Journal of Infrastructure, Policy and Development 2024, 8(8), 6300.
https://doi.org/10.24294/jipd.v8i8.6300

Article

Towards smarter and greener cities: Harnessing AI and green technology for urban sustainability

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CITATION

Khlie K, Benmamoun Z. (2024). Towards smarter and greener cities: Harnessing AI and green technology for urban sustainability. Journal of Infrastructure, Policy and Development. 8(8): 6300. https://doi.org/10.24294/jipd.v8i8.6300

ARTICLE INFO

Received: 9 May 2024
Accepted: 28 May 2024
Available online: 21 August 2024

Abstract: In the face of growing urban problems such as overcrowding and pollution, we urgently need innovative ideas to build smarter and greener cities. Current urban development strategies often fail to address these challenges, revealing a significant research gap in integrating advanced technologies. This study addresses these gaps by integrating green technologies and artificial intelligence (AI), studying its impact on achieving smart and sustainable habitats and identifying barriers to effective use of these technologies, considering local variations in infrastructural, cultural, and economic contexts. By analyzing how AI and green technologies can be combined, this study aims to provide a vision that can be used to improve urban development planning. The results emphasize the significance of environmental responsibility and technological innovation in the development of sustainable urban environments and provide practical recommendations for improving the overall quality of life in cities through planning and urban planning.

Keywords: artificial intelligence; smart cities; urbanization; sustainability

1. Introduction

Large global cities are increasingly facing complex issues of population growth, resource scarcity, and environmental impacts. They are actively seeking for effective solutions to forge smart sustainable cities. In this context, this research seeks to establish the possibilities of applying Artificial Intelligence (AI) and Green Technology in the development of smart cities. Therefore, this study explores the advantages and disadvantages, opportunities and obstacles influencing smart cities. The aim of the work is to contribute to the discourses on urbanization and technological dimensions of creating smart and sustainable urban environments to further the enhanced formation of sustainable and well-structured cities.

From the international development perspectives and the global rapid urbanization, solving problems like traffic congestion, pollution, and industrial oppressions become a top priority as the world shifts towards the forming of mega cities. Classical planning methods cannot address these challenges. thereby necessitating the exploration of advanced technological solutions. AI, with its capabilities in handling and analyzing vast amounts of data, building intricate prediction models, and automating many procedures, offers substantial potential to revolutionize urban development. At the same time, green technologies including renewable energy, energy efficiency and sustainable building practices are needed to clean up the urban environment on the integration of these technologies promises to create smarter, more sustainable cities that are better equipped to meet today's urban challenges.

The aim of the paper is to explore how green technologies and artificial intelligence (AI) can work together to better support the sustainability of smart communities. The study aims to provide valuable information for policy makers and policy makers by analyzing potential benefits, challenges and geographical differences This includes benefits such as infrastructure, increased quality of life, environment reduced accessibility and potential barriers such as technological gaps, economic barriers and geographical or regional preparedness for urban development.

Local differences strongly influence the likelihood of implementing green AI technologies. Understanding local differences is essential to the development of tailored strategies that are more feasible and more accurately implemented.

The research aims to predict how specific regional traits impact the deployment of AI and green technology, offering valuable input for designing region-specific policies and action plans.

For this, the rest of the paper is structured as follows: Section 2 elaborates on the existing literature and identifies the gap. Section 3 provides the proposed methodology of the study followed by the findings and discussion in section 4. The implications and conclusion are given in section 5.

2. Literature review

2.1. Smart cities development key variables

The advancement of smart towns is affected by several variables. According to the literature, the most important factors include apparent advantages, challenges in execution, the government's role, community engagement, and crucial AI applications (Al-Saadi and Khudari, 2024). It is expected that in the conduct of the study, the external locals will give recommendations on the local dynamics of AI and green technologies on the creation of smart and sustainability cities.

Another variable that can also highly influence smart and sustainable development of urban areas is the location of development centers (Alanazi and Alenez, 2024). A thorough summary of earlier studies provides insights into how various regions have tackled the idea of smart cities (Ullah et al., 2020). Diversity brings in variances in solutions, limitations, and achievements as per geographical regions. Studying these variables will ensure a comprehensive and well-informed examination of the complex field of smart city development (Muhammad et al., 2019). This includes setting the foundation for future talks about the potential advantages, difficulties, government involvement, community engagement, and important AI applications.

