

Neglected Water Heritage of Mahalaxmi-8, Lalitpur: A Policy Lens on Traditional Water Management Practices



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CHAPTER 1: INTRODUCTION

1.1. Background

Increasing water-related crises, urban demographic shifts, and international water disputes underscore the urgent need for stronger water governance and integrated resource management strategies (UNESCO, 2006). This global challenge is evident locally in the Kathmandu Valley, where traditional water infrastructure, such as stone spouts (Hitis), ponds (Pokharis), and canals (Rajkulos), historically served as key sources for meeting water demand but are now seriously threatened by rapid urbanization, excessive groundwater extraction, and lack of maintenance (Sengupta, 2012).

In Mahalaxmi-8, many of these traditional systems are buried, encroached upon, or completely nonfunctional. As the region faces growing water insecurity, revisiting these traditional practices through the lens of modern environmental policy is not only urgent but also holds potential for ecological and cultural restoration.

1.2 Rationale

This research aims to document and assess traditional water management systems that have been overlooked due to rapid urban growth. Mahalaxmi-8 represents a clear example of how modern development can conflict with heritage-based local water practices. Although current water management strategies emphasize centralized infrastructure, they frequently ignore the sustainability and resilience benefits offered by traditional indigenous systems (Asad et al., 2023). This study will help fill that gap by providing evidence to support policy changes that include traditional water systems in modern urban water management.

1.3 Hypothesis/ Research Questions

This study investigates the influence of modern policy interventions on traditional water management systems in Mahalaxmi-8 and explores their potential for integration into contemporary water governance frameworks, particularly considering their recognized role in supporting groundwater recharge through localized conservation practices. The central research question guiding this investigation is: How have traditional water management practices in Mahalaxmi-8 been affected by modern policy decisions, and what role can local policy play in their preservation, revitalization, and enhancement of groundwater recharge functions? This

question is designed to examine the impact of current governance structures on these heritage systems, the opportunities for their meaningful inclusion in present-day policy, and their contribution to sustainable aquifer replenishment. This will be examined through policy analysis, documentation review, and stakeholder interviews to generate evidence-based recommendations for resource conservation.

1.4 Objectives

General Objective:

To evaluate the condition, significance, and policy implications of traditional water management practices in Mahalaxmi-8, with the aim of promoting heritage-integrated local water governance.

Specific Objectives

- i. To assess the current physical, functional, and policy status of traditional water infrastructures (stone spouts, ponds, canals) in Mahalaxmi-8.
- ii. To analyze the gaps and opportunities in current municipal water and heritage policies concerning traditional water infrastructure.
- iii. To propose localized policy recommendations for the revitalization and integration of traditional water management practices into municipal planning.

1.5 Limitations

This study is constrained by its focus on a single urban locality, Mahalaxmi-8, which may limit the generalizability of the findings to other contexts or regions. The field survey relied heavily on guidance from local residents, which could have led to certain water resources or locations being overlooked. Furthermore, the qualitative nature of stakeholder interviews introduces subjectivity, and the perspectives captured may not fully represent the broader community. Time limitations also restricted the extent and duration of field observations. Future research should aim to cover a wider geographic area and incorporate quantitative methods to enhance the robustness and applicability of the results.

CHAPTER 2: LITERATURE REVIEW

Water is a central element for achieving multiple Sustainable Development Goals, especially SDG 6 (Clean Water and Sanitation) and SDG 13 (Climate Action), as climate change threatens water resources, infrastructure, and ecosystems, making integrated water management essential for sustainable development and resilience (UNESCO World Water Assessment Programme, 2020).

In the context of Nepal, traditional stone spouts, locally known as *dhunge dhara* or *hiti*, represent one of the most sophisticated heritage-based water systems. Supported by canals (*rajkulo*), ponds, and wells, these systems date back to the Licchavi and Malla periods and historically supplied both irrigation and city water. In addition to their utilitarian role, they hold strong cultural and religious significance (Joshi, 2015). Most freshwater was once supplied or recharged through the royal canals, but the decline of these canals has left hundreds of sources without water (Gautam et al., 2018).

Despite their historical importance, the number and functionality of stone spouts in the Kathmandu Valley have sharply declined. Of the 573 spouts identified in 2019, only 224 remain functional, while 94 have disappeared entirely. Many are now contaminated, primarily due to rapid urbanization, infrastructure development, and land use change, which have disrupted both water flow and traditional management practices (Shrestha et al., 2022). In places like Mahalaxmi-8, heritage-based water systems are increasingly being disconnected from contemporary supply infrastructure, leading to both cultural erosion and hydrological dysfunction (Singh & Dhakal, 2024). Growing conservation efforts now stress the need for source protection, recharge, and strong policies (Shrestha et al., 2022).

