

# Community Participation and Institutional Effectiveness in Rural Water and Sanitation Programs: A District-Level Statistical Study in Rajasthan

Ranjan Mohnot<sup>1</sup>, Dr. Vinod Kumar Sharma<sup>2</sup>

<sup>1</sup>Research Scholar, <sup>2</sup>Professor  
Department of Mathematics  
Tantia University, Sri Ganganagar Rajasthan

## Abstract:

This study statistically evaluates community participation in rural drinking water and sanitation programs across five districts of Rajasthan (Jaipur, Jodhpur, Udaipur, Barmer, and Bharatpur) based on primary data from 500 households. Using chi-square tests, one-way ANOVA, correlation, and regression analysis, the study examines the relationship between participation, socio-economic factors, institutional effectiveness, and service satisfaction. The results reveal significant district-wise differences in participation ( $p < 0.05$ ), with higher participation levels observed in Jaipur and Udaipur. A strong positive association was found between income and participation ( $r > 0.90$ ), while satisfaction with water services significantly influenced engagement levels. Desert districts exhibited lower participation due to infrastructure unreliability and water scarcity. The findings underscore the importance of institutional strengthening, financial transparency, and inclusive governance in enhancing sustainability of rural water initiatives. The study provides empirical evidence supporting participatory water governance models in water-stressed regions.

**Keywords:** Community Participation; Rural Water Governance; Sanitation Services; Institutional Effectiveness; Socio-economic Determinants; Chi-square Analysis; Rural Rajasthan; Jal Jeevan Mission.

## 1. INTRODUCTION

Access to safe drinking water and improved sanitation remains a central development challenge in many semi-arid regions of India, particularly in Rajasthan, where ecological constraints, groundwater depletion, and socio-economic disparities significantly influence service delivery outcomes. Over the past decade, major national initiatives such as the Jal Jeevan Mission and the Swachh Bharat Mission (Gramin) have sought to expand infrastructure coverage while emphasizing decentralized governance and community participation as mechanisms for long-term sustainability.

Community participation has increasingly been recognized as a critical determinant of service functionality, maintenance efficiency, and behavioral change in rural water and sanitation systems. Participatory governance structures, including Village Water and Sanitation Committees and women-led Self-Help Groups, are intended to promote accountability, local ownership, and financial transparency. However, empirical evidence suggests that participation levels are uneven across regions and social groups, often shaped by institutional capacity, income disparities, education levels, gender roles, and environmental constraints.

In Rajasthan, regional disparities between eastern agricultural districts and western desert districts create distinct governance challenges. While some districts have achieved relatively higher piped water coverage

and institutional strengthening, others continue to face water scarcity, quality issues such as salinity and fluoride contamination, and weak community engagement. Despite significant policy attention, limited studies provide comparative statistical evaluation of participation patterns across multiple districts using primary household-level data.

This study addresses this gap by conducting a district-wise statistical assessment of community participation in rural drinking water and sanitation programs across five diverse districts of Rajasthan. Using primary data collected from 500 rural households, the study applies inferential statistical tools—including chi-square tests, one-way analysis of variance, correlation, and regression analysis—to examine the relationship between socio-economic characteristics, institutional effectiveness, service satisfaction, and participation levels. By integrating governance analysis with quantitative evaluation, the study contributes empirical evidence to the growing literature on participatory water management in water-stressed regions.

## 2. LITERATURE REVIEW

The Ministry of Jal Shakti (2019) report highlights that community-managed water supply systems, particularly through Village Water and Sanitation Committees (VWSCs), have improved functionality and accountability in rural areas. The Jal Jeevan Mission emphasizes decentralization, household-level connections, and community ownership, which are considered critical for long-term sustainability.

A study by the World Bank (2020) found that rural water schemes with strong local participation and financial contribution mechanisms demonstrate significantly higher operational sustainability. The report further emphasized that institutional capacity, transparency, and regular monitoring enhance user satisfaction and increase willingness to participate.

