



## **Assessing Drinking Water Accessibility in Diverse Provinces of Nepal**

**Lila Prasad Limbu**

Lecturer of Rural Development

Ratna Rajyalaxmi Campus, Tribhuvan University, Nepal

Email: [lila.limbu@rrlc.tu.edu.np](mailto:lila.limbu@rrlc.tu.edu.np)

**To cite this article:** Limbu, L. P. (2024). Assessing drinking water accessibility in diverse Provinces of Nepal. *Humanities and Social Sciences Journal*, 16(1-2), 113–124.

<https://doi.org/10.3126/hssj.v16i1-2.87408>

**Received:** January 1, 2025; **Accepted:** November 7, 2025; **Published:** December 14, 2025

---

### **Abstract**

Access to safe and reliable drinking water remains a critical concern in Nepal, where geographical, socioeconomic, and infrastructural disparities shape drinking water security across regions. This study aims to identify provincial differences in drinking water access and to examine the disparities between rural and urban areas. Using a mixed-methods approach, it integrates quantitative data from the 2022 Nepal Demographic and Health Survey (NDHS) with qualitative insights from observation and key informant interviews. The quantitative sample includes 3,997 households from both urban and rural areas, analyzed through chi-square tests and cross-tabulations to assess variations in availability and accessibility. The findings reveal significant provincial and regional disparities: urban households have greater access to on-premises drinking water, while rural areas—particularly in Karnali and Sudurpaschim Provinces—experience limited, unreliable, and often unsafe drinking water sources. Qualitative evidence further highlights poor enforcement of national drinking water quality standards and inadequate regulatory oversight. The study concludes that although access has improved in some regions, inequalities in quality and sustainability continue. It recommends more vigorous policy enforcement, decentralized infrastructure investment, and community-based education on drinking water safety. Coordinated action among government bodies and stakeholders is essential to ensure equitable, sustainable, and safe access to drinking water throughout Nepal.

**Keywords:** Water accessibility, province, sustainable development goals, resilience

---

### **Introduction**

Access to safe and clean drinking water is considered a fundamental human right and a precept of sustainable development. While improvements in access to better sources have improved globally, the disparities remain significant. In 2020, 75% of the world's population

had access to uncontaminated drinking water, from 70% in 2015, while the percentage in Central and Southern Asia increased from 61% to 68% (UNICEF/WHO, 2021). However, equitable access to drinking water sustainably remains a significant challenge in developing countries like Nepal, especially in rural, urban, and peri-urban areas, where infrastructure and environmental constraints persist.

In Nepal, the drinking water sector has made substantial progress over recent decades, reflecting both national commitment and international support. Access to drinking water supply increased from 36% in 1990 to 85% in 2018 (National Planning Commission, 2020). Accordingly, the government's Drinking Water Supply and Sanitation Program has set ambitious targets to expand basic drinking water services to 98% of the population by 2024, medium-level services to 30%, and sewage treatment facilities to 4.5% (Government of Nepal, 2024). However, these bigger achievements mask significant inequalities. Rural areas and marginalized groups continue to experience inconsistent service delivery, poor drinking water quality, and limited infrastructure investment. These disparities reveal the gap between policy aspirations and on-the-ground realities, signaling a more inclusive, regionally balanced course toward universal access to safe drinking water in Nepal.

These prevailing challenges call for a detailed analysis of inequalities in access to drinking water across Nepal's provinces and between rural and urban areas. This inequality helps unmask structural deficits in service provision while providing evidence-based policy responses to address inequalities in access to safe drinking water. In addition, analyzing such inequalities helps researchers identify socioeconomic and geographic factors that determine access to safe drinking water across the country. Such evidence would be important in informing national planning efforts and enhancing implementation of the existing guidelines on safe drinking water supply. Therefore, this study evaluates provincial disparities in drinking water access and differences between rural and urban areas. This study, therefore, aims to provide empirical evidence to inform fairer and more sustainable approaches to drinking water management in Nepal.