The policy and governance landscape in Nepal, however, often sidelines traditional water systems. While national frameworks such as the Water Resources Act (1992) and Local Government Operation Act (2017) provide guidelines for water and heritage management, coordination between water utility bodies and cultural conservation authorities remains weak. Municipal policies, empowered by decentralization, tend to prioritize modern infrastructure over heritage-based practices. Mahalaxmi Municipality, for example, has advanced water management through sanitation-focused policies. The Faecal Sludge Management (FSM) By-Laws (2020) regulate septic tank standards to safeguard groundwater, while a pilot Faecal Sludge Treatment Plant (FSTP) in Lubhu employs anaerobic technology to reduce pollution in local water bodies. The municipality has also adopted the Integrated Municipal Information System (IMIS,

2025), which links sanitation data with building permits and connects to national dashboards for evidence-based decision-making. These initiatives, aligned with ISO 24521 guidelines, reflect a Citywide Inclusive Sanitation (CWIS) framework. Yet, despite their sustainability orientation, they fail to directly integrate traditional ponds and stone spouts into municipal planning, highlighting a critical governance gap that excludes heritage systems from urban water strategies.

Experiences from neighboring countries provide valuable insights for Nepal. In India, stepwells historically integrated engineering, agriculture, and socio-cultural functions, offering lessons for sustainable modern water management (Selvaraj et al., 2022). Similarly, Sri Lanka's Tank Cascade System (TCS) represents an ancient, interconnected ecological network that supports irrigation, biodiversity, food security, and rural livelihoods. However, it faces threats from neglect, biodiversity loss, and climate variability, prompting rehabilitation as a Nature-based Solution for climate resilience (Ratnayake et al., 2024).

Traditional water harvesting technologies across South Asia demonstrate how indigenous systems can advance multiple SDGs. They contribute to water security, support food systems, promote gender equity, and reduce climate-related risks (Jain et al., 2024). Revitalizing these practices, when coupled with modern technology, can enhance efficiency and sustain livelihoods in developing and arid regions (Aklan, de Fraiture, & Hayde, 2025). For example, tanks, cisterns, and ponds have long served domestic, agricultural, and livestock needs in semi-arid regions (Aklan, de Fraiture, & Hayde, 2025). Tank rehabilitation has been promoted as a sustainable irrigation strategy in South India, but state-led programs that emphasized only physical restoration without community involvement have often led to cycles of poor maintenance and deterioration (Aggarwal, 2021).

Ultimately, optimizing traditional infrastructure through ecological engineering, adaptive reuse, and participatory planning offers cities an opportunity to enhance resilience and sustainability while preserving cultural heritage (Milsom & Bassetti, 2025).

CHAPTER 3: MATERIALS AND METHODS

3.1 Study Area

The study was conducted in Mahalaxmi Municipality Ward No. 8, Lalitpur, a peri-urban area in Nepal's Bagmati Province historically rich in traditional water infrastructure.