Singh and Bhaduri (2020) examined rural water management in Rajasthan and reported that participation levels vary significantly across regions due to ecological constraints, socio-economic disparities, and groundwater stress. The study noted that arid districts face lower community engagement primarily due to service unreliability and acute water scarcity.

The NITI Aayog (2021) Composite Water Management Index underscored the importance of demand-side management and community involvement, particularly in water-stressed states such as Rajasthan. Institutional strengthening and capacity building were identified as major policy priorities for improving long-term sustainability.

Research by UNICEF (2021) on WASH interventions in India observed that community-led awareness campaigns and women's Self-Help Groups (SHGs) play a crucial role in promoting hygiene behavior and sustaining open defecation-free (ODF) status. The study emphasized gender-inclusive participation as a key determinant of effective water governance.

Kumar et al. (2022) identified a strong positive association between household income, education, and participation in rural water governance. Higher socio-economic status was linked to greater financial contribution, meeting attendance, and involvement in maintenance activities.

UNDP (2022) further highlighted that community trust and satisfaction with service quality significantly influence participation levels. Where water supply is regular and of acceptable quality, communities are more willing to assume ownership of infrastructure and governance responsibilities.

Recent evaluations by the Government of Rajasthan (2023–2024) indicate that districts supported by non-governmental organizations and regular training programs demonstrate stronger VWSC performance and higher levels of community engagement.



The WHO–UNICEF Joint Monitoring Programme (2023) reported that although infrastructure coverage has improved substantially, sustainability challenges persist due to weak local institutions and limited community ownership in certain regions.

Recent academic work by Sharma and Meena (2024) emphasized that financial transparency, social inclusion, and women’s participation are critical determinants of institutional effectiveness in rural water and sanitation programs.

Collectively, these studies highlight the central role of institutional capacity, socio-economic factors, service reliability, and gender inclusion in shaping participation outcomes. However, despite these insights, limited research provides comparative district-level statistical analysis using primary household data across diverse ecological contexts in Rajasthan. The present study addresses this gap by examining community participation through quantitative methods across multiple districts, integrating socio-economic, institutional, and service-related variables within a unified analytical framework.

### 3. OBJECTIVES OF THE STUDY

The present study aims to examine the interaction between government-led water and sanitation schemes and community participation in Rajasthan through statistical analysis. The specific objectives are:

1. **To assess the current status of drinking water and sanitation facilities in Rajasthan**, including access to water supply, functionality of sources, sanitation infrastructure, and hygiene practices.
2. **To evaluate the effectiveness of major government schemes related to drinking water and sanitation**, including the Jal Jeevan Mission, Swachh Bharat Mission, and other related programs, in terms of coverage and implementation outcomes.
3. **To analyze the level, forms, and socio-economic and institutional determinants of community participation** in drinking water and sanitation programs, with particular reference to income, education, occupation, caste, gender, and institutional support mechanisms.
4. **To statistically examine the relationship between community participation and the performance of government water and sanitation schemes**, using appropriate quantitative tools to measure the strength and direction of associations.
5. **To propose measures for strengthening participatory governance and ensuring sustainable management of drinking water and sanitation services** based on empirical findings.

### 4. HYPOTHESES OF THE STUDY

The following hypotheses are formulated for statistical testing:

**H<sub>01</sub>**: There is no significant relationship between community participation and the performance of water and sanitation programs.

**H<sub>11</sub>**: There is a significant positive relationship between community participation and the performance of water and sanitation programs.

**H<sub>02</sub>**: The effectiveness of government water and sanitation schemes is not significantly associated with the level of community participation.

**H<sub>12</sub>**: The effectiveness of government water and sanitation schemes is significantly associated with the level of community participation.

**H<sub>03</sub>**: Socio-economic characteristics such as income, literacy, and gender are not significantly associated with levels of community participation.

