GMMC Journal of Interdisciplinary Studies
Vol. 13, December 2024, pp. 142-160
ISSN : 2392-4519 (Print), 3021-9086 (Online)
Journal homepage: http://gmmcjournal.edu.np

Exploring Issues for Sustainable Smart City Development: A Resident-Centric Case Study in Hetauda

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Received: July, 2024
Revised: September, 2024
Accepted: October, 2024
Available online: December, 2024
DOI: https://doi.org/10.3126/jis.v13i1.73349

ABSTRACT

This study explores the challenges and opportunities for sustainable smart city development in Hetauda, Nepal, through a resident-centric approach. Using surveys and interviews, it investigates urban issues, residents' preferences for smart solutions, and their readiness to adopt new technologies. The findings reveal critical challenges, including inadequate healthcare, traffic congestion, poor drainage systems, lack of higher education institutions, and limited digitization in government services. Residents emphasized the need for smart healthcare systems, advanced traffic management, and improved public transportation, highlighting a preference for solutions that address both social and environmental concerns. The study underscores the importance of resident engagement in planning and decision-making, recommending mechanisms like public forums and citizen advisory boards to ensure inclusive development. It also calls for capacity building within local governments and transparent communication to address resident anxieties. By prioritizing public needs and integrating green technologies, Hetauda can create a smart city framework that enhances quality of life while promoting sustainability. This research provides valuable insights for policymakers, emphasizing a resident-driven approach to urban transformation. Its implications extend beyond Hetauda, offering lessons for other underdeveloped regions seeking to balance technological advancements with social and environmental goals in their journey towards sustainable urban development.

Keywords: Challenges, resident, rural, smart city, sustainable, technology

INTRODUCTION

Urbanization is a global phenomenon driving significant changes in cities worldwide. As cities expand and modernize, the concept of "smart cities" has emerged, integrating technology to enhance the quality of life for residents, improve operational efficiency, and ensure sustainable development (Bhuvandas et al., 2012). Hetauda, the capital of Bagmati Province in Nepal, is composed to embrace these advancements. However, sustainable development in Hetauda necessitates a thorough understanding of the residents' needs, urban challenges, and their preferences for smart city solutions. This study aims to explore these aspects, focusing on identifying key urban issues faced by Hetauda residents and determining their preferred smart city solutions to promote sustainable development. By prioritizing a resident-centric approach, this work seeks to contribute to the development of a smart city framework that is both inclusive and effective in addressing the unique needs of Hetauda's populace.

Hetauda, a significant urban center in Nepal, is undergoing rapid urbanization, characterized by a growing population and increasing infrastructural demands. This urban expansion presents both opportunities and challenges. According to the (Ramsamy, 2013), urbanization in developing countries like Nepal can lead to improved economic opportunities and living standards, but it also poses significant sustainability challenges, including environmental degradation, inadequate infrastructure, and social inequalities.

The concept of smart cities has gained grip as a potential solution to these urban challenges. Smart cities utilize technology and data to enhance urban living, improve efficiency, and promote sustainability (Giffinger et al., 2010). Key components of smart cities include smart governance, smart mobility, smart environment, smart people, smart living, and smart economy (Nam & Pardo, 2011). However, the success of smart city initiatives largely depends on understanding and addressing the specific needs and preferences of local residents.

Hetauda's journey towards becoming a smart city involves addressing several urban issues. Previous studies suggest to take a response from residents countering issues that they are facing such as health care services, traffic congestion, parking management issues, inadequate public transportation, waste management issues and limited access to essential services (Timsina et al., 2020) . These issues not only affect the quality of life but also affect sustainable development by compromising the ability of future generations to meet their own needs (Elliott, 2012). Therefore, it is crucial to identify and prioritize these urban challenges from the residents' perspective to develop effective smart city solutions.

The methodology of this research involves a comprehensive questionnaire designed to

capture demographics, urban issues, and smart city solutions preferred by Hetauda residents. The demographic section will gather data on age, gender, education, occupation, and length of residency, which are essential for understanding the diverse needs of the population. The section on urban issues will include multiple-choice and ranking questions to identify and prioritize the key problems faced by residents. Furthermore, the smart city solutions section will explore residents' preferences for various technological and infrastructural improvements. Open-ended questions will provide an opportunity for residents to share additional comments and suggestions, ensuring that their voices are heard and considered in the planning process.