Although World Bank and UNICEF (2020) reports show that approximately a quarter of the global population still lacks access to safely managed drinking water services, this stark global disparity in drinking water access, the situation in Nepal also reflects parallel challenges despite progressive policy frameworks. While Nepal's Long-Term Sectoral Development Plan 2017-2030 articulates a phased strategy for universal, affordable, and sustainable WASH services aligned with Sustainable Development Goal 6, actual implementation remains constrained by weak institutional accountability and uneven resource allocation. For example, a case study of the Melamchi Water Supply Project exposed significant governance and timing failures that delayed project completion by nearly 15 years. In this regard, the present study makes a vital contribution by analyzing how access to drinking water varies across provinces and between rural and urban areas in Nepal, moving beyond national averages to uncover localized disparities and institutional shortcomings, and thus informing more targeted and equitable water-service strategies.

This study addresses the persistent and uneven topography of drinking-water access in Nepal, where national strategies and frameworks, for example, the Long-Term Sectoral Development Plan (2017-2030), fall short of fully overcoming stark provincial and urban-rural disparities (National Planning Commission, 2020). Despite robust policy commitments, rapid urbanisation intensifies pressure on drinking water systems, producing competition and conflict over the resource (Shrestha et al., 2018). These difficulties are further compounded by institutional weaknesses: governance, accountability, and localised resource allocation remain critical bottlenecks (Daniel, Djohan & Nastiti, 2021). This study, therefore, seeks to make an important contribution by rigorously investigating how drinking-water accessibility and quality diverge across provinces and between urban and rural areas in Nepal. By integrating quantitative survey data with qualitative insights, the research illuminates the structural and regional factors that sustain inequality. The findings aim to inform more finely tuned, equitable, and sustainable drinking water service strategies that align with the goal of universal drinking water access and to provide actionable guidance for policymakers, local governments, and development actors committed to advancing drinking water equity in Nepal.

Despite numerous studies on Nepal's drinking water supply and sanitation sector, much research remains focused either on national-level statistics or on specific projects, often neglecting intra-provincial variations and rural–urban disparities (Mandal, 2019). Such a narrow focus leads to a limited understanding of how geographic, socioeconomic, and governance factors combine in multifaceted ways to affect access to improved drinking water at the subnational level. Moreover, although policy frameworks advocate universal coverage, empirical evidence on the institutional arrangements and governance mechanisms that redress inequities across provinces and settlement types is scarce. The present study addresses these gaps by providing a comprehensive assessment of differences in drinking water access across provinces and between rural and urban areas, combining quantitative data from household surveys with qualitative information from observation and key informants. This study not only identifies where the disparities lie but also explores the structural, institutional, and governance-related determinants of these findings, thus providing actionable knowledge for policymakers and stakeholders seeking to attain equitable and sustainable access to drinking water throughout Nepal..

The study addresses these gaps through a mixed-methods approach, combining the quantitative analysis of the 2022 NDHS with qualitative insights from key informant interviews across provinces. This design offers a comprehensive examination of both drinking water distribution and its quality, while considering the institutional and governance factors that impinge on access. It provides policymakers, local authorities, and development partners with valuable information on persistent provincial and rural–urban disparities, thus helping identify areas where interventions are most needed. This study links the evidence to the objectives of the Long-Term Sectoral Development Plan (2017–2030) and to SDG 6, while advancing equitable, sustainable, and transparent drinking water governance in Nepal through actionable recommendations to strengthen service delivery and infrastructure planning across diverse regional contexts.

## **Methodology of the Study**

This study employed an exploratory research design and adopted a mixed-methods approach to analyzing drinking water inequalities across Nepal. Quantitative uses a stratified multi-stage cluster sampling strategy to achieve national representativeness across all seven provinces and both urban and rural areas, based on the 2022 NDHS. Analysis focused on NDHS variables related to drinking water sources, categorized as improved or unimproved according to definitions from WHO and UNICEF, along with household wealth, education, and location. The provincial and rural-urban patterns of differences in drinking water access were tested using cross-tabulation and Chi-square tests in SPSS.