**H<sub>13</sub>**: Socio-economic characteristics such as income, literacy, and gender are significantly associated with levels of community participation.

**H<sub>04</sub>**: Government initiatives such as the Jal Jeevan Mission and the Swachh Bharat Mission are not significantly associated with improvements in water accessibility and sanitation coverage.

**H<sub>14</sub>**: Government initiatives such as the Jal Jeevan Mission and the Swachh Bharat Mission are significantly associated with improvements in water accessibility and sanitation coverage.



**H<sub>0s</sub>:** Institutional and community coordination has no significant association with the sustainability of water and sanitation infrastructure and hygiene outcomes.

**H<sub>1s</sub>:** Higher levels of institutional and community coordination are significantly associated with improved sustainability of water and sanitation infrastructure and hygiene outcomes.

## 5. RESEARCH METHODOLOGY

### 5.1 Study Area

The study was conducted across five districts of Rajasthan representing ecological and socio-economic diversity: Jaipur, Jodhpur, Udaipur, Barmer, and Bharatpur. These districts were selected to capture variation in water availability, institutional functioning, infrastructure coverage, and environmental conditions. Jaipur and Bharatpur represent relatively developed regions with higher infrastructure coverage, while Jodhpur and Barmer reflect arid and water-stressed contexts. Udaipur represents a tribal and semi-arid region with distinct governance dynamics.

### 5.2 Research Design

The study adopts a quantitative cross-sectional research design to examine the relationship between community participation and the performance of drinking water and sanitation programs. The design enables comparative district-level analysis and statistical testing of socio-economic and institutional determinants of participation.

### 5.3 Sampling Design and Sample Size

A multi-stage sampling approach was used to ensure balanced representation across ecological and socio-economic contexts.

- Stage 1: Selection of five districts representing diverse regional conditions.
- Stage 2: Selection of rural blocks within each district.
- Stage 3: Random selection of villages.
- Stage 4: Random selection of households within selected villages.

A total of 500 rural households were surveyed, with equal representation (100 households) from each district. This structure ensured comparability across regions while maintaining statistical adequacy for inferential analysis.

### 5.4 Data Collection

Primary data were collected through:

- Structured household questionnaires
- Field observations
- Institutional records related to Village Water and Sanitation Committees and local governance bodies

The questionnaire captured information on:

- Socio-economic characteristics (income, education, occupation, gender)
- Access to water and sanitation services
- Level of community participation
- Institutional engagement
- Service satisfaction

### 5.5 Measurement of Key Variables

Dependent Variable:

Community Participation Score (constructed from indicators such as meeting attendance, financial contribution, maintenance involvement, and monitoring activities).

Independent Variables:

- Socio-economic characteristics (income, education, occupation, gender)
- Institutional effectiveness (VWSC functioning, SHG involvement)
- Service reliability and household satisfaction
- Scheme coverage indicators

Participation and satisfaction were measured using structured response scales and aggregated indices.

## 5.6 Statistical Tools and Data Analysis

Data were analyzed using descriptive and inferential statistical techniques.

1. Percentage Analysis to describe demographic and service-related characteristics.
2. Chi-square Test to examine associations between categorical variables.
3. One-way Analysis of Variance (ANOVA) to assess district-wise differences in participation levels.
4. Pearson Correlation to measure the strength and direction of relationships between participation and socio-economic variables.
5. Linear Regression Analysis to estimate the influence of independent variables on participation outcomes.

Statistical analysis was conducted at a 5 percent level of significance.

## 5.7 Ethical Considerations

Participation in the survey was voluntary. Respondents were informed about the purpose of the study, and confidentiality of personal information was maintained.

## 6. DATA ANALYSIS

The data analysis is based on primary information collected from 500 households across five districts of Rajasthan—Jaipur, Jodhpur, Udaipur, Barmer, and Bharatpur (100 households from each district). The analysis examines demographic characteristics, access to services, institutional participation, and participation outcomes using descriptive statistics and comparative district-level analysis.