By focusing on a resident-centric approach, this study aims to contribute valuable insights into the development of sustainable smart city solutions that fit to Hetauda's unique context. The findings will not only help local authorities and policymakers in Hetauda but also serve as a reference for other cities in Nepal and similar developing regions aiming to transition towards smart city frameworks.

LITERATURE REVIEW

The concept of smart cities has been a focal point in urban development research, offering innovative solutions to contemporary challenges. Nam and Pardo (2011), laid a foundation for understanding smart cities by identifying three core dimensions: technology, people, and institutions. Their framework emphasizes the integration of infrastructure and technology-mediated services, social learning to enhance human infrastructure, and governance that fosters institutional improvement and citizen engagement. This approach is particularly relevant for Hetauda's resident-centric smart city initiatives, offering a comprehensive strategy for sustainable urban solutions.

Sustainable transport development has been another critical aspect of urban planning. Pokharel and Acharya (2015) reviewed Nepal's transport policies post-political conflict, highlighting challenges and proposing strategies for sustainability. Their insights align with the objectives of Hetauda's smart city development, emphasizing the need for policy-driven solutions that prioritize resident needs and urban sustainability.

The importance of defining and understanding smart city concepts was highlighted by Albino et al. (2015), seeks to conduct an extensive review of global initiatives. Their study stresses the need for shared definitions and metrics to assess smart city performance effectively. Similarly, Khan et al. (2020) addressed challenges in sustainable smart city development, focusing on legislation, policies, funding, and technology. Their conceptual framework offers

a practical guide for incorporating sustainability into smart city initiatives, directly applicable to Hetauda's context.

Technological integration, particularly through AI and IoT, has transformed urban planning. Kumar Jha et al. (2021) explored the role of these technologies in addressing urban challenges, showcasing their application in infrastructure management and quality-of-life improvement. Gautam et al. (2021) extended this perspective by introducing an IoT framework for efficient water supply management, a critical issue for smart cities. Their research underscores the potential of IoT in enhancing infrastructure and citizen services, resonating with Hetauda's goals.

In the context of developing countries, Antwi-Afari (2021) examined sustainable smart city initiatives using Kumasi City as a case study. The findings underscore the importance of integrating ICT, renewable energy, and quality education while addressing challenges like financial inclusiveness and policy readiness. Similarly, by Adhikari and Bhattarai, 2021 explored smart city aspirations in Nepal, highlighting the potential of incremental technology integration, such as the Bus Rapid Transit system, to improve urban mobility and service efficiency.

Nepal's broader urban challenges are also evident in studies addressing renewable energy and urbanization. Lohani et al. (2023) reviewed Nepal's energy landscape, advocating for aggressive policies to promote clean energy adoption. Their insights on solar energy and hydropower align with Hetauda's exploration of sustainable energy solutions. Dixit & Shaw (2023) emphasized the integration of technology and resilience strategies in smart city initiatives, addressing infrastructure deficits and natural disaster vulnerabilities. Their recommendations for flexible indicators and interconnected smart city components are critical for achieving urban sustainability.

Expanding the scope, Chaudhary (2023) introduced the concept of 'smart villages' as a complementary approach to smart cities, emphasizing rural development through tailored technological solutions. This perspective highlights the interconnectedness of rural and urban economies in Nepal, suggesting a holistic approach to sustainable development.

Global challenges such as climate change and the COVID-19 pandemic further complicate urbanization and the achievement of Sustainable Development Goals (SDGs). Chen et al., (2022) analyzed the interplay between urbanization and SDGs, proposing recommendations for sustainable urbanization through green development and enhanced cooperation. Similarly, Pandey (2023) highlighted the role of community involvement and

evidence-based policymaking in addressing urban issues and achieving sustainability.

While existing literature provides valuable frameworks and global insights into smart city development, there is a notable gap in understanding the specific challenges faced by Hetauda's residents and their preferences for smart city solutions. Empirical research engaging directly with residents is needed to identify and prioritize urban issues from a local perspective. This study aims to bridge this gap, focusing on practical implementation strategies tailored to Hetauda's unique context, thereby integrating theoretical insights with actionable solutions for sustainable urban development.

The primary objective of this study is to explore key urban issues in Hetauda, assess residents' preferences for smart city solutions, and propose sustainable development strategies.

RQ: What are the primary urban challenges experienced by residents of Hetauda, and what smart city solutions do they prefer to mitigate these challenges?