The dependent variables include the possible gains in AI and green technologies with regards to the development of smart cities and possible issues in the implementation of the same, which addresses the barriers which hinder the implementation of AI and green technologies as well as its variable characteristics—dynamics of AI and green technology adoption (Agarwal et al., 2024). The "government's role in the development process" is another essential factor that clarifies the policy implications (Bin-Qiang et al., 2024). "Community engagement" is emphasized for its social component, highlighting the element of participation.

Usage of AI is also considered in the literature as an essential factor for smart cities development. **Figure 1** summarizes some of the key applications of AI in smart city development (Golubchikov and Thornbush, 2020).

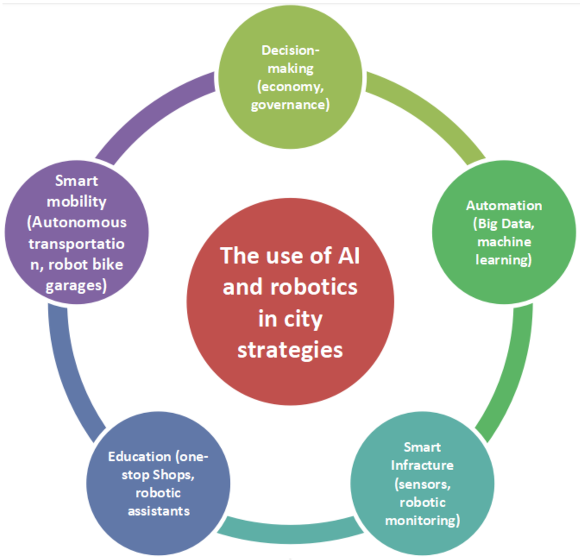

Figure 1. Usage of AI in smart city development.

There is a strong correlation between all the smart cities development factors that we discussed above. As shown in **Figure 2**, The development area is the dependent variable in the user-centric conceptual model. It is impacted by independent variables like the possible advantages of artificial intelligence (AI) and green technology, implementation challenges, the role of the government, community engagement, and important AI applications for smart town development. This model suggests that the relationships between these significant factors determine user experiences and preferences within a particular region (Nikitas et al., 2020). This model offers a user-centric perspective by outlining the connections between the region and the various factors influencing it. This makes it easier to conduct a thorough analysis of the user's involvement in the creation of smart cities.

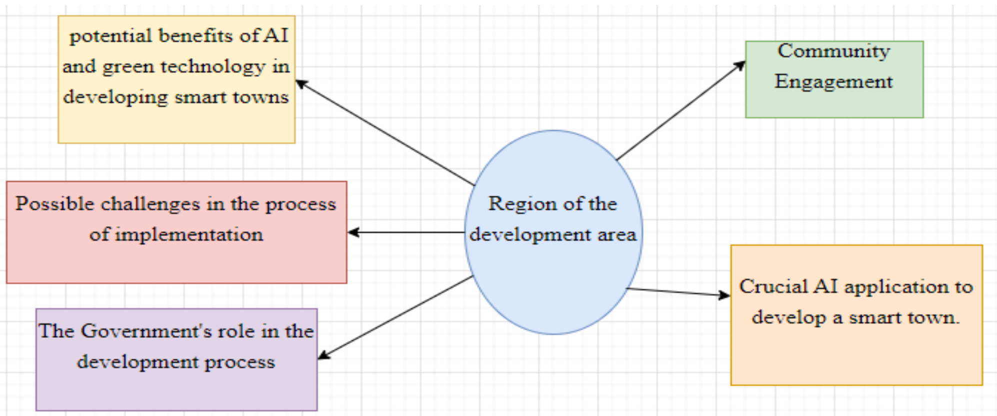

Figure 2. Conceptual model.

2.2. Smart cities solutions

Many solutions that address different aspects of urban functionality have come up in the field of smart city development. One of the solutions is the Smart Traffic Management that often includes adaptive control systems, real-time monitoring, and advanced data analytics (Alanazi and Alenezi, 2024). Theories that help explain how data might be effectively used for traffic optimization, resulting in more smooth transportation within urban areas, include the information flow theory.

