Wiley Interdisciplinary Reviews: Climate Change

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Climate Change Communication in the Age of Artificial Intelligence

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Received: 9 October 2025 | **Revised:** 8 May 2026 | **Accepted:** 15 May 2026

Editor-in-Chief: Maria Carmen Lemos | **Domain Editor:** Irene Lorenzoni

Keywords: artificial intelligence | ChatGPT | climate change | climate change communication | climate change education

ABSTRACT

Artificial intelligence (AI), and especially generative AI (GenAI), is rapidly reshaping climate change communication (CCC). Once dominated by news coverage and public campaigns, CCC now extends across scientists, NGOs, corporations, journalists, influencers, and citizens—all increasingly encountering and adopting AI tools. This article provides a comprehensive review of scholarship on the nexus of AI and CCC, synthesizing insights scattered across disciplines from social and computer science, and interdisciplinary fields like environmental and science studies. It identifies robust patterns alongside significant gaps, highlighting areas where future research is needed. Based on existing evidence, it shows that AI—as of now—functions less as a disruptive replacement of established communication and information-seeking practices rather than as an assistive layer in CCC: accelerating routine newsroom tasks, enabling personalized and multilingual outreach, and generating new textual, visual, and multimodal representations of climate change. Stakeholders use AI to monitor discourse, expose greenwashing, and broaden access to climate information, though systematic research on uptake and effects remains limited. Journalists experiment cautiously with AI, emphasizing human oversight, while influencers and content creators are understudied despite their growing role. The potential of AI-driven systems for fact-checking, policy analysis, and creative engagement has been explored, yet studies remain heavily English-centric and focused on text. Citizen studies reveal promises and risks: generative dialogues can reduce skepticism and foster engagement, but biases, misinformation, and equity concerns persist. Advancing the field requires comparative and interdisciplinary agendas that integrate computational and traditional methods, foreground transparency and inclusion, and address how AI can equitably support awareness, trust, and climate action.

This article is categorized under:

Perceptions, Behavior, and Communication of Climate Change > Communication

1 | Introduction

Climate change is a core challenge for contemporary societies, and public communication about it shapes awareness, understanding, and action. Research on climate change communication (CCC) has proliferated, examining how information circulates, gains meaning, and affects attention, attitudes, and behavior in ways that shape policy and practice (Moser 2016; Holmes and Richardson 2020; Pearce et al. 2015).

CCC spans stakeholders (like scientists, policymakers, corporations, NGOs, or social movements) and intermediaries (like journalists, influencers, or celebrities) and reaches audiences via news, social media, campaigns, and events (Klinger and Metag 2021; Newman et al. 2020; Schäfer 2015). In recent years, CCC has changed markedly: the news economy is tighter and more fragmented; digital-born and niche outlets have proliferated; newsroom roles have moved from gatekeeping toward curation; source ecologies have diversified and public relations (PR) influence has grown (Newman et al. 2025; Painter and Schäfer 2018; Schäfer and Painter 2021). Social media are now central to CCC and cater to ideologically diverse publics; spikes of coverage and mobilization coexist with platform logics that can amplify polarization and misinformation; visual, narrative, and short-video formats have diversified across countries and audiences (Hautea et al. 2021; Pearce et al. 2019; Schäfer 2025; Schäfer and Metag 2026a; Williams et al. 2015).

Since 2022, artificial intelligence (AI)—and especially generative AI (GenAI)—has become a new driver of change in both climate science (Materia et al. 2024; Muccione et al. 2024) and CCC (Chen and Shi 2024). AI denotes computational systems that perform tasks commonly associated with human cognition; GenAI such as large language models (LLMs) produces seemingly novel texts, images or other forms of content from large-scale digital training data and human feedback. AI is increasingly mediating how climate information is created, curated, and encountered (Cowls et al. 2023; Greussing et al. 2025; Fletcher and Nielsen 2024), and predictions about its impact range from optimistic to dystopian (Schäfer 2023):

Discussed benefits include that AI may simplify complex topics through clearer language and structure (Skjuve et al. 2024), enable interactive learning via human-like exchanges (Chen et al. 2024), summarizing publications (Lund et al. 2023), drafting media releases or articles (Tatalovic 2018), and tailoring content to user needs (Karpouzis et al. 2024). For CCC, this implies potential gains in accessibility (e.g., through multimodal or multilingual explanations), personalization, lower production costs for resource-constrained actors, and more conversational or visual formats that can render abstract risks more concrete (Biyela et al. 2024).