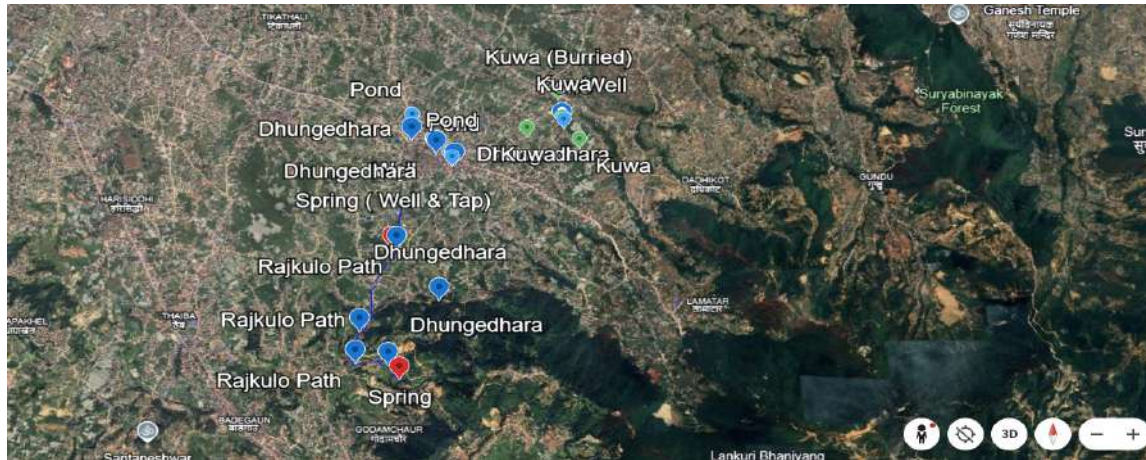


FIGURE 1: DISTRIBUTION OF THE WATER HERITAGE SITES IN MAHALAXMI-8

3.2. Methods

Employing a mixed-methods approach, the research integrates descriptive and exploratory designs to holistically assess physical, cultural, and policy dimensions.

Primary data collection includes:

1. Field Mapping using GPS devices and photographic documentation to inventory stone spouts, ponds, wells, and canals.
2. Structured Observations via checklists categorizing structural conditions (active/inactive, encroached, dry, polluted).
3. Semi-Structured Interviews with municipal officials, local elders, conservationists, and water users; and
4. Focus Group Discussions (FGDs) capturing community narratives on cultural relevance and decline of drivers.

Concurrently, Policy Review analyzed municipal development plans, heritage guidelines, and water strategies through content analysis.

Quantitative data on structural conditions were analyzed using descriptive statistics, while qualitative data from interviews and focus group discussions were thematically coded to identify

key conservation barriers. Finally, a policy gap analysis triangulated field evidence, community inputs, and document reviews to assess the alignment between governance frameworks and on-the-ground heritage realities.

CHAPTER 4: RESULTS

4.1 Demographic Characteristics of Respondents

All participated individuals in the survey had been permanent residents of Mahalaxmi-8 for more than two decades. The respondents, mostly men between the ages of forty and eighty, represented a mix of professions such as agriculture, teaching, business, government service, pharmacy, and household work. Their educational backgrounds ranged to the Intermediate level. This long-term connection to the locality allowed them to provide informed perspectives on changes in water use and management practices over time.

4.2 Knowledge and Use of Traditional Sources

Every participant was familiar with traditional water structures such as wells (*kuwa*), ponds (*pukhusi*), irrigation canals (*rajculo*), and stone spouts (*dhungedhara*). Some neighborhoods reported having all of these resources within their reach. Although dependence on these systems has declined due to piped water, several households still make use of them. Three respondents reported regular use for drinking, irrigation, and washing, while four mentioned occasional use, mainly for cultural and ritual needs. Only one household stated that they rarely use these sources. Uses was depended on access of type of water resources nearby. This suggests that traditional systems, while secondary today, remain relevant for both practical and cultural purposes.

4.3 Current Condition of Sources

The condition of traditional water sources in Mahalaxmi-8 shows considerable decline, with many no longer functioning as they once did. While a few sources are still in use, they are often poorly maintained and show signs of deterioration. Field observations revealed that some wells contained turbid, greenish water with an unpleasant odor, casting doubt on their suitability for household use. Respondents attributed this neglect to several factors, including shifts in lifestyle due to the availability of modern water supply systems, rapid urban expansion and encroachment on traditional sites, lack of government attention, and weak community mobilization for their upkeep. Although local households have occasionally organized clean-up campaigns, these efforts have been irregular and inadequate to ensure the long-term functionality of the sources.

Community accounts also revealed instances where traditional sources were completely lost due to human activities and natural changes. Two *kuwas* were reportedly buried to construct a road, and one pond was filled in to build a structure over it. In the Bojini Kuwa area, there was

once a pond where people used to fish, but it was buried to construct a temple. One *kuwa* near Poudel Tole was destroyed due to natural shifting of the riverbank. Seasonal flooding further worsens the condition of the area; during the monsoon, water often overflows onto the streets from nearby canals. The concrete canals do not allow water to infiltrate the ground, while the non-concrete canals are too narrow and shallow to hold the large volumes of rainwater during heavy rainfall.

Additionally, the water flow from one of the stone spout of Lubhu has dried up. To continue supplying water to local households, a pipe distribution system was installed using water stored in a collection tank, while only the outer traditional stone spout structure has been maintained as a cultural remnant rather than an active source.

4.4 Cultural and Heritage Significance

Despite the reduced use of traditional water systems, their cultural and heritage value was widely recognized. Seven out of eight respondents emphasized their importance in community rituals, funerals, and religious practices. However, recent conservation efforts often prioritize replacement with modern concrete structures rather than true preservation. In Khadka Gaun, one of the traditional *kuwa* of ward 8 has been enclosed within a concrete structure to accommodate funeral rituals, and there are also plans to replace the historic Bojini *Kuwa* with a modern storage tank. These kinds of interventions risk erasing the traditional character and environmentally friendly essence of such water resources.