Another sustainable solution would be effective waste management through the application of sensor technology, circular economy models, and sustainable practices (Ortega-Fernández et al., 2020). The circular economic model prioritizes decreasing waste and increasing resource efficiency, which is consistent with the overarching objectives of smart and sustainable cities.

In Smart cities, the optimization of “energy consumption” is consistent with ideas such as smart grid models and demand response theory. This contributes to improving the overall energy efficiency in cities. This strategy promotes the integration of intelligent energy distribution management, waste reduction, and renewable energy (Hussin et al., 2024).

Public education and community policing are often referred to as a smart city approach because they place a high value on community engagement and use of technology to improve public safety. Moreover, it educates communities residents to prevent crime (Kaginalkar et al., 2021). This situation can also benefit from the use of the broken window theory, which emphasizes the importance of solving smaller challenges to solve larger challenges (Wang et al., 2021).

3. Methodology

Understanding the different conditions created by different geographies is the basis for design in any development project (Khlie et al., 2013). The process of integrating AI and green technologies to build smart cities is heavily influenced by the requirements and impacts at different locations. Different assumptions are applied in an educated guess of possible local impacts of their specific characteristics on the successful integration of innovative technologies and sustainable practices.

Understanding the unique characteristics each sector has, including socio-economic, cultural, and infrastructural sectors, facilitates the development of comprehensive overviews of potential constraints and possibilities (Ahmad et al., 2021; Serrou et al., 2016). Theories suggest that areas with stronger technology connections and higher levels of environmental awareness may have an easier time adopting green technologies. On the other hand, the use of AI in urban planning may be difficult in areas where there is no technological development or income gap (Ahmad et al., 2022).

The study anticipates and methodologically tests hypotheses about the effects of regional conditions on smart town technology adoption by formulating hypotheses. Adopting a dynamic cycle makes it easier to establish a customized and regionally relevant understanding, which in turn creates more focused and effective ways to drive AI and technology green together in a smart city effort.

This research methodology is based on research themes and quantitative analysis. A 52-person population survey methodology is provided to formally assess the objectives of the study. The survey attempts to systematically collect statistical data on the identified variables. A purposive sampling method will be used to select participants, ensuring representation from all relevant populations. A well-designed survey was used to collect quantitative data so that statistical analysis could identify trends, relationships, and patterns. This strategic decision unequivocally discusses the place and role of quantitative data specifics in the relations between the changes associated with AI smart cities and green technologies.

By design, the data gathering method in this study is systematic and incorporates both primary and secondary sources. gain preliminary knowledge on the characteristics of the variables in question; Quantitative data in this research is collected from 52 purposively sampled participants. The survey tool allows for an examination of surveying that is producing statistics that has preset questions for reliability. The secondary data in the present research are collected mainly from reports, case studies and available literature (Humayun et al., 2020). Using this two-step computation process, the results are squared to make the study more reliable and accurate. These are theoretical and ethical principles that ensure that the participants' privacy and that prior information is used appropriately. The data collection technique's goal is to offer a broad perspective on the range of factors that may influence the development of smart cities that use artificial intelligence and sustainable technologies.

The specific technique that the data analysis incorporated employed an accurate use of statistics and other quantitative tests used for the study included sample size which was 52 responses. The *t*-test will be used to compare variables and identify if variables differ significantly, this will help to uncover the advantage and disadvantage in the incorporation of Artificial Intelligence and Green Technologies on the development of smart cities While the regression analysis will assist in analyzing the relation between variables to help identify the characteristics associated with the development of smart cities. It verifies reliability of the survey responses collected; the reliability testing boosts validity of the survey (Chang et al., 2020). Relational current data presents relationships between two or more variables and correlation test aids in developing a better estimate about their relationships. In general, the goals of the assessment's tools depending on the size of the models under analysis are to make several crucial conclusions and to paint an informative picture in smart urban development studies.

Data collection research employs an objective sampling technique, the quantitative study with 52 participants to explore the application of AI Green Technologies in Building Smart Cities Questionnaire devised with an express intent to develop data set and data analysis, Descriptive theoretical analysis shows potentials for improvement.

