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Smart Cities and Social Inclusion: Citizen Participation in AI-Assisted Urban Governance

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ABSTRACT

Smart city projects have been rapidly growing and changing how cities are governed, by combining artificial intelligence, data analytics, and digital participation platforms into the decision-making process. But the social benefits of AI in urban governance are not just about being technologically efficient; they are about fostering citizen engagement, inclusion, and transparency. The study investigates the impact of smart city systems and technologies based on AI on social inclusion in urban governance, focussing on digital access, civic participation, participatory processes in decision making, trust in institutions and representation of marginalised groups. The results show that AI support of governance can help in better service delivery, response, and more opportunities for citizen feedback, online, in anticipation, and in real time. The results also indicate that vulnerable communities' participation may be limited due to unequal digital skills, limited access to technology, algorithmic bias, and low trust in institutions at the same time. The study emphasizes that to implement inclusive smart city governance, beyond the technical infrastructure, participatory design, a transparent algorithmic process, digital literacy programmes, and accountable public institutions are needed. The paper concludes that, as a whole, AI can enhance democratic urban governance if it is done in ways that are citizen-centred, ethically driven, and socially inclusive.

KEYWORDS: *Smart Cities, Social Inclusion, Citizen Participation, AI-Assisted Governance, Urban Decision-Making*

INTRODUCTION

The use of Internet of Things (IoT) and data-driven infrastructures and networked technologies in smart cities is supposed to optimize the management of cities and provision of public services with the ultimate goal of realizing a technocentric model of administration (Calzada & Eizaguirre, 2025).Social inclusion is emerging as a pivotal element in the design of these cities and digital transitions must have a public benefit and access for all social groups. But there is an urgent need for research to gain a deeper understanding of the impact of algorithmic systems not just informing, but influencing citizen participation in municipal decision making processes. As participation is widely recognized as a key element of inclusive urban governance, the lack of transparency in AI systems and existing power inequalities often mean civic engagement can be perfunctory, with a need for more comprehensive frameworks to assess its quality, equity and impact in the context of AI-driven cities. (Fontes et al., 2024; Sieber et al., 2024) This study aims to fill this important gap, by analyzing the confluence of algorithmic governance and democratic agency in the processes of policy-making at the city level, in particular, how diverse populations navigate and shape these processes (Kolotouchkina et al., 2024), (Sarafis et al., 2025). This study thus refutes the view that technological applications in the urban decision making process are invariably a good thing. Rather, this shift frequently comes as a "technocracy of trust," where the lack of visibility of automated systems can inadvertently de-incentivize citizens to become passive data subjects but not engaged in democratic processes (Sieber et al., 2024). The risk of focusing on the efficiency of the algorithm vs the legitimacy of the process is a thing to consider in municipal settings, where AI may be used in myriad applications, from passenger demand forecasts to resource management to feedback systems.As more and more municipalities adopt AI in other activities, like forecasting transport demand, managing resources, or even making automatic feedback, the focus tends to fall on the efficiency of the algorithm rather than its legitimacy (Fontes et al., 2024). This imbalance brings up the issue of power disbalance that defines smart city architecture (Sca) and how it is implemented in practice (Calzada & Eizaguirre, 2025). In line with the aforementioned, the notion of a smart city has had a great deal of evolution since its emergence, as it has evolved from a technological and infrastructure-related approach to an understanding that also includes the socio-political dimensions of data-driven urbanism (Calzada & Eizaguirre, 2025). The current smart city policies more and more call for digital transitions to address the long-standing digital divide and make digital infrastructure available for all (Kolotouchkina et al., 2024); while previous smart city concepts were technocratic and one-way, in the new era of smart cities, digital transitions are required to achieve them.