4.5 Institutional Responsibility and Local Management

Management responsibility for traditional water resources was attributed to the ward office, municipality, local user groups, and *guthi*. While most respondents had participated in cleaning or restoration activities at least once, there was little evidence of consistent government or NGO-led interventions. This issue was particularly visible in the case of the Mulpani spring. Local user groups noted that the spring is at risk of contamination from nearby houses and farmland, and although a concrete boundary wall was constructed, its traditional features were overlooked and maintenance was minimal. Furthermore, jurisdictional disputes between ward offices have stalled efforts at proper management. The canal that originates from this spring remains crucial for irrigation and groundwater recharge downstream, but upstream users frequently face blockages that they must clear themselves. For this issue, soak pits and baffle blocks along the canal would improve infiltration, aeration, and overall recharge efficiency compared to the fully concrete canal now being prioritized.

4.6 Government Projects and Priorities

According to the ward chairperson, current efforts are mainly directed towards piped water supply schemes such as Mathillo Dovan, Tallo Dovan, Sankhadevi, and Bishnudol. Among these, the Chapakharka system was reported as the most preferred by locals, though its damaged pipeline has created serious supply disruptions. The chairperson also mentioned plans to construct a pond for groundwater recharge. However, traditional sources have not been given priority. For example, budget that had once been allocated for cleaning a pond could not be used due to disputes among local residents.

4.7 Community Engagement and Sustainability

Community involvement in conservation was found to be limited, as most families now rely on tap water. Older generations still value these traditional systems, but overall participation in maintenance is declining. Long-term sustainability could only be achieved if traditional sources were made functional and linked to present-day needs. For example, ponds could be repurposed for tourism or income-generating activities such as fishing, which would encourage community ownership and interest in preservation.

4.8 Support Required for Revival

Across both the survey and field observations, several support needs were repeatedly highlighted. These included financial resources, awareness programs, policies mandating local participation, and legal recognition of traditional water sources. Respondents also stressed the importance of water quality testing and technical assessments to determine safe uses. Rainwater harvesting was noted as a particularly underutilized option. Despite its potential, none of the ponds or wells observed in the study area had rainwater harvesting systems that could serve as effective recharge points.

4.9 Risks and Observed Challenges

The neglect of traditional systems presents both health and safety risks. Contaminated water may lead to illness, while unsafe maintenance practices pose hazards; one incident of a fatal accident during well cleaning was reported. Jurisdictional disputes, weak institutional coordination, and occasional community conflict further limit effective conservation. Overall, findings indicate that while traditional water systems in Mahalaxmi-8 remain culturally significant and environmentally valuable, their continued existence depends on stronger community

engagement, institutional support, modern technical solutions, and innovative uses that ensure both functionality and sustainability.

CHAPTER 5: DISCUSSION

The results of this study reveal a complex interplay between traditional water management systems, modern urbanization, and local governance in Mahalaxmi-8. While traditional sources such as wells, ponds, stone spouts, and canals remain culturally significant, their practical use has declined due to piped water supply, encroachment, and insufficient maintenance. This discussion interprets these findings in light of the literature, examining the physical condition of water sources, community engagement, policy gaps, and opportunities for integrating heritage systems into contemporary water management.

5.1 Traditional Systems in Transition

The findings from Mahalaxmi-8 reveal a community that is aware of and attached to its traditional water sources (wells, ponds, canals, and stone spouts) but increasingly disengaged from their practical use. This transition reflects broader patterns across the Kathmandu Valley, where modern piped supply has overshadowed heritage systems. While a few households continue using traditional sources for drinking, irrigation, and rituals, the majority depend primarily on municipal supply, echoing Shrestha et al. (2022) who documented the sharp decline in functional stone spouts. This indicates that traditional systems have not disappeared, but are slowly shifting toward symbolic and cultural roles rather than daily water provision.

5.2 Condition, Neglect, and Threats

The physical condition of traditional infrastructures in Mahalaxmi-8 highlights the pressing challenges of neglect, pollution, and structural modifications. Wells observed with turbid, greenish water reflect the risks of contamination also noted by Gautam et al. (2018), who linked poor water quality to encroachment and loss of canal connections. The replacement of traditional designs with modern concrete structures, such as in Khadka Gaun and Bojini Kuwa, mirrors patterns described in Singh & Dhakal (2024), where cultural heritage is compromised in favor of quick infrastructural fixes. Such interventions may fulfill immediate needs but risk eroding ecological functionality and heritage authenticity.

