GRASSROOTS JOURNALS

Grassroots Journal of Natural Resources, Vol.8 No.2 (August 2025)
ISSN: 2581-6853 | CODEN: GJNRA9 | Published by The Grassroots Institute
Website: https://grassrootsjournals.org/gjnr | Main Indexing: Scopus and WoS

ISSN 2581-6853 | 8(2) August 2025

00580 | Analytical Article

Artificial Intelligence Application in the Digitalization of Local Governance: Opportunities and Challenges of Sustainable Development

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How to cite this paper: Piatnychuk, I., Gudz, I., Rovynska, K., Savytskyy, A., Stepanenko, S. and Zhdankevych, M. (2025). Artificial Intelligence Application in the Digitalization of Local Governance: Opportunities and Challenges of Sustainable Development. *Grassroots Journal of Natural Resources*, 8(2): 662-682. Doi: https://doi.org/10.33002/nr2581.6853.080231

Received: 14 June 2025
Reviewed: 02 July 2025
Provisionally Accepted: 05 July 2025
Revised: 21 July 2025
Finally Accepted: 30 July 2025
Published: 28 August 2025

Abstract

The growing advancement of artificial intelligence (AI) technologies has prompted local governments worldwide to contemplate incorporating it into their operations. This study investigates the intersection of digitalization and AI within the framework of local governance, drawing on principles from the sustainable development paradigm. Utilizing a hybrid study technique that incorporates both constructivist and positivist paradigms, the research demonstrates that AI can serve as a tool and intermediary between individuals and governments, assisting them in understanding one another and developing a more democratic governance model. It can also promote community welfare and health, break down socioeconomic barriers, and ensure a more sustainable and fair future for all. Particular attention is paid to the possibilities of AI in facilitating effective environmental (ecological) monitoring in communities.

Keywords

Artificial Intelligence; Local government; Digital transformation; Environmental protection; Awareness; Local-level strategies

Introduction

Globally, local government reform has been taking place in various forms and at varying paces over the past few decades. A central aim of these reforms is to enhance the delivery of public services by promoting citizen choice, tailoring services to individual needs, and ensuring a better understanding of service users' expectations. The use of technology to transform operations, inform policy,

target resources, and support decision making has been a part of local governments' reform plans, which are often influenced by state and federal reform agendas (Kasiyanchuk and Shtohryn, 2021; Poudel and Joshi, 2020; Subair, Prianto and Amri, 2025). This has led to the acceleration of digital transformation processes, which are influenced by external pressures such as environmental technological change, private sector organizational demands for change, and citizen demands that local governments adjust to the technological changes they encounter in their daily lives and at work (Mirea and Nistoreanu, 2021; Sherzad and Chennappa, 2022).

The literature on the subject is limited and disjointed since, even among specialists, the term "digital transformation" is still ambiguous and seldom used, despite the efforts local governments have made over the years. The uneven practice of digital transformation at the local level is also reflected in this fragmentation; over time, local governments have adopted disparate approaches that reflect their unique local circumstances, applying and utilizing various technologies for various purposes (Arivazhagan *et al*., 2023). As a result, local digital transformation projects have taken many different shapes and faced a number of challenges, all of which have had a varied impact on local government reform projects. Research on digital transformation within local governments has frequently utilized descriptive single case studies rooted in a public administration framework. This reliance has constrained a comprehensive understanding of the phenomenon, highlighting the need for more diverse methodological approaches to capture the complexities of digital transformation in this context (Gasco Hernandez, 2024).

Both new and conventional technologies are increasingly being used by local governments in every aspect of their operations, from service delivery to data collecting and analysis. It is no longer possible to study local governments without taking into account how technology affects their operations and the value they provide to the public, as well as the fact that technology influences organizations just as much as the other way around. Most recent studies focus on the role of technology in reshaping organizational structures, processes, and service delivery, thereby exploring how digital transformation drives change within local governments (Avedyan *et al*., 2023).

Adopting a technological deterministic viewpoint, such studies often view organizational structures, procedures, and service delivery as dependent variables and technology's role as an independent variable. Since technology is not a neutral tool and has capabilities that can be interpreted and used in a variety of ways, producing a range of results, there is a need to be a shift that acknowledges the dual nature of technology, where it is seen as both shaping and being shaped by social contexts and human actions (Bibri, 2024).

Moreover, it appears that going forward, studies on local governments could benefit from a supplementary comprehensive interdisciplinary viewpoint that recognizes that digital transformation is a complex socio-technical phenomenon and that it could build on the domains of information systems, information science, and computer science. Particularly since studies on local government structures and operations have traditionally examined them from naturally interrelated perspectives, such as local politics, policy, public administration, management, and governance (Bashtannyk, Terkhanov and Kravtsov, 2024). Integrating theoretical and methodological perspectives from diverse disciplines can enhance both the breadth of issues explored and the depth of analysis concerning

those topics. This multidisciplinary approach is likely to enrich our understanding of the various components of digital transformation within local governments, leading to more comprehensive insights and applications.