MATERIALS AND METHOD

This study employs a mixed-methods approach to explore urban challenges in Hetauda and identify resident-preferred smart city solutions for sustainable development. A structured questionnaire collected quantitative data, while open-ended responses provided qualitative insights, enabling a comprehensive understanding of residents' needs and priorities.

Hetauda, a key city in Nepal with a population of 193,576 (Census 2078 B.S.), serves as an ideal case study due to its strategic location, demographic diversity, and blend of urban and rural characteristics. These factors provide valuable context for examining urban issues and potential smart city initiatives.

The target population included Hetauda residents across various demographics such as age, gender, education, and occupation. This diversity ensured a holistic perspective on urban challenges and the feasibility of sustainable smart city solutions tailored to the community's needs.

Given the large population of Hetauda, it is necessary to determine an appropriate sample size that will provide reliable and generalizable results. The sample size was calculated using the formula for an above population proportion as provided by (Israel, 1992):

$$S = \frac{\frac{z^2(p)(1-P)}{e^2}}{1 + \frac{z^2(P)(1-P)}{e^2 N}}$$

Where,

S= Sample size for unknown population

z= Z-score (1.96) determined on confidence level of 95%)

P= Population proportion (assumed to be 50% =0.5)

e= Margin of error 0.05

N = Population Size

Calculation from formula;

$$S = \frac{\frac{1.96^2*0.5*(1-0.5)}{0.05^2}}{1 + \frac{1.96^2*0.5*(1-0.5)}{0.05^2*193576}}$$

$$\sim 384$$

Therefore, the minimum sample size required for the study is 384 respondents. This ensures sufficient statistical power to detect meaningful relationships and insights from the data collected.

A stratified random sampling method was used to ensure that the sample is representative of Hetauda's diverse population. Stratification was based on key demographic factors such as age, gender, and length of residency, capturing the perspectives of different demographic groups proportionately and balancing representation in the sample. To further enhance representativeness, efforts were made to include respondents from various socio-economic backgrounds and different residential areas within Hetauda. This comprehensive approach ensured that the sample accurately reflected the diverse population of Hetauda, capturing the perspectives of different age groups, genders, and education levels, and thereby providing robust insights into the major urban issues faced by residents and their views on potential smart city solutions.

The questionnaire was structured into four main sections to systematically gather data:

Demographics: This section collected information on respondents' age, gender, education level, occupation, and length of residency in Hetauda. This data is crucial for analyzing trends and patterns in responses based on different demographic groups.

Urban Issues: Respondents were asked to identify and rank key urban problems in Hetauda, such as traffic congestion, waste management, water supply, public safety, and air pollution. Both multiple-choice and ranking questions were employed to assess the significance and priority of these issues.

Smart City Solutions: This section explored residents' preferences for various smart city initiatives. Questions focused on technologies and smart solutions. Multiple-choice and ranking questions were used to determine the most preferred solutions among residents.

Open-ended Questions: To capture deeper insights and suggestions, respondents were given the opportunity to provide additional comments on urban issues and potential solutions. This qualitative data enriched the understanding of residents' views and highlighted areas that may not have been covered in the structured questions.

To reach a broad and diverse audience, the questionnaire was distributed through multiple channels:

- Online Distribution: The survey was posted on Google Forms and shared via email and social media platforms such as Facebook, WhatsApp, Viber, and E-mail. This method targeted tech-savvy residents and facilitated easy access and quick response.
- Offline Distribution: Printed copies of the questionnaire were distributed in public locations such as community centers, markets, and government offices. This approach ensured participation from residents with limited internet access or those who prefer paper-based surveys.

Ethical considerations were a critical aspect of this study to ensure the privacy and confidentiality of all respondents. Participants were fully informed about the study's purpose, the voluntary nature of their participation, and their right to withdraw at any time without any consequence. Informed consent was obtained from all participants before they completed the questionnaire. All collected data were anonymized and securely stored to protect the respondents' privacy and confidentiality.