5.3 Cultural and Heritage Significance

Despite reduced functionality, the strong cultural role of traditional systems remains evident. Rituals, funerals, and community ceremonies still depend on stone spouts and wells, showing alignment with Joshi (2015), who emphasized the religious and social embeddedness of these systems. However, the growing tendency to alter traditional sites for ritual accommodation,

rather than conserving their original form, illustrates how heritage is being reinterpreted in modern contexts. This poses the risk of cultural erosion if conservation continues to prioritize replacement over authentic restoration.

5.4 Institutional Responsibility and Policy Gaps

The research identified fragmented responsibility among ward offices, municipalities, guthi, and community groups, leading to inconsistent management. This situation reflects Nepal's broader governance gap, where policies such as the Water Resources Act (1992) and Local Government Operation Act (2017) acknowledge heritage but fail to provide clear implementation frameworks. In Mahalaxmi-8, jurisdictional disputes over resources like the Mulpani spring and stalled pond-cleaning budgets demonstrate weak institutional coordination. Moreover, while the municipality has advanced FSM by-laws and adopted IMIS for sanitation data, these sustainability-focused innovations have not yet extended to heritage-based systems, highlighting a governance gap between modern service delivery and traditional resource management.

5.5 Community Engagement and Sustainability

Community involvement is limited, with older generations showing greater commitment than younger households. This generational divide echoes Aggarwal (2021), who argued that traditional systems decline when community participation diminishes and state-led projects replace, rather than empower, local management. Respondents' suggestion to repurpose ponds for tourism or income-generating activities aligns with global lessons from Sri Lanka's Tank Cascade System (Ratnayake et al., 2024) and India's stepwells (Selvaraj et al., 2022), where economic and cultural integration has proven essential for sustainability. Revitalization in Mahalaxmi-8 will require similar adaptive reuse strategies that make heritage systems relevant to contemporary livelihoods.

5.6 Technical Needs and Opportunities

Lack of rainwater harvesting, water testing, and technical assessment were observed as major barriers. These findings resonate with Jain et al. (2024), who stressed the role of indigenous water harvesting technologies in advancing multiple SDGs. The suggestion for soak pits and baffle blocks along the canal is particularly significant, as it connects traditional infrastructure with modern recharge techniques. This reflects Milsom & Bassetti (2025), who advocate for ecological engineering as a pathway to enhance resilience while preserving heritage systems. Integrating such hybrid approaches could help Mahalaxmi-8 address both water scarcity and groundwater recharge deficits.

5.7 Risks and Observed Challenges

The reported health risks from polluted wells, safety concerns during maintenance, and jurisdictional conflicts underscore the vulnerabilities associated with neglecting traditional water systems. These risks illustrate the double burden of losing both safe water alternatives and cultural identity. Without immediate action, Mahalaxmi-8 risks repeating the valley-wide pattern of disappearing stone spouts documented by Shrestha et al. (2022).

Overall, the study demonstrates that traditional water systems in Mahalaxmi-8 remain culturally valued and environmentally relevant, but are undermined by weak governance, limited community engagement, and lack of technical integration. The findings confirm the hypothesis that modern policy interventions have marginalized heritage practices, while also revealing opportunities for policy reform. By incorporating heritage systems into municipal planning, adopting ecological restoration techniques, and linking conservation to economic and cultural incentives, these resources can continue to support groundwater recharge, cultural identity, and sustainable water management in the urbanizing landscape of Kathmandu Valley.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study of traditional water management systems in Mahalaxmi-8 highlights the ongoing decline of traditional water heritage systems: stone spouts (dhunge dhara), wells (kuwa), ponds (pukhusi), and canals (rajculo). Once integral to local water supply and cultural life, these systems are now largely inactive, poorly maintained, or even lost due to rapid urbanization, encroachment, neglect, and lack of institutional coordination.

Although the community still acknowledges their cultural and ritual significance, actual use has sharply decreased as households rely almost entirely on modern piped water systems.

Conservation efforts, when attempted, often prioritize structural modernization rather than authentic restoration, thereby eroding traditional character. Fragmented governance, unclear responsibilities, and insufficient funding have further weakened their upkeep.

