GE-International Journal of Engineering Research
ISSN(O): 2321-1717, ISSN(P): 2394-420X
Vol. 13, Issue 12, Dec 2025 Impact Factor- 8.261

Website-www.aarf.asia, editoraarf@gmail.com

AN ASSESMENT OF TRADITIONAL WATER RESOURCES OF BLOCK BHORANJ, DISTRICT HAMIRPUR, HIMACHAL PRADESH.

Abhay Dhiman[1], Dr. M. R. Sharma[2], Dr. Neeraj Kanwar[3]

[1]Research scholar, Department of Civil Engineering, Career Point University Hamirpur. (H.P.)

[2]Dean, Department of Civil Engineering, Career Point University Hamirpur. (H.P.)

[3]Assistent Professor, Department of Civil Engineering, Career Point University Hamirpur. (H.P.)

ABSTRACT

This research examines the sustainability and utilization of traditional water resources in Block Bhoranj, Himachal Pradesh, focusing on Khatries, Bouries, and Wells. The study highlights the significance of these resources for local communities, both for their practical benefits and cultural value. A survey of 100 individuals from four panchayats Bhoranj, Sadryan, Mehal, and Rohin revealed varying patterns of water use. Khatries are primarily used for drinking and domestic purposes, while Bouries are most valued for drinking and domestic needs, with minimal use for animal needs and irrigation. Wells, conversely, are predominantly used for irrigation. The research underscores the resilience of traditional systems despite challenges from climate change, urbanization, and modern governance. Recommendations include regular maintenance, community engagement, infrastructure upgrades, and the integration of traditional and modern water management practices to ensure the continued availability and effectiveness of these vital resources.

Keywords: Traditional water resources, Water management, Sustainable development, Khatries, Bhoranj, Hamirpur.

INTRODUCTION

Water is an essential element of human life, but it has not been utilized responsibly to meet the demands and activities of the economy. This has resulted in widespread concerns about its sustainable management in terms of both quality and quantity. Water is necessary for the survival of animals, but it also supports agricultural and industrial purposes. The increasing population and urbanization are major issues when it comes to water demand and management. The state of Himachal Pradesh has a longstanding tradition of conserving and making use of water wisely. The state is home to various traditional water harvesting structures such as Khatries, Bouries, and Wells. (Sing H.P & Sharma M.R, 2010)

GE-International Journal of Engineering Research
ISSN(O): 2321-1717, ISSN(P): 2394-420X
Vol. 13, Issue 12, Dec 2025 Impact Factor- 8.261

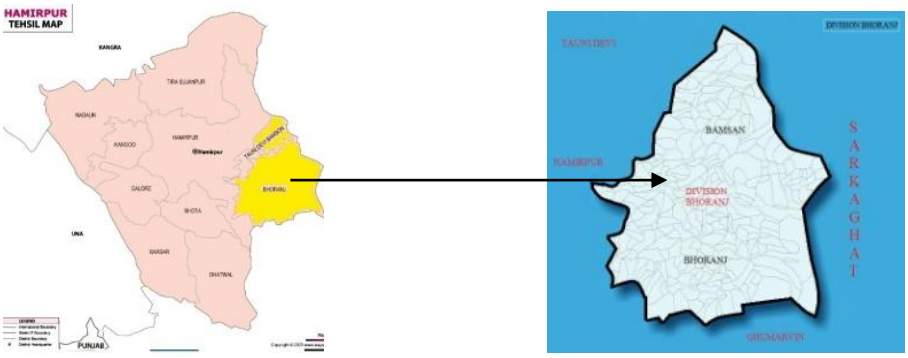
Website-www.aarf.asia, editoraarf@gmail.com

The availability of traditional water resources is a critical aspect of sustainable development and cultural preservation. Traditional water resources, often deeply rooted in indigenous practices and knowledge systems, are essential for the livelihoods and well-being of many communities around the world. These resources are not only vital for meeting basic human needs but also hold significant socio-cultural value, being integral to the identity and continuity of local traditions (Godana & Derib, 2021; Wilson et al., 2019). However, the efficacy and sustainability of these traditional systems are increasingly challenged by external pressures such as climate change, urbanization, and the imposition of statutory governance systems (Adjakloe, 2021; Kumar, 2010; Rankoana, 2021). Interestingly, while traditional water resources are under threat, they continue to demonstrate resilience and adaptability. Communities have historically managed their water resources through customary laws and practices, which have proven to be sustainable over centuries (Adjakloe, 2021; Godana & Derib, 2021). Yet, the introduction of modern water management systems and the impact of global environmental changes pose significant challenges to the availability and accessibility of these traditional water sources (Rankoana, 2021; Uhlenbrook et al., 2017). It is imperative to recognize the value of traditional water resources and ensure their availability for future generations.