At the same time, the qualitative concept is reinforced by extensive literature reviews (Park et al., 2019; Schürholz et al., 2020). The process is guided by ethical concerns of anonymity of participants and responsible use of data. The goal of this methodological project is to develop a comprehensive understanding of the relationship between community characteristics, community engagement, government involvement, and AI adoption in designing smart cities to ensure that the complexity and diversity of urban challenges are addressed, there will be a multifaceted, effective, and sustainable urban development strategy.

4. Results and discussion

This section may be divided by subheadings. It should provide a concise and precise description of the experimental results, their interpretation, as well as the experimental conclusions that can be drawn.

4.1. Results analysis

4.1.1. *T*-test

The provided information in **Table 1** presents responses from 52 members on different perspectives connected with artificial intelligence and Green Technology in smart town improvement. The average familiarity with artificial intelligence and green technology is 3.25, proposing a moderate degree of awareness. Members express a conviction (normal score of 3.12) that it is the huge responsibility of the government to develop these innovations. The concerns and difficulties (normal score of 2.13) and differing discernments on local area commitment (normal score of 2.56) feature regions for thought in cultivating sustainable town development.

Table 1. One sample statistic—*T* test result from SPSS.

One-Simple Statistics				
	N	**Mean**	**Std. Deviation**	**Std. error mean**
1) What is your age group?	52	2.62	1.207	0.167
2) What is your gender?	52	1.65	0.653	0.091
3) What is your highest degree?	52	2.17	1.061	0.147
4) In which region do you reside?	52	3.85	1.334	0.185
5) How familiar are you with the concepts of AI and green technology?	52	3.25	1.312	0.182
6)What potential benefits do you think AI and green technology could bring to smart and sustainable towns?	52	2.94	1.110	0.154
7) What concerns or challenges do you foresee in the implementation of AI and green technology in smart towns?	52	2.13	1.048	0.145
8) Do you believe that government should play a significant role in promoting and implementing AI and green technology in town development?	52	3.12	1.381	0.192
9) How important do you think community engagement is the development and implementation of smart and sustainable town initiatives?	52	2.56	1.602	0.222
10) Which AI applications do you think are most crucial for the development of smart towns?	52	2.38	1.270	0.176

The one-sample *t*-tests in **Table 2** show massive differences in respondents' perceptions across different parts of AI and green technology in smart town development. Members display an essentially higher mean age group ($t = 15.624$) and a strong belief in the government's role ($t = 16.264$) contrasted with the hypothetical test value of 0. These outcomes highlight distinct attitudes and convictions inside the surveyed group, focusing on the significance of figuring out different viewpoints for effective smart, and sustainable town development.

Table 2. One sample test from SPSS.

Test value = 0					
	T	**df**	**Sig. (2-tailed)**	**Mean difference**	**95% confidence interval difference lower**
1) What is your age group?	15.624	51	0.000	2.615	2.28
2) What is your gender?	18.254	51	0.000	1.654	1.47
3) What is your highest degree?	14.765	51	0.000	2.173	1.88
4) In which region do you reside?	20.79	51	0.000	3.846	3.47
5) How familiar are you with the concepts of AI and green technology?	17.867	51	0.000	3.25	2.88
6)What potential benefits do you think AI and green technology could bring to smart and sustainable towns?	19.116	51	0.000	2.942	2.63
7) What concerns or challenges do you foresee in the implementation of AI and green technology in smart towns?	14.682	51	0.000	2.135	1.84
8) Do you believe that government should play a significant role in promoting and implementing AI and green technology in town development?	16.264	51	0.000	3.115	2.73
9) How important do you think community engagement is the development and implementation of smart and sustainable town initiatives?	11.516	51	0.000	2.558	2.11
10) Which AI applications do you think are most crucial for the development of smart towns?	13.536	51	0.000	2.385	2.03

4.1.2. Regression results

The regression coefficients in **Table 3** show the effect of different elements on the dependent variable, "In which region do you reside?" For this variable, respondents' familiarity with AI and green technology (B = 0.001) and their impression of expected benefits (B = −0.135) and concerns (B = −0.074) have negligible effect. Faith in the government's role (B = 0.166) and opinions on the importance of community engagement (B = −0.014) show slight impacts, while the apparent criticalness of simulated AI applications (B = 0.253) makes a fairly more impressive difference.