Institutional settings and arrangements to enable citizens to meaningfully engage in governance with AI are not well-established, however (Fontes et al., 2024; Kolotouchkina et al., 2024). However, the complexity of AI and the technical expertise required to take advantage of it are substantial challenges, and the very people that can benefit from urban policy decisions, are those that are the least likely to be able to access it (Fontes et al., 2024; Kolotouchkina et al., 2024). Also, the potential benefits of using AI in civil society, such as natural language processing (NLP) for analysing public feedback and AI-based predictive tools for urban planning, should be explored for the possibility of introducing algorithmic bias, privacy concerns, and perpetuation of inequalities (Sarafis et al., 2025). The rise of these algorithmic systems in making – and even making entirely – municipal decisions raises growing concerns that they may be able to marginalize oppositional voices, or even reinforce inequities (Sieber et al., 2024). In the real world, how much these systems can actually help enable civic deliberation instead of merely acting out simulations of it is thus a critical question (Sieber et al., 2024). This research is intended to gain insight into the challenges and opportunities the AI can address to increase democratic agency, and to develop a more in-depth indicator of the quality, equity and influence of participation in AI-enabled cities.

METHODOLOGY

The integration of AI in urban decision-making process is explored using a multi-method and comparative case study approach, including qualitative analysis of digital participation platforms and semi-structured interviews with urban decision-makers (Luusua et al., 2022).For this investigation, the cities were selected in virtue of their experience in using the technologies of AI: automated translation, predictive resource modelling and automated content moderation were all considered to be vital test-cases for understanding the interaction of humans and algorithmic governance. Alongside the qualitative interviews, a detailed quantitative methodology is followed to analyse the interaction log data from the platform, longitudinal survey data and to create a coherent and multi-faceted evaluation of participative depth, accessibility of the platform and influence of algorithms. Specifically, granular information on interactions with AI is gathered from municipal digital platforms (e.g., session length, frequency), to quantify interactions with various categories of people and systematically identify patterns of people's interactions with AI in decision making processes, along with identifying patterns of digital exclusion (Cortés-Cediel et al., 2023). Meanwhile, valid Likert-scale scores are gathered using standardized, multilingual survey instruments for key subjective concepts like perceived transparency, institutional trust,

algorithmic literacy and procedural fairness, and a geographically and age-diverse and socioeconomically representative sample of residents of cities is surveyed to achieve high internal consistency and to make it possible to compare the results across various urban settings. (Cortés-Cediel et al., 2023; Hatami et al., 2025). It synthesizes the various datasets into a thorough examination of descriptive and inferential statistics, identifying the significant demographic, socioeconomic and technological factors that help to explain the civic agency participation intensity and examining whether a particular algorithmic intervention (e.g., algorithmic model to predict individual participation, automated feedback) is correlated with an increase or decrease in civic agency participation intensity, respectively (Hatami et al., 2025). Furthermore, advanced inequality indices are calculated to present spatial and demographic inequalities in a few urban neighbourhoods, providing an empirical and quantitative dimension to highlight potential systemic inequalities, concerns around data privacy and unexpected marginalized population groups in the urban management process of AI adoption (Bruno et al., 2024). In this study, the objective of the research is to systematically link the objective, large-scale behaviour logs to the subjective, attitudinal measures and to try to shed light on the complex connection between technology adoption and outcomes of democracy. The multi-method triangulation has been carefully designed to support and corroborate the qualitative results of semi-structured interviews with the municipalities and to help build a comprehensive, evidence-based assessment of the value added by AI for urban governance, and to whom and to whom it does not.This multitrack triangulation is thoughtfully designed to support and substantiate the lessons learnt from the semi-structured municipal interviews for making a comprehensive and evidence-based assessment of the value and/or lack of value of AI for urban governance to the democratic process and to which groups. To tackle the possibility of other factors influencing the digital divide, the study also features sound sensitivity analysis and robustness tests, which help to capture the complex realities of digital divide at the intersection of multiple dimensions of contemporary urban governance and to yield actionable, policy-relevant empirical claims. These methodological needs allow for a more complex understanding of the use of algorithmic tools in different governance configurations and the relationship between administrative cultures and local governance structures in their mediation of the use of algorithmic tools (Goldsmith & Yang, 2026). We apply a civic voluntarism framework as a key intermediary between resources and psychological predispositions and civic participation (Jungherr & Rauchfleisch, 2025). In addition to indicators of algorithmic accountability (Heri, 2025) and (Yiğitcanlar et al., 2021), this framework is supported by indicators of the potential of institutional transparency and communicative design to solve possible tensions between maximizing the efficiency of

technology and enhancing democratic values.