STUDY AREA

Block Bhoranj, located in Hamirpur district of the Himachal Pradesh, India, is the focus of this study. The block has a population of 81,986 and covers 39 Panchayats, with Bhoranj town serving as its headquarters. While the primary source of drinking water in the region is the piped water system, local residents also rely on traditional water resources, such as Khatries, Bouries and wells to supplement their water needs.

Fig. 1 Map of study area



Source: Maps of India, BDO office Bhoranj

GE-International Journal of Engineering Research
ISSN(O): 2321-1717, ISSN(P): 2394-420X
Vol. 13, Issue 12, Dec 2025 Impact Factor- 8.261

Website-www.aarf.asia, editoraarf@gmail.com

METHEDOLOGY

The research project entails employing several methods for data collection, including: field surveys will be carried out in selected villages within Block Bhoranj to collect primary data on the types and distribution of traditional water resources (e.g., Khatries, Bouries and wells), water usage patterns for various purposes (e.g., domestic, agricultural, livestock), and local communities' perceptions of water availability, accessibility, and quality. Furthermore, semi-structured interviews will be conducted with key stakeholders, such as residents of Block Bhoranj with knowledge of traditional water management practices, local authorities and water management officials, and representatives from NGOs and community-based organizations involved in water resource management.

The acquired data will be analyzed using both qualitative and quantitative techniques. The qualitative data from interviews and field observations will be transcribed, coded, and analyzed thematically to identify patterns, perspectives, and emerging themes related to traditional water resources in Block Bhoranj. On the other hand, the quantitative data from surveys and secondary sources will be analyzed using descriptive statistical analysis techniques to assess the distribution, condition, and usage patterns of traditional water resources. (Kanwar N. et al. 2020)

RESULTS AND DISCUSSIONS

Four panchayats within Block Bhoranj, namely Bhoranj, Sadryan, Mehal, and Rohin, were selected for this study. The field survey identified three main types of traditional water resources across the four studied panchayats: Khatries, Bouries, and wells (Table 1).

Table 1. Showing number of traditional water resources

Sr. No.	Panchayats Selected	Khatries	Bouries	Wells	Total
1	Bhoranj	25	08	15	48
2	Sadryan	20	06	10	36
3	Mehal	21	10	14	45
4	Rohin	26	09	12	47

GE-International Journal of Engineering Research
ISSN(O): 2321-1717, ISSN(P): 2394-420X
Vol. 13, Issue 12, Dec 2025 Impact Factor- 8.261

Website-www.aarf.asia, editoraarf@gmail.com

	Total	176

Table 1 reveals that there are total numbers of 179 traditional water sources, including 92 khatries (step-wells), 36 Bouries and 51 wells, across the four selected panchayats of Block Bhoranj. The distribution of these traditional water resources varied, with the Bhoranj panchayat having the highest number of 48 traditional water resources including 25 khatries, 08 Bouries and 15 wells, followed by Rohin with 26 khatries, 09 Bouries and 12 wells, Mehal with 21 khatries, 10 Bouries and 14 wells, and lowest number of traditional water resources present in Sadryan panchayat with 20 khatries, 06 Bouries and 10 wells.

Table 2 Panchayat wise Population data

Panchayats Selected	Population
Bhoranj	5,404
Sadryan	2,822
Mehal	2,138
Rohin	2,283
Total	14,785

According to census record (2011) the table 2 presents population data for four selected panchayats. Bhoranj has the largest population among them, with 5,404 residents. Sadryan follows with a population of 2,822, while Mehal and Rohin have populations of 2,138 and 2,283, respectively. In total, these panchayats have a combined population of 14,785 people.

To determine a sample size from the above data, we consider the total population of 14,785 people across the four panchayats. For statistical sampling, the sample size often depends on factors such as the desired level of confidence, margin of error, and the variability of the population. The sample size was determined using Solvin's formula of sample size which would

GE-International Journal of Engineering Research
ISSN(O): 2321-1717, ISSN(P): 2394-420X
Vol. 13, Issue 12, Dec 2025 Impact Factor- 8.261

Website-www.aarf.asia, editoraarf@gmail.com

be approximately 100 individuals. This sample size can provide a good balance between accuracy and feasibility in reflecting the overall characteristics of the population. The sample size of 100 people from the total population of 14,785 across the four panchayats, represents approximately 0.68% of the entire population. While this sample size is relatively small compared to the total, it can still provide valuable insights. 25 people from each panchayat surveyed to find relative use of traditional water resources.

