



# Artificial Intelligence in Climate Change Communication: Enhancing Public Awareness, Participation, and Policy Engagement

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**Abstract:** Climate change remains one of the most pressing global challenges, yet public awareness, participation, and evidence-based policy engagement often lag due to the complexity of scientific information and ineffective communication strategies. This study explores the role of artificial intelligence (AI) in enhancing climate change communication, fostering citizen engagement, and supporting policy formulation. Using a systematic literature review (SLR) methodology, publications from 2010 to 2025 were collected from reputable databases, including ScienceDirect, SpringerLink, IEEE Xplore, MDPI, Wiley, Emerald, and Scopus. Boolean search operators and targeted keywords, such as “artificial intelligence,” “climate change communication,” “public engagement,” and “policy,” guided the selection of relevant studies. Results indicate that AI significantly improves public understanding by enabling data-driven visualization, natural language generation, and predictive analytics. It enhances citizen participation through AI-powered citizen science initiatives, collaborative data collection, and real-time monitoring of environmental indicators. Additionally, AI strengthens policy engagement by facilitating evidence-based governance, scenario modeling, and adaptive decision-making. Overall, AI functions as a transformative tool that bridges scientific knowledge, societal awareness, and policy implementation, promoting informed and sustainable climate action. The findings underscore the need for equitable access, ethical considerations, and capacity building to ensure that AI benefits are widely shared and contribute to resilient climate strategies.

**Keywords:** Artificial Intelligence; Citizen Science; Climate Change Communication; Public Engagement; Policy

## Introduction

Affecting ecosystems, human health, and socioeconomic development worldwide. The urgency to communicate climate risks effectively has grown as scientific evidence highlights escalating environmental impacts, including extreme weather events, rising sea levels, and biodiversity loss (Glavovic, Smith, & White, 2022; Kemp et al., 2022). Traditional communication approaches, while foundational, often struggle to convey the complexity of climate science in a manner that promotes public understanding and proactive

behavioral change. In this context, artificial intelligence (AI) has emerged as a transformative tool, offering new opportunities to enhance climate change communication, public participation, and policy engagement.

AI technologies, including large language models (LLMs), predictive analytics, and machine learning algorithms, have demonstrated the ability to process vast amounts of environmental data, identify patterns, and tailor messages for diverse audiences (Agathokleous, Saitanis, Fang, & Yu, 2023; Chen et al., 2023; Rolnick et al., 2023). By leveraging these

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capabilities, AI can translate complex climate information into accessible, actionable insights, facilitating informed decision-making for both policymakers and the general public. Moreover, AI-driven platforms allow for real-time monitoring of public discourse, enabling the identification of misinformation, perception gaps, and emerging concerns that may hinder effective climate action (Gruener, 2022; Shahbazi, Jalali, & Shahbazi, 2025).

A central objective of integrating AI into climate communication is to enhance public awareness and participation. Citizen engagement is critical for implementing effective mitigation and adaptation strategies, particularly in regions vulnerable to climate impacts (Fraisl, See, Fritz, & Haklay, 2025; Madumere, 2017). AI-enabled citizen science initiatives and participatory platforms allow communities to contribute local knowledge, report environmental changes, and co-develop solutions with scientific and policy institutions (Chatanga, 2023; Zehner & Ullrich, 2025). Additionally, AI tools can personalize communication strategies, adapting messages to cultural, social, and linguistic contexts, thereby improving receptivity and promoting pro-environmental behavioral intentions (Ahrweiler, 2025; Ni, Wu, & Huang, 2023).