Table 3. Coefficients.

Coefficients (Dependent variable 4: In which region do you reside)					
	Unstandardized *B*	**Coefficients Std. Error**	**Standardized Coefficients Beta**	***t***	**Sig.**
5) How familiar are you with the concepts of AI and green technology?	3.312	1.006	-	3.293	0.002
6)What potential benefits do you think AI and green technology could bring to smart and sustainable towns?	0.001	0.146	0.001	0.007	0.994
7) What concerns or challenges do you foresee in the implementation of AI and green technology in smart towns?	−0.135	0.181	−0.112	−0.746	0.460
8) Do you believe that government should play a significant role in promoting and implementing AI and green technology in town development?	0.166	0.141	0.172	1.177	0.246
9) How important do you think community engagement is the development and implementation of smart and sustainable town initiatives?	−0.014	0.119	−0.017	−0.118	0.907
10) Which AI applications do you think are most crucial for the development of smart towns?	0.253	0.160	0.241	1.582	0.121

The coefficient connections and covariances give detailed insight into the connections among the factors. The apparent significance of AI applications for smart towns corresponds potentially with convictions in expected benefits (r = 0.355). On the other hand, there is a negative connection between confidence in the government's role and the perceived importance of AI applications (r = −0.208). Covariances demonstrate the level of fluctuation in the factors, with positive covariances recommending a synchronous increment, while negative covariances propose a backward relationship. These outcomes offer a detailed comprehension of the interconnected and mentalities inside the survey reactions.

The ANOVA results in **Table 4** show the general meaning of the regression model in predicting the dependent variable, "In which region do you reside?" The regression model, which includes indicators like the impression of AI applications, community engagement, concerns, familiarity with AI, confidence in the government's role, and expected benefits, doesn't essentially make sense of the difference in participant's response (F = 1.187, p = 0.331). This proposes that the included indicators don't altogether contribute to anticipating the region of residence in this survey.

Table 4. ANOVA results.

ANOVA[a]					
Model	**Sum of Squares**	**df**	**Mean Square**	***F***	**Sig.**
Regression	12.399	6	2.067	1.187	0.331[b]
Residual	78.370	45	1.742		
Total	90.769	51			

a) Dependent Variable: 4) In which region do you reside?
b) Predictors:
1) Which AI applications do you think are most crucial for the development of smart towns?
2) How important do you think community engagement is in the development and implementation of smart and sustainable town initiatives?
3) What concerns or challenges do you foresee in the implementation of AI and Green Technology in smart towns?
4) How familiar are you with the concepts of Artificial Intelligence (AI) and Green Technology?
5) Do you believe that government should play a significant role in promoting and implementing AI and Green Technology in town development?
6) What potential benefits do you think AI and Green Technology could bring to smart and sustainable towns?

Table 5. Model summary.

Model Summary[b]									
					Change Statistics				
Model	***R***	***R* Square**	**Adjusted *R* Square**	**Std. Error of the Estimate**	***R* Square Change**	***F* Change**	**df1**	**df2**	**Sig. *F* Change**
1	0.370[a]	0.137	0.021	1.320	0.137	1.187	6	45	0.330

a. Predictors: (Constant),
10) Which AI applications do you think are most crucial for the development of smart towns?
9) How important do you think community engagement is in the development and implementation of smart and sustainable town initiatives?
7) What concerns or challenges do you foresee in the implementation of AI and Green Technology in smart towns? 5) How familiar are you with the concepts of Artificial Intelligence (AI) and Green Technology?
8) Do you believe that government should play a significant role in promoting and implementing AI and Green Technology in town development?
6) What potential benefits do you think AI and Green Technology could bring to smart and sustainable towns?
b. Dependent Variable: 4) In which region do you reside?