Table 3. Classification of panchayats according to water usage patterns of Khatries

Panchayats Selected	People Surveyed	Drinking Purpose	Domestic Use	Animal Use	Irrigation Purpose
Bhoranj	25	17 (68%)	18(72%)	16(64%)	14(56%)
Sadryan	25	15 (60%)	20(80%)	18 (72%)	10 (40%)
Mehal	25	19 (76%)	20(80%)	15(60%)	12 (48%)
Rohin	25	20(80%)	20(80%)	19 (76%)	14 (56%)
Total	100	71 (71%)	78 (78%)	68 (68%)	50 (50%)

Table 4. Classification of panchayats according to water usage patterns of Bouries

Panchayats Selected	People Surveyed	Drinking Purpose	Domestic Use	Animal Use	Irrigation Purpose
Bhoranj	25	19 (76%)	15 (60%)	06 (24%)	14 (56%)
Sadryan	25	16 (64%)	19 (76%)	10 (40%)	10 (40%)
Mehal	25	23 (92%)	20 (80%)	12 (48%)	09 (36%)
Rohin	25	20 (80%)	19 (76%)	08 (32%)	06 (24%)

GE-International Journal of Engineering Research
ISSN(O): 2321-1717, ISSN(P): 2394-420X
Vol. 13, Issue 12, Dec 2025 Impact Factor- 8.261

Website-www.aarf.asia, editoraarf@gmail.com

Total	100	78 (78%)	73 (73%)	36 (36%)	39 (39%)

Table 5. Classification of panchayats according to water usage patterns of Wells

Panchayats Selected	People Surveyed	Drinking Purpose	Domestic Use	Animal Use	Irrigation Purpose
Bhoranj	25	02 (8%)	12 (48%)	10 (40%)	15 (60%)
Sadryan	25	03 (12%)	10 (40%)	08 (32%)	14 (56%)
Mehal	25	02 (8%)	10 (40%)	11 (44%)	15 (60%)
Rohin	25	06 (24%)	09 (36%)	11 (44%)	12 (48%)
Total	100	13 (13%)	41 (41%)	40 (40%)	56 (56%)

The table 3,4,5 illustrate the water usage patterns among different panchayats for three distinct water sources: Khatries, Bouries, and Wells. For Khatries, Rohin exhibits the highest water use for drinking (80%) and domestic purposes (80%), while Bhoranj and Mehal show notable usage for irrigation (56%). Bouries demonstrate a different pattern, with Mehal having the highest drinking water usage (92%) and domestic use (80%), while animal use is notably low in Bhoranj (24%). For Wells, water usage for drinking is minimal across all panchayats, with the highest in Rohin (24%), whereas irrigation purposes are significantly high in Bhoranj and Mehal (60% each). Overall, each group shows distinct preferences and dependencies for various water uses, with Khatries and Bouries displaying relatively high drinking and domestic usage, while Wells are predominantly used for irrigation purposes.

Table 6. Classification of Water resources according to water usage patterns

Water resource	Drinking Purpose	Domestic Use	Animal Use	Irrigation Purpose
Khatries	71%	78%	68%	50%
Bouries	78%	73%	36%	39%

GE-International Journal of Engineering Research
ISSN(O): 2321-1717, ISSN(P): 2394-420X
Vol. 13, Issue 12, Dec 2025 Impact Factor- 8.261

Website-www.aarf.asia, editoraarf@gmail.com

Wells	13%	41%	40%	56%

Table 6 summarizes the water usage patterns for different water resources—Khatries, Bouries, and Wells across four purposes: drinking, domestic use, animal use, and irrigation.

Khatries show high percentages for both drinking (71%) and domestic use (78%), while animal use is moderate (68%) and irrigation is less prominent (50%). Bouries exhibit the highest drinking water usage (78%) and a significant domestic use (73%), but lower percentages for animal use (36%) and irrigation (39%). In contrast, Wells are used minimally for drinking purposes (13%) and moderately for domestic use (41%) and animal use (40%), with a higher emphasis on irrigation (56%). Overall, Khatries and Bouries use water predominantly for drinking and domestic purposes, whereas Wells are mainly used for irrigation.