Discussed risks are equally salient, however. LLMs generate outputs from statistical patterns rather than understanding, so answers may be inaccurate albeit seeming convincingly factual (Angelis et al. 2023) or may include "hallucinated" facts or studies (Perkins and Roe 2024). Even when accurate on core aspects of climate change, AI may exhibit biases toward STEM and positivist framings (Volk et al. 2025). While users partly recognize these limitations (Skjuve et al. 2024) and have limited trust in AI-generated content (Schäfer et al. 2024), spotting errors often requires domain expertise and remains difficult. Beyond factual reliability, critics flag flawed reasoning, limited critical reflection, and derivative style in AI outputs (Dwivedi et al. 2023) as well as its potential to further dis- and misinformation (Chen and Shi 2024). Proprietary AI systems limit transparency and explainability (Van Dis et al. 2023; Dwivedi et al. 2023), and biases in training data might be reproduced or amplified (Gichoya et al. 2023). For CCC specifically, these problems intersect with concerns about large-scale mis- and disinformation, eroding credibility and trust, and the environmental footprint of GenAI (Bender et al. 2021; Weidinger et al. 2022).

These potentials and risks need to be explored rigorously, and research on CCC has started to assess the role of AI. The overview article at hand synthesizes this rapidly growing body of scholarship. It provides a comprehensive narrative review driven by the authors' expertise in CCC research and adjacent fields like environmental and science communication, supported by a systematic database search for relevant scholarly literature to minimize omissions. Specifically, we conducted a search in the Web of Science (WoS) Core Collection across all years, languages, and subject categories, limiting document types to articles, review articles, and book reviews. The query was run on 19 February 2026, using the search string TS=("climate chang*" OR "global warming*" OR "greenhouse effect*"; Hase et al. 2021) AND TS=("artificial intelligence*") AND TS=(communication OR media OR news) in the titles, abstracts, or author keywords of all publications. The initial search returned 976 publications. We screened titles, abstracts, and full texts where eligibility remained unclear, retaining publications that addressed climate change in conjunction with artificial intelligence and a communication-related focus. This process yielded 57 publications, which were then individually reviewed by the author team and incorporated into the relevant sections where appropriate. On this basis, the article maps research on communicators, intermediaries, content, and audiences and their use of AI in CCC. Where needed, it draws on adjacent fields to clarify mechanisms and strength of evidence.

2 | Research on AI in CCC: Emerging Yet Rapidly Growing

Research on CCC has expanded rapidly since the 1990s and diversified in topics, theories, and methods. Systematic reviews chart a strong post-2007 expansion, with the field moving from foci on generic environmental or risk communication to more focused work on climate change and a wider array of media, actors, and effects (Comfort and Park 2018; Schäfer and Schlichting 2018; Shrivastava and Swartz 2025). At the same time, syntheses continue to note a strong focus on Western countries and news media, and call for broader geographical, platform, and stakeholder perspectives (Agin and Karlsson 2021).

AI has only recently become a topic of interest in CCC research. As in adjacent areas such as science and health communication (Kessler et al. 2025; Schäfer 2023), it represents an emerging but rapidly expanding subfield. While exact publication counts vary with search terms and inclusion criteria, a scoping bibliometric review conducted for this article confirms the same trend observed elsewhere: minimal output before late 2022, followed by a sharp surge thereafter. Across the Scopus database, the interdisciplinary Nature Climate Change and the communication-focused Environmental Communication journals, as well as presentations on climate change at the International Conference on Machine Learning (ICML), the pattern is consistent (Figure 1)—reflecting the diffusion of foundational GenAI models.

Within research on AI and CCC, two methodological directions stand out. First, AI-assisted content analyses at scale—using classifiers or multilingual models—extends