The model summary in **Table 5** gives an outline of the regression model's exhibition in forecasting the dependent variable, "In which region do you reside?" The model shows a modest fit (*R* square = 0.137), demonstrating that the included indicators on the whole record for 13.7% of the change in occupants' regions. The changed *R* square (0.021) adapts to the number of indicators, proposing a restricted improvement in model fit. The *p*-worth of the *F* change measurement (p = 0.331) demonstrates that the noticed changes in the model are not genuinely critical.

The residual statistics in **Table 6** give data about the data between the anticipated and predicted and actual values, "In which region do you reside?" The mean of the residuals of the model predicts the areas precisely. The standard deviation of the residuals (1.240) addresses the changeability in prediction error. The normalized residuals survey the number of standard deviations of every expectation from the mean. The residuals' distribution and qualities assist with evaluating the accuracy of the model and predicted qualities.

Table 6. Residual statistics.

Residuals Statistics					
	Minimum	**Maximum**	**Mean**	**Std. Deviation**	***N***
Predicted Value	2.90	4.75	3.85	0.493	52
Std. Predicted Value	−1.910	1.840	0.000	1.000	52
Standard Error of Predicted Value	0.281	0.653	0.476	0.091	52
Adjusted Predicted Value	2.77	4.91	3.85	0.529	52
Residual	−3.116	2.106	0.000	1.240	52
Std. Residual	−2.361	1.596	0.000	0.939	52
Stud. Residual	−2.454	1.708	−0.001	0.999	52
Deleted Residual	−3.367	2.413	−0.004	1.403	52
Stud. Deleted Residual	−2.607	1.747	−0.004	1.014	52
Mahal. Distance	1.324	11.519	5.885	2.883	52
Cook's Distance	0.000	0.140	0.019	0.024	52
Centered Leverage Value	0.026	0.226	0.115	0.050	52
a) Dependent Variable: 4) In which region de you reside					

As per the reliability test, the reliability statistic, Cronbach's alpha, is 0.247, showing low inner consistency among the things in the study. The low alpha recommends that the overview questions may not dependably measure a basic development based on 7 variables. A higher alpha (more like 1) is the desired one for a reliable scale.

The descriptive statistics in **Table 7** give a detailed of respondents' viewpoints on different perspectives connected with artificial intelligence and green technology in smart town development. In general, members are in their mid-20s to mid-30s, with a slight tendency toward a positive perspective on government contribution. Knowledge of AI and Green Technology is moderate while seeing the advantages and concern's part. Community engagement is considered significant in the process. These measurements offer a summary of the central tendencies and variability in respondents' viewpoints on the surveyed responses.

Table 7. Descriptive statistics.

Descriptive Statistics			
Question	**Mean**	**Std. Deviation**	***N***
1) What is your age group?	2.62	1.207	52
2) What is your gender?	1.65	0.653	52
3) What is your highest level of education?	2.17	1.061	52
4) In which region do you reside?	3.85	1.334	52
5) How familiar are you with the concepts of Artificial Intelligence (AI) and Green Technology?	3.25	1.312	52
6) What potential benefits do you think AI and Green Technology could bring to smart towns?	2.94	1.110	52
7) What concerns or challenges do you foresee in the implementation of AI and Green Technology?	2.13	1.048	52
8) Do you believe that government should play a significant role in promoting and implementing AI?	3.12	1.381	52
9) How important do you think community engagement is in the development of smart towns?	2.56	1.602	52
10) Which AI applications do you think are most crucial for the development of smart towns?	2.38	1.270	52

We used the correlation matrix to uncover the connections between study factors. Significant connections include a positive connection between education level and confidence in government role ($r = 0.402$) and a negative relationship between experience with artificial intelligence and worries about its execution ($r = -0.128$). Critical negative connections arise between the apparent benefits of artificial intelligence and green technology and faith in their significant applications ($r = -0.359$), proposing differing points of view on their effect. These experiences indicate understanding the transaction of sentiments on various parts of smart town advancement.

4.2. Discussion

The findings from the study on the proposed project offer significant details of knowledge from a public point of view. The connections between factors uncover complex connections, such as the compromise between apparent advantages and concerns with AI and green technology. The negative connection between the apparent advantages and the faith in the criticalness of artificial intelligence applications proposes a detailed understanding among respondents, which may be impacted by concerns. The study findings focus on the urgency of tending to metropolitan difficulties through technological innovation, aligning with the surveyed population's acknowledgment of government significance in advancing artificial intelligence and green technology. The review highlights the need to overcome any barrier between innovation-driven approaches and long-term, sustainable urban development, aligning with the study objectives headed to investigate the significance of green artificial intelligence in smart urban areas.