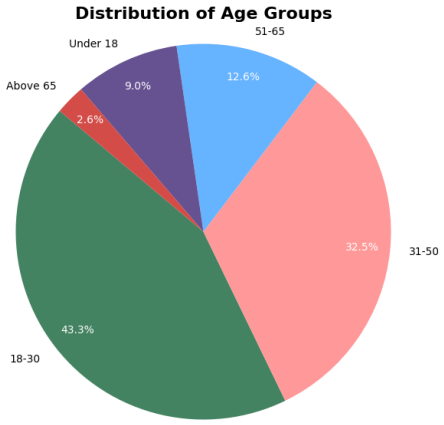
RESULTS

This section presents the findings of the study, focusing on the key urban issues faced by Hetauda residents and their preferred smart city solutions for sustainable development. The results are analyzed and discussed in relation to the research question. Data visualization techniques, such as charts and graphs, are employed to illustrate the findings clearly and effectively.

The data on age, gender, education level, occupation, and length of residency in Hetauda were analyzed and are presented as:

Figure 1

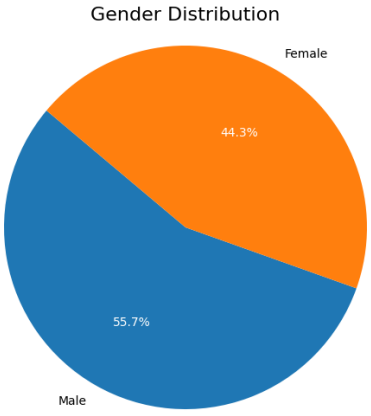
Distribution of Age Groups



The age distribution among the 388 respondents reveals that the largest group is aged 18-30, accounting for 43.3% (168 respondents), followed by the 31-50 age group at 32.5% (126 respondents). The 51-65 age group constitutes 12.6% (49 respondents), while those under 18 make up 9.0% (35 respondents), and those above 65 represent 2.6% (10 respondents). This skew towards younger participants suggests that the perspectives of Hetauda's youth and middle-aged residents are well-represented, highlighting their significant role in urban development discussions. The lower participation from older adults and minors indicates the need for further engagement strategies to ensure their views are also considered in smart city planning.

Figure 2

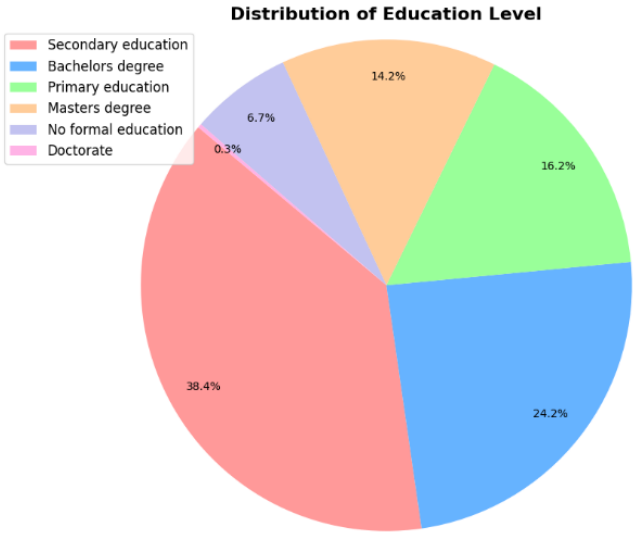
Gender Distribution



The gender distribution of the survey respondents is illustrated in the chart. The sample included 216 male respondents and 172 female respondents, reflecting a near-balanced representation of gender in the study.

Figure 3

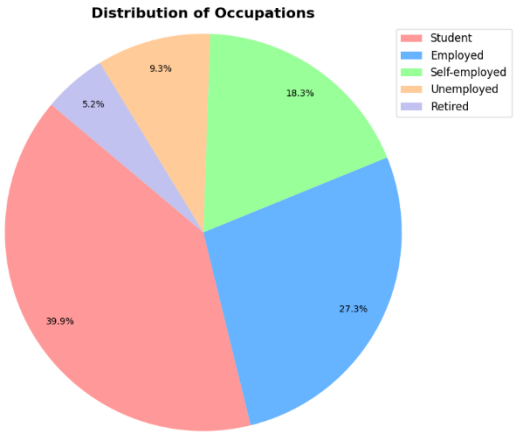
Distribution of Education Level



The education levels of the 388 respondents show a wide range, with the majority having completed secondary education (38.4%, 149 respondents) and a significant portion holding a bachelor's degree (24.2%, 94 respondents). Those with primary education account for 16.2% (63 respondents), while master's degree holders make up 14.2% (55 respondents). A smaller group has no formal education (6.7%, 26 respondents), and only one respondent has a doctorate (0.3%). This diverse educational background implies that residents with higher education levels, such as bachelor's and master's degrees, might lean towards supporting advanced technological and sustainable solutions to urban challenges. Meanwhile, individuals with primary or secondary education may focus on more immediate and practical urban improvements. This variety in educational perspectives ensures a comprehensive understanding of community needs, critical for designing inclusive and effective smart city strategies in Hetauda.