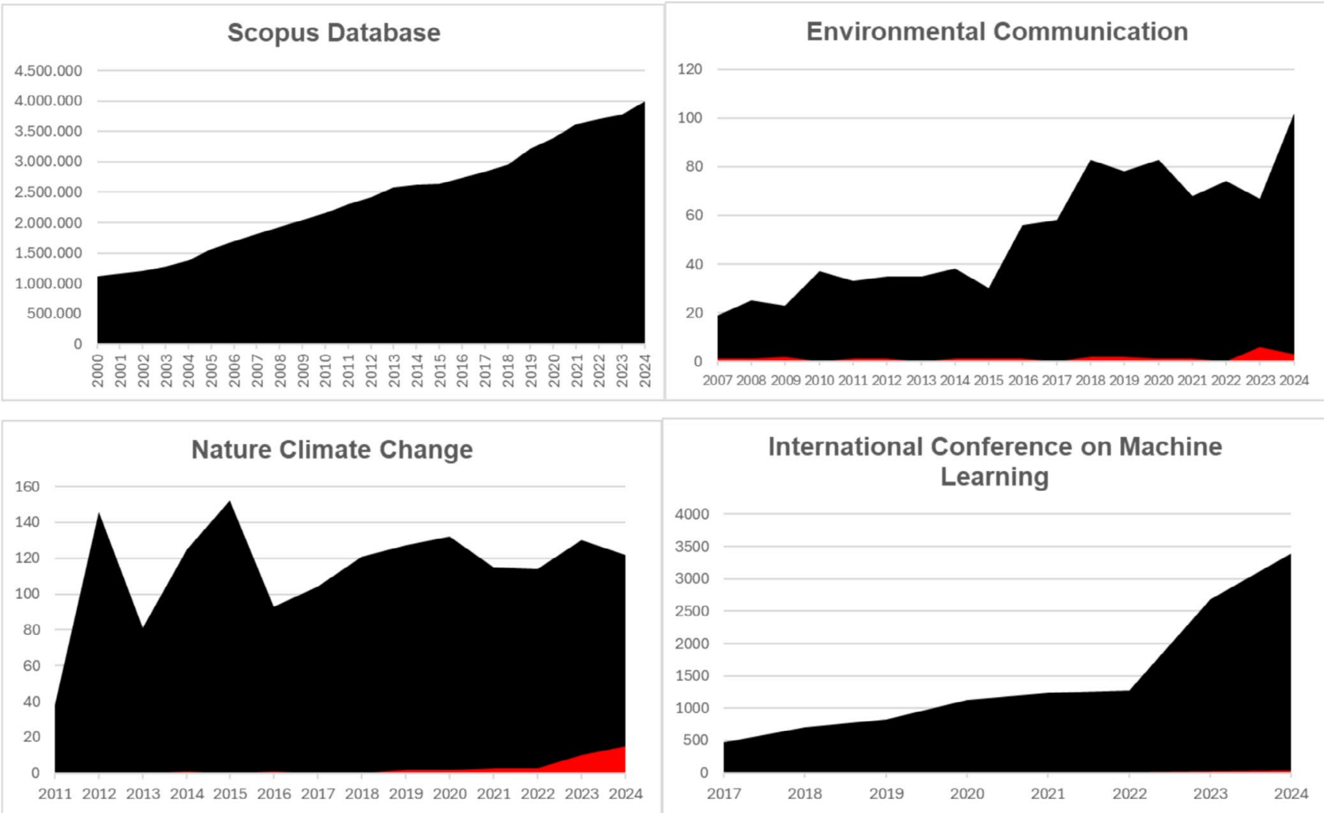

FIGURE 1 | Black = annual number of articles and/or presentations in the Scopus database and in three leading venues publishing work on climate change communication ("Environmental Communication" journal), interdisciplinary research on climate change ("Nature Climate Change" journal) and artificial intelligence (ICML International Conference on Machine Learning). Red = number of those articles or presentations that mention (((climate chang*) OR (global warming)) AND (artificial intelligence) AND (communication OR media)) (for Scopus database), "artificial intelligence" (for "Environmental Communication" and "Nature Climate Change") or ("climate change" or "global warming") (for ICML) in headline or abstract. Queries run on September 23, 2025.

CCC's computational turn by mapping frames, actors, and misinformation across platforms and countries (Cho and Ackom 2025). Second, model-mediated audience research—using LLMs to estimate attitudes or simulate responses—has provoked debate over algorithmic fidelity, is beginning to be benchmarked against surveys, and is sensitive to model versioning, prompting, and the timing of data collection (Lee et al. 2024). Both approaches underscore the need for transparent validation, hybrid designs, and reflexive application (Agin and Karlsson 2021; Comfort and Park 2018; Schäfer and Hase 2023). Yet, as in CCC more broadly, scholarship remains Western-centric, with relatively little evidence from the Global South (Agin and Karlsson 2021; Comfort and Park 2018).

3 | AI and Its Use in and Impact on Stakeholder Communication

AI is reshaping how organizations and other actors communicate about climate change—that is, how they use strategic, purposeful communication to reach and influence key stakeholders such as the public, consumers, or policymakers. From scientists and scientific institutions to NGOs, social movements, companies, and AI developers, AI is increasingly used for stakeholder communication, including on climate-related topics (Bag et al. 2025). Yet, despite the rapid diffusion of AI for strategic communication in organizations more generally, relatively little evidence exists about how AI specifically affects strategic CCC, from the production and distribution of climate-related content to the monitoring of climate-related discourses or (mis-)information.