### 6.1 District-wise Distribution of Sample

District	Number of Households	Percentage
Jaipur	100	20%
Jodhpur	100	20%
Udaipur	100	20%
Barmer	100	20%
Bharatpur	100	20%
<b>Total</b>	<b>500</b>	<b>100%</b>

### Interpretation:

Equal representation was maintained to ensure statistical comparability across ecologically and socio-economically diverse districts.

### 6.2 Age Distribution of Respondents

Age Group (Years)	Frequency	Percentage
18–24	72	14.4%
25–34	148	29.6%
35–50	162	32.4%
51–65	88	17.6%
Above 65	30	6.0%
<b>Total</b>	<b>500</b>	<b>100%</b>

**Analysis:**

Nearly 62% of respondents fall within the 25–50 age group, representing the economically active population segment most likely to participate in local governance and infrastructure management decisions.

**6.3 Educational Profile**

Education Level	Frequency	Percentage
Illiterate	135	27%
Primary	150	30%
Secondary	140	28%
Higher Secondary	35	7%
Graduate & above	40	8%
<b>Total</b>	<b>500</b>	<b>100%</b>

**Interpretation:**

More than half of the respondents have basic education, while higher education levels remain low, which may influence awareness levels, institutional engagement, and capacity to participate in technical or administrative aspects of water governance.

**6.4 Monthly Household Income**

Income Range (INR)	Frequency	Percentage
Below 5,000	110	22%
5,001–10,000	160	32%
10,001–20,000	130	26%
20,001–30,000	60	12%
Above 30,000	40	8%
<b>Total</b>	<b>500</b>	<b>100%</b>

**Analysis:**

More than half (54%) belong to low-income groups, which may constrain their financial contribution capacity and limit sustained engagement in community-managed water systems.

**6.5 Primary Source of Drinking Water (District-wise %)**

District	Piped Water	Hand Pump	Borewell	Tanker/Others
Jaipur	72%	15%	10%	3%
Jodhpur	45%	30%	20%	5%
Udaipur	60%	25%	10%	5%
Barmer	35%	40%	15%	10%
Bharatpur	68%	18%	10%	4%

**Interpretation:**

Piped water coverage is highest in Jaipur and Bharatpur, while Barmer shows heavy dependence on hand pumps and tankers reflecting ecological constraints, groundwater stress, and infrastructure limitations in arid regions.

### 6.6 Institutional Participation (VWSC/SHG)

District	Households Participating (%)
Jaipur	70%
Jodhpur	55%
Udaipur	72%
Barmer	48%
Bharatpur	65%

**Analysis:**

Participation is highest in Udaipur and Jaipur, suggesting that institutional capacity, external facilitation, and structured governance mechanisms significantly influence participation outcomes.

### 6.7 Satisfaction with Water and Sanitation Services

District	Mean Satisfaction Score (1–5)
Jaipur	4.19
Jodhpur	3.65
Udaipur	3.93
Barmer	3.43
Bharatpur	4.17

**Interpretation:**

Higher satisfaction levels correspond with improved infrastructure coverage and service reliability, supporting the hypothesis that service quality is positively associated with community engagement.

### 6.8 Participation Score by Income

Income Group	Average Participation Score (0–100)
Below 10,000	42
10,001–20,000	55
20,001–30,000	64
Above 30,000	72

**Analysis:**

Participation increases consistently with income, Higher satisfaction levels correspond with improved infrastructure coverage and service reliability, supporting the hypothesis that service quality is positively associated with community engagement.

### 6.9 Inferential Statistical Analysis

#### 6.9.1 District-wise Variation in Participation (ANOVA)

To examine whether participation levels differ significantly across districts, a one-way Analysis of Variance (ANOVA) was conducted.

The results indicate a statistically significant difference in mean participation scores across the five districts ( $F = 95.90, df = 4, 495, p < 0.001$ ).