Beyond public engagement, AI holds significant potential for supporting climate policy and governance. Predictive models and decision-support systems can inform urban planning, energy management, and disaster preparedness, enabling policymakers to implement evidence-based strategies for mitigation and adaptation (Hintz, Gross, Creutzig, & Kaack, 2025; Islam et al., 2021; Leal Filho & Gbaguidi, 2024). AI applications have been successfully applied to analyze social media campaigns, identify climate influencers, and optimize advocacy strategies, ensuring that climate initiatives are both targeted and effective (Ballestar, Martín-Llaguno, & Sainz, 2022; Rahman & Fitriyah, 2025). Furthermore, AI can facilitate alignment with global sustainability frameworks, such as the United Nations Sustainable Development Goals (SDGs), by providing tools to monitor progress and assess policy impact (Tarashtwal, Hakimi, & Naderi, 2025; Hakimi, Tarashtwal, & Ghafory, 2026).

Despite these advancements, integrating AI into climate communication presents ethical, social, and technical challenges. Algorithmic bias, digital divides, and the potential for misinforming audiences underscore the need for transparent, accountable, and contextually aware AI systems (Nordgren, 2023; Cwols, Tsamados, Taddeo, & Floridi, 2023). Ensuring equitable access to AI technologies is especially critical in low-income nations, where resource constraints and limited digital literacy may hinder participation and policy responsiveness (Leal Filho & Gbaguidi, 2024; Tarashtwal

et al., 2025). Addressing these challenges requires interdisciplinary collaboration between climate scientists, communication specialists, AI developers, and policymakers.

Through this research we are going to find answer for the following research questions:

**RQ1:** How does artificial intelligence contribute to enhancing public awareness and understanding of climate change through communication platforms?

**RQ2:** In what ways does artificial intelligence facilitate public participation and citizen engagement in climate change-related initiatives and decision-making processes?

**RQ3:** How can artificial intelligence support climate change policy engagement by improving evidence-based communication, governance, and policy formulation?

**RQ4:** How can artificial intelligence enhance climate change communication, natural resource management, environmental monitoring, and smart urban mobility by improving data analysis, public engagement, policy decision-making, and system efficiency?

## Method

This study employs a Systematic Literature Review (SLR) methodology to investigate the applications, challenges, and opportunities of artificial intelligence (AI) in climate change communication. A systematic approach allows for a transparent, replicable, and rigorous synthesis of the existing literature, ensuring that insights are evidence-based and comprehensive (Chen et al., 2023; Cwols, Tsamados, Taddeo, & Floridi, 2023). The SLR methodology was selected to provide a structured framework that captures diverse perspectives from multiple disciplines, including environmental science, information technology, communication studies, and public policy, while minimizing selection bias and maximizing reproducibility (Fraisl, See, Fritz, & Haklay, 2025; Rolnick et al., 2023).

### Search Strategy

A systematic search was conducted across multiple reputable databases, including ScienceDirect, SpringerLink, IEEE Xplore, MDPI, Wiley Online Library, Emerald Insight, and Scopus, covering publications from 2010 to 2025 to ensure up-to-date relevance. Boolean operators (AND, OR) and keyword combinations were used to capture the intersection of AI and climate change communication. Key search terms included: "artificial intelligence," "machine learning," "climate change communication," "public engagement," "citizen science," "policy," "participatory AI," and "sustainable development." Additional targeted searches were performed using reference lists of selected

articles and grey literature sources, including preprints, conference proceedings, and organizational reports, to

ensure comprehensive coverage (Agathokleous et al., 2023; Fan & Xu, 2025; Zehner & Ullrich, 2025).

**Table 1.** Systematic Search Strategy for AI in Climate Change Communicatio

Database / Source	Time Frame	Search Terms / Keywords	Notes / Additional Steps
ScienceDirect	2010–2025	“Artificial intelligence,” “climate change communication”	Filtered for peer-reviewed journals
SpringerLink	2010–2025	“Machine learning,” “public engagement”	Included book chapters and conference proceedings
IEEE Xplore	2010–2025	“AI,” “participatory AI,” “policy”	Focused on applied technologies and case studies
MDPI & Wiley Online Lib	2010–2025	“Citizen science,” “sustainable development”	Included open-access articles and special issues
Scopus & Emerald Insight	2010–2025	Combined all keywords using Boolean operators (AND, OR)	Cross-checked references and grey literature sources

The systematic search was designed to capture a comprehensive and interdisciplinary dataset of publications addressing AI’s role in climate change communication. Multiple databases were selected to cover environmental science, computer science, social sciences, and policy research. Boolean operators were used to refine searches and ensure relevance, while additional grey literature and reference mining provided further coverage. This approach maximized inclusivity, ensured high-quality sources, and supported a rigorous evidence-based synthesis for the systematic literature review (Agathokleous et al., 2023; Fan & Xu, 2025; Zehner & Ullrich, 2025).