Emerging research spans disciplines and fields like strategic, science, and environmental communication, sustainability science, and organization and management. Most studies focus on AI as a tool for producing or analyzing CCC, for example through NLP models such as ClimateBERT (e.g., Bingler et al. 2022). Far fewer examine AI itself as an object or explore its implications for the spread of climate misinformation (Dhiman et al. 2024).

Overall, the evidence base remains limited, uneven,—and heterogeneous: First, although many studies analyze AI diffusion within organizations, only a small subset explicitly addresses climate-specific contexts; nevertheless, their findings can inform our understanding of AI-based CCC. Second, while corporate applications of AI are relatively well documented, its use by climate scientists or NGOs for stakeholder engagement remains underexplored. Third, research relies on highly diverse methods and samples from different national contexts, ranging from surveys and interviews with communication professionals to stakeholder experiments, content analyses of CCC-related documents or reports, case studies of individual organizations, or evaluations of newly developed LLMs. While much of the research on AI use for stakeholder communication appears in peer-reviewed outlets, emerging evidence on LLMs for CCC is frequently disseminated through preprints or conference proceedings and insights on practical applications are published in working or white papers, reflecting the rapid pace of technological development. Against this backdrop, drawing generalizable conclusions from the current state of knowledge remains challenging, but the following sections will identify more robust findings as well as key gaps in scholarship.

3.1 | Scientific Organizations and Scientists: Climate-Specific AI Applications and Adoption of AI for Communication

Research on how scientific organizations use AI to communicate with their stakeholders has been growing, albeit not specifically regarding climate change. Three quantitative surveys of university communicators indicate an increase in AI use in university communication departments from 2023 to 2025, particularly for text generation (Henke 2025; Henke and Begenat 2026) and suggest a *shift from cautious experimentation to mainstream adoption*.

Research on scientists' use of AI in their own work has been expanding (Naddaf 2025), yet little is known about how they employ AI for outreach and public communication (Schäfer 2023). Specifically, studies examining how climate scientists use AI to communicate their findings to stakeholders are still absent. The Intergovernmental Panel on Climate Change (IPCC), which convenes 1000 of scientists to assess climate research, has recently discussed the potential of AI not only for literature identification and assessment but also for communicating report contents to wider audiences (Buck et al. 2025). However, empirical research on the IPCC's actual adoption and use of AI remains at an early stage (Khourdajie 2025).

Interestingly, *AI researchers have developed LLM–based systems grounded in climate science to produce accessible, timely, and reliable climate information and analyze CCC*. For instance, tools such as ChatClimate and ClimateGPT use or fine-tune foundation models to provide stakeholders—from citizens to journalists—with science-based answers about climate change (Vaghefi et al. 2023). Others, such as ClimateBERT, ChatReport, ChatNetZero, or ImpactScope's Greenwashing Identifier, evaluate and detect misleading corporate claims in sustainability or corporate social responsibility (CSR) reports or environment, social, and governance (ESG) disclosures (Bingler et al. 2022; Hsu et al. 2024; Ni, Bingler, et al. 2023; Vinella et al. 2024; Webersinke et al. 2022). These tools showcase AI's potential to strengthen access to climate-related information, improve the quality of CCC, and identify misleading narratives and greenwashing. However, research on the real-world uptake by and potential democratizing effects of such tools on stakeholders (e.g., citizens, journalists, regulators) remains scarce—and thus a key area for future inquiry.

3.2 | NGOs, NPOs and (New) Social Movements: Practice-Driven Development of AI Applications, Little Research

Research on how non-governmental and non-profit organizations (NGOs and NPOs) or (new) social movements adopt AI to communicate with stakeholders is limited, despite beginning adoption in practice. Qualitative studies of communication professionals from NGOs and NPOs suggest that *AI is used for content creation and editing to save time and increase efficiency* (Bonin et al. 2025). However, the adoption of AI chatbots is often hindered by lack of technical expertise, financial constraints, or security concerns (Dube et al. 2024). These benefits and challenges likely also apply to climate-specific NGOs or social movements. While research about those is limited, examples and case studies from practice exist: Fridays for Future US, for instance, used AI-generated portraits of young individuals to draw attention to the harmful effects of air pollution (cf. Efthymiou et al. 2023).

