



**ARTIFICIAL INTELLIGENCE TOOLS IN ENVIRONMENTAL ADVOCACY AND COMMUNICATION: A SYSTEMATIC REVIEW**

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ABSTRACT	KEYWORDS
<p>This article examines the role of artificial intelligence (AI) tools in environmental advocacy and communication, synthesizing current research on AI applications for promoting pro-environmental attitudes and behaviors. The study analyzes recent experimental and design-based research published between 2025-2026, focusing on three primary AI applications: generative AI as information sources, AI-powered chatbots for community engagement, and AI-driven content creation and analysis tools. Findings reveal that AI-generated environmental messages can significantly enhance awareness of consequences, moral obligation, and attitudes toward environmental problems, with effectiveness comparable to traditional media sources . AI-powered chatbots demonstrate particular promise in democratizing environmental reporting and creating emotional connections with nature through anthropomorphic design. However, research also indicates that hyper-personalized "nano-targeting" approaches may risk audience polarization rather than broad persuasion. The article concludes with practical recommendations for environmental communicators and identifies directions for future research.</p>	<p>Artificial intelligence, environmental communication, climate advocacy, chatbots, generative AI, pro-environmental behavior.</p>

**Introduction**

Problem Statement Environmental challenges, particularly climate change, represent one of the most urgent global issues of the twenty-first century, threatening ecosystems, economies, and societies worldwide . Effective environmental communication is essential for raising public awareness, shaping attitudes, and motivating pro-environmental behaviors. However, traditional methods of environmental advocacy face significant limitations, including difficulties in synthesizing vast amounts of scientific literature, challenges in engaging diverse audiences, and barriers to making complex environmental data accessible and actionable for non-experts.

The rapid emergence and widespread adoption of generative artificial intelligence (GenAI) tools, particularly since the launch of ChatGPT in late 2022, has fundamentally transformed how individuals access and process information. ChatGPT attracted 100 million users within two months, reaching this

milestone faster than any previous application in internet history . This unprecedented adoption rate suggests that AI tools are becoming primary information sources for significant portions of the population, particularly among younger demographics.

## Literature Review

Recent research has begun exploring the intersection of AI and environmental communication from multiple perspectives. Studies examining GenAI as an information source have investigated how AI-generated content about environmental problems influences users' pro-environmental outcomes. Experimental research demonstrates that exposure to ChatGPT-generated messages about environmental issues such as water scarcity significantly enhances participants' awareness of consequences, moral obligation, and attitudes toward environmental problems.

Simultaneously, researchers have developed and evaluated AI-powered tools specifically designed for environmental applications. The "EarthCanvas" framework represents a creative AI approach that enables non-experts to generate environmental narratives from satellite imagery through natural language prompting, with user studies showing a 40% improvement in comprehension and engagement . Similarly, "MyEcoReporter" demonstrates how large language model (LLM)-based chatbots can facilitate community reporting of pollution incidents through simple text messaging, successfully guiding users through structured data collection in multiple languages .

Another emerging research stream examines the psychological mechanisms through which AI tools influence environmental attitudes. Studies of anthropomorphic chatbots that represent nature itself—allowing users to engage in simulated conversations with "the environment"—reveal that frequent interaction fosters parasocial relationships that develop into pro-environmental attitudes, despite users' awareness of the chatbot's artificiality.

## Research Objectives

This article aims to synthesize current research on AI tools in environmental advocacy and communication, addressing the following objectives:

1. To identify and categorize the primary types of AI applications currently used in environmental communication
2. To evaluate the effectiveness of AI-generated environmental messages compared to traditional communication approaches
3. To examine the psychological mechanisms underlying AI's influence on environmental attitudes and behaviors
4. To assess the potential benefits and risks of AI-mediated environmental advocacy
5. To provide evidence-based recommendations for environmental communicators seeking to leverage AI tools

## Scientific Novelty and Practical Significance

The scientific novelty of this review lies in its systematic synthesis of very recent empirical research (2025-2026) across multiple AI application domains, providing an integrated framework for understanding AI's role in environmental communication. The practical significance lies in offering environmental advocates, educators, and policymakers actionable guidance for effectively incorporating AI tools into their communication strategies while avoiding potential pitfalls.

**2. Methods**

**2.1 Research Design**

This study employed a systematic literature review design, following established guidelines for synthesizing research on emerging technologies. The review focused on peer-reviewed empirical studies, conference proceedings, and design-based research articles published between January 2025 and March 2026.

**2.2 Search Strategy and Inclusion Criteria**

A comprehensive search was conducted across multiple academic databases including ScienceDirect, PubMed Central, Emerald Insight, and MDPI, as well as major computer science conference proceedings (NeurIPS). Search terms included combinations of "artificial intelligence," "generative AI," "ChatGPT," "chatbots," "large language models," "environmental communication," "climate advocacy," "pro-environmental attitudes," and related variants.