The challenges in the execution process, as recognized in the study, highlight the obstacles to the proposition's goals. The conversation between education and confidence in the government's role recommends that educational drives assume an urgent part in understanding and backing smart and sustainable town improvement. In brief, the summary of discoveries informs and supplements the proposed project, focusing on the significance of tending to public points of view and predictive difficulties in executing green technology and artificial intelligence for reasonable urban development.

5. Conclusion

The study investigated public points of view on AI and green innovation in smart town improvement, uncovering detailed connections between the advantages, concerns, and perspectives toward government roles and community engagement. While respondents perceived expected benefits, concerns affected sees on the significance of artificial intelligence applications. The review highlights the requirement for long-term training and local area commitment techniques to connect research gaps and underscores the vital role of government in manageable urban development. The discoveries add to current information by featuring the complicated variables affecting public thoughts. Designated educational campaigns and local area inclusion drives are suggested.

The survey findings feature different viewpoints on artificial intelligence and green technology in smart town development. While participants recognize the possible advantages, concerns, and difficulties, require careful consideration. The analysis highlights complex connections, proposing a requirement for detailed approaches. The study aligns with these findings, underlining the significance of understanding open insights and addressing complications. Connecting technological arrangements with long-term maintainability and encouraging community engagement is essential. Knowledge from the review enhances the project, supporting the meaning of a thorough, comprehensive methodology for effectively coordinating artificial intelligence and green technology in developing smart and sustainable towns.

The findings highlight the significance of considering diverse viewpoints and difficulties in implementing AI and green technology for smart town improvement. The negative relationship between apparent advantages and belief in essential artificial intelligence applications. Knowledge of the role of government and community engagement underlines all the factors of maintainable urban development. This adds to current knowledge by featuring the complex elements affecting public perceptions and revealing insight into possible implementation processes, directing the policymakers, and scientists towards additional successful systems for the joining of advanced technology in developing smart and sustainable towns.

Specialists need to focus on comprehensive public education and commitment systems to address detailed impressions of artificial intelligence and green innovation. Perceiving the negative connection between apparent advantages and confidence in significant artificial intelligence applications, experts need to understand communication efforts. Emphasizing the role of government and fostering community engagement is fundamental for the effective execution of smart town projects.

Recommendations include designated educational campaigns to connect understanding gaps in AI benefits by addressing concerns. Policymakers need to focus on local area commitment, perceiving its significance. Techniques for advancing artificial intelligence applications need to align with public perceptions. Further exploration can analyze public awareness and acceptance of artificial intelligence and green technology in smart town development.

Despite its comprehensive exploration of the integration of green technology and

AI in the development of smart towns, this article has certain limitations. It primarily focuses on the technological and environmental aspects of urban planning, potentially overlooking the broader context of how these innovations can be harmonized with existing urban planning and development strategies. The study does not delve deeply into the socio-political dynamics, economic policies, or the participatory planning processes that are equally crucial for the holistic development of smart and sustainable urban environments. Future research should aim to address these gaps by investigating the integration of green AI with other urban planning frameworks, examining the interplay between technology, policy, and community engagement to provide a more rounded perspective on sustainable urban development.

Future research needs to investigate designated structures to upgrade public awareness and acknowledgment of artificial intelligence and green technology in smart town advancement. Investigating educational initiatives that address concerns and feature explicit advantages can guide successful correspondence systems. Also, exploring regional factors in discernments and boundaries can direct custom-made approaches. A longitudinal analysis for evaluating the advancing perspectives toward AI applications and the effect of the government's role on public perception can contribute important experiences for sustainable urban development.

Author contributions: Conceptualization, KK; methodology, KK; software, ZB; validation, KK; data curation, ZB; writing—original draft preparation, ZB; writing—review and editing, KK. All authors have read and agreed to the published version of the manuscript.

Conflict of interest: The authors declare no conflict of interest.

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