Several NGOs have developed AI-based chatbots and tools based on climate data to produce, disseminate or analyze climate-related information. Examples include tools like Farmer. Chat or FarmerAI that provide localized climate insights for farmers, or Climate Policy Radar, which uses AI to map climate policy documents for local decision-makers (Barenblat and Morenzoni 2024). An example for assessing and monitoring climate risks and facilitating disaster communication is Flood Hub—developed by NGOs, the UN, and Google—which delivers early flood warnings to vulnerable communities. Such applications promise to enhance equitable access to actionable climate information. However, little is known about the use, accessibility, or trustworthiness of these tools—especially given that some are developed with powerful AI companies. Research is needed to understand how NGOs and social movements deploy AI equitably for CCC in diverse socio-political contexts.

3.3 | Companies: Rapid Adoption of AI, but Little Evidence Specific on CCC

Academic work on companies' use of AI for stakeholder communication has grown rapidly. Survey studies show that *AI is widely adopted in corporate communication departments* (e.g., Sutherland 2025; Uysal and Deng 2025; Zerfass et al. 2020), including in energy and related industries (Chmielewska-Muciek et al. 2024). Yet, fewer studies examine AI's role in corporate sustainability, CSR, or ESG communication—domains closely tied to climate change (e.g., Shrivastava and Swartz 2025). Still, general adoption trends likely also extend to CCC (e.g., Akter et al. 2024).

For producing or analyzing stakeholder communication, AI allows firms to personalize and microtarget sustainability messaging, generate ESG disclosures, automate responses about environmental responsibility via chatbots, or monitor climate discourse and public sentiment in real time, feeding into predictive analytics to refine messaging strategies for different stakeholder groups (e.g., Raghupathi et al. 2023). Survey and experimental research indicate that consumers engage with AI chatbots on topics like CSR (e.g., Jiang et al. 2025; Oh and

Ki 2024), but that AI-generated communication can also undermine the authenticity of CSR (Illia et al. 2025). While AI offers productivity gains for corporate communicators (e.g., Kelm and Johann 2024; Yue et al. 2024), concerns persist around data privacy, authenticity, accountability, or lack of AI literacy (e.g., Bowen 2024; Dong and Van Den Berg 2025; Germinder and Capizzo 2024).

Risks of AI adoption specifically in CCC include its potential to facilitate greenwashing (Moodaley and Telukdarie 2023), as AI may help firms craft persuasive sustainability narratives that lack substance (Gehricke et al. 2025). AI systems may also facilitate other malicious uses, as they lower the costs of persuasive, tailored, and high-volume climate-related content, which can support coordinated manipulation through synthetic personas or microtargeted messaging (Chen 2024). In turn, firms can use open-source AI applications like *ChatReport* to verify their own ESG statements against standards like those of the Task Force on Climate-Related Financial Disclosures (TCFD) (Ni, Bingler, et al. 2023). A growing market of startups has emerged offering AI-based services for emissions tracking or net-zero planning (e.g., *Climatiq* or *ClimateAI*)—but their influence on CCC is yet unclear and future research is needed.

3.4 | AI Developers: Little Research on Developers' Communication About Their Footprint

Finally, AI developers themselves have become relevant actors in climate change communication. As public scrutiny grows regarding the energy use and carbon footprint of AI systems (Cowls et al. 2023), *companies such as Microsoft, OpenAI, and Google increasingly use strategic communication to frame their environmental responsibility and sustainability commitments*, often through corporate reports, ethics or CEO statements (Zhang et al. 2026). At the time of writing, Microsoft emphasizes its aim to become carbon-negative by 2030 and highlights AI as a tool for sustainability as a key priority, while Google focuses on developing more energy-efficient and sustainable AI systems (Zechiel et al. 2024). OpenAI, in contrast, communicates less prominently in publicly available materials about climate-related aspects. Despite their growing visibility, the content, framing, and reception of AI developers' corporate messaging—across social media, reports, and public statements—remain under-examined in scholarship.

3.5 | Research Gaps and Future Avenues

Overall, while AI adoption in strategic communication is an expanding area of research, studies on AI-generated CCC by actors other than companies remain scarce. This includes scientific institutions, NGOs, social movements, policymakers, and politicians. The gap is particularly striking given the rapid emergence of practical AI applications and the likely widespread diffusion of AI as a tool for strategic CCC. Future research should examine how diverse actors use AI for CCC and how such communication shapes stakeholder perceptions and responses. Key priorities include assessing the transparency, framing, and reception of AI-generated environmental narratives—especially in high-emission sectors such as energy, oil, and automotive, and among AI developers themselves. Surveys and experiments are needed to evaluate how AI-generated communication influences trust, credibility, and public understanding of climate change, and whether these