IJPP

African Journal of Geography and Regional Planning
Vol. 13 (1), pp. 001-004, February, 2026
ISSN: 2736-1586

Full Length Review Article

Water Conservation Practices In The Indian Knowledge System: Regional Traditions And Their Relevance To Contemporary Water Challenges

Saransh Ukey[1], Rohit Ranjan[2], Akshay Kumar Jain[3]

[1,2,3]SRF(Geography) School Of Social Sciences, Davv, Indore (M.P.)

Accepted 20th January 2026

ABSTRACT

Water scarcity, depletion of groundwater resources, and hydrological variability due to climate change have come to be recognized as major challenges in the twenty-first century. Although contemporary water management practices are dominated by large-scale infrastructure and technological solutions, traditional knowledge systems provide sustainable, decentralized, and ecologically friendly alternatives. The Indian Knowledge System (IKS) represents a treasure trove of water conservation knowledge developed over the millennia in different ecological zones. This paper explores region-specific water conservation traditions in ancient and traditional India, including stepwells, tanks, johads, kuls, ahar-pyne systems, bamboo drip irrigation systems, and temple tanks, and assesses their relevance in the context of contemporary water challenges. The paper contends that the integration of IKS with modern scientific knowledge can improve water security, resilience, and sustainability.

KEYWORDS

Indian Knowledge System, Water Conservation, Traditional Water Management, Sustainability, Climate Change, Indigenous Knowledge

1. INTRODUCTION

The water crisis has been aggravated by population growth, urbanization, industrialization, and climate change. Estimates show that the availability of freshwater per capita is dwindling at a rapid pace, especially in developing nations such as India. Traditional water resource management practices, such as large dams, deep borewells, and river interlinking projects, tend to disregard ecological constraints and hydrological realities. On the other hand, the Indian Knowledge System (IKS) offers a comprehensive perspective on water as a holy, ecological, and social element, rather than a simple economic resource. Ancient Indian civilization had evolved region-specific water conservation systems based on observation and participation. This paper examines these practices and their relevance in the contemporary context.

2. OBJECTIVES

1. To identify and describe the major traditional methods of water conservation in different parts of India.
2. To analyze the cultural, ecological, and technical principles behind these traditional methods of water conservation.
3. To assess the relevance and applicability of traditional methods in the modern context of water conservation.
4. To develop frameworks for the incorporation of indigenous knowledge of water conservation into modern initiatives.

3. METHODOLOGY

The current research relies completely on secondary data sources. The data have been gathered from published books, research journals, government publications, policy papers, and genuine online sources associated with traditional water conservation systems and the Indian Knowledge System. The major sources of data include publications of environmental researchers, reports of the Ministry of Jal Shakti, publications of the Centre for Science and Environment (CSE), and case studies compiled by academic and non-governmental institutions. The research adopts a

qualitative and descriptive research methodology to study the regional water conservation systems like johads, baolis, tank systems, anicuts, and khuls. The gathered data has been categorized region-wise and thematically to comprehend their ecological roles, socio-cultural importance, and relevance to the current water crisis. The comparative study has been employed to study the similarities and differences between the traditional water management systems and the contemporary water conservation systems. The research also assesses their efficacy in dealing with problems such as groundwater depletion, drought, and water conservation. The data interpretation has been conducted through content analysis of existing literature, allowing the synthesis of results and the drawing of conclusions about the convergence of indigenous knowledge with modern water management practices.

4. WATER CONSERVATION IN INDIAN KNOWLEDGE SYSTEM (IKS)

Water conservation in the Indian Knowledge System has very ancient roots in Indian texts and traditions. The oldest Vedic texts, like the Rigveda, Yajurveda, and Atharvaveda, described water (Āpaḥ) as sacred, life-giving, and purifying. Rain was considered a divine gift from gods like Indra and Parjanya, representing prosperity and sustenance. Since water was considered sacred, it was only natural that people were encouraged not to waste and pollute it. The Atharvaveda even cautioned against the pollution of rivers, ponds, and wells, indicating an early moral concern for the conservation of water sources. The Upanishads took this further by including water in the Panchamahabhuta (five elements) and associating it with the universal order (ṛta). The Upanishads held that there is a relationship between human society and nature, and that any disturbance in the natural elements, such as water, would create an imbalance in both nature and society. Therefore, water conservation became a moral and spiritual responsibility. These ideas were developed into social norms and laws by the Dharmashastra texts like Manusmriti and Yajnavalkya Smriti. Water resources such as wells and ponds were considered community property, not personal property. Fines were imposed for contaminating or damaging them, making these texts some of the earliest examples of environmental legislation.