Complementing the survey results, the study incorporated qualitative insights from seven key informant interviews and six on-site observations conducted in the Koshi, Madhesh, Bagmati, Gandaki, Lumbini, and Karnali provinces. Thematic analysis was used to interpret the qualitative data, focusing on perceptions of water quality, accessibility, and system performance. Ethical considerations were addressed by using publicly available, anonymized NDHS data and ensuring informed consent and confidentiality during field interviews. Combining quantitative and qualitative evidence enhances the interpretation of provincial disparities and supports a comprehensive understanding of the challenges regarding access to improved water in Nepal.

### **Theoretical Framework**

It is a matter of human dignity, equity, and social justice, rather than just a question of infrastructure. Lack of access to safe, sufficient drinking water carries implications that go beyond mere inconvenience, particularly for rural district schoolchildren who walk for hours to fetch water that may contain contaminants; their health is at risk, and the burden falls disproportionately on women and girls. According to studies in Nepal, institutional arrangements—not physical scarcity—limit access, and socially marginalised groups bear the brunt of this limitation more (Shrestha, 2011). The UN recognition of drinking water and sanitation as human rights binds governments to uphold principles of fairness, non-discrimination, and accountability in drinking water service delivery mechanisms (UNDP-SIWI, 2016). Framing drinking water accessibility from a rights-based perspective, therefore, shifts attention away from merely expanding supply to the social and governance dimensions of who gets access, how decision-making is structured, and by whom benefits are realized. Failure to do so risks perpetuating the very inequalities that development programmes seek to eradicate, as access to drinking water continues to mirror broader patterns of marginalization rather than serving as a pathway to inclusion.

## **Results and Discussion**

In this study, we investigate drinking water accessibility in Nepal's seven provinces, with a particular focus on the differences between rural and urban areas. Our methodology examines household-level drinking water sources, compares rural and urban distributions of respondents, and identifies significant associations between drinking water sources and provinces using chi-square tests. These results provide a comprehensive picture of drinking

water accessibility across Nepal, illuminating differences in access by residential and geographic areas, as well as the Nepalese government's activities in the drinking water sector to meet the Sustainable Development Goal.

**Table 1**

*Distribution of Respondents' Households by Seven Provinces*

Provinces	Frequency	Percent
Koshi	576	14.4
Madhesh province	789	19.7
Bagmati province	438	11.0
Gandaki province	330	8.3
Lumbini province	572	14.3
Karnali province	696	17.4
Sudurpashchim province	596	14.9
Total	3997	100.0

*Note.* NDHS Survey, 2022

The provincial analyses indicate huge disparities in household access to drinking water throughout Nepal. The highest levels of limited access are recorded in Madhesh Province at 19.7%, Karnali at 17.4%, and Sudurpashchim at 14.9%, while the lowest is in Gandaki at 8.3%. This quantitative result points to continued regional and administrative inequalities. Qualitative information explains these gaps: key informants identified political favoritism, weak policy implementation, and low stakeholder involvement as major reasons for unequal service delivery. Most respondents said that influential political actors tend to shift resources toward their constituencies, bringing about unequal development and inefficient management of drinking water systems. Taken together, the evidence suggests that inequalities in access to drinking water at the provincial level are more an issue of institutional and governance deficiencies than of physical drinking water scarcity.

**Table 2**

*Distribution of Respondents' Households by Rural and Urban Areas*

Areas	Frequency	Percent
Urban	2049	51.3
Rural	1948	48.7
Total	3997	100.0

*Note.* NDHS Survey, 2022

Table 2 indicates that 51.3% of respondents stay in urban areas and 48.7% in rural areas, thus providing a balanced foundation for comparing access to drinking water across settlements. National figures further reveal the rapid urbanization that the country is undergoing, with 4.47 million households in urban areas compared to 2.19 million in rural areas (Government of Nepal, 2021). Qualitative evidence indicates that internal migration accounts for 44.1% of the in-migrant population (Government of Nepal, 2022), placing increasing demands on urban drinking water services, while many rural areas face inadequate supplies due to limited infrastructure. Accordingly, interviewees emphasized that drinking water scarcity in the nation is less a consequence of natural constraints than institutional weaknesses, such as poor policy implementation and ineffective management. For instance, they pointed out that government-operated systems provide an irregular water supply, while schemes run by the British Gurkha Welfare offer reliable 24-hour service regardless of the source's capacity.

Taken together, the findings indicate that Nepal's drinking water problems are primarily due to governance and institutional inefficiencies, underscoring the need for transparent, accountable, and inclusive management in both rural and urban contexts.

**Table 3**

*Distribution of Respondents' Households by Drinking Water Sources*

Drinking Water Sources of Respondents	Frequency	Percent
Piped into the dwelling	145	3.6
Piped to yard/plot	1365	34.2
Piped to the neighbour	68	1.7
Public tap/standpipe	464	11.6
Tube well or borehole	1292	32.3
Protected well	18	0.5
Unprotected well	27	0.7
Protected spring	72	1.8
Unprotected spring	48	1.2
River/dam/lake/ponds/stream/canal/irrigation channel	7	0.2
Tanker truck	4	0.1
Bottled Water	116	2.9
Not a de jure resident	371	9.3
Total	3997	100.0

*Note.* NDHS Survey, 2022

Household access to drinking water in Nepal varies significantly across source types. Most households rely either on "Piped to yard/plot" (34.2%), "Tube well or borehole" (32.3%), accounting for over two-thirds of the sources. Public standpipes and taps serve 11.6% of households, while less secure sources—protected springs (1.8%), unprotected wells (0.7%), unprotected springs (1.2%), and open drinking water bodies such as rivers and ponds (0.2%)—are still in use by a smaller section. Drinking water is also delivered by tanker trucks and bottled water for 0.1% and 2.9%, respectively, reflecting gaps in public drinking water infrastructure. This distribution indicates variations in accessibility between rural and urban areas and across the seven provinces, thus providing a basis for analyzing sources that may be more accessible to households. Field observations showed that some government-managed projects failed to protect the drinking water sources from contamination, thus compromising their reliability. In this regard, these findings raise the need to focus not only on availability but also on safety, sustainability, and equitable access in the Nepalese drinking water supply systems.

**Table 4**

*Distribution of Respondents' Households by Access to Drinking Sources*

Access to Drinking Water	Frequency	Percent
On Premises	2928	73.3
1 to 30 Minutes	608	15.2
31 to 90 Minutes	90	2.2
No, a de facto resident	371	9.3
Total	3997	100.0

*Note.* NDHS Survey, 2022

As Table 4 shows, 73.3% of households have drinking water available on their premises, which generally reflects good physical access. However, 15.2% report taking 1–30



minutes to fetch drinking water, and another 2.2% take 31–90 minutes. This quantitative result suggests moderate to severe time burdens for a segment of the population. Furthermore, 9.3% of the respondents are not de jure residents, indicating that households face irregular or unreliable access to drinking water. These patterns illustrate significant rural–urban and provincial differences in drinking water accessibility and the time burdens associated with drinking water collection. Field observations also demonstrated that even for households with tap connections, supply is inconsistent, and low water quality — particularly during the rainy season — is frequently degraded by mud, making it unsafe. When quantitative levels of access are considered alongside these qualitative insights, it becomes apparent that meaningful access requires proximity, as well as the reliability and safety of drinking water systems. In turn, these challenges are intensified by seasonal variability in drinking water supply, seriously affecting vulnerable and hard-to-reach populations. The time required to collect drinking water reduces opportunities for education, income generation, and domestic work, with these burdens falling disproportionately on women and children. Overall, the fact that access, time burdens, and reliability of supplies vary widely across provinces and by type of settlement underlines the necessity of directed policies and strategic investments toward equal, sustainable, and safe drinking water for all Nepali households.

**Table 5**

*Source of Drinking Water Respondent Households by Province in Nepal ( N=3997)*

Sources of Water	Koshi THHs N=576	Madesh THHs N=789	Bagmati THHs N=438	Gandaki THHs N=330	Lumbini THHs N=572	Karnali THHs N=696	Sudur Pachim THHs N=596
Piped into the dwelling	3.1%	2.3%	9.4%	6.4%	6.6%	0.7%	0.7%
Piped to yard/plot	38.9%	3.8%	42.2%	53.9%	26.7%	52.2%	38.9%
Piped to the neighbor	0.7%	0.0%	2.1%	2.1%	1.0%	3.7%	2.7%
Public tap/standpipe	2.8%	0.8%	11.4%	16.4%	3.3%	29.6%	19.0%
Tube well or borehole	39.8%	80.4%	4.6%	0.3%	42.7%	0.3%	27.2%
Protected Well	0.2%	0.1%	0.0%	0.0%	2.3%	0.1%	0.3%
Unprotected well	0.0%	0.1%	0.2%	0.0%	4.2%	0.0%	0.2%
Protected spring	0.9%	0.0%	2.3%	2.7%	0.3%	4.6%	2.3%
Unprotected spring	1.6%	0.1%	1.6%	0.3%	0.5%	2.7%	1.3%
River/dam/lake/ponds/ stream/canal/irrigation channel	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	1.0%
Tanker truck	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%
Bottle	0.3%	0.8%	15.8%	6.7%	2.4%	0.4%	0.0%
Not a de jure resident	11.6%	11.7%	9.8%	11.2%	9.8%	5.5%	6.4%
Total	100.0 %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

*Note.* P-Value=0.00, Source: NDHS Survey, 2022

This study investigated the relationship between drinking water sources and provincial variation among 3,997 households using a chi-square test that confirmed significant regional differences in access ( $p < 0.05$ ). Tube wells and boreholes dominate in Madhesh (80.4%) and

Lumbini (42.7%) but are nearly absent in Gandaki and Karnali (0.3%). In contrast, piped water to the yard is common in Gandaki (53.9%) and Karnali (52.2%), yet limited in Madhesh (3.8%). Standpipes and public taps are more frequently used in Karnali (29.6%) and Sudurpashchim (19.0%) but remain rare in Madhesh and Lumbini. These patterns reflect Nepal's geographic diversity: the Terai relies heavily on groundwater, while hilly and mountain regions depend on surface water systems.

Qualitative findings also show that most municipalities do not follow the government's 2076 BS drinking water construction guidelines, leading to poor-quality sources and inadequate protection. Open reservoirs, lack of enclosures, and contamination from bathing, washing, irrigation, and nearby toilets undermine drinking water safety-even in urban centers like Pokhara, where supplies have been trying to improve as a result of Japanese-supported filtration. The situation is even more dire in rural areas: Terai households frequently use untested hand pumps for drinking water, while in the hills and mountains, the vast majority of drinking water sources are open and often shared by humans and animals. Deep-borehole tube wells are being tested in metropolitan areas, but users often lack the knowledge or training to maintain filtration and disinfection. These findings, combined, underscore the immediate need for more vigorous enforcement of water-quality standards and increased community education to ensure access to safe and reliable drinking water across Nepal.

**Table 6**

*Source of Drinking Water Respondent Households by Rural and Urban in Nepal (N=3997)*

Drinking Water Sources	Urban NHs=2049	Rural NHs=1948
Piped into the dwelling	5.7%	1.4%
Piped to yard/plot	29.1%	39.5%
Piped to the neighbor	1.9%	1.5%
Public tap/standpipe	6.9%	16.5%
Tube well or borehole	35.8%	28.7%
Protected well	.7%	.2%
Unprotected well	.4%	.9%
Protected spring	2.0%	1.6%
Unprotected spring	1.0%	1.4%
River/dam/lake/ponds/stream/canal/irrigation channel	.2%	.2%
Tanker truck	.1%	0.0%
Bottled Water	5.4%	.3%
Not a de jure resident	10.8%	7.7%
Total	100.0%	100.0%

*Note.* P-Value=0.00, Source: NDHS Survey, 2022

The study examined the drinking water source and location type, using a chi-square test to analyze data from 3,997 households in Nepal, of which 2,049 were urban and 1,948 were rural. Results from this analysis indicate significant differences in the sources of drinking water used between rural and urban areas ( $p < 0.05$ ). In urban households, piped water is more prevalent than in rural households: 29.1% have water piped to the yard/plot and 5.7% to the dwelling, while 39.5% of rural households have yard/plot access to piped water, but only 1.4% have indoor access. Conversely, rural communities rely more on shared public taps or



standpipes — 16.5% compared with 6.9% in urban areas — indicating a greater reliance on community-level provision. Tube wells/boreholes serve relatively comparable numbers of both urban (35.8%) and rural (28.7%) households. Triangulating these quantitative data with field observations suggests that current patterns of access to drinking water are shaped by infrastructure, settlement patterns, and modes of governance; however, a larger share of rural households' dependence on community sources, along with a limited number of indoor piped connections, adds to the disparity. This analysis thus provides the basis for necessary interventions to ensure equitable, reliable, and safe access to drinking water in both rural and urban settings.

**Table 7**

*Association of Water Source and Time by the household Respondents (Total N=3997)*

Provinces	1 to 30 minutes (THHs N=666)	31 to 90 Minute(THHs N=32)	on premises(THHs N=2928)	Not a deure Resident(THHs N=371)
Koshi	8.9%	3.1%	15.3%	18.1%
Madesh	16.1%	0.0%	20.2%	24.8%
Bagmati	6.6%	15.6%	11.8%	11.6%
Gandaki	7.5%	9.4%	8.2%	10.0%
Limbini	7.7%	6.3%	15.8%	15.1%
Karnali	35.4%	50.0%	13.9%	10.2%
Sudurpaschim	17.9%	15.6%	14.8%	10.2%
Total	100.0%	100.0%	100.0%	100.0%

*Note.* P-Value=0.00, Source: NDHS Survey, 2022

The chi-square test of independence examines the use of provinces and household drinking water access time in Nepal. The resulting p-value is 0.000, indicating a significant correlation and sharp regional differences. Relatively better access characterizes Koshi at 15.3% and Madhesh at 20.2%, where most households reported having water on-premises and a travel time of less than 31 minutes. In Bagmati and Gandaki provinces, there is greater variability: whereas 11.8% and 8.2% reported having on-premises water, respectively, 15.6% and 9.4% reported needing 31–90 minutes. Lumbini has moderate access to drinking water, whereas Karnali is the most difficult to reach: only 13.9% of homes have on-site water, and 50% of households travel 31–90 minutes, indicating a very high time burden. Sudurpashchim showed a more or less even distribution, with about equal percentages accessing on-site water (14.8%) and in 31–90 minutes (15.6%). Field observations and key informant interviews indicate that disparities in infrastructure development, weak support from government authorities, and unequal resource allocation are major issues faced by Karnali and Sudurpashchim. Triangulation of quantitative and qualitative data points to a need for focused interventions to reduce the time required to collect water and to supplement equitable access across the provinces.

**Table 8**

*Association of Residents Areas and Drinking Fetching Time in Nepal ( N=3997)*

Resident Areas	1 to 30 minutes	31 to 90 minutes	on premises	Not a de jure Resident
Urban	38.7%	43.8%	53.1%	59.6%
Rural	61.3%	56.2%	46.9%	40.4%
Total	100.0%	100.0%	100.0%	100.0%

*Note.* P-Value=0.00, Source: NDHS Survey, 2022

Using the chi-square test of independence, with  $p = 0.000$ , shows a significant association between drinking water access times and residents' areas, highlighting disparities between rural and urban households in Nepal. Households with access to drinking water within 1–30 minutes in rural areas (61.3%) are greater compared to those of urban areas (38.7%), while the household share of intermediate access times (31–90 minutes, 43.8%) and on-premises access (53.1%) is greater in urban than in rural areas, at 46.9%. Areas with non-de jure residents also dominate in towns, accounting for 59.6%; their access to drinking water varies. These seem to suggest that urbanization and weak policy implementation shape drinking water accessibility. Distance and infrastructure gaps contribute to water inaccessibility for rural households.

Field observations and key informant interviews indicate that many systems have highly irregular operations: daily supply ranges from 20 minutes to several hours, and daily interruptions can last up to 15 days during the wet season in some systems, such as Mudebash Kurule and Mauna Budhuk. Rural households in the provinces of Koshi, Bagmati, Gandaki, Karnali, and Sudurpashchim reported severe disruptions to daily life, including fetching drinking water from other communities located quite far away, missing meals, or relocation—e.g., shifting 10 households from Bhadaure, Dhankuta, due to unreliable drinking supply. Urban residents in cities such as Dharan, Kathmandu, Pokhara, and Sukhet also face irregular power and drinking water supply, which disproportionately affects low-income households.

Interviews further reveal systemic problems: inequitable budget allocation, lack of coordination across levels of government, mismatched budget cycles and project implementation periods, limited technology, municipalities with weak management, political interference, and corruption, all of which contribute to weakening water delivery. These, along with insufficient training and a lack of public participation, hamper the development of dependable, safe, and equitable drinking water systems. Triangulating quantitative access-time data with qualitative observations underscores that improvements in water accessibility in Nepal require simultaneous attention to infrastructure, governance, and community involvement.

## Conclusion

This study has brought to light large regional and rural-urban disparities in drinking water accessibility and quality across Nepal, shaped by geographic, socioeconomic, and infrastructural factors. Analysis of 3,997 households using chi-square tests showed that provinces such as Koshi and Madhesh offer greater on-premise access, while Karnali and Sudurpashchim face severe time and access constraints. The sources of drinking water for rural households were mostly communal, while in urban areas, though with higher on-site access, supply was irregular, and fetching time was moderate. These qualitative interviews are further

show widespread noncompliance with the drinking water guidelines of Nepal 2076 BS, with many municipalities having constructed systems without adequate protection or monitoring mechanisms, thereby rendering drinking water sources susceptible to contamination. A high reliance on tube wells and boreholes in Madhesh (80.4%) further underscores the inequitable distribution of infrastructure.

These combined quantitative and qualitative insights identify a pressing need for robust, decentralized water management policies. The government should implement national water-quality standards, invest in treatment facilities, and educate the community on safe drinking water use. Addressing gaps necessarily requires fair resource distribution, infrastructure investment in underprivileged provinces, and increased oversight to ensure a reliable and sustainable supply of drinking water. By connecting local needs with policy and stakeholder engagement, Nepal can move towards more equitable, safe, and consistent access to drinking water, reducing the burden on household time and public health risks.

**Acknowledgment:** The Researcher acknowledges the University Grand Commission, Sanothimi, Bhakthapur, which provided a grant to support research.

## References

- Acharya, G., Upreti, B. R., Paudel, S. B., Tandukar, A., & Harvey, P. (2015). *The drinking water service and users' perceptions of the state in Rolpa, Nepal: Researching livelihoods and services affected by conflict*. Secure Livelihoods Research Consortium. <http://www.securelivelihoods.org>
- Bessette, J., & Niblock, E. (2020). Water-quality pilot study of the potential for traditional water structure revitalization in the Deccan Plateau of India. *Consilience: The Journal of Sustainable Development*, 22(22), 6–17. <https://doi.org/10.7916/consilience.vi22.6739>
- Birkinshaw, M., Grieser, A., & Tan, J. (2021). How does community-managed infrastructure scale up from rural to urban? An example of co-production in community water projects in Northern Pakistan. *Environment and Urbanization*, 33(2), 496–518. <https://doi.org/10.1177/09562478211034853>
- Central Bureau of Statistics. (2022). *Population monograph of Nepal 2022: Volume III (Economic demography)*. Government of Nepal, National Planning Commission. <https://cbs.gov.np/population-monograph-of-nepal-2022/>
- Central Bureau of Statistics. (2023). *National population and housing census 2021: National report*. Government of Nepal, National Planning Commission. [https://censusnepal.cbs.gov.np/results/files/result-folder/National%20Report\\_English.pdf](https://censusnepal.cbs.gov.np/results/files/result-folder/National%20Report_English.pdf)
- Daniel, D., Djohan, D., & Nastiti, A. (2021). Interaction of factors influencing the sustainability of water, sanitation, and hygiene (WASH) services in rural Indonesia: Evidence from small surveys of WASH-related stakeholders in Indonesia. *Water*, 13(3), 1–11. <https://doi.org/10.3390/w13030314>

- Daniel, D., Djohan, D., Machairas, I., Pande, S., Arifin, A., Al Djono, T. P., & Rietveld, L. (2021). Financial, institutional, environmental, technical, and social (FIETS) aspects of water, sanitation, and hygiene conditions in indigenous rural Indonesia. *BMC Public Health*, 21(1), 1–15. <https://doi.org/10.1186/s12889-021-11800-x>
- Derrington, E. (2011). Drinking water in the United States: Are we planning for a sustainable future? *Journal of Environmental and Sustainability Issues*, 6(6), 63–90.
- Government of Nepal. (2021). *National population and housing census 2021: National report*. Central Bureau of Statistics.
- Government of Nepal. (2022). *Nepal demographic and health survey 2022*. Ministry of Health and Population.
- Kumpel, E., MacLeod, C., Stuart, K., Cock-Esteb, A., Khush, R., & Peletz, R. (2020). From data to decisions: Understanding information flows within regulatory water quality monitoring programs. *NPJ Clean Water*, 3(1), 1–11. <https://doi.org/10.1038/s41545-020-00084-0>
- Mas Moudi, R., Kettani, A., & Bousnoubra, B. (2016). Drinking water consumption and loss in Algeria: The case of networks with low-level counting. *Journal of Urban and Environmental Engineering*, 10(2), 162–168. <https://doi.org/10.4090/juee.2016.v10n2.162168>
- National Planning Commission. (2020). *Nepal's Sustainable Development Goals: Progress Assessment Report 2016–2019*. National Planning Commission. <http://www.npc.gov.np>
- Navaneeth, A., Sreedha, P., Vishnu Maya, T. M., Sanusree, P. S., & Harikumar, P. S. (2021). Evaluation of the challenges in water governance through citizens' perception and Water Quality Index: A case study of a fast-growing city in India. *H2Open Journal*, 4(1), 336–351. <https://doi.org/10.2166/H2OJ.2021.106>
- Onjala, J., Ndiritu, S. W., & Stage, J. (2013). Risk perception, choice of drinking water, and water treatment: Evidence from Kenyan towns. *Environment and Development Economics*, 1–20.
- Shrestha, A., Roth, D., & Joshi, D. (2018). Flows of change: Dynamic water rights and water access in peri-urban Nepal. *Water Alternatives*, 23(2).
- The Gurkha Welfare Trust. (2023). *Annual review 2021/2022: Clean water and sanitation*. [https://www.gwt.org.uk/wp-content/uploads/2023/02/Annual-Review-21-22\\_web.pdf](https://www.gwt.org.uk/wp-content/uploads/2023/02/Annual-Review-21-22_web.pdf)
- UNICEF. (2018). *Programming for sustainability in water services: A framework*. UNICEF.
- UNICEF/WHO. (2021). *Progress on household drinking water*. <https://washdata.org>