One specific illustration of this needed change is an inquiry into the problems of AI-led digital transformation at the municipal level. As described in the previous section, local governments around the world are investing, albeit cautiously, in AI, drawn by the popularity of this new technology and its potential benefits, such as process optimization, service transformation to improve quality, and improved interaction with citizens. However, in this process, local governments face numerous hurdles that may threaten their performance as they transition from "beginning digital" to "being digital" (Deloitte, 2021) (see Figure 1). In this context, artificial intelligence (AI) systems can analyze extensive datasets on road usage, infrastructure challenges, and utility consumption, thereby prioritizing maintenance and development initiatives effectively. However, the use of vast amounts of data is not without risks, which vary from data bias to protecting individuals' privacy rights and addressing data security issues. A comprehensive understanding of these difficulties necessitates the collaboration of various disciplines, including public administration, cybersecurity, informatics, computer science, and data science.

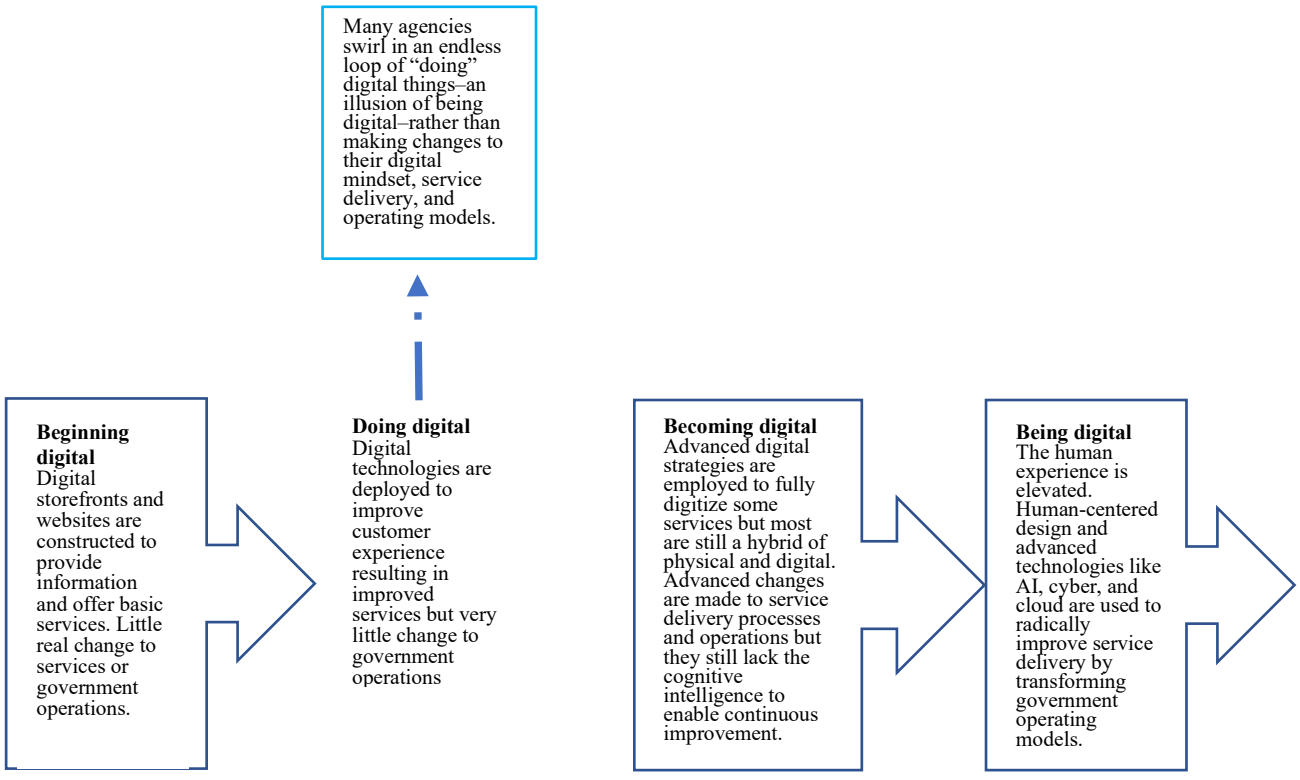

Figure 1: Governments' journey from "beginning digital" to "being digital" (Deloitte, 2021)

As local governments adjust to an ever-changing digital world, the task of providing new public services grows. According to the CIVICA (2025) report, the top three digital

priorities in the digital transformation of local governments are updating outdated systems (51%), improving the digital user experience for people (49%), and lowering operational expenses (46%). This paper not only describes the future goals but also unpacks the ongoing challenges that could derail progress: 57% of councils face funding constraints, 43% of councils face integration issues with older systems, and 40% of councils are dealing with staff who lack digital literacy.

In 2022, over 60% of local governments serving populations of more than 10,000 expected an increase in their FY2022 IT expenditure (Power Almanac Support, 2021) (see Figure 2).

Moreover, in recent decades, the discourse on sustainability has become one of the most crucial within the landscape of local governments. Local sustainability is extremely important since change and progress begin locally. If towns and county governments across the country strengthen their sustainable practices to reduce their communities' environmental impact, their combined efforts will result in a more environmentally friendly local governance as a whole (Chiancone, 2023). When considering the legacy of local sustainability processes, one question naturally arises: has the local sustainability movement succeeded in making the world a more sustainable place? Looking at the available statistics and estimates for both environmental and social performance, it is evident that we are still a long way from achieving global sustainability. Regarding cities, it is impossible to ignore the unsustainable patterns of urban development that are already in place, which result in segregation, sprawl, and traffic. Communities around the world continue to face challenges due to unsustainable consumption behaviors and rapid urban growth (Bibri, 2024). Even if there is still much to be done, local sustainability practices have had a significant influence on how we currently conceptualize and carry out sustainable development.