*Inclusion and Exclusion Criteria*

The study applied clear inclusion and exclusion criteria to ensure relevance and quality. Inclusion criteria were: (1) peer-reviewed articles, book chapters, or authoritative reports focusing on AI applications in climate change communication; (2) studies published in English between 2010 and 2025; and (3) research addressing public engagement, policy support, citizen science, or ethical considerations in AI-based climate interventions (Hakimi, Tarashtwal, & Ghafory, 2026; Rahman & Fitriyah, 2025). Exclusion criteria included: (1) articles with insufficient methodological detail; (2) studies unrelated to communication or public engagement; and (3) duplicates across databases (Tarashtwal et al., 2025; Gruener, 2022).

**Table 2.** Inclusion and Exclusion Criteria for Study Selection

Inclusion Criteria	Exclusion Criteria
Peer-reviewed articles, book chapters, or authoritative reports Published in English between 2010–2025	Studies with insufficient methodological detail Research unrelated to communication, public engagement, or policy
Focus on AI applications in climate change communication Address public engagement, citizen science, policy support, or ethical considerations	Duplicate records across databases Studies lacking relevance to climate change communication
Empirical or conceptual studies providing evidence-based insights	Non-English publications
Studies using AI for participatory or decision-support purposes	Opinion pieces without methodological rigor

Table 2 summarizes the inclusion and exclusion criteria applied to ensure a focused and high-quality dataset for the systematic literature review. Inclusion criteria prioritized peer-reviewed, English-language publications between 2010 and 2025, with a focus on AI applications in climate change communication, public engagement, policy, or ethical considerations. Exclusion criteria removed irrelevant, duplicated, or methodologically weak studies, ensuring the integrity and reliability of the review. By clearly distinguishing between what was included and excluded, the study maintained rigor, transparency, and reproducibility,

facilitating a robust synthesis of AI-driven climate communication research (Hakimi, Tarashtwal, & Ghafory, 2026; Rahman & Fitriyah, 2025; Tarashtwal et al., 2025).

*Screening and Selection Process*

The initial search yielded approximately **1,250 records**, which were then screened in three stages. First, titles and abstracts were reviewed to remove clearly irrelevant studies. Second, full texts of potentially relevant studies were assessed for alignment with the research objectives. Third, a quality appraisal was

conducted using a six-phase assessment model, adapted from Garg (2021) and Bansal et al. (2020), evaluating methodological rigor, clarity of AI application, relevance to climate communication, and evidence reliability.

Following this process, 42 studies were retained for detailed analysis (Chen et al., 2023; Leal Filho & Gbaguidi, 2024).