Figure 4

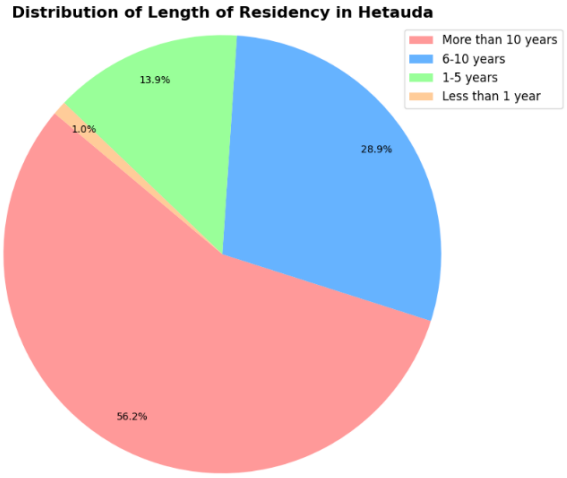
Distribution of Occupations



The largest occupational group is students, comprising 39.9% of the respondents. This significant representation suggests that the younger population, likely with a future-oriented perspective, is highly engaged in the conversation about urban development. Employed individuals, who make up 27.3%, and the self-employed, at 18.3%, bring practical concerns related to their work and business environments, potentially emphasizing issues like infrastructure, transportation, and economic opportunities. Unemployed respondents (9.3%) might focus on the availability of job opportunities and social services, while retirees (5.2%) could prioritize community facilities and healthcare services. This occupational diversity ensures a broad array of perspectives on urban issues and smart city solutions, reflecting the varied needs and priorities of Hetauda's residents.