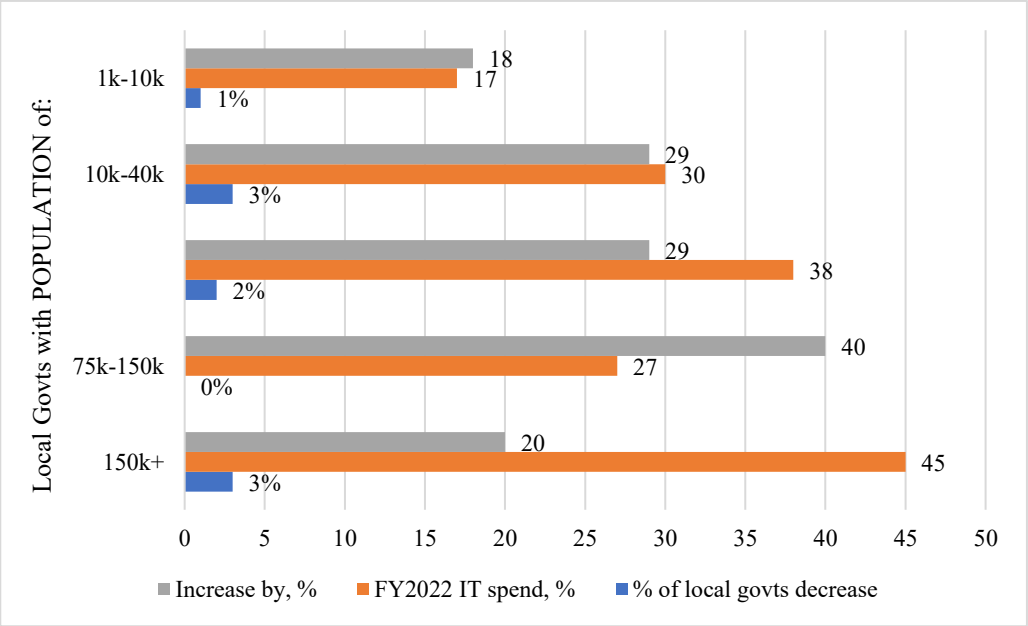

Figure 2: Local governments: projected IT spend for FY2022, segmented by population (Power Almanac Support, 2021)

Environmental monitoring, which is most significant at the community level, monitors the health of natural environments such as air, water, soil, and ecosystems by measuring pollutant levels, temperature, and chemical composition. This information aids in identifying areas of concern that require immediate action. AI enhances this process by evaluating enormous amounts of data from various sources such as satellite photos, sensors, and drones. Using this data, specialists may shift from reactive observation to proactive action, making faster, more educated decisions to safeguard people and the environment. For example, RiverAware is a platform that employs machine learning to assist towns in assessing the condition of their rivers. The data gathered enables them to make educated resource allocation decisions and prioritize efforts to safeguard their waterways. It also allows additional stakeholders, including people, to participate in sustainability activities.

Hybrid models combine the advantages of machine learning with deep learning models, resulting in excellent accuracy and strength. They are utilized in environmental monitoring activities that demand the capture of complicated nonlinear relationships between input and output variables (Zaresefat and Derakhshani, 2023). While hybrid models can be more difficult to train and comprehend, they perform better in high-stakes environmental monitoring duties. However, the ambition for digital transformation and sustainability is closely intertwined. Sigurjonsson, Jónsson and Gudmundsdottir, 2024) specifically examine the consequences and insights surrounding the sustainability of digital projects in public services in the context of local government's digital transformation. According to the authors, digital development is playing a significantly larger role in the debate over how services are organized and delivered, and the sustainability of these initiatives and digital development in terms of service delivery efficiency. They highlight how it is essential to ensure that technological advancements can meet present demands and can be adjusted to meet those of the future. These developments are fueled by efficiency gains, technological advancements, and growing awareness of digital solutions. According to Guandalini (2022), users' expectations for digital services are growing, which suggests that technical solutions are being used more frequently in interactions with organizations and corporations. To improve public services and expand their reach while guaranteeing the long-term viability of their digital transformations, public institutions are thus encouraged to methodically employ technological solutions, such as artificial intelligence (Rupeika-Apoga and Petrovska, 2022).

When discussing digital transformation, sustainability refers to the ability of digital projects to continue being successful and flexible throughout time, meeting present demands without sacrificing those of the future (Brunetti *et al*., 2020; Gradillas and Thomas, 2023; Kleievink *et al*., 2017;). According to Rupeika-Apoga and Petrovska (2022), sustainable digital transformations prioritize long-term resilience, flexibility, and efficiency in processes and structures. This allows institutions to adapt to changing institutional and technical needs. Incorporating sustainability into digital strategies enables municipalities and public institutions to tackle both present and future difficulties as they integrate digital solutions (Ringenson *et al*., 2018). By finding a balance between resource management and technological advancement, sustainable digital transformations ensure that systems are functional and ready to support future growth, innovation, and social needs. This approach lessens the likelihood of issues brought on by the quick development

of technology by ensuring that digital initiatives are robust and able to adapt to new demands as they emerge (Aidanpaa and Sjöberg, 2021).