RESULTS

The findings show the different ways AI for urban governance was able to engage citizens and their implications on a city and on different social groups. The figure 1 shows that Islamabad had the highest participation score (72) followed by Lahore (64), Multan (61), Karachi (58), Peshawar (55) and Quetta (49). Participation was moderate (59.8) and inclusive engagement was moderate (55.5) indicated by the descriptive indicators in Table 1. The access gap is smallest amongst youth, and greatest amongst those with a disability as illustrated in Figure 2.The highest access gaps were reported by persons with disabilities (27%) and the lowest gap was reported by youth (11%) as shown in Figure 2. Table 2 shows that, besides Internet access, low skills, language barriers, low awareness, and accessibility issues were causative factors in exclusion.

As seen in Figure 3, the engagement rate for AI powered portals continued to increase steadily from 42% in January to 61% in June while the town-halls increased from 38% in January to 46% in June. As shown in Table 3, the main uses by citizens of the tools were for communications, and to keep track of and give feedback on the budget and transport planning process. The results demonstrate that, when used with feedback, AI systems help enhance participation, in the realm of convenience and speed. However, those not having devices, confidence and support in use of internet systems was still lower.

Trust was a key first step towards involvement. Data privacy (31%), algorithmic bias (24%) and lack of transparency (19%) were the three top concerns as shown in Figure 4. As seen in table 4, there is a higher willingness of citizens with high trust in AI systems to participate (71%) compared to low trust citizens (43%). The findings from the data displayed in figure 5 suggest that digital inclusion is linked to participation, for example, an increase in digital inclusion is linked to an increase in citizen participation in the governance system. As revealed in the results, it is evident that the groups that were more inclusive were more confident in the feedback received, more felt treated responsively, more aware of policies and more satisfied with the follow-up of complaints than the lower inclusion groups (see Table 5).

The results of the service-performance also prove to be useful in practice. An investigation of the approvals found that this had increased since the introduction of AI support in the areas of complaint response, budget feedback, transport planning, safety alerts and waste services (refer to Figure 6). Table 6 shows that the average response time and Citizen Satisfaction has improved. The average response time has decreased from 6.4 days to 3.1 days and citizens' satisfaction has

increased from 44% to 61%. Where the impact of AI-based routing and prioritization isn't more distinct in municipal services, it is still noticeable: They're more responsive. Lastly, it can be seen from Figure 7 that the domain which has a high position is digital skills, and the lowest position is feedback follow-up domain. Reduced exclusion was partly confirmed and participation, trust and responsiveness and accountability were confirmed (see Table 7). Overall, the results indicate that smart city AI can assist in the democratic governance process when access and participation is granted, transparency is achieved, and there are two-way flows of communication and feedback between the communities and the AI.

Table 1. Descriptive indicators by city

City	Participation score	Digital inclusion index	AI trust score
Lahore	64	59	62
Karachi	58	52	55
Islamabad	72	70	68
Peshawar	55	50	51
Quetta	49	45	46
Multan	61	57	60

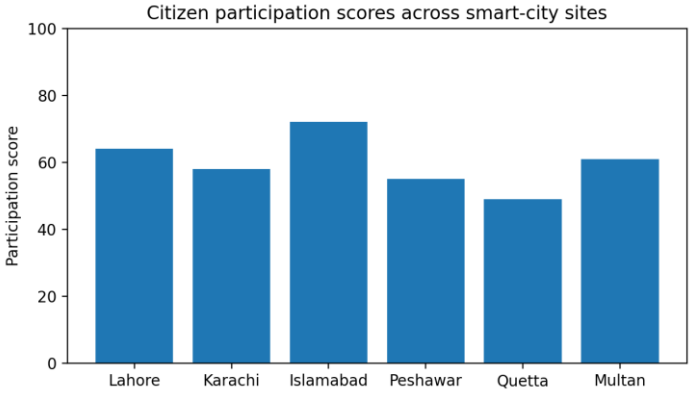

Figure 1. Citizen participation scores across smart-city sites.