Figure 5

Distribution of Length of Residency in Hetauda

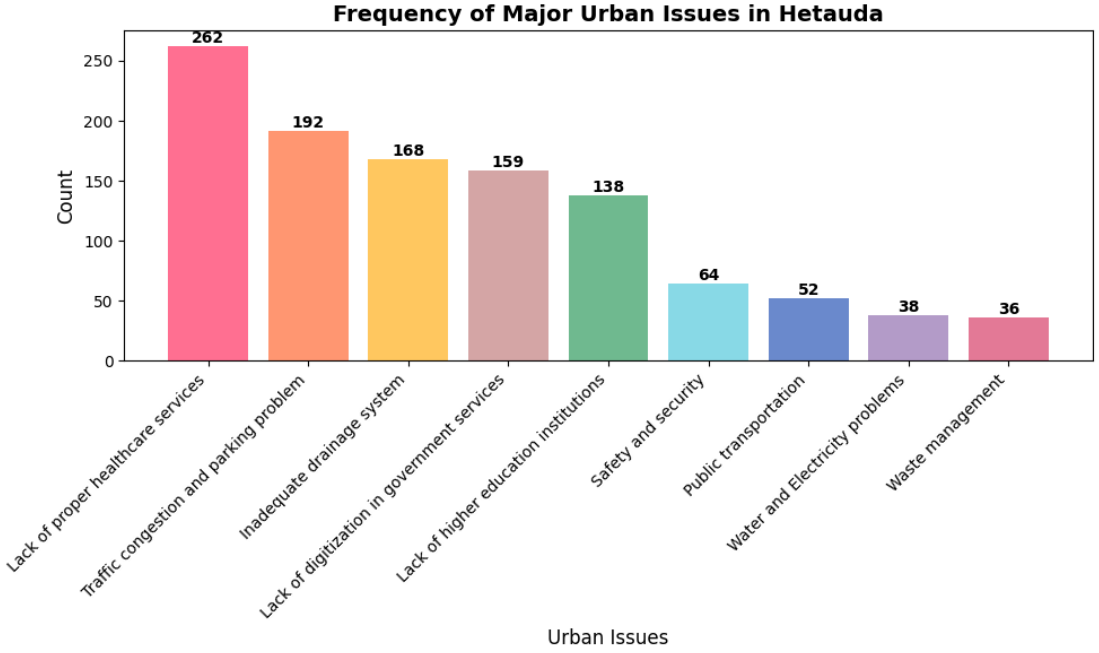


The majority of respondents have lived in Hetauda for over 10 years (56.2%, 218 respondents), indicating a strong presence of long-term residents. Those residing for 6-10 years make up 28.9% (112 respondents), while 13.9% (54 respondents) have lived there for 1-5 years. Only 1.0% (4 respondents) are newcomers with less than 1 year of residency. Long-term residents are likely more concerned with persistent urban challenges and advocate for sustainable, long-term improvements in infrastructure and services. In contrast, newer residents tend to prioritize immediate and adaptable urban solutions, focusing on ease of integration and modern facilities. This blend of perspectives highlights the need for development strategies in Hetauda that address both enduring and emerging urban issues.

The survey identified several key urban issues that residents face in Hetauda. These issues were analyzed using multiple-choice responses and ranking data.

Figure 6

Frequency of Major Urban Issues in Hetauda



The survey results indicate that residents of Hetauda face several critical urban challenges. The most commonly reported issue is the lack of proper healthcare services, noted by 262 respondents. This highlights significant concerns regarding the availability and quality of medical care in the city. Traffic congestion and parking problems are also prevalent, with 192 respondents identifying these as major issues, suggesting considerable frustration with the city's transportation infrastructure. Inadequate drainage systems were mentioned by 168 respondents, pointing to recurring problems with water management and flooding that disrupt daily life.

Additionally, 159 respondents highlighted the lack of digitization in government services, emphasizing the need for more efficient and accessible public services. The absence of higher education institutions like universities, engineering colleges was a concern for 138 respondents, indicating a demand for more advanced educational facilities to support local academic and professional growth. Safety and security concerns were noted by 64 respondents, reflecting worries about personal and community safety that can significantly affect residents' quality of life.

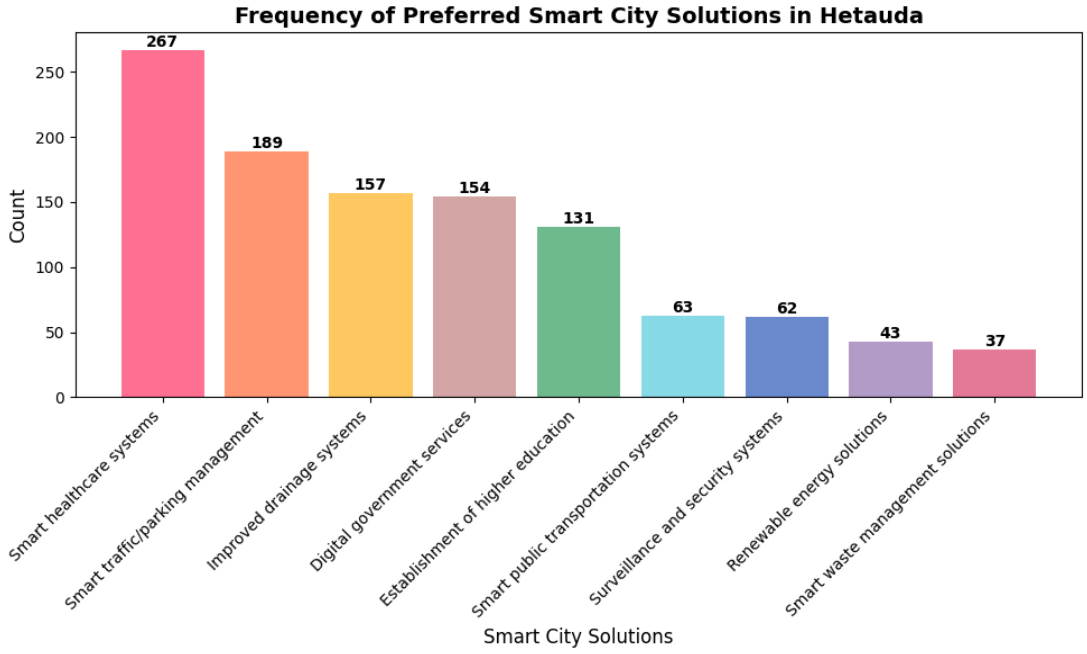
Other notable issues include public transportation, identified by 52 respondents, which points to challenges in mobility and accessibility within the city. Water and electricity problems were highlighted by 38 respondents, indicating areas where basic utilities require improvement. Finally, waste management issues were reported by 36 respondents, underscoring the need for better waste disposal and recycling services.