This confirms that participation is not uniform across regions and supports the hypothesis that district-level ecological and institutional factors influence community engagement.

Post-hoc comparisons suggest that Jaipur and Udaipur exhibit significantly higher participation scores compared to Barmer and Jodhpur.

This finding supports  $H_{11}$ , which posits significant variation in participation across districts.

#### 6.9.2 Association Between Income and Participation (Chi-square Test)

To assess the relationship between household income and participation level, a chi-square test of independence was conducted.

The results show a statistically significant association between income category and participation level ( $\chi^2 = 218.4$ ,  $df = 6$ ,  $p < 0.001$ ).

Higher-income households demonstrate significantly greater involvement in meetings, financial contribution, and maintenance activities.

This supports  $H_{13}$ , confirming that socio-economic characteristics are significantly associated with participation levels.

### **6.9.3 Correlation Between Income and Participation Score**

Pearson's correlation analysis was performed to measure the strength and direction of the relationship between income and participation score.

A strong positive correlation was observed ( $r = 0.971$ ,  $p < 0.001$ ), indicating that participation increases consistently with income level.

This suggests that economic capacity plays a critical role in enabling active engagement in governance and infrastructure management.

### **6.9.4 Relationship Between Institutional Effectiveness and Participation**

Chi-square analysis examining institutional functioning (VWSC activity and SHG engagement) and participation levels revealed a significant association ( $p < 0.01$ ).

Villages with active and transparent institutional mechanisms exhibit higher participation scores compared to those with weak or inactive committees.

This finding supports  $H_{15}$ , emphasizing the importance of institutional coordination in sustaining participatory governance.

### **6.9.5 Participation and Service Satisfaction**

To examine whether satisfaction influences engagement, correlation analysis was conducted between satisfaction scores and participation levels.

Results show a positive and statistically significant relationship ( $p < 0.01$ ), indicating that improved service reliability enhances willingness to participate.

This supports the hypothesis that service quality and participation are mutually reinforcing.

## **6.10 Overall Interpretation**

The inferential analysis confirms that community participation in drinking water and sanitation programs is significantly influenced by socio-economic capacity, institutional effectiveness, district-level variation, and service satisfaction. The one-way ANOVA results demonstrate statistically significant differences in participation across districts ( $p < 0.001$ ), indicating that ecological and institutional contexts play a decisive role in shaping engagement outcomes.

Chi-square and correlation analyses further reveal a strong and statistically significant association between income and participation ( $p < 0.001$ ), suggesting that economic capacity enhances the ability of households to contribute financially and engage in governance activities. Institutional effectiveness, particularly the functioning of Village Water and Sanitation Committees and Self-Help Groups, also shows a significant positive association with participation levels. Villages with active, transparent, and well-trained institutional mechanisms demonstrate higher community trust and involvement.

Additionally, satisfaction with service reliability is positively associated with participation ( $p < 0.01$ ), indicating that infrastructure performance and community engagement are mutually reinforcing. In contrast, districts characterized by water scarcity and service unreliability exhibit comparatively lower participation levels. These findings collectively validate the proposed hypotheses and provide empirical evidence that participatory governance is shaped by a combination of socio-economic, institutional, and environmental determinants.

## **6.11 Discussion**

The findings of this study demonstrate that community participation in rural water and sanitation governance is neither uniform nor spontaneous; rather, it is structured by measurable socio-economic and

institutional conditions. The statistically significant district-level variation confirms that regional ecological constraints and governance capacity influence participatory outcomes.

Western desert districts such as Barmer and parts of Jodhpur face structural limitations due to groundwater scarcity, dispersed settlements, and higher infrastructure vulnerability. These environmental constraints, combined with lower income levels, reduce the capacity for sustained engagement. Conversely, districts such as Jaipur and Udaipur, characterized by relatively stronger institutional frameworks and external facilitation, exhibit higher participation scores.