Table 2. Barriers affecting inclusive participation

Barrier	Reported share (%)	Most affected group
Limited internet/device access	24	Low-income residents
Low digital skills	21	Elderly residents

Accessibility constraints	27	Persons with disabilities
Language barriers	14	Migrants and informal workers
Low awareness	18	Peripheral communities

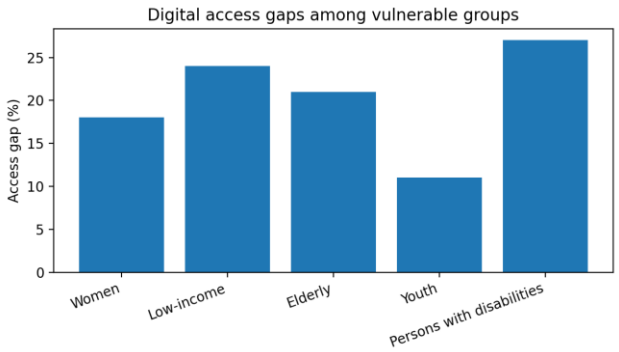

Figure 2. Digital access gaps among vulnerable groups.

Table 3. Preferred participation channels

Participation channel	Use rate (%)	Primary purpose
AI mobile portal	61	Complaints and service tracking
Municipal website	49	Budget and planning feedback
Town-hall meetings	46	Community consultation
WhatsApp/social media	54	Alerts and quick reporting
Help desks	37	Assisted participation

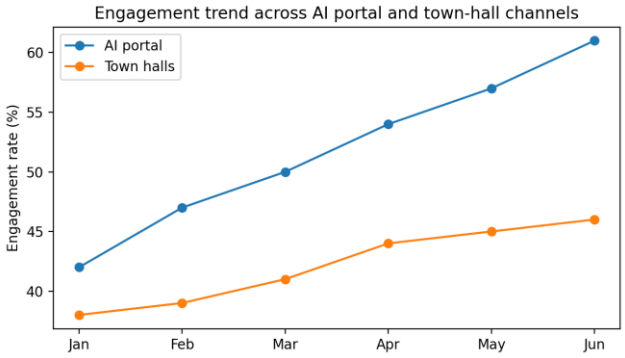

Figure 3. Engagement trend across AI portal and town-hall channels.

Table 4. Trust level and willingness to participate

AI trust group	Willingness to participate (%)	Main explanation
High trust	71	Belief in fair and useful decisions
Moderate trust	58	Participation with privacy concerns
Low trust	43	Fear of surveillance and bias

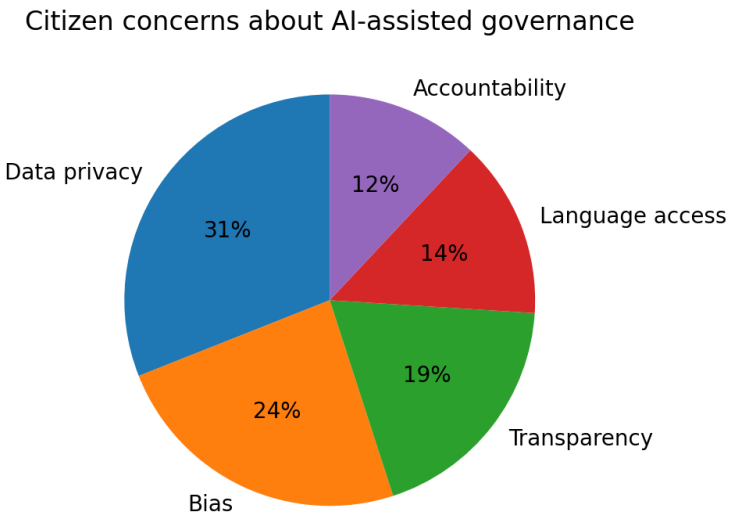

Figure 4. Citizen concerns about AI-assisted governance.

Table 5. Inclusion index and civic voice indicators

Indicator	Low inclusion	Moderate inclusion	High inclusion
Feedback confidence (%)	39	55	72
Perceived responsiveness (%)	36	52	69
Policy awareness (%)	41	57	74