Maintaining AI in local governance should be specifically mentioned in this context. There is growing hope that towns and municipalities will use AI to strengthen their local government as they investigate the technology's potential. Being one of the most useful and important environments for change in the public sector, city governments are well-positioned to benefit from new technologies. Long Beach, California, is testing an AI chatbot to help constituents navigate the city's website, Barcelona is using the technology to optimize public transportation speeds, Buenos Aires is using AI to streamline waste collection, and Amsterdam is using AI tools to reduce district energy use (Young, 2024).

To fully achieve the potential of digitization, a multilayered governance framework is necessary. An effective strategy requires a comprehensive assessment of operational conditions, alignment with national and regional policies, and active engagement of stakeholders. Building capacity, allocating resources, and using cooperative tactics like intergovernmental collaboration and public-private partnerships are all crucial to this process. To evaluate the effects of digital initiatives, local governments must develop strategies for involving stakeholders, encourage innovation and confidence in IT infrastructure, and put in place systematic monitoring and evaluation.

Importantly, the digital transformation of AI is essential to promoting environmental sustainability in local governance. Adopting digital governance techniques has a favorable environmental impact by drastically lowering paper use (Liebig *et al*., 2022). By lowering infrastructure costs and improving scalability, cloud-based solutions aid in resource optimization (Chiancone, 2023). Better data collection and analysis are also made possible by digital transformation, and these are essential for efficient environmental monitoring and well-informed decision-making in the pursuit of sustainability objectives.

The above determines the relevance of analyzing and systematizing vectors in artificial intelligence applications in the digitalization of local government within the local sustainable development landscape.

Methodology

The methodological basis of this research is formed by dialectical, structural-logical, and systemic research methods. The research toolkit includes a quasi-scoping review, content analysis, and elements of grounded theory. Given the challenges of maintaining reliability in content analysis, we drew on a broad range of literature sources. These were initially selected using a grounded theory-based classification of discourse found in reports, road maps, and white papers from the UN, OECD, and Deloitte focusing on sustainable local governments, digital transformation, and the role of AI. Thus, the first stage of research involved applying the grounded theory toolkit. In overall, 188 publications were processed (predominantly based on topics and abstracts), which allowed formulating the following categories: digital governance; contribution of digital transformation to localizing SDGs; AI governance; digital transition; local governments' digital journey.

The next stage employed final searching of literature sources, to compile the sample (we selected 63 items) for content analysis and quasi-scoping review; at this stage, in particular, also the case study method was applied. The overall research paradigm is shaped by a synergy of constructivist and positivist approaches, which together form the foundation of the methodology as illustrated in figure 3.

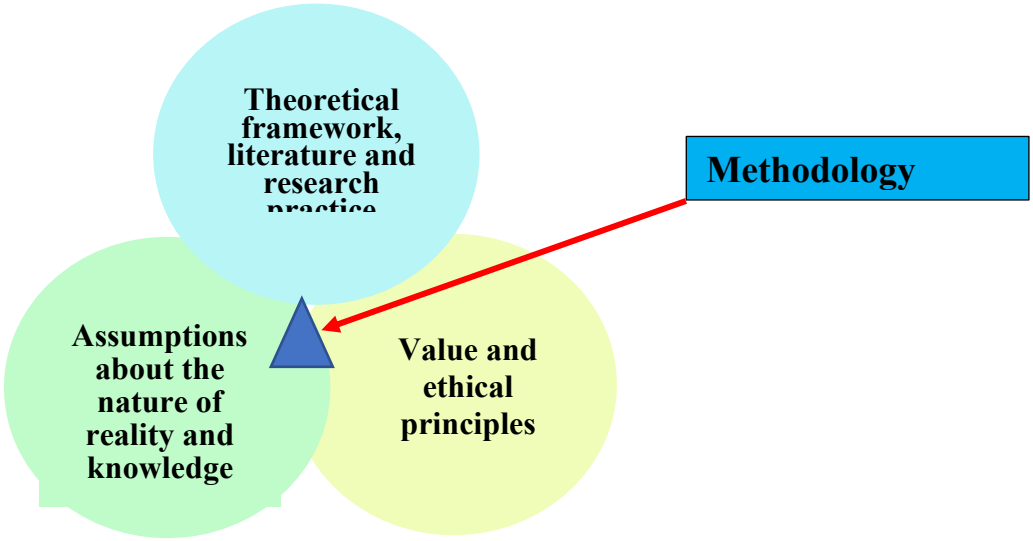

Figure 3: A paradigm of research methodology

While the positivist component of this methodology was applied to extract statistical data, case studies, and expert analyses, the constructivist component enabled conceptualizing and synthesizing existing concepts and assumptions, allowing for a comprehensive understanding of the current state of the field.

Results and Discussion

Local governance digital transition

A varied and intricate image of local governments' current digital transition may be seen throughout the world. A wide range of challenges, such as the availability of funding, the state of the technology infrastructure, and the particular local context in which these governments function, affect the degree of progress and maturity that varies greatly between localities (Gupta, Nagar and Srivastava, 2024). The absence of standardized metrics and consistent data collection methods across jurisdictions hinders accurate assessment of digital transformation in this context. However, local councils around the world are beginning to understand the strategic significance of digital transformation in spite of these obstacles. These governments are actively adopting digital technologies as a way to deal with the ongoing financial constraints that are characterized by decreasing budgetary allocations and increasing demands for a wide range of public services. This is undertaken in response to residents' growing expectations for services that are more sustainable, efficient, and accessible.