Nevertheless, field findings show that these heritage-based water systems still hold potential value. They could contribute to groundwater recharge, local water security, disaster mitigation, cultural identity, and community tourism, if they are revitalized and re-integrated into present-day water planning. The study confirms that without policy attention, participatory management, and functional linkage to current needs, these heritage systems are at risk of permanent loss.

6.2 Recommendations Not Explicitly Addressed in Nepal's Policies

Based on the study's findings in Mahalaxmi-8, several recommendations are crucial for conserving and integrating traditional water systems but are not explicitly mentioned or detailed in Nepal's current policies. These gaps should be addressed to ensure effective preservation, functional restoration, and sustainable use of heritage water resources.

6.2.1 Conservation and Restoration of Traditional Water Resources

➤ Use of Traditional Construction Techniques

- **Policy Gap:** The *National Water Resources Policy 2020* emphasizes sustainable water development but does not specifically mention the use of traditional construction or eco-friendly materials for restoration.

- **Recommended Action:** Restoration of wells, ponds, stone spouts, and canals should prioritize traditional or hybrid construction methods that retain cultural authenticity and ecological functionality.

➤ **Protection Against Encroachment During Urban Development**

- **Policy Gap:** Existing policies do not provide clear guidelines to prevent burial or conversion of heritage water sites during construction or infrastructure expansion.
- **Recommended Action:** Establish legal protection for heritage water sources and integrate them into municipal urban planning to avoid encroachment.

6.2.2. Integration into Modern Water Management

➤ **Maintenance of Soak Pits, Baffle Blocks, and Perforated Canal Sections**

- **Policy Gap:** *National Water Resources Policy 2020* does not explicitly address these technical interventions that improve groundwater recharge and filtration.
- **Recommended Action:** Adopt ecological engineering solutions, including perforated canal sections and soak pits, to maintain hydrological functionality while preserving traditional structures.

➤ **Functional Integration with Municipal Systems**

- **Policy Gap:** Current policies do not clearly guide how traditional water sources can be linked to municipal piped water systems for redundancy and emergency supply.
- **Recommended Action:** Develop municipal guidelines for integrating heritage water sources into modern distribution networks.

6.2.3. Community Engagement and Stewardship

➤ **Promotion of Income-generating Activities**

- **Policy Gap:** While the *National Water Resources Policy 2020* encourages water-related economic activities, it does not explicitly mention using tourism, fishing, or other incentives to promote preservation of heritage water sites.
- **Recommended Action:** Encourage community-based tourism, ritual services, or aquaculture linked to traditional ponds and wells to incentivize local stewardship.

➤ **Intergenerational Knowledge Transfer**

- **Policy Gap:** Policies do not provide mechanisms for involving younger generations in heritage water management.
- **Recommended Action:** Implement programs to engage youth and transfer traditional water management knowledge to ensure continuity of stewardship.

6.2.4. Institutional Strengthening and Policy Support

➤ **Resolution of Jurisdictional Disputes**

- **Policy Gap:** The *Water Resources Act 1992* and *National Water Resources Policy 2020* offer general mechanisms for dispute resolution but do not specifically address conflicts between wards, municipalities, and local water user groups over heritage water sources.
- **Recommended Action:** Establish clear municipal protocols defining responsibilities and dispute-resolution mechanisms for traditional water systems.

➤ **Training Municipal Staff in Heritage-sensitive Water Conservation**

- **Policy Gap:** Policies emphasize capacity building but do not specifically mandate training on traditional water system restoration.
- **Recommended Action:** Provide technical training and guidelines to municipal staff on heritage-sensitive restoration, maintenance, and ecological engineering.

6.2.5. Awareness and Cultural Promotion

➤ **Inclusion in Educational Programs**

- **Policy Gap:** *National Water Resources Policy 2020* encourages water education but does not explicitly incorporate traditional water systems or heritage values.
- **Recommended Action:** Integrate heritage water system education into school curricula and community awareness programs.

➤ **Celebration of Water Heritage Festivals and Events**

- **Policy Gap:** No specific mention of promoting cultural events related to heritage water sources.
- **Recommended Action:** Organize festivals, rituals, and awareness campaigns to strengthen community attachment and cultural significance of traditional water systems.

6.2.6. Sustainable Financing and Incentives

➤ **Dedicated Funding for Large-scale Rehabilitation**

- **Policy Gap:** While collaboration with NGOs and donors is encouraged, policies do not specifically address funding for large-scale restoration of traditional water systems.
- **Recommended Action:** Allocate municipal budgets, grants, and incentives specifically for heritage water system rehabilitation, monitoring, and community-led conservation initiatives.

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ANNEX