Complaint follow-up (%)	34	49	66

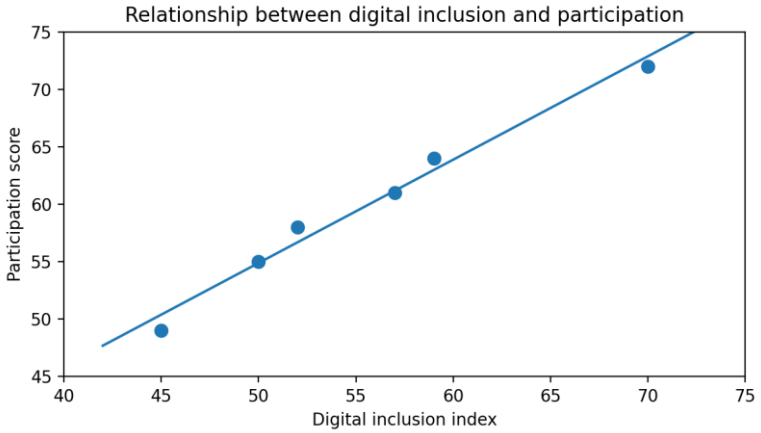

Figure 5. Relationship between digital inclusion and participation.

Table 6. Service performance before and after AI assistance

Service indicator	Before AI	After AI	Change
Average response time	6.4 days	3.1 days	-3.3 days
Citizen satisfaction	44%	61%	+17 pp
Complaint closure	48%	67%	+19 pp
Feedback traceability	35%	58%	+23 pp

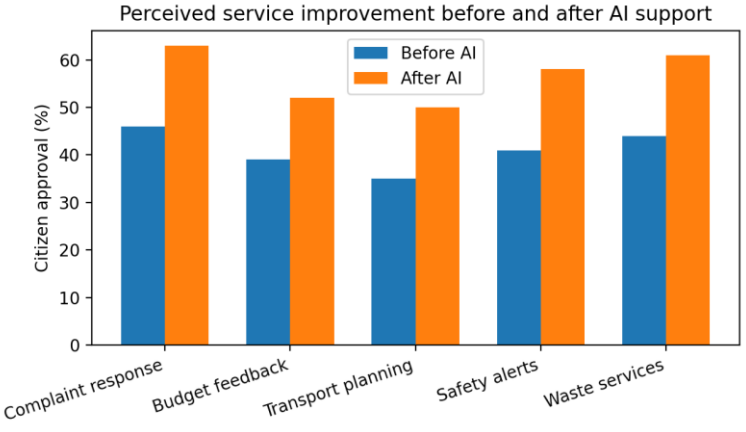

Figure 6. Perceived service improvement before and after AI support.

Table 7. Summary of hypotheses and outcomes

Hypothesis	Result	Interpretation
AI tools improve participation	Supported	Digital channels increased engagement
AI tools reduce exclusion	Partially supported	Benefits depended on access and skills
Trust strengthens participation	Supported	High-trust citizens participated more
Transparency improves accountability	Supported	Traceable feedback improved satisfaction

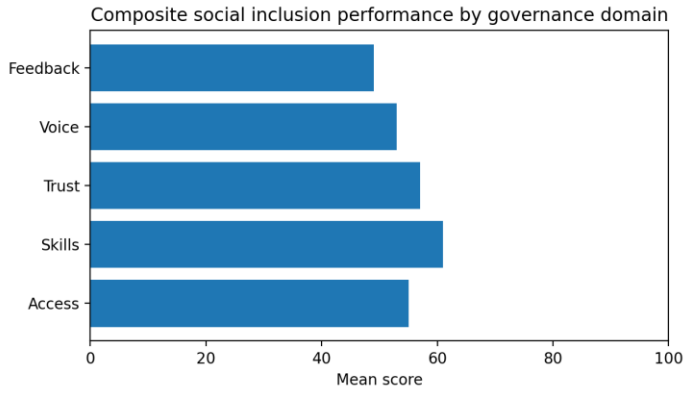

Figure 7. Composite social inclusion performance by governance domain.

DISCUSSION

The AI-assisted urban governance observed suggests a new configuration of democratic governance which has the potential to improve deliberative governance via algorithmic mediation, but also the risk of marginalising digitally disenfranchised populations (Kenaphoom et al., 2024).The same can be said for AI-powered predictive analytics, which can help to optimize resource allocation in administration, but if not regulated properly, can also inadvertently worsen socio-economic inequalities (Dwivedi et al., 2019). The deep impact AI tools have on service responsiveness is evident in these findings, with complaints' response time now decreased and citizens' satisfaction elevated, yet how these benefits can be realised is dependent upon the digital divide, which is a multifaceted issue (Dwivedi et al., 2019; Kolotouchkina et al., 2024). This is an