These findings reflect critical areas for development in Hetauda and align with common urban challenges identified in previous studies. Addressing these issues is essential for enhancing the quality of life and ensuring sustainable urban growth. Improvements in healthcare services and educational institutions would benefit long-term residents, while enhancements in traffic management, public services, and utilities could better accommodate the needs of newer residents. These insights are crucial for aligning the city's development plans with the diverse needs and priorities of its population.

Respondents were asked to indicate their preferred smart city solutions that would most benefit Hetauda.

Figure 7

Frequency of Preferred Smart City Solutions in Hetauda



The survey results highlight several key smart city solutions that Hetauda residents consider essential for improving their quality of life and promoting sustainable urban development. The most preferred solution, favored by 267 respondents, is the implementation of smart healthcare systems. This indicates a significant demand for enhanced medical services. The city should focus on deploying telemedicine services to increase access to healthcare, integrating electronic health records to streamline patient information, and establishing smart hospitals equipped with advanced medical technologies. Additionally, a public health surveillance system could play a critical role in early detection and management of health issues, thereby improving overall public health.

Traffic congestion and parking issues are also major concerns, with 189 respondents prioritizing smart traffic and parking management systems. To address these challenges, the city can introduce intelligent traffic signals that adjust in real-time based on traffic conditions, automated payment systems for parking, and parking guidance systems that direct drivers to available spaces. Developing smart parking lots and garages with sensor-based monitoring can further enhance traffic flow and reduce congestion.

Improved drainage systems were identified as a critical need by 157 respondents, pointing to recurring issues with water management and flooding. The city should consider implementing real-time monitoring of drainage systems using IoT sensors, which can provide early warnings for potential blockages and flooding. Predictive maintenance and automated control systems can optimize water flow management, helping to prevent disruptions caused by inadequate drainage.

Digital government services are another priority, with 154 respondents highlighting the need for more efficient and accessible public services. The development of e-government portals offering a wide range of services online, such as permit applications and digital payments, can significantly enhance service delivery. By making government services more accessible and transparent, residents will experience improved efficiency in their interactions with the public sector.

The establishment of higher education institutions, as indicated by 131 respondents, is essential for supporting local academic and professional growth. To meet this demand, the city should consider opening new universities or engineering colleges that focus on both undergraduate and graduate programs. Investing in smart campus infrastructure, including smart libraries with digital resources, research and innovation hubs equipped with the latest technology, and smart security systems, will ensure a modern and secure learning environment.

These new institutions should offer programs aligned with the city's development goals and workforce needs, providing specialized courses in engineering, technology, and other critical fields. By doing so, Hetauda can cultivate a skilled workforce that contributes to the city's sustainable development and economic growth.

Smart public transportation systems were favored by 63 respondents, underscoring the importance of improving mobility and accessibility within the city. Enhancing public transportation can be achieved by implementing real-time transit tracking systems, dynamic route guidance, and introducing electric and hybrid buses to reduce emissions. Additionally, bicycle-sharing programs and infrastructure upgrades can promote eco-friendly transportation options.

Safety and security concerns were noted by 62 respondents, emphasizing the need for robust surveillance and security systems. The city should install smart surveillance cameras with advanced video analytics for real-time monitoring, smart lighting and environmental sensors to enhance visibility and safety in public areas, and utilize drones for surveillance and emergency response.

Renewable energy solutions, selected by 43 respondents, are vital for promoting sustainable development. The city should invest in solar power systems for public and residential use, develop charging infrastructure for electric vehicles (EVs), and implement water conservation technologies. Policy and regulatory support will be essential to encourage the adoption of these green technologies.

Lastly, smart waste management systems, preferred by 24 respondents, are crucial for addressing waste disposal and recycling issues. Deploying IoT sensors to monitor waste levels, optimizing waste collection routes, and implementing waste sorting and recycling programs can improve waste management practices. Data analytics can be utilized to enhance efficiency, while public awareness campaigns can educate residents on proper waste disposal and recycling methods.

Finally, the preferred smart city solutions identified by Hetauda residents highlight the need for improvements in healthcare, transportation, public services, education, security, renewable energy, and waste management. By implementing these targeted initiatives, the city can significantly enhance the quality of life for its residents and promote sustainable urban development.