Kautilya's Arthashastra offered a more pragmatic and organized way of managing water. It provided detailed guidelines for the construction and maintenance of water tanks, canals, and reservoirs, as well as officials to allocate water resources justly. It also advocated rainwater harvesting and punished those who damaged water resources. The Puranas promoted water conservation by describing the construction of wells and ponds as a religious merit (punya). Water resources were deified, and this created a cultural and emotional attachment to water resources. Technical texts such as Agni Purana, Matsya Purana, and Brihat Samhita by Varahamihira described the science of rainfall forecasting, groundwater location, and correct well construction, indicating a high level of environmental knowledge. Regional literature, such as Sangam literature in South India, described tank irrigation and community water management. In summary, Indian traditions integrated religion, law, science, and community action to conserve water. Such ancient concepts are very relevant in modern times to meet the challenges of water scarcity, pollution, and climate change.

5. REGIONAL WATER CONSERVATION PRACTICES IN INDIA

India has been able to develop various indigenous systems for conserving water. These systems have been developed based on the climatic and physiographic conditions of the region. They have been developed over the years through observation and experimentation by the people of India and are an integral part of the Indian Knowledge System. The Eri system in Tamil Nadu is one of the oldest tank irrigation systems in India. It is a series of interlinked tanks that harvest rainfall and the overflow of rivers during the monsoon season. These tanks control floods, protect soil from erosion, and help recharge groundwater. Excess water from one tank overflows into another, ensuring equal supply to neighboring villages. This helped large-scale rice production in Tamil Nadu. Similar irrigation systems are found in other parts of the country, like keres in Karnataka and cheruvus in Andhra Pradesh.

The Pat system in Jhabua (Madhya Pradesh) relies on the diversion of water from hill streams and natural slopes into small channels called pats. Stone bunds are constructed across streams and topped with mud and leaves. Water is then channeled through narrow passages carved out of rocky areas. Supply is also based on the traditional turn system. This irrigation system is most effective in hilly and tribal areas where the construction of large dams is not feasible. Baolis or stepwells were constructed by kings and rich people for public use. Baolis had steps leading down to the water level and sometimes had resting areas for travelers. The deep design of baolis helped in reducing evaporation and ensured that water was available even in droughts. Some baolis also helped irrigate the surrounding fields. The Kund system of Rajasthan and Gujarat is a bowl-shaped rainwater harvesting system that leads water to an underground well. The Kund system was primarily used as a source of drinking water in the desert regions. Lime and ash were used to maintain the cleanliness of the water. The Kund system demonstrates how desert dwellers harvested and conserved every drop of rainwater.

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Johads are small earthen check dams constructed to conserve rainwater and recharge groundwater. Johads enhance soil moisture and revive wells and rivers. The revival of Johads in Rajasthan has successfully increased water levels and revived dried-up rivers. The Ahar-Pyne system of South Bihar is a floodwater harvesting system that harvests floodwater from rivers through channels (pynes) into reservoirs (ahars). The conserved water is later used for irrigation during the dry season and also helps in flood control. Taanka, a system in the Thar Desert, is an underground tank that harvests rainwater from rooftops and courtyards. The water from one taanka can last a family for several months, thus easing the burden of fetching water from distant sources. Bawaris in Rajasthan are stepped reservoirs that harvest rainwater and also replenish groundwater. They are deep to prevent evaporation and keep the water cool. They also acted as social meeting points.

Table 1: Groundwater Dynamics (CGWB Assessment Data)

Indicator	**2017 Assessment**	**2022 Assessment**	**Change / Trend**
Annual Extraction (Usage)	18.88 BCM	19.25 BCM	**Increased (+0.37 BCM)**
Annual Groundwater Recharge	36.42 BCM	35.24 BCM	**Decreased (-1.18 BCM)**
Highest Extraction District	Indore (106%)	Indore (118.84%)	**Critical Over-extraction**

(BCM = Billion Cubic Meters)

Table 2: River Flow Regimes (Dry vs. Flood Periods)

River System	**2017 Condition (Scarcity)**	**2022 Condition (Excess)**
Narmada	**Low Flow:** Bargi & Indira Sagar dams struggled to fill; power generation reduced.	**Extreme Flood:** Breached danger mark (271.56m) at Sethani Ghat; massive dam releases.
Betwa	**Dry:** Upper stretches dried up by Dec 2017; tributaries ceased flowing.	**Severe Flood:** Overflowed banks in August; caused extensive damage in Vidisha/Bhopal.
Chambal	**Deficit:** Gandhi Sagar reservoir levels low; irrigation supply curtailed.	**High Alert:** Combined releases from Kota Barrage flooded Sheopur & Morena districts.
Kshipra	**Dead/Dry:** Flow maintained artificially by Narmada-Kshipra Link pumping.	**Flowing:** Natural flow restored briefly during monsoon; returned to stagnation post-monsoon.
Parvati	**Dry:** No flow in non-monsoon months.	**Flood:** Flowed at Maximum Water Level (MWL) in Guna/Chachoda.