The strong positive association between income and participation aligns with broader development literature that links economic capacity with governance engagement. Households with higher income and education levels are better positioned to contribute financially, attend meetings, and participate in monitoring activities. However, this also underscores the risk of exclusion of economically marginalized groups unless targeted inclusion strategies are adopted.

Institutional strength emerges as a central determinant of sustainable participation. Active Village Water and Sanitation Committees, transparent financial practices, and capacity-building initiatives significantly enhance community trust and collective action. Women's Self-Help Groups further contribute to behavioral change and hygiene awareness, demonstrating the importance of gender-inclusive governance mechanisms.

Overall, the study reinforces the argument that participatory water governance is not solely a function of infrastructure expansion but depends critically on socio-economic empowerment, institutional coordination, and service reliability. Sustainable outcomes therefore require integrated strategies that combine infrastructure investment with institutional strengthening and inclusive community mobilization.

## 7. POLICY IMPLICATIONS

The empirical findings of this study suggest several policy directions for strengthening participatory water governance in Rajasthan.

First, institutional capacity building must be prioritized. Regular training, performance monitoring, and technical support for Village Water and Sanitation Committees are essential to enhance transparency, accountability, and community trust.

Second, financial transparency mechanisms—including public disclosure of funds, community audits, and participatory budgeting—should be institutionalized to strengthen credibility and sustained engagement.

Third, targeted inclusion strategies are necessary for low-income and marginalized households. Flexible contribution mechanisms, subsidies, and social mobilization efforts can prevent exclusion from participatory governance structures.

Fourth, women-led Self-Help Groups should be further integrated into planning and monitoring processes, given their demonstrated role in promoting hygiene awareness and collective action.

Fifth, region-specific interventions are required in desert districts such as Barmer and Jodhpur, where ecological constraints and water scarcity demand adaptive planning, technical innovation, and enhanced support mechanisms.

Finally, structured partnerships with non-governmental organizations can strengthen community mobilization, training programs, and institutional sustainability.

## 8. MAJOR FINDINGS

The statistical analysis across the five study districts reveals significant regional disparities in access, reliability, institutional functioning, and participation in drinking water and sanitation programs.

First, infrastructure coverage varies considerably across districts. Jaipur and Bharatpur demonstrate higher piped water access, while Barmer and Jodhpur exhibit greater reliance on hand pumps and tanker supply, reflecting environmental and infrastructural constraints in arid regions.

Second, service reliability significantly influences community engagement. Districts facing irregular supply and seasonal shortages report lower participation levels. Inferential analysis confirms significant

district-level variation (ANOVA,  $p < 0.001$ ), validating the hypothesis that ecological and institutional contexts shape participation outcomes.

Third, socio-economic determinants play a substantial role. Chi-square and correlation analyses indicate a strong positive association between income and participation ( $p < 0.001$ ). Higher-income and better-educated households demonstrate greater involvement in financial contribution, monitoring, and governance activities.

Fourth, satisfaction with service delivery is positively associated with community participation ( $p < 0.01$ ), suggesting that reliable infrastructure strengthens community trust and collective ownership.

Fifth, institutional effectiveness emerges as a critical determinant. Villages with active Village Water and Sanitation Committees, transparent financial practices, and structured engagement mechanisms report higher functionality and community involvement.

Overall, the findings confirm that participation is influenced by an interaction of socio-economic capacity, institutional strength, infrastructure reliability, and environmental constraints.

## 9. CONCLUSION

This study provides a district-level statistical assessment of community participation in rural drinking water and sanitation programs across five ecologically diverse districts of Rajasthan. The findings demonstrate that participation is not merely a behavioral outcome but a structured response shaped by socio-economic capacity, institutional effectiveness, service reliability, and environmental context.

Statistical analysis confirms significant variation in participation across districts and establishes strong associations between income, institutional performance, satisfaction levels, and community engagement. Desert districts characterized by groundwater stress and infrastructure vulnerability exhibit lower participation, while districts with stronger institutional frameworks demonstrate higher levels of collective action.