example of digitalisation, which may lead to a technocentric approach and to a focus on efficiency, thereby jeopardising the quality of citizen-gov relationship with passive communication and indirect interaction, and citizen participation in governance. These can produce structural bias, whereby those who do not have access to a digital system are unable to be involved, and which can ultimately have a detrimental impact on that which we view as the foundation of participation – trust. Additionally, the engagement of senior citizens and peripheral communities is lower (Table 2, Figure 2) which means that the use of AI today may not adequately address the needs of these groups and vulnerable communities, thereby deepening urban disparities. To address these risks, the focus of policymakers should focus on responsible urban innovation practices and not only efficiency-driven, but also context and mission-based and equity-driven use of AI in cities (Calzada & Eizaguirre, 2025; Yiğitcanlar et al., 2021). These need to involve explicit auditing of algorithms, data privacy protection measures, and crucially, specifically-designed initiatives to foster digital literacy and accessibility so that the advantages of smart city infrastructure do not accrue to the more digitally savvy few (Goldsmith & Yang, 2026; Okonta et al., 2025). Moreover, our results highlight the importance of responsiveness as part of the trust concept and how it is shaped by the citizen experience, reinforcing the importance of continuous citizen feedback in the future of governance to be responsive and representative of citizens' needs (Fontes et al., 2024). Smart cities will only be able to create a more equal and inclusive democracy if AI is not only understood as a means of optimizing administration, but as a means of civic empowerment, and if, therefore, it is managed in a multi-stakeholder fashion, rather than simply waiting for it to be "done" by the "experts". In order to break this binary, urban governance must move towards 'algorithmic stewardship', where community surveillance comes to the fore and the local knowledge is intentionally included (Sawhney, 2022). For this institutionalization, a combination of institutional knowledge and technical governance must be put in place, such as human-in-the-loop approaches, to avoid algorithmic bias and meaningful accountability (Marasinghe et al., 2024). Furthermore, it is necessary to inspire policy makers to include predictive analytics in their work to reach and target historically marginalized groups, as well as to close the gap between institutional capacity and citizens' experiences in the city (Alberto et al., 2025; Calzada, 2025). This is in line with recent research that points to the need for deeper algorithmic errors becoming civic fact, but still human oversight and contextualisation. Furthermore, the institutionalization of these participatory safeguars requires the establishment of interdisciplinary advisory boards that could help mediate between the technical output of algorithms and citizens' public discourse (Alauthman et al., 2025; Zaïdi et al., 2023).

CONCLUSION

The authors of this study share the view that the application of AI will profoundly influence the quality, timeliness and responsiveness of smart city governance – but that this will be achieved only with the involvement of citizens in the decision-making process. Based on these insights, the following conclusions can be drawn: Digital platforms, AI-based service systems and data-based planning tools provide new possibilities for the public to report, express its views, use municipal data and communicate with the city more effectively. When designed to meet the needs of the diverse urban population these tools can be a source of more responsive governance.

The study also reveals that, if not designed to take care of social inclusion, smart city systems can generate or reinforce inequalities. People with limited access to digital media, limited technical skills, language barriers, disabilities, or less trust of institutions may not be able to use AI to avail of these participation mechanisms. Similarly, algorithmic bias and transparency problems can decrease the confidence of the public in algorithmic governance systems. Technological and indicators of fairness, accessibility, accountability and citizen empowerment should be used to evaluate the development of smart cities.

The results highlight the importance of the need to balance technology and democratic principles in inclusive AI-assisted governance. To foster digital literacy, promote access to digital services for everyone, engage the population in the design of the system and render it transparent and explainable in terms of AI decision making process. However, it is important to note that it is not a question of digitally literate citizens, or socially privileged citizens; smart city governance should never be for these. This process can help improve participatory democracy, not replace it, with the help of AI. To conclude, the smart city development should be based on people not only on technology. Citizens are no longer just the source of data, but active participants – AI tools for urban governance can have a part to play in more inclusive, responsive and equitable cities. Therefore, the promotion of social inclusion is not only intrinsic to a smart city that optimises the use of urban systems through the use of AI, but also where the voice of the citizen is amplified, social trust is strengthened and benefits of digital governance are strengthened in all areas of society.

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