Data Sources:

- *IMD Rainfall Statistics (2017 & 2022)*
- *CGWB Dynamic Ground Water Resources of India Reports (2017 & 2022)*
- *MPSDMA (MP State Disaster Management Authority) Flood/Drought Reports*

6. HOW ANCIENT INDIAN WATER CONSERVATION PRACTICES HELP ADDRESS CONTEMPORARY WATER ISSUES

Madhya Pradesh is also grappling with serious issues of water shortages and depleting groundwater levels because of the fast pace of urbanization, agricultural expansion, and over-reliance on borewells. The districts of Indore, Ujjain, Dewas, Sagar, and Bundelkhand are the worst-affected. In the past, people relied on traditional water harvesting systems such as stepwells (baolis and vavs), johads, kunds, and water tanks that stored monsoon rains for the dry months. These water harvesting systems allowed water to percolate into the groundwater. In Malwa, stepwells and temple tanks in cities like Mandu, Dhar, and Ujjain maintained the groundwater balance. In Bundelkhand, massive community water tanks (talabs) stored monsoon rains for months. Now, restoration and cleaning up of these traditional water harvesting systems can ease the burden on borewells. Already, johad-based recharge initiatives in Panna and Sagar have yielded positive outcomes in improving groundwater levels.

Madhya Pradesh is also affected by floods and waterlogging during the monsoon season, particularly in river basins like Narmada, Betwa, and Chambal, and in urban areas like Bhopal and Indore. In the past, water storage structures like tanks, lakes, and canals were constructed not only for the purpose

of storing water but also for regulating excess runoff. The Bhojtal or Upper Lake of Bhopal, constructed by Raja Bhoj, is a classic example of how cities were planned in the past to meet their water needs. The lake's waterways regulated both floodwater and water supply for drinking. Nowadays, floods are also caused by the obstruction of natural water drainage courses by buildings. The traditional water bodies also ensured that water was clean and healthy. Temple tanks, village ponds, and kunds were natural filters with the aid of plants and wetlands. They supported fish, birds, and other aquatic life. However, pollution from sewage and industries has severely affected water bodies such as Bhopal's Lower Lake and Shipra River. The concept of reviving ponds and wetlands with green belts can naturally clean water and restore the ecosystem in Sehore and Raisen districts.

Community participation was the strength of traditional water resource management in Madhya Pradesh. The community as a whole maintained ponds, stepwells, and springs. In tribal regions such as Mandla, Dindori, and Jhabua, water bodies were considered sacred and were protected by community regulations. The modern, centralized water management system has the drawbacks of leakage and mismanagement. Community participation through gram panchayats and water user groups can ensure equitable and sustainable water use. The traditional systems were also energy-efficient. They relied on natural slopes and the force of gravity, and thus did not require any pumps or electricity. Anicuts and small check dams in the Baghelkhand and Vindhya areas of the region helped water flow into fields naturally. Today, modern irrigation systems rely on electric pumps and pipelines, such as the Indore water supply scheme from the Narmada River, which requires enormous amounts of energy and expenditure. The revival of gravity irrigation can help cut costs, conserve energy, and reduce carbon emissions. Lastly, water was considered sacred in Indian culture. Rivers such as the Narmada and Shipra were considered goddesses, and the upkeep of ponds and ghats was considered a pious deed. This helped promote responsible water use. Today, water is considered a commodity. The revival of cultural practices through river festivals, tank cleaning, and cleanliness campaigns, such as the Narmada and Shipra campaigns, can help promote behavioral change.

7. CONCLUSION

The Indian Knowledge System is a profoundly ecological and ethical way of water conservation. The regional water traditions of the Indian Knowledge System, developed over the years through observation and adaptation, hold important lessons for the present-day water problems. With the growing intensity of modern water crises, it is not a nostalgic exercise but a necessity to go back to these traditions and revitalize them. The future of water conservation is in integrating traditional knowledge with modern scientific advancements.

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