The analysis of the Likert scale questions reveals that residents generally perceive smart city solutions as important, with a mean value of 3.73 indicating moderate to high importance,

and a high willingness to adopt digital and smart technologies, evidenced by a mean of 4.16. Awareness of the concept of smart cities is relatively low, with a mean of 2.86, suggesting the need for educational campaigns. Residents are moderately optimistic about the potential for smart city solutions to improve the quality of life, with a mean of 3.23, and show moderate confidence in the local government's capability to implement these projects, with a mean of 3.25. Additionally, there is a high willingness to participate in initiatives promoting smart city solutions, reflected by a mean of 3.72, and a strong belief in the role of smart city technologies in achieving sustainable development, with a mean of 3.91. These findings indicate a generally positive attitude towards smart city initiatives, highlighting the importance of increasing awareness and demonstrating tangible benefits to foster greater community support and engagement.

CONCLUSION

The study on sustainable smart city development in Hetauda highlights significant urban challenges and residents' preferences for smart city solutions. The research reveals that the most pressing urban issues include inadequate healthcare services, traffic congestion, and insufficient drainage systems. Additionally, the lack of digitization in government services, absence of higher education institutions, and safety concerns were identified as critical areas needing attention.

The demographic analysis shows a diverse representation of Hetauda's population, with a significant proportion of younger residents and students actively engaged in the urban development discourse. This demographic diversity ensures a broad range of perspectives, contributing to a comprehensive understanding of the community's needs and priorities.

Preferred smart city solutions identified by residents include the implementation of smart healthcare systems, advanced traffic and parking management, and improved drainage systems. The demand for digital government services, higher education institutions, and enhanced public transportation further underscores the need for a multifaceted approach to urban development. The study also indicates a high level of willingness among residents to adopt smart technologies and participate in initiatives promoting sustainable development.

Overall, the findings emphasize the importance of a resident-centric approach in developing smart city strategies. By addressing the unique needs and preferences of Hetauda's populace, policymakers can ensure that smart city initiatives are inclusive, effective, and sustainable, ultimately enhancing the quality of life for all residents.

IMPLICATION

This study provides valuable insights into the unique challenges and opportunities associated with sustainable smart city development in Hetauda, offering a resident-centric perspective that can inform future urban planning initiatives. By highlighting the specific needs and priorities of the community, such as improved healthcare, traffic management, and digital government services, the research underscores the necessity of tailoring smart city strategies to local contexts. The findings emphasize the critical role of public engagement, inclusive policymaking, and capacity building in ensuring the success of smart city projects. Additionally, the study serves as a reference for other underdeveloped regions aiming to balance technological integration with social and environmental sustainability, showcasing the importance of aligning developmental efforts with the lived realities of residents.

RECOMMENDATION

This study investigates challenges faced in achieving sustainable smart city development through a resident-centric case study in Hetauda, Nepal. The focus is on understanding resident perspectives on the integration of technological advancements with social and environmental sustainability goals. The research employs qualitative methods, including interviews and surveys, to gather resident experiences and concerns. By centering the resident voice, the study aims to identify key issues that must be addressed to ensure smart city initiatives promote a truly sustainable urban future for Hetauda.

Following are the recommendation of this study:

- **Resident engagement:** The study suggests for establishing mechanisms for ongoing resident participation in Hetauda's smart city development. People are mostly unaware about the facilities and policies applied by the Municipality. Therefore, the programs and activities should be launched to engage the city people to literate the municipal plans and policies. This could involve citizen advisory boards, public forums, or online surveys to ensure resident voices are heard throughout the process.
- **Prioritizing resident needs:** The demand of the public is constantly increasing and they dream for the facilitated city for their comfort. The study recommends prioritizing smart city initiatives that directly address resident concerns. This could involve focusing on areas like waste management, health services, traffic congestion, or improving access to public services.
- **Social and environmental focus:** The study recommends to emphasize the importance

of integrating social and environmental considerations into technological solutions. This could involve promoting green technologies, creating smart grids for renewable energy, or using technology to improve air quality and public health.

- **Addressing resident anxieties:** The study likes to suggest some measures to address resident concerns about their issues such as health services, public libraries, age care center, data privacy, affordability, or potential disruptions caused by smart city initiatives. Transparency and clear communication plans could be crucial.
- **Capacity building:** The study highlights the need to build capacity within the local government and community to manage and maintain smart city technologies. This could involve community involvement programs, training programs or partnerships with tech companies.

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