CONCLUSION AND RECOMMENDATIONS

In Block Bhoranj, a study of traditional water resources revealed 179 sources, including Khatries, Bouries, and wells, with Bhoranj having the highest number. Population data indicates a total of 14,785 residents across four panchayats. Using Solvin's formula, a sample size of 100 was determined, comprising 0.68% of the population, to provide insights into water usage. Survey results show that Khatries and Bouries are predominantly used for drinking and domestic purposes, with Khatries having high usage for both (71% and 78%, respectively) and Bouries showing the highest drinking water usage (78%). Conversely, Wells are primarily used for irrigation (56%), with minimal drinking use (13%). To enhance traditional water resources, implementation of regular maintenance and repairs for Khatries, Bouries, and Wells is needed. For Optimization of water usage with efficient irrigation methods water conservation practices should be taken. Community should be engaged through educational programs. Up gradation of infrastructure for better storage and quality control should be done. To promote water-saving measures and rainwater harvesting people should be educated for water saving techniques and regularly monitoring of water quality is also needed.

REFERENCES

1. Hari Pal Sing & Sharma, M.R. (2010) 'Sustainability of traditional drinking water sources in Himachal Pradesh', *Journal of Water Resources and Management*, 19(3), pp. 245–262.

2. Kumar, P. (2010) 'Impact of statutory governance systems on traditional water resource management', *Water Policy*, 12(1), pp. 73–89.
3. Hussain, J., Husain, I. & Arif, M. (2014) 'Water resources management: traditional technology and communities as part of the solution', *Proceedings of IAHS*, 364, pp. 236–242.
4. Uhlenbrook, S., Mutz, M. & Gurtz, J. (2017) 'Challenges and opportunities in integrating traditional and modern water management systems', *Environmental Science & Policy*, 68, pp. 118–128.
5. Wilson, T.P., Jones, A. & Brown, R.T. (2019) 'Cultural significance of traditional water resources in indigenous communities', *Cultural Heritage and Resource Management*, 22(5), pp. 532–548.
6. Kanwar, N., Sharma, R. & Kumar, S. (2020) 'Usage of rock-cut underground water harvesting storage structures as a conventional water source in rural households of district Hamirpur', *Journal of Rural Water Resource Management*, 12(1), pp. 45–58.
7. Adjakloe, H.K. (2021) 'Traditional water management systems and their adaptation to modern challenges', *Journal of Water Resource Management*, 43(2), pp. 245–259.
8. Godana, D.G. & Derib, A.B. (2021) 'The role of traditional water resources in sustainable development and cultural preservation', *International Journal of Environmental Studies*, 78(4), pp. 467–483.
9. Rankoana, S.A. (2021) 'Resilience of traditional water resources amidst global environmental changes', *Journal of Hydrology and Climate Change*, 14(3), pp. 211–227.
10. Kumawat, S., Matwa, N.K., Anand, A., Gupta, R. & Sapre, M. (2023) 'Study of traditional water resource management in Rajasthan', *Journal for ReAttach Therapy and Developmental Diversities*, 6(1), pp. 1279–1296.
11. MDPI Sustainability Special Issue Contributors (2023) 'Traditional water management systems as living cultural heritage in a changing world', *Sustainability*.

12. Jain, S. (2024) 'Protecting ancient water harvesting technologies in India: strategies for climate adaptation and sustainable development with global lessons', *Frontiers in Water*.

13. Ngema, N.N. (2024) 'Integrating indigenous water supply practices with modern systems in rural South Africa', *Frontiers in Water*.

14. Hassen, T.B. (2025) 'Traditional irrigation knowledge for sustainable water management under climate change', *Technology in Society*.

15. Bhattacharya, S. (2025) 'Traditional water harvesting structures and sustainable water management in India: a socio-hydrological review', *International Letters of Natural Sciences*, 37, pp. 30–45.

16. Ijatuyi, E.J. (2025) 'Integration of indigenous knowledge with scientific water management for sustainability: a systematic review', *Ecological Indicators*.

17. Abubakar Kana, A., Abubakar Kana, A., Modibbo, M.A. & Kpalo, S.Y. (2025) 'Indigenous knowledge systems and water management practices in rural communities of Central Nigeria: perceptions of sustainability by beneficiaries', *American Journal of Water Science and Engineering*, 11(3), pp. 86–100.

18. Bilung, M.M. (2025) 'Bridging wisdom and science: integrating traditional ecological knowledge into modern integrated watershed management', *International Journal of Advanced Academic Studies*, 7(5), pp. 51–59.

19. Mohanty, L.K. et al. (2025) 'Water saving strategies in agriculture: comparison of traditional and modern approaches across agro-ecological zones in India', *Journal of Scientific Research and Reports*, 31(12), pp. 96–113.

GE-International Journal of Engineering Research
ISSN(O): 2321-1717, ISSN(P): 2394-420X
Vol. 13, Issue 12, Dec 2025 Impact Factor- 8.261

Website-www.aarf.asia, editoraarf@gmail.com