SDGs' place and role in the digital transformation of local governments

Simultaneously, the 2030 Agenda for Sustainable Development Goals (SDGs) introduces the idea of data-driven government and emphasizes the difficulty of greatly expanding the supply of timely, accurate, high-quality, and disaggregated data by 2030. The term "digital transformation" refers to the significant alteration of business and organizational operations, procedures, skills, and models to take full advantage of the opportunities and changes brought about by a variety of digital technologies and their rapidly expanding social impacts in a strategic and prioritized manner while keeping current and future changes in mind (Nekhai, Melnyk and Bilyk, 2024). The possible contribution of digital transformation to localizing SDGs is a crucial question in this context.

The Sustainable Development Goals (SDGs) can be enhanced through digital transformation, wherein data is collected and analyzed using data-driven methods to uncover trends and patterns. This process transforms information into actionable insights regarding human behavior, environmental issues, and lived experiences. Policymakers may use this data to create appropriate development strategies, track advancements, and make dynamic improvements. By reducing transaction costs, new opportunities are created for advancing the SDGs. Through comprehensive data gathering, digital transformation helps local governments create resilient and sustainable communities. Efficiency, inclusivity, transparency, reliability, and accountability are the five main SDG scopes highlighted by both e-government and big data. Local governments around the world can leverage a variety of best practice digital transformation scenarios as models (El-Massah and Mohieldin, 2020).

Dimensions, concerns, and challenges of AI integration

In addition to concentrating on the technological potential, local governments must also acknowledge and manage the difficulties associated with using AI at the local level in the public sector. Despite the low national unemployment rate in the United States, state and local governments are disproportionately affected by a lack of workers; since early 2020, more than 500,000 posts have gone unfilled. To ensure that AI is used efficiently, responsibly, and, perhaps most importantly, over the long term, it must be applied within this context using carefully considered strategies. Achieving this requires addressing a critical question: How can AI be applied in a community-centered way when local governments often lack the necessary capacity? (Heinisuo, Kuoppakangas and Stenvall, 2025). Intentionality is crucial; sustainable success in AI governance relies on more than just financial investment in AI technology. Rather, the three Ts: *Transition, Transfer, and Trust*, would establish the framework for the responsible integration of AI into local governance.

1. Transition: Simplifying Administrative Procedures. A willingness to move toward automating repetitive work is necessary to optimize AI's influence in the public service sector. This change can ease the strain on the frequently overworked civil services departments and free up government workers' time to concentrate on areas where human judgment and interaction are crucial (Pasichnyi, Bykova and Nekhai, 2024). The ability of technology to automate time-consuming and repetitive operations is one of its biggest benefits. By assigning AI tools to perform tasks like data input and form processing, civil

officials can alleviate their infamously heavy administrative workload. Government workers can then concentrate on more intricate, specialized work (Pavlovskyi, Blikhar and Karpa, 2024). Last but not least, local governments can demonstrate how organizations can proactively adopt AI to enhance performance without causing job displacement. It is important to recognize that the current wave of AI technology is not the first instance of a workforce-transforming innovation. The advent and uptake of technology throughout history, from the printing press to the tractor, have changed the workforce by giving the labor force more time to learn specialized skills instead of concentrating on repetitive jobs like copying or harvesting crops. Similar opportunities exist in AI adoption, as it can support civil servants to develop specializations and new skills, such as focused community engagement or emerging IT management. According to a World Bank (2020) report, AI has aided in tasks like automating time-consuming manual bid rigging auditing processes, quickly identifying tax evasion among numerous government forms, and synthesizing public opinion qualitatively to relieve civil servants from manually sorting tens of thousands of individual comments (Poliova, Polova and Stepanenko, 2024). City governments must thoroughly examine their current procedures to find areas for automation to carry out this shift successfully. More importantly, they must prioritize and develop job skills training for more specialized human-to-human roles. In the face of automation, job security will be preserved by creating pathways for civil workers to acquire the skills needed for recently identified occupations and avoid employment loss.

2. Transfer: Establishing Interoperability of Data Across Government. For AI to be applied to municipal governance effectively, data must be seamlessly integrated across agencies. AI's ability to enhance decision-making and service delivery is undermined by its limited insights in the absence of interoperable systems. The capacity to safely transfer data between systems is known as data interoperability (Pyatnychuk, Vengerskyi and Pershko, 2024). The quality of artificial intelligence depends on the data it utilizes. Local governments have a lot of data stored in several offices or systems that are inaccessible to a single AI system, making its analysis less usable. AI finds it difficult to offer thorough insights that can support well-informed decision-making in the absence of efficient data sharing (Sydorchuk, Kharechko and Khomenko, 2024). The development of interoperable infrastructures that facilitate smooth data sharing between agencies must be a top priority for municipal administrations in order to optimize the usefulness of AI. A prime example of the value of interoperable systems is in the City of Los Angeles's GeoHub platform, which allows 20 city departments to share over 500 datasets in real time for important information such as environmental data, public health measurements, or traffic patterns (Foster, 2024). Cross-agency cooperation in fields including traffic management, urban planning, and emergency response is facilitated by this type of data exchange. With the help of GeoHub, city employees can spend more time utilizing location-based data for Los Angeles's top projects in climate resilience, street cleanliness, and pedestrian safety rather than wasting time looking for pre-existing data (Serhieiev, Voronina and Rovynska, 2025). Initial infrastructure and technology investments are necessary to set up these interoperability systems, but the long-term advantages-such as better decision-making and service delivery, far exceed those expenses. As demonstrated by cybersecurity, where data breaches have cost governments an estimated $26 billion over the last eight years, a failure to invest in technology can have disastrous long-term effects (Foster, 2024).