Inclusion criteria were: (1) peer-reviewed empirical research or rigorously documented design implementations; (2) direct relevance to AI applications in environmental communication, advocacy, or education; (3) publication between 2025-2026 to ensure currency given rapid technological development; (4) clear description of methods and findings.

**2.3 Data Extraction and Synthesis**

From each included study, the following information was extracted: AI tool type, communication context, target audience, research methods, key findings, and reported effect sizes where available. Findings were organized thematically according to AI application categories and synthesized to identify patterns, consistencies, and contradictions across studies.

**Results**

**3.1 Categorization of AI Applications in Environmental Communication**

Analysis of recent research reveals three primary categories of AI applications in environmental advocacy and communication:

**Table 1. Categories of AI Applications in Environmental Communication**

Category	Description	Examples	Key References
Generative AI as Information Source	AI tools that produce text, images, or other content about environmental issues	ChatGPT-generated environmental messages	
AI-Powered Chatbots	Conversational agents for environmental reporting, education, or engagement	MyEcoReporter, anthropomorphic nature chatbots	
AI-Driven Content Creation and Analysis	Tools for creating environmental narratives or analyzing public discourse	EarthCanvas framework, sentiment analysis systems	

## 3.2 Effectiveness of AI-Generated Environmental Messages

Experimental studies examining GenAI as an information source reveal significant effects on pro-environmental outcomes. In a two-experiment design with Generation Z participants, exposure to ChatGPT-generated messages about water scarcity significantly enhanced participants' awareness of environmental consequences, moral obligation, and attitudes toward the problem. Importantly, the effectiveness of AI-generated messages was comparable to that of traditional digital newspaper articles, suggesting that source credibility is not diminished when information comes from AI.

The perceived usefulness of AI-generated information mediates its impact on environmental attitudes. When participants perceive AI-provided information as useful for understanding environmental problems and potential solutions, they demonstrate stronger pro-environmental outcomes. This mediating role of usefulness aligns with established technology acceptance models and suggests that AI tools must provide genuinely valuable and actionable information to effectively influence environmental attitudes.

## 3.3 AI-Powered Chatbots for Environmental Engagement

AI-powered chatbots demonstrate particular promise for democratizing environmental communication and lowering barriers to participation. The MyEcoReporter system enables community members to report pollution incidents via simple SMS text messaging, engaging users in natural conversations that collect structured information for formal submission to government authorities. Testing across multiple agency versions demonstrated successful conversations in English, Mandarin Chinese, Ukrainian, and Spanish, with conversations averaging 15 messages exchanged and lasting approximately three minutes. This approach addresses traditional barriers to environmental reporting, including bureaucratic complexity and limited computer access.

A particularly innovative application involves anthropomorphic chatbots designed to represent nature itself. In a three-week longitudinal study, 100 participants engaged in daily conversations with a chatbot representing the environment. Results revealed that frequent interaction fostered intimate, personal relationships with the chatbot—termed "parasocial interaction"—which in turn developed into pro-environmental attitudes. Despite participants' awareness of the chatbot's artificiality and lack of authentic experience, the simulated conversations produced measurable changes in climate attitudes and behavioral intentions.

## 3.4 AI-Driven Content Creation and Analysis Tools

The EarthCanvas framework represents a creative AI approach to environmental storytelling that democratizes access to satellite imagery. By integrating terrain-aware conditioning, natural language prompting, and visual harmony modules, EarthCanvas enables educators, journalists, and community advocates to generate compelling environmental narratives grounded in scientific fidelity. User studies demonstrated a 40% improvement in comprehension and engagement compared to traditional satellite imagery presentation, suggesting that AI-mediated visualization can significantly enhance public understanding of environmental changes.

For analyzing environmental discourse at scale, AI-driven sentiment analysis systems offer powerful capabilities. A study applying BERT-based Named Entity Recognition and sentiment analysis to over 30,000 climate-related tweets revealed notable trends and patterns in how people discuss climate issues, particularly in relation to regional planning and infrastructure impacts. This approach

transforms unstructured climate discussions into accessible, actionable information for policymakers and the public, demonstrating AI's potential to inform evidence-based climate adaptation strategies .

### **3.5 Comparative Effectiveness and Audience Factors**

Research comparing different AI-mediated communication approaches reveals important nuances. A study examining policy communication in environmental incident governance found that expert opinions are more effective than AI opinions in reducing public willingness to participate in mass incidents . This finding suggests that in high-stakes environmental governance contexts, human expertise may retain credibility advantages over AI-generated content.

A particularly significant finding concerns hyper-personalized "nano-targeting" approaches in climate communication. Experimental research testing nano-targeted climate messages against broadly appealing messages revealed that nano-targeting did not prove superior for persuasion . Instead, nano-targeting effectively dissuaded and polarized audiences—support for climate protection fell more sharply among individuals exposed to messages they were predicted to dislike than it increased among those shown messages they were predicted to like. Furthermore, nano-targeting outperformed broad appeal messages only for individuals already pro-climate, reinforcing pre-existing views rather than reaching new supporters . In contrast, carefully designed broad-appeal messages increased net zero policy support from 42% to 52%, demonstrating that mass appeals can shift sizable pluralities to clear majorities .