The study underscores that infrastructure expansion alone is insufficient to ensure sustainability. Long-term success depends on strengthening local governance institutions, enhancing financial transparency, promoting inclusive participation, and addressing ecological constraints through region-specific planning. A participatory governance model that integrates institutional capacity building, socio-economic inclusion, gender-sensitive engagement, and service reliability is essential for achieving sustainable water and sanitation outcomes in Rajasthan.

## REFERENCES:

1. Government of India. (2023). *Jal Jeevan Mission: Annual Report*. Ministry of Jal Shakti, New Delhi.
2. Government of India. (2022). *Swachh Bharat Mission (Gramin) Phase II Guidelines*. Ministry of Drinking Water and Sanitation.
3. Census of India. (2011). *District Census Handbook: Rajasthan*. Office of the Registrar General of India.
4. Government of Rajasthan. (2023). *Rural Water Supply Status Report*. Public Health Engineering Department (PHED), Jaipur.
5. Ministry of Jal Shakti. (2021). *National Rural Drinking Water Programme Framework*. Government of India.
6. Planning Commission. (2013). *Twelfth Five Year Plan: Water and Sanitation Sector*. Government of India.
7. World Bank. (2020). *Community Participation in Rural Water Supply and Sanitation*. Washington, DC.
8. United Nations Development Programme (UNDP). (2021). *Water Governance in India: Community-Based Approaches*.

9. United Nations Children’s Fund (UNICEF). (2019). *Water, Sanitation and Hygiene (WASH) in India*.
10. Chambers, R. (1994). Participatory rural appraisal (PRA): Analysis of experience. *World Development*, 22(9), 1253–1268.
11. Narayan, D. (1995). *The Contribution of People’s Participation: Evidence from 121 Rural Water Supply Projects*. World Bank.
12. Agarwal, A., & Narain, S. (1997). *Dying Wisdom: Rise, Fall and Potential of India’s Traditional Water Harvesting Systems*. Centre for Science and Environment.
13. Singh, R. (2018). *Water Conservation and Community Participation in Rajasthan*. Tarun Bharat Sangh Publications.
14. Shah, T. (2009). *Taming the Anarchy: Groundwater Governance in South Asia*. Resources for the Future Press.
15. Mukherjee, N., & van Wijk, C. (2003). *Sustainability Planning and Monitoring in Community Water Supply and Sanitation*. IRC International Water and Sanitation Centre.
16. Rogers, P., & Hall, A. (2003). *Effective Water Governance*. Global Water Partnership.
17. Government of Rajasthan. (2020). *Economic Review of Rajasthan*. Directorate of Economics and Statistics.
18. PHED Rajasthan. (2022). *District-wise Drinking Water Coverage Report*.
19. Ministry of Rural Development. (2021). *Gram Panchayat Development Plan Guidelines*. Government of India.
20. Kothari, C. R. (2004). *Research Methodology: Methods and Techniques* (2nd ed.). New Age International.
21. Bryman, A. (2016). *Social Research Methods* (5th ed.). Oxford University Press.
22. Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics* (5th ed.). Sage Publications.
23. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate Data Analysis* (7th ed.). Pearson.
24. Government of India. (2014). *National Water Policy*. Ministry of Water Resources.
25. Singh, C., & Bhaduri, A. (2016). Rural water management and community participation in India. *Water Policy*, 18(2), 345–360.
26. Kumar, M. D., & Shah, T. (2004). Groundwater pollution and water scarcity in Rajasthan. *Economic and Political Weekly*, 39(25), 2681–2690.
27. International Water Management Institute (IWMI). (2018). *Water Scarcity and Management in Rajasthan*.
28. O’Reilly, K. (2006). Combining sanitation and women’s participation in water management. *Gender & Development*, 14(2), 253–265.
29. United Nations. (2022). *Sustainable Development Goal 6: Clean Water and Sanitation – Progress Report*.