3. Trust: Establishing Public Trust. Any new government endeavor, particularly one as innovative as artificial intelligence, requires public trust. Building open, moral procedures for local governments to use AI is essential to encouraging public trust and participation. Building public trust involves more than just technical proficiency; it also calls for a cultural change away from opaque bureaucracy and toward transparent communication with stakeholders (Voronina, Lopushynskyi and Grechanyk, 2024). Trust in government agencies is currently at an all-time low. Concerns have also been raised regarding how AI increases data collecting, compromises privacy, exacerbates bias, and uses "black-box" decision-making; these problems heighten mistrust. Municipal administrations must, however, confront these challenges head-on to foster confidence. Individual agency and meaningful community participation must be given top priority in any successful AI integration (Yigitcanlar and Yi Man Li, 2023). Governments now have the chance to establish a new benchmark for transparency by being transparent about the potential uses of AI, including when, how, and why. In order to address issues early and promote a cooperative approach to governance, California's proposed CPPA guidelines on automated decision-making, for instance, call for pre-use notices, opt-out alternatives, and unambiguous access rights. Every size of government uses a variety of strategies to win over the public, such as ethics committees, oversight agencies, and even unofficial public forums. Building trust requires both community involvement and technological transparency, as well as consistency in making sure local citizens are actively participating in local governance. It is worth mentioning New York City's participatory budgeting pilot program, which uses its Online Idea Map to allow residents to suggest and vote on how to spend a portion of the city's budget (Chiancone, 2023). By helping to anonymize citizen ideas, openly clustering inputs by theme, or delivering real-time updates on ongoing initiatives, artificial intelligence (AI) could enhance the capability of this kind of participatory process. AI creates opportunities to put privacy, openness, and equity first, and local governments need to set an example if they want to genuinely win over the public.

Best practices and case studies

Because of their manageable size, hyper-localized specificity of difficulties, and possibility for bureaucratic innovation, municipal governments provide one of the most ideal environments for the intelligent application of AI. To succeed in this attempt, however, it will be necessary to carefully move toward automating bureaucratic procedures, develop transfer systems for data interoperability between departments, and foster confidence through community pilots and ethical principles.

City governments may lead the way in using AI to support local governance in the future. They can accomplish this by using community-centered strategies, organized data exchange, and careful adaptation. RethinkAI, a cross-sector collaboration of organizations, academics, and practitioners striving to spark safe, efficient, and equitable AI initiatives that revolutionize local government operations, is one such example arising from New America's Technology and Democracy programs (Mykolaichuk, Pozniakovska and Hudenko, 2025). The pilot approach from RethinkAI focuses on how well-informed decisions are made, who has access to the data needed to make those judgments, and how individuals and organizations are then held accountable (Chiancone, 2023). RethinkAI hopes to have communities all over the United States embrace a

common framework - combined with a vast computing infrastructure - that will enable the development and scaling of ethical and efficient AI solutions across locations through research, ambitious pilots, and a strong community of practice.

AI has particular uses in promoting sustainability in municipal government, which is essential to the creation of sustainable and intelligent urban systems. AI can optimize energy use in public areas and municipal buildings, lowering costs and fostering sustainability in the process 4. Examples include smart grids that incorporate renewable energy and smart lighting systems that adapt to situations in real time. AI also improves water management through distribution optimization, leak detection, and usage monitoring. It increases the accuracy of garbage sorting and optimizes collection routes in waste management (Zayats, Serohina and Mazalov, 2024). AI can also be used to manage natural resources, track pollution, and monitor the environment. Lastly, AI can evaluate data in urban planning to improve transportation and energy systems and guide choices for sustainable development (David *et al*., 2024). The greening of businesses through the process of environmental regulation is a common focus in local government green development initiatives. Planning, establishing emission reduction goals, and greening public sector activities are common ways to put these ideas into action (Pittaway and Montazemi, 2020). Adoption of comprehensive plans that prioritize climate action and sustainability is growing.

Community-driven AI, monitoring, and legal implications

The concept of community-driven artificial intelligence for ecological monitoring and stewardship combines local knowledge, technical capability, and environmental imperatives. This notion goes beyond data collecting, picturing a future in which individuals and communities deeply connect to their environment and use sophisticated technologies to study and safeguard natural systems. According to this method, algorithmic processing can amplify localized ecological information, which is typically passed down through generations or collected through lived experience, exposing patterns and insights that would otherwise be concealed. It asserts that stewardship, which has traditionally been a hands-on job, can be made more precise and impactful through data-driven decision making.

Traditional ecological knowledge, which is often deeply ingrained in indigenous cultures, gives a comprehensive grasp of unique ecosystems and their resilience. When combined with AI, this knowledge can lead to the creation of algorithms adapted to local ecological subtleties, avoiding the imposition of broad models that fail to account for distinct bioregional traits. For example, an algorithm trained on global deforestation patterns may overlook subtle indicators of sustainable forest management practices unique to a given community, whereas a model informed by local observation may distinguish between destructive logging and traditional agroforestry. This integration necessitates a careful balance in which technology sophistication complements, rather than replaces, human action and conventional knowledge (Walker, 2025).