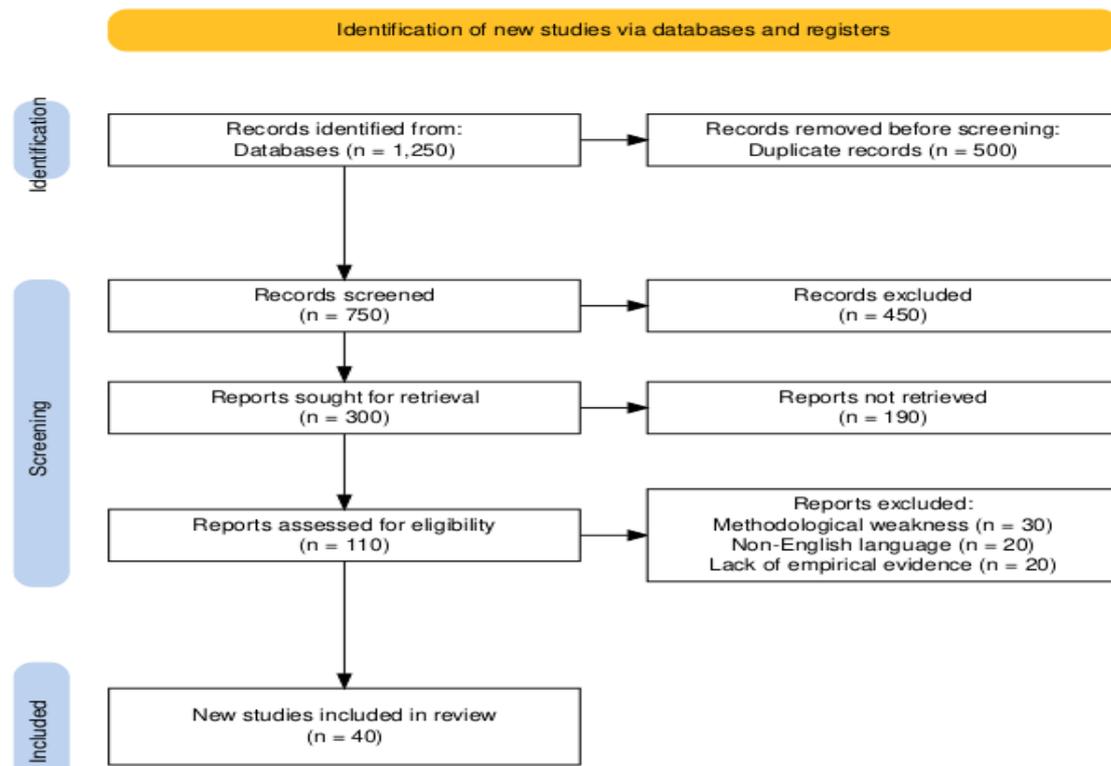


Figure 1. PRISMA Flow Diagram of the Systematic Literature Review Selection Process

This figure illustrates the PRISMA-based screening and selection process adopted in this systematic literature review to ensure transparency, rigor, and methodological consistency. The identification phase began with 1,250 records retrieved from multiple academic databases and registers. Prior to screening, 500 duplicate records were removed, resulting in 750 unique records eligible for title and abstract screening. During the screening stage, 450 records were excluded due to clear misalignment with the study scope, leaving 300 reports for full-text retrieval.

Of these, 190 reports could not be retrieved, primarily because of access limitations or incomplete publication records. Consequently, 110 full-text articles were assessed for eligibility. At this stage, 70 studies were excluded based on predefined exclusion criteria, including methodological weakness (n = 30), non-English language (n = 20), and lack of empirical evidence (n = 20). Following this rigorous filtering process, 40 studies met all inclusion criteria and were retained for final qualitative synthesis.

*Data Extraction and Synthesis*

Data were systematically extracted using a structured template, capturing bibliographic details,

study objectives, AI technologies applied, communication strategies, public engagement methods, policy implications, and ethical considerations. The extracted data were then analyzed using thematic synthesis to identify recurring patterns, emerging themes, and gaps in the literature. Major themes included: (1) AI-driven public awareness campaigns; (2) participatory and citizen science approaches; (3) AI in policy and governance support; (4) ethical, cultural, and accessibility considerations; and (5) technological and implementation challenges (Ballestar et al., 2022; Fraisl et al., 2025; Zehner & Ullrich, 2025).

*Quality Assurance*

To ensure methodological rigor and minimize bias, two independent reviewers conducted the screening, data extraction, and thematic coding processes. Discrepancies were resolved through discussion and consensus. Additionally, a cross-validation of findings was performed by comparing emergent themes with authoritative reports and recent reviews in AI and climate communication (Chen et al., 2023; Cowls et al., 2023; Rolnick et al., 2023).