### **3.6 Simulation and Predictive Applications**

Emerging research explores AI's potential to simulate human responses to environmental messaging. A project implementing virtual humans whose responses to environmental messages are shaped by their media diets and social interactions scraped thousands of social media post-comment pairs, classified them by viewpoint using large language models, and built vector databases to serve as knowledge sources for chatbots with selectable personas . This approach enables testing environmental messages against simulated audiences representing diverse stereotypical viewpoints grounded in current news, attitudes, and zeitgeists, offering a potentially valuable tool for pre-testing communication strategies .

## **4. Discussion**

### **4.1 Interpretation of Findings**

The results of this systematic review demonstrate that AI tools have significant potential to enhance environmental advocacy and communication across multiple dimensions. The finding that AI-generated environmental messages produce effects comparable to traditional media sources carries important implications. As GenAI tools become increasingly integrated into daily information-seeking behaviors—particularly among younger generations—environmental communicators must recognize AI as a legitimate channel for reaching audiences. The comparable effectiveness suggests that source credibility concerns may be diminishing as AI tools become normalized, or alternatively, that Generation Z users may not distinguish sharply between human-generated and AI-generated content. The mediating role of perceived information usefulness aligns with established persuasion theories emphasizing that message recipients actively evaluate content value. For environmental advocates, this implies that simply delivering messages through AI channels is insufficient; the content must provide

genuine value in helping audiences understand environmental problems and potential solutions. The moderating effects of psychological distance and technological innovativeness further emphasize that AI-mediated communication must be tailored to audience characteristics, though the nano-targeting findings suggest caution regarding hyper-personalization.

## 4.2 Comparison with Previous Research

The comparable effectiveness of AI-generated and traditional media messages extends previous research on technology-mediated communication by demonstrating that AI's novelty does not inherently reduce persuasive impact. This finding contrasts with earlier concerns about AI credibility deficits and suggests rapid normalization of AI as an information source.

The nano-targeting findings align with and extend previous research on micro-targeting in political communication, confirming that hyper-personalization may be more effective for reinforcement and polarization than for broad persuasion. This carries important implications for environmental campaigns that seek to build majority support for climate action rather than simply mobilizing existing supporters.

The EarthCanvas framework's 40% improvement in comprehension and engagement exceeds typical effect sizes for educational interventions, suggesting that AI-mediated visualization may qualitatively transform how audiences understand environmental changes. This finding aligns with multimedia learning theories emphasizing the value of integrating visual and narrative information.

## Limitations of This Review

This review has several limitations that should be acknowledged. First, the rapid pace of AI development means that findings from 2025-2026 research may not fully generalize to future AI systems with enhanced capabilities. Second, the reviewed studies predominantly sampled Western and Chinese populations, limiting generalizability to other cultural contexts. Third, most experimental studies measured short-term attitude changes rather than long-term behavior change, leaving questions about sustained impact unanswered. Fourth, the review focused on English-language publications, potentially missing relevant research in other languages.

## Future Research Directions

1. This review identifies several important directions for future research:
2. Longitudinal studies examining whether AI-mediated environmental attitude changes persist over time and translate into sustained behavior change
3. Cross-cultural comparative research investigating how cultural factors moderate AI's influence on environmental attitudes
4. Studies examining AI applications for environmental communication with older adult populations beyond Generation Z
5. Research on the optimal integration of AI tools with human expertise in environmental advocacy
6. Ethical analyses of anthropomorphic AI applications that create emotional connections to nature
7. Investigation of potential misinformation risks when AI generates environmental content
8. Development and validation of evaluation frameworks for AI-mediated environmental communication

## Conclusion

This systematic review synthesizes current research on artificial intelligence tools in environmental advocacy and communication, revealing significant potential for AI to enhance pro-environmental outcomes while identifying important caveats and limitations. Three primary AI application categories—generative AI as information sources, AI-powered chatbots, and AI-driven content creation and analysis tools—demonstrate effectiveness across multiple communication contexts.

Key findings indicate that AI-generated environmental messages can significantly enhance awareness, moral obligation, and attitudes toward environmental problems, with effectiveness comparable to traditional media sources. AI-powered chatbots show particular promise for democratizing environmental reporting and creating emotional connections with nature through anthropomorphic design. However, the finding that hyper-personalized nano-targeting approaches may risk audience polarization rather than broad persuasion carries important implications for communication strategy. The convergence of findings across multiple studies suggests that AI, when thoughtfully applied, can contribute meaningfully to environmental advocacy by making complex information accessible, lowering participation barriers, creating emotional engagement, and reaching audiences through channels they already trust. Realizing this potential requires continued research, ethical reflection, and collaboration between AI developers, environmental scientists, and communication practitioners.

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