Traditional environmental monitoring methods include statistical analysis, laboratory analysis, and manual sampling (Zhang, 2024). Unfortunately, these techniques have disadvantages, including high cost, lengthy processes, and low accuracy. AI has emerged

as a critical component in environmental monitoring efforts, with the goal of improving objectivity and accessibility in resource-constrained locations. Olawade *et al*. (2024) underline the enormous benefits of AI in improving the efficiency and efficacy of environmental monitoring, while also emphasizing the potential early costs and the significance of evaluating long-term outcomes. For example, AI models such as Convolutional Neural Networks (CNNs) are utilized for image-based environmental monitoring tasks such as deforestation detection and animal identification (Bidari and Chickerur, 2024). Support Vector Machines (SVMs) were used to forecast dangerous algal blooms in lakes, proving the model's ability to handle high-dimensional data (Li *et al*., 2020). Recurrent Neural Networks (RNNs) are used to anticipate time series occurrences, such as floods, using previous rainfall data.

The fundamental framework and data required for AI to successfully support environmental sustainability in local governance are provided by digital transformation. AI can now access and analyze the massive volumes of data required for intelligent resource management and environmental monitoring, thanks to the move to paperless operations and cloud-based data storage. Significant cost reductions and better environmental outcomes can result from AI's capacity to forecast environmental problems and optimize resource allocation. A city's livability, health, and economic development can all be improved by using green technologies, which are frequently made possible by artificial intelligence and digital transformation (Chinchamalatpure and Khandare, 2025). Effective AI applications frequently focus on certain issues and produce observable results. The advantages are numerous and include sustainability, cost savings, efficiency, and the welfare of citizens. Although the use of AI is expanding, there are still ethical questions due to biases, lack of transparency, and public knowledge. For example, in order to lower the likelihood of fraud, the Rotterdam municipal government used artificial intelligence in 2017 to create a risk score for citizens. Females, young individuals, parents, and those who did not speak Dutch were frequently categorized as high risk and marked for further inquiry (Constantaras *et al*., 2023).

This example demonstrates how AI can also create major social concerns in addition to opportunities for efficient service delivery. These difficulties exacerbate other societal challenges, like privacy loss as a result of increased surveillance, and threaten social values like justice, fairness, equity, safety, and accountability (Nabavi and Browne, 2023).

A wider conversation on the function and accountability of local government in implementing AI technologies has been spurred by these kinds of difficulties (Atkinson *et al*., 2017). Local authorities must concentrate on strategies for promoting AI that benefit rather than damage the community, as the technology is increasingly being incorporated into local government services, from administrative duties to platforms for citizen interaction (Mikalef *et al*., 2022). To maximize the benefits of AI technology, local governments must foster collaboration, enabling effective problem-solving and optimal utilization of AI resources (David, 2024). Collaboration among stakeholders promotes legitimacy, accountability, and trust in AI governance procedures, which increases public support and acceptance. In the end, local governments may more successfully negotiate the complexities of AI adoption and reach AI's full potential to help society while limiting negative effects by embracing stakeholder collaboration (Zilinska, Avedyan and Kyrychenko, 2022). Furthermore, local governments must

concentrate on informing the public about the planned applications of AI in resolving social issues, how the technology will be applied, the expected outcomes, and the precise actions that will be taken to accomplish those aims (OECD, 2020).

Growing public awareness and understanding of AI applications will be advantageous (Robinson, 2020). Nevertheless, it is important to recognize the diversity of audiences and adapt diverse instructional strategies to suit varying generational degrees of digital literacy. Kenya is another great example to take into consideration in this context. With assistance from the World Bank, the Kenya Open Data Initiative (KODI) made government data publicly accessible in 2011. This included data on infrastructure, national health, education, and census surveys. Numerous laws have now been implemented to guarantee accessibility, particularly for people with poor levels of computer literacy. Additionally, by holding public forums, the program hopes to generate a conversation based on this data (Peña-López, 2016). In addition to promoting ICT literacy, capacity, innovation, and enterprise, the Kenyan ICT Authority, a state corporation under the Ministry of Information, Communication, and Technology, was founded in 2013 with the goal of "enforcing ICT standards in Government and enhancing the supervision of its electronic communication". Big data and e-government can be very helpful in achieving Kenya's SDG localization goals. The Kenyan government's commitment to enhancing e-governance has fostered a conducive environment for utilizing and analyzing data for progressive political objectives. At the same time, civil society has created a number of platforms and projects, like the Institute for Social Accountability and the Ushahidi platform, to support SDG-related achievements. According to Loureiro *et al.* (2016), these platforms promote public involvement and communication with local and federal governments. These initiatives generally accelerated digital transformation, with the potential to increase information for quality resource distribution, resulting in increased access to clean water and sanitation at the local level (SDG 6), poverty reduction (SDG 1), hunger elimination (SDG 2), improved health conditions (SDG 3), and adequate quantity and quality of education (SDG 4). Furthermore, the initiative improves inter-ministerial cooperation, makes data available to all stakeholders, including commercial companies and civil society actors (SDG 17), and allows for the establishment of specific national targets for infrastructure and sustainable city needs (SDGs 9, 11). Better methods of enhancing sustainability and well-being can also be developed and innovated by private industry and civil society actors (SDG 9, 11, 12).

Understanding how national and local AI-responsible plans differ from one another is essential. While local government plans frequently highlight traits or concepts, national-level strategies typically concentrate on putting certain instruments into practice. The different tasks and responsibilities at each level of governance are the cause of this discrepancy. According to Djeffal, Siewert and Wurster (2022), national governments often use a variety of tools to appropriately control AI: (a) Direct regulation; (b) Governmental plans; (c) Public investment; (d) Financial incentives; (e) Data and monitoring; (f) Institutions; (h) Certification and labeling; (i) Outreach and literacy. Liebig *et al*. (2022), on the other hand, discovered that subnational strategies, even though they also employ instruments, give more weight to traits and principles like (a) state responsibility; (b) leadership claims; (c) ethical principles, in addition to more

pragmatic measures like (d) network/cooperation; (e) competition; (f) civil society and citizen consultation; (g) legislation; (h) investment; and (i) certification.

This distinction draws attention to a crucial relationship between national and local strategies: while local strategies concentrate on putting these frameworks into practice and tailoring them to particular contexts, with an emphasis on ethical principles and citizen engagement, national strategies frequently supply the overall framework and tools. A national strategy might, for example, set up general AI laws and investment goals, whereas local strategies would convert these into specific moral standards and neighborhood-based projects. Taeihagh (2021) and Hagendorff (2020) have observed that both levels collaborate to establish trust, guarantee transparency, and integrate ethical concepts into the AI ecosystem. By integrating top-down policy tools with bottom-up implementation of responsible AI features, this complementary approach enables a comprehensive governance structure that covers AI research and deployment at different levels (Ferdman, Kravets and Akimova, 2025). This updated edition discusses the connection between responsible AI plans at the municipal and national levels, stressing their diverse goals and complementary roles in the overall governance of AI.

However, there are several obstacles in the way of putting this complementary strategy into practice, especially at the local level. The fact that half of the policy documents emphasize the necessity of having a suitable legal framework is another important point. However, according to research findings, none of the local administrations have such a framework. The usage of AI by local governments has grown dramatically (Herath and Mittal, 2022). This includes anything from basic task automation to reminding the police and the judiciary system to support the legal system. Without an appropriate AI regulatory framework, local governments have made significant progress (Wu and Liu, 2023). The local government stops the project when an ethical issue arises. For instance, in collaboration with Carnegie Mellon University's Metro21 (Smart Cities Institute), the Pittsburgh Bureau of Police and the Department of Innovation and Performance tested an algorithmic predictive policing system in 2017. Because of the skewed data and transparency issues, that system is presently suspended. Local governments must create a framework of policies to address these new ethical concerns. However, the study's conclusions point to a "responsibility gap" about accountability for AI's ethical challenges.

Nevertheless, according to the report, local governments are giving responsible innovation and technology a higher priority in their policy frameworks. This change in emphasis among local governments is indicative of a greater understanding of the necessity of striking a balance between societal norms and expectations and technical innovation. Governments and public bodies have a plethora of opportunities to address the requirements of their constituents and operate more efficiently thanks to AI technology. Among many other examples, Estonia, the UK, and Singapore demonstrate how AI use is already starting to gain traction. Cities are becoming smarter and more livable, municipalities are simplifying procedures, budgets are becoming more transparent, and health results are improving.

Conclusion

Key findings demonstrate that it is impossible to overestimate the importance of responsible innovation in technology since it is essential to reducing the negative effects of AI and promoting public confidence in these systems. This is an ongoing effort that requires constant monitoring, evaluation, and improvement of AI systems to make sure they are in line with the expectations and values of society.

As to recommendations, all things considered, our results highlight the significant ramifications for the incorporation of AI in municipal governance. It is necessary to establish industry-academia collaboration with well-defined responsibilities, an emphasis on fostering trust, and the application of strong accountability procedures. It is crucial to strike a balance between morality and the flexibility needed for AI developments, which calls for ongoing capacity-building programs. Setting explicit rules and creating industry standards are necessary to distinguish between explainability and transparency in AI interactions in local government policy texts. A major challenge is integrating environmental sustainability into AI policies, which calls for extensive awareness efforts, legislative actions, and pledges to sustainability standards. In order to address ethical issues and guarantee the proper implementation of AI in municipal contexts, the creation of specialized legal frameworks is crucial. Establishing well-organized frameworks for ethics and accountability is equally important since they establish roles and close the so-called “responsibility gap”, and thus this area should enter the vectors of future research.

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Authors' Declarations and Essential Ethical Compliances

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*	*Author 3*	*Author 4*	*Author 5*	*Author 6*
Conceived and designed the research or analysis	Yes	No	Yes	Yes	No	No
Collected the data	No	No	Yes	Yes	Yes	Yes
Contributed to data analysis and interpretation	Yes	Yes	No	No	No	No
Wrote the article/paper	Yes	Yes	No	No	No	No
Critical revision of the article/paper	No	Yes	No	Yes	No	No
Editing of the article/paper	No	Yes	Yes	No	Yes	Yes
Supervision	No	No	Yes	Yes	Yes	Yes
Project Administration	Yes	No	Yes	No	No	No
Funding Acquisition	No	No	No	No	No	No
Overall Contribution Proportion (%)	20	20	15	15	15	15

Funding
No funding was available for the research conducted for and writing of this paper.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

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