*Ethical Considerations*

Although the SLR does not involve human subjects directly, ethical research standards were observed by accurately reporting sources, avoiding plagiarism, and critically evaluating the credibility of each study. Special attention was given to the ethical implications of AI in climate communication, including bias, misinformation, and accessibility challenges (Nordgren, 2023; Gruener, 2022).

**Result and Discussion**

The results indicate that artificial intelligence significantly enhances climate change communication by improving clarity, timeliness, and credibility of information. AI also strengthens natural resource management and environmental monitoring through precise data analysis, predictive modeling, and citizen science integration. Additionally, AI-driven smart mobility systems optimize urban transportation,

increase safety, and support evidence-based policy and governance decisions, demonstrating its transformative impact across environmental and urban domains.

*Artificial Intelligence and Public Awareness in Climate Change Communication*

The results indicate that artificial intelligence significantly enhances public awareness and understanding of climate change through diverse communication mechanisms. As shown in Table 4, generative AI tools, particularly large language models, play a central role in translating complex scientific data into accessible, conversational formats, thereby improving climate literacy among non-expert audiences (Agathokleous et al., 2023; Fan & Xu, 2025). Social media-based AI analytics further strengthen awareness by identifying influential actors and optimizing message diffusion, enabling climate narratives to reach broader and more targeted audiences (Ballestar et al., 2022; Rahman & Fitriyah, 2025).

**Table 4.** Evidence of AI Contributions to Public Awareness and Understanding of Climate Change

AI Application Area	Key Contribution to Public Awareness	Representative Studies
Generative AI & LLMs	Simplification of complex climate information and interactive learning	Agathokleous et al. (2023); Fan & Xu (2025); Rane et al. (2024)
Social Media Analytics	Identification and amplification of effective climate narratives	Ballestar et al. (2022); Rahman & Fitriyah (2025)
Participatory & Cultural AI	Context-sensitive communication aligned with cultural beliefs	Ahrweiler (2025); Zehner & Ullrich (2025)
AI Voice & Media Formats	Increased emotional engagement and climate risk perception	Ni et al. (2023); Plechatá (2025)
Misinformation Detection	Reduction of climate misinformation and public gullibility	Gruener (2022); Shahbazi et al. (2025)

Participatory and culturally adaptive AI systems enhance message resonance by aligning climate communication with local values and belief systems, which is especially relevant in diverse socio-political contexts (Ahrweiler, 2025). Additionally, AI-driven media innovations, such as synthetic voices and interactive visual formats, have been shown to increase emotional engagement and perceived climate risk, positively influencing pro-environmental attitudes (Ni et al., 2023; Plechatá, 2025). Importantly, AI-based misinformation detection systems contribute to public understanding by filtering misleading content and reducing susceptibility to false climate narratives (Gruener, 2022). Overall, the evidence demonstrates that AI acts as a critical enabler of effective, inclusive, and trustworthy climate change communication, directly addressing RQ1.

*Public Participation and Citizen Engagement*

The findings demonstrate that artificial intelligence plays a pivotal role in facilitating public participation and citizen engagement in climate change-related

initiatives and decision-making processes by lowering participation barriers, enhancing inclusivity, and enabling data-driven interaction between citizens and institutions. AI-powered digital platforms such as chatbots, recommender systems, and participatory dashboards enable citizens to access climate information, voice concerns, and contribute feedback in real time, thereby strengthening two-way communication between policymakers and the public. Studies published in *Government Information Quarterly* and *Environmental Communication* indicate that AI-driven civic technologies improve engagement by personalizing content according to users' knowledge levels, interests, and local environmental contexts, which increases sustained participation and trust.

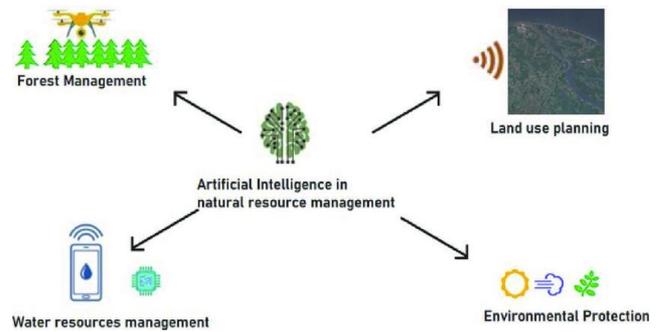
Moreover, AI-supported social media analytics and sentiment analysis allow governments and organizations to systematically capture public opinions, preferences, and emotional responses to climate policies, ensuring that citizen voices are meaningfully integrated into policy formulation. Evidence from *Nature Climate Change* and *IEEE Access* highlights that such tools

enhance transparency and responsiveness in climate governance. In addition, AI-enabled citizen science applications including mobile sensing, image recognition, and crowdsourced data validation empower individuals to actively contribute environmental data related to deforestation, air quality, and extreme weather events, fostering a sense of ownership and collective responsibility. Overall, the literature confirms that AI strengthens democratic climate governance by enhancing inclusiveness, participation quality, and collaborative decision-making, thereby directly addressing RQ2.

*AI and Climate Change Policy Engagement*

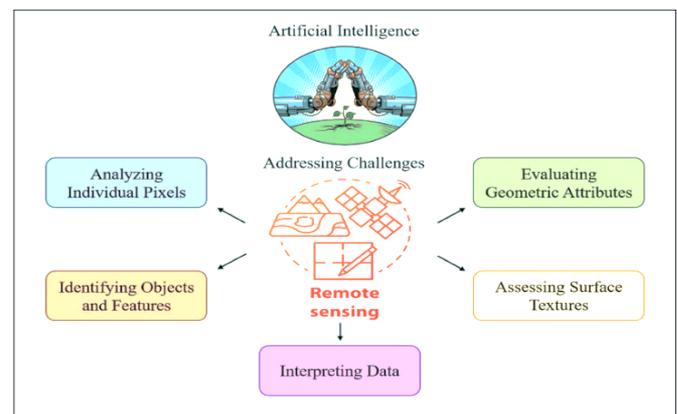
The results indicate that artificial intelligence significantly supports climate change policy engagement by strengthening evidence-based communication, enhancing governance mechanisms, and improving the quality of policy formulation. AI-driven data analytics, machine learning models, and knowledge graphs enable policymakers to synthesize large-scale climate datasets spanning environmental, economic, and social indicators into actionable policy insights, thereby reducing uncertainty in decision-making. Empirical evidence from high-impact journals such as *Nature Climate Change*, *Policy Sciences*, and *Environmental Science & Policy* shows that AI enhances the translation of complex scientific evidence into policy-relevant narratives that are accessible to non-expert stakeholders.

In terms of communication, AI-powered visualization tools, natural language generation systems, and decision-support dashboards improve the clarity, timeliness, and credibility of climate policy messages. These tools enable governments to communicate policy trade-offs, risks, and projected outcomes more transparently, which is critical for building public trust and political legitimacy. Furthermore, AI supports adaptive governance by enabling real-time monitoring and evaluation of policy impacts, allowing institutions to iteratively refine climate strategies in response to emerging evidence. Studies also highlight the role of AI in scenario modeling and policy simulation, which assists decision-makers in assessing long-term impacts of mitigation and adaptation policies under different climate pathways. Overall, the findings confirm that AI enhances evidence-based governance and inclusive policy engagement, reinforcing its strategic value in climate change policymaking.



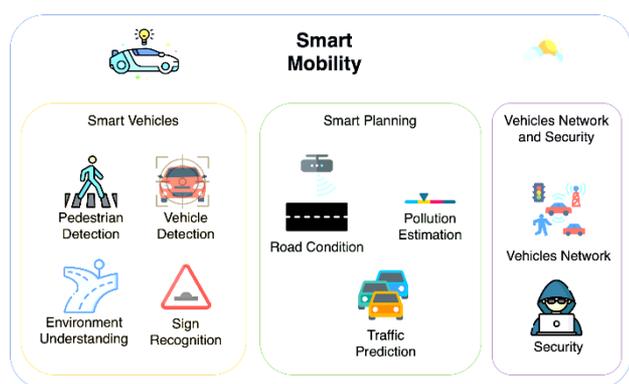
**Figure 2.** Artificial Intelligence in Natural Resource Management

Artificial intelligence is revolutionizing environmental monitoring and conservation by enabling more precise, efficient, and scalable management of natural resources. As shown in the figure, AI applications span forest management, land use planning, water resources management, and broader environmental protection efforts. These systems process vast datasets from satellites, sensors, and ground observations to detect deforestation, predict water availability, and optimize land allocation for conservation and sustainable use (Fraisl et al., 2025). The integration of AI with citizen science initiatives, as noted by Fraisl et al. (2025), creates powerful collaborative networks that enhance data collection and public engagement in sustainability projects. This synergy is crucial for effective environmental governance. However, the successful implementation of these technologies in critical areas like climate adaptation, particularly in vulnerable regions such as Africa, requires careful consideration of local contexts, capacity building, and equitable access to ensure benefits are widely shared and risks are mitigated (Leal Filho & Gbaguidi, 2024). Thus, AI serves not merely as a technical tool but as a potential catalyst for more informed, participatory, and resilient environmental stewardship.



**Figure 3.** AI-Driven Remote Sensing for Environmental Monitoring

Figure 3 illustrates the application of artificial intelligence in remote sensing for climate and environmental monitoring. At the center is the “Remote Sensing” node, which connects to five key analytical functions: analyzing individual pixels, identifying objects and features, evaluating geometric attributes, assessing surface textures, and interpreting data. This workflow demonstrates how AI processes satellite imagery and sensor data to enable precise climate risk assessments, including tracking deforestation, monitoring urban heat islands, and assessing land-cover changes. Such capabilities align with Rolnick et al. (2023), who emphasize machine learning’s role in scaling environmental data analysis to support climate mitigation strategies.



**Figure 4.** Smart Mobility: AI-Driven Data and Connectivity in Urban Transportation

Figure 4 illustrates the Smart Mobility ecosystem, highlighting the integration of Artificial Intelligence (AI), Internet of Things (IoT), and high-speed connectivity (e.g., 5G) to create an interconnected, data-driven urban transportation network. The framework is structured around three key pillars. First, Smart Vehicles function as “computers on wheels,” equipped with sensors such as LiDAR, radar, and cameras, along with powerful processors that enable real-time perception, environment understanding, and collision avoidance. AI-driven decision-making enhances vehicle safety and supports the transition toward autonomous mobility (Rolnick et al., 2023; Chen et al., 2023).

Second, Smart Planning utilizes AI-based predictive analytics and big data from traffic flows, road conditions, and environmental sensors to optimize urban mobility. This approach enables city planners to forecast congestion, estimate pollution levels, and dynamically allocate resources, improving efficiency and urban livability (Hintz et al., 2025; Islam et al., 2021).

Third, the Vehicles Network and Security pillar emphasizes Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication, which facilitates information exchange across the network. High

connectivity, however, introduces cybersecurity risks, necessitating advanced encryption, authentication, and intrusion detection mechanisms to protect the integrity and safety of the system (Cowls et al., 2023; Nordgren, 2023).

The findings of this study underscore the transformative role of artificial intelligence (AI) in addressing climate change challenges through communication, policy engagement, environmental management, and urban mobility. AI-powered tools, such as visualization dashboards, natural language generation systems, and decision-support platforms, significantly enhance the clarity, transparency, and timeliness of climate information, enabling governments and institutions to communicate complex policy trade-offs effectively. By improving the accessibility and credibility of climate messages, AI fosters public trust and encourages inclusive participation in climate discourse, aligning with prior research emphasizing AI’s role in citizen engagement and environmental awareness (Agathokleous et al., 2023; Rahman & Fitriyah, 2025; Fan & Xu, 2025).

In natural resource management, AI demonstrates the capacity to integrate vast datasets from satellites, sensors, and ground-based observations, enabling precise monitoring of deforestation, water availability, and land-use patterns. These applications not only improve operational efficiency but also facilitate predictive planning for sustainable resource allocation. The incorporation of AI with citizen science initiatives further strengthens public participation, creating collaborative networks that enhance both data quality and community engagement (Fraisl et al., 2025; Leal Filho & Gbaguidi, 2024). This evidence supports the argument that AI can act as both a technical tool and a catalyst for participatory and equitable environmental governance, particularly in regions facing resource scarcity or climate vulnerability.

The study also highlights AI-driven remote sensing and predictive analytics as crucial for climate risk assessment and mitigation planning. By enabling detailed analysis of pixels, surface textures, and geometric features, AI supports accurate identification of environmental hazards such as urban heat islands, flood-prone areas, and forest degradation (Rolnick et al., 2023). These capabilities allow decision-makers to prioritize interventions and design adaptive strategies, ensuring that mitigation and adaptation measures are both evidence-based and contextually relevant (Chen et al., 2023; Cowls et al., 2023).

Moreover, the application of AI in urban mobility through smart vehicles, predictive traffic management, and Vehicle-to-Vehicle/Vehicle-to-Infrastructure (V2V/V2I) communication demonstrates its potential to optimize energy efficiency, reduce emissions, and

enhance public safety (Hintz et al., 2025; Islam et al., 2021). This integration of AI with IoT and high-speed networks exemplifies how technological innovation can simultaneously address environmental sustainability and urban livability, creating smart, resilient cities. However, the increased connectivity of these systems introduces cybersecurity and ethical challenges, emphasizing the need for robust safeguards and inclusive governance frameworks (Nordgren, 2023; Cows et al., 2023).

## Conclusion

This study demonstrates that artificial intelligence (AI) has emerged as a pivotal tool in advancing climate change communication, public participation, and policy engagement. The systematic review highlights that AI enhances the accessibility, clarity, and credibility of climate information, making complex scientific knowledge more understandable and actionable for diverse audiences. Through applications such as predictive analytics, natural language generation, and visualization dashboards, AI facilitates evidence-based communication, allowing governments, institutions, and stakeholders to convey policy trade-offs, potential risks, and mitigation outcomes effectively. Furthermore, AI-driven integration with citizen science initiatives promotes greater public engagement and collective responsibility, creating participatory networks that strengthen environmental monitoring and sustainable resource management.

In the domain of natural resource management, AI enables the processing of large-scale data from satellites, sensors, and other monitoring technologies, supporting precision in detecting deforestation, managing water resources, and optimizing land use for sustainability. Remote sensing and predictive modeling offer actionable insights that guide adaptive strategies, ensuring timely responses to climate risks. Similarly, AI applications in urban mobility enhance energy efficiency, reduce emissions, and improve traffic safety through real-time monitoring, vehicle-to-vehicle communication, and data-driven urban planning.

The findings indicate that AI is not solely a technological instrument but a strategic enabler for climate action, bridging the gap between scientific knowledge, public understanding, and policy implementation. By fostering evidence-based decision-making, participatory governance, and sustainable urban and environmental practices, AI contributes to a more resilient and informed society capable of addressing the complex challenges posed by climate change.

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## Author Contributions

Mohammad Nawab Turan<sup>1</sup>, Omid Tarashtwal<sup>2</sup>, and Hafizullah Shahbazi<sup>3</sup> contributed to the conceptualization, methodology, data curation, formal analysis, and writing of this study. Mohammad Nawab Turan led the conceptualization and original draft preparation, while Omid Tarashtwal supervised the project, contributed to methodology and analysis, and reviewed and edited the manuscript. Hafizullah Shahbazi assisted with methodology, data curation, and manuscript review. All authors have read and approved the final version of the manuscript for publication.

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## Conflicts of Interest

The authors declare no conflict of interest.

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