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Achieving SDG 6 in Nepal: A Focus on Sanitation Access in Urban vs. Rural Makawanpur

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Abstract

Background & Objective: Access to adequate sanitation is a fundamental human right and essential for public health. This study investigates the disparities in sanitation access and quality between urban and rural areas in Makawanpur District, Nepal. Despite significant improvements, recent reports indicate a lack of comprehensive sanitation services, particularly in rural settings. The objective is to assess the types of sanitation facilities used, the quality of waste management services, and the satisfaction levels among households.

Methodology: A descriptive research design was employed, utilizing a quantitative approach through structured questionnaires. A total of 200 respondents were randomly selected from both urban and rural households. Cross-tabulation analysis and Chi-square tests were conducted to determine statistical significance and compare sanitation indicators between the two settings.

Results: Findings indicate that while 97.7% of urban households access piped water, only 91.7% of rural households do the same. Moreover, a concerning 53.8% of rural households lack access to solid waste collection services, contrasted with 9.1% of urban households. Furthermore, satisfaction levels regarding sanitation services were significantly higher in urban areas, with 9.1% rating sanitation as excellent compared to 3.2% in rural areas.

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Conclusion & Recommendation: There exist significant disparities in sanitation access and quality between urban and rural areas in Makawanpur District. The study recommends targeted interventions to enhance rural sanitation infrastructure, empower local governments, and implement community-based initiatives to promote responsible sanitation practices and improve overall public health.

Keywords: Accessibility, Public Health, Sanitation, Urban-Rural Disparities, Waste Management

1. Introduction

Access to adequate sanitation is fundamental to human health, dignity, and development. In Nepal, despite notable progress in recent decades, disparities in sanitation facilities persist across geographic and socio-economic settings, particularly between urban and rural areas. According to the Nepal Demographic and Health Survey (NDHS, 2022), approximately 95% of households nationwide have access to some form of sanitation, but the quality, type, and reliability of these facilities vary significantly. Urban areas generally benefit from improved infrastructure, including piped water systems and sewage networks, while rural communities often rely on pit latrines and face irregular waste management services (MoWS, 2020). Nepal achieved a major milestone in 2019 when it was declared Open Defecation Free (ODF), marking the culmination of years of grassroots activism and collaboration among government agencies, local communities, and development partners. By 2025, sanitation coverage had reached 95.5%, while water supply coverage stood at 88.6%. Despite these achievements, only 19% of households currently have access to safely managed sanitation services, highlighting gaps in fecal sludge treatment and safe disposal (Chhetri, 2025; Rokaya, 2022). Efforts to maintain ODF status have shifted focus toward "total sanitation," which includes sustainable hygiene practices such as handwashing with soap, safe waste management, and improved toilet use. However, challenges persist in ensuring comprehensive sanitation coverage across urban and rural areas(World Health Organization, 2019).

In Makawanpur District, which encompasses both urbanizing municipalities and remote rural settlements, these contrasts are especially evident. Understanding the current sanitation scenario in this mixed setting is essential for informing inclusive and targeted development interventions.

Makwanpur District was declared Open Defecation Free (ODF) in 2013 as part of Nepal's national campaign to reduce diarrhoeal diseases, particularly among children under five. Post-declaration assessments revealed that 92% of households had toilets, and 90% accessed improved water sources by 2018. However, only 68% of households met comprehensive WASH standards, with gaps in hygiene practices and waste management (Kafle & Pradhan, 2018). Despite the ODF status, improved sanitation access (facilities safely separating waste) remains inconsistent, mirroring national trends where rural areas lag behind urban centers (Budhathoki, 2019; World Bank, 2021).

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Despite national efforts and investments in sanitation, such as the Open Defecation Free (ODF) campaign and integrated water, sanitation, and hygiene (WASH) programs, gaps in equitable access remain. In Makawanpur District, anecdotal evidence and local reports suggest that while urban households may enjoy improved sanitation infrastructure, many rural communities still face challenges such as poor waste disposal systems, non-functional toilets, and a lack of regular sewage management. These inconsistencies hinder public health outcomes and violate basic human rights to safe and clean sanitation (UNICEF, 2021). However, limited empirical data is analyzing and comparing the level of access to sanitation facilities between urban and rural areas within the district. This lack of localized evidence constrains policy planning and the effective allocation of resources.

2. Research Objectives

The primary objective of this study is to assess and compare access to sanitation facilities in urban and rural areas of Makawanpur District, Nepal. Specifically, the study aims to:

1. Identify the types of sanitation facilities commonly used in both urban and rural households.
2. Examine the frequency and quality of waste and sewage management services.
3. Evaluate household satisfaction levels and perceptions regarding sanitation services.
4. Analyze the statistical significance of differences in sanitation access between urban and rural areas.
5. Provide evidence-based recommendations for improving equitable sanitation services across the district.

3. Materials & Methods

This study employed a descriptive research design to assess sanitation conditions and community perceptions in the Makawanpur District, Nepal. The research followed a quantitative approach, focusing on numerical data collected through structured questionnaires(Karki & D'Mello, 2024). A total of 200 respondents from both urban and rural areas of the district were selected to ensure diverse representation. The sample was calculated considering the 95% confidence level, 7% margin of error, and 50% prevalence.

To maintain objectivity and avoid selection bias, a random sampling technique was used to select the respondents. This allowed each household an equal chance of being included in the study, thereby enhancing the generalizability of the findings. Before data collection, the questionnaire was pre-tested with a small group of individuals from a similar demographic to ensure its reliability and clarity.

For data analysis, cross-tabulation was used to compare sanitation indicators across different residential settings, while the Chi-square test was conducted to determine the statistical significance of the observed relationships. This combination of methods provided a comprehensive understanding of the sanitation situation and highlighted key areas for improvement.

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4. Results

4.1 Primary source of drinking water at household level

The table presents the distribution of households by their primary source of drinking water, categorized by residence type—urban and rural. It shows that a vast majority of urban households (97.7%) rely on piped water from the public supply as their main source of drinking water. In rural areas, although piped water is also the dominant source, the percentage is slightly lower at 91.7%. Overall, across both urban and rural areas, 93.0% of households use piped water from the public supply.

Table 1: Primary source of drinking water at household level

		Residence		Total
		Urban	Rural	
What is the primary source of drinking water in your household	Piped water from the public supply	97.7%	91.7%	93.0%
	Well water	2.3%	8.3%	7.0%
Total		100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.936[a]	1	.164

Source: Field Survey 2025

On the other hand, well water is used by a small fraction of households. Only 2.3% of urban households report well water as their primary source, while the proportion is notably higher in rural areas at 8.3%. When aggregated, well water accounts for 7.0% of the total households' drinking water sources.

The results of a Pearson Chi-Square test are also presented to examine whether there is a statistically significant association between residence type and the primary source of drinking water. The test yields a chi-square value of 1.936 with 1 degree of freedom and a p-value (Asymp. Sig., 2-sided) of 0.164. Since the p-value is greater than the conventional threshold of 0.05, we fail to reject the null hypothesis. This indicates that there is no statistically significant relationship between whether a household is in an urban or rural area and its reported primary source of drinking water.

4.2 Access to a toilet facility at your home

The table presents data on household access to toilet facilities, comparing urban and rural areas. It shows that all urban households (100%) reported having access to a toilet facility at home. In rural areas, 98.1% of households reported having toilet access, while 1.9% reported not having access. Overall, 98.5% of all surveyed households have access to a toilet facility, and only 1.5% do not.

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Table 2: Access to a toilet facility at your home

		Residence		Total
		Urban	Rural	
Do you have access to a toilet facility at your home?	Yes	100.0%	98.1%	98.5%
	No		1.9%	1.5%
Total		100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.859[a]	1	.354

Source: Field Survey 2025

The results of the Chi-Square test ($\chi^2 = 0.859$, df = 1, p = 0.354) indicate that the difference in access to toilet facilities between urban and rural households is not statistically significant. This suggests that access to household toilet facilities is relatively high in both settings and that the type of residence (urban or rural) does not significantly influence whether a household has a toilet facility.

4.3 Type of toilet facility

The table illustrates the types of toilet facilities used at the household level, categorized by urban and rural residences. In urban areas, the majority of households (72.7%) use flush toilets connected to a sewer system, indicating higher access to modern sanitation infrastructure. In contrast, only 41.0% of rural households use flush toilets, showing a significant disparity in sanitation services between urban and rural areas.

Table 3: Types of toilet facility at your home

		Residence		Total
		Urban	Rural	
What type of toilet facility do you use?	Flush toilet (connected to sewer system),	72.7%	41.0%	48.0%
	Pit latrine	27.3%	58.3%	51.5%
	Open pit		0.6%	0.5%
Total		100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.897[a]	2	.001

Source: Field Survey 2025

On the other hand, pit latrines are more common in rural areas, used by 58.3% of households compared to 27.3% in urban areas. This suggests that many rural communities still rely on basic, non-sewered sanitation options. Additionally, a very small percentage of households in rural areas (0.6%) still use open pit toilets, while this type is not reported in urban areas. Overall, 48.0% of all households use flush toilets, 51.5% use pit latrines, and 0.5% rely on open pits.

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The Chi-Square test result ($\chi^2 = 13.897$, df = 2, p = 0.001) shows that the differences in types of toilet facilities between urban and rural areas are statistically significant. This implies a strong association between the type of residence and the kind of toilet facility used, highlighting the need for targeted interventions to improve sanitation infrastructure, especially in rural areas.

4.4 Time to collect the waste from your toilet/sewage system

The table presents information on how frequently waste from household toilets or sewage systems is collected or managed, comparing urban and rural residences. Among rural households, 36.5% reported that waste is managed regularly (once a week), slightly higher than the 29.5% in urban areas. Interestingly, urban households were more likely to report occasional (every few weeks) management of waste, at 29.5%, compared to 18.6% in rural areas.

Table 4: Time to collect the waste from your toilet/sewage system

		Residence		Total
		Urban	Rural	
How often is the waste from your toilet/sewage system collected or managed?	Regularly (once a week)	29.5%	36.5%	35.0%
	Occasionally (every few weeks)	29.5%	18.6%	21.0%
	Rarely (< than once a month)	34.1%	42.9%	41.0%
	Not applicable (no toilet facility)	6.8%	1.9%	3.0%
Total		100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.839[a]	3	.120

Source: Field Survey 2025

A larger proportion of both urban (34.1%) and rural (42.9%) households reported that toilet/sewage waste is rarely managed—less than once a month—with rural households more frequently falling into this category. Additionally, 6.8% of urban and 1.9% of rural respondents indicated that the question was not applicable, likely reflecting the small percentage without access to toilet facilities.

Overall, the majority of households (41.0%) across both settings indicated infrequent (rare) waste management, suggesting that timely and consistent sanitation services may be lacking. The results of the Chi-Square test ($\chi^2 = 5.839$, df = 3, p = 0.120) show that the difference in frequency of waste collection between urban and rural households is not statistically significant. This suggests that while there are variations, residence type does not strongly influence how often toilet/sewage waste is managed. Nonetheless, the high percentage of infrequent waste management highlights the need for improved sanitation services across both urban and rural settings.

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4.5 Access to solid waste collection services

Table 5: Access to solid waste collection services

		Residence		Total
		Urban	Rural	
Do you have access to solid waste collection services in your area?	Yes, regularly	65.9%	25.0%	34.0%
	Yes, occasionally	25.0%	21.2%	22.0%
	No	9.1%	53.8%	44.0%
Total		100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	32.747[a]	2	.000

Source: Field Survey 2025

The table highlights the availability of solid waste collection services in urban and rural areas. A significant disparity is observed between the two settings. In urban areas, 65.9% of households reported having regular access to solid waste collection services, compared to only 25.0% in rural areas. Additionally, 25.0% of urban and 21.2% of rural households stated they had occasional access to such services.

However, a notable concern is the high percentage of rural households—53.8%—that reported having no access to solid waste collection services at all. In contrast, only 9.1% of urban households lacked access. Overall, 34.0% of all respondents reported regular access, 22.0% occasional access, and 44.0% reported no access to solid waste collection services.

The Chi-Square test result ($\chi^2 = 32.747$, df = 2, p = 0.000) indicates a statistically significant difference between urban and rural areas regarding access to solid waste collection. This strong association between place of residence and access to waste collection services suggests a critical gap in sanitation service delivery in rural areas, emphasizing the need for targeted infrastructure and policy interventions to improve waste management systems beyond urban centers.

4.6 Level of satisfaction with the sanitation services

The table outlines the level of satisfaction with sanitation services among urban and rural residents. A clear difference in perception is observed between the two groups. In urban areas, a majority of respondents (70.5%) reported being satisfied with sanitation services, while only 39.7% of rural respondents expressed the same. Additionally, 6.8% of urban residents reported being very satisfied, compared to just 3.8% in rural areas.

Table 6: Level of satisfaction with the sanitation services

		Residence		Total
		Urban	Rural	
	Very satisfied	6.8%	3.8%	4.5%
	Satisfied	70.5%	39.7%	46.5%

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Are you satisfied with the sanitation services in your area?	Neutral	15.9%	28.2%	25.5%
	Unsatisfied	2.3%	26.3%	21.0%
	Very unsatisfied	4.5%	1.9%	2.5%
Total		100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.035[a]	4	.000

Source: Field Survey 2025

In contrast, dissatisfaction is significantly higher in rural areas. About 26.3% of rural respondents reported being unsatisfied, compared to just 2.3% of urban respondents. Interestingly, the proportion of people who were neutral about their satisfaction was also higher in rural areas (28.2%) than in urban areas (15.9%). Very few respondents in either group reported being very unsatisfied: 4.5% in urban and 1.9% in rural areas.

Overall, 4.5% of all respondents were very satisfied, 46.5% were satisfied, 25.5% were neutral, 21.0% were unsatisfied, and 2.5% were very unsatisfied. The Chi-Square test result (χ^2 = 20.035, df = 4, p = 0.000) indicates a statistically significant difference in satisfaction levels between urban and rural households. This suggests that residence type is strongly associated with satisfaction regarding sanitation services, with urban areas reporting significantly higher satisfaction. The data highlights a need to improve service quality and consistency in rural areas to bridge the satisfaction gap.

4.7 Quality of sanitation in your community

The table provides an overview of how residents perceive the quality of sanitation in their communities, with comparisons between urban and rural areas. A significant proportion of urban respondents rated the sanitation quality positively, with 9.1% describing it as excellent and 68.2% as good. In contrast, only 3.2% of rural residents rated sanitation as excellent and 44.9% as good, showing a notable disparity in positive perceptions between the two groups.

Table 7: Quality of sanitation in your community

		Residence		Total
		Urban	Rural	
In your opinion, how would you rate the quality of sanitation in your community?	Excellent	9.1%	3.2%	4.5%
	Good	68.2%	44.9%	50.0%
	Fair	13.6%	27.6%	24.5%
	Poor	9.1%	23.7%	20.5%
	Very Poor		0.6%	0.5%
Total		100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.953[a]	4	.012

Source: Field Survey 2025

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On the other hand, negative perceptions were more common in rural areas. About 27.6% of rural respondents rated the sanitation quality as fair, 23.7% as poor, and 0.6% as very poor. Among urban residents, 13.6% rated it as fair and 9.1% as poor, with no responses for very poor. These figures suggest that rural communities are more likely to view local sanitation services as inadequate or only moderately satisfactory.

Overall, 4.5% of all respondents rated community sanitation as excellent, 50.0% as good, 24.5% as fair, 20.5% as poor, and 0.5% as very poor. The Chi-Square test result ($\chi^2 = 12.953$, df = 4, p = 0.012) indicates a statistically significant difference in perceptions of sanitation quality between urban and rural residents. This underscores a critical need for improvements in rural sanitation infrastructure and services to align public satisfaction levels more closely with those seen in urban communities.

5. Conclusion

The findings reveal significant disparities in sanitation access, quality, and satisfaction between urban and rural areas in Nepal. Urban households tend to have better access to piped water, improved toilet facilities, and regular waste collection services. They also report higher levels of satisfaction with sanitation services and rate the overall quality of sanitation in their communities more positively. In contrast, rural areas are characterized by greater reliance on pit latrines, infrequent sewage and solid waste management, and limited access to formal sanitation services. These conditions contribute to lower satisfaction and poorer perceptions of sanitation quality among rural residents. Although some indicators, like toilet access, show near-universal coverage, the quality and sustainability of services remain uneven. Statistically significant differences across multiple variables underscore the persistent urban–rural sanitation gap.

6. Recommendations

To bridge this gap, targeted interventions are needed to enhance rural sanitation infrastructure and services. Local governments should be empowered with technical and financial support to develop sustainable waste management systems and upgrade existing sanitation facilities. Public awareness campaigns and community-based initiatives can further encourage responsible sanitation practices and increase participation in local efforts. Strengthening coordination between federal, provincial, and local governments is crucial to ensuring consistent service delivery. Moreover, integrating inclusive approaches that address the needs of marginalized and remote populations will be essential for achieving equitable and sustainable sanitation outcomes across Nepal.

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