement development.

Industrial Development: Adequate water supply is also necessary for industrial activities. However, industrial water use should remain compatible with agricultural and ecological requirements.

Major Problems of Water Resource Utilization: Despite considerable water resources, several problems affect their efficient utilization.

Seasonal Water Scarcity: The concentration of rainfall during the monsoon produces seasonal differences between water availability and demand.

Irrigation Losses: Leakage, seepage and inefficient distribution may reduce the quantity of water reaching agricultural fields.

Groundwater Pressure: Increasing dependence on bore wells can increase groundwater extraction, particularly where surface irrigation is inadequate.

Deterioration of Traditional Water Bodies: Ponds and tanks may suffer from siltation, encroachment and inadequate maintenance.

Unequal Spatial Distribution: Not all villages and agricultural fields receive equal access to irrigation water. Areas located away from major canals may remain more dependent on rainfall and groundwater.

Climate Variability: Changing rainfall patterns and extreme rainfall events can create both flood and drought risks.

Water Pollution: Domestic sewage, agricultural runoff and industrial activities may affect the quality of surface and groundwater.

Water Resources and Sustainable Development: Sustainable development requires a balance between water availability, present utilization and future requirements. The objective should not simply be to increase water extraction but to improve water-use efficiency.

A recent state-level development is particularly relevant: Chhattisgarh was reported in September 2026 as the top-performing state in the Ministry of Jal Shakti's **Jal Sanchay Jan Bhagidari and Catch the Rain** campaigns, with extensive construction of water-conservation and groundwater-recharge structures.

Such approaches are highly relevant for Janjgir–Champa because decentralized water conservation can supplement large irrigation systems.

Suggestions for Sustainable Water Management: The following measures may improve water-resource management in the district:

1. Modernization of canal systems to reduce leakage and conveyance losses.
2. Rainwater harvesting in rural and urban settlements.
3. Groundwater recharge structures near suitable recharge zones.
4. Renovation of ponds and traditional tanks.
5. Promotion of drip and sprinkler irrigation where economically suitable.
6. Adoption of water-efficient cropping patterns.
7. Development of village-level Water User Associations.
8. Regular monitoring of groundwater levels.
9. GIS-based mapping of water resources.
10. Integration of surface-water and groundwater management.

11. Promotion of farm ponds and field-level water harvesting.
12. Prevention of water pollution.
13. Community participation in maintenance of water structures.
14. Development of drought and flood preparedness plans.
15. Greater coordination among Water Resources, Agriculture, Rural Development and Panchayati Raj institutions.

Conclusion: Water resources constitute a fundamental geographical basis of development in Janjgir–Champa district. The district possesses significant surface-water and groundwater resources, while the Hasdeo-Bango canal system has played a particularly important role in agricultural development. The district's position as a major food-grain producing region is closely associated with the availability of irrigation facilities.

The utilization of water resources has contributed to agricultural productivity, cropping intensity, rural employment, food security and socio-economic development. However, seasonal variability, inefficient irrigation, groundwater dependence, deterioration of traditional water bodies and unequal access to irrigation remain important challenges.

Therefore, the future development of Janjgir–Champa requires a shift from merely increasing water supply toward integrated and sustainable water-resource management. Efficient canal management, groundwater recharge, rainwater harvesting, restoration of traditional water bodies, water-efficient agriculture and community participation can significantly improve water security.

The sustainable utilization of water resources can consequently become a major instrument for achieving agricultural prosperity, rural development, livelihood security and balanced regional development in Janjgir–Champa district.

References:-

1. Central Ground Water Board, Ministry of Jal Shakti, Government of India. Reports on groundwater resources and hydrogeology of Chhattisgarh.
2. Department of Water Resources, Government of Chhattisgarh. Irrigation and water-resource reports.
3. District Administration, Janjgir–Champa. District profile and departmental information. Janjgir-Champa
4. Census of India. District Census Handbook, Janjgir–Champa.
5. Department of Agriculture, Government of Chhattisgarh. Agricultural statistics.
6. Ministry of Jal Shakti, Government of India. Water conservation and groundwater-recharge programmes.
7. Recent spatial studies on cropping intensity and canal proximity in Janjgir–Champa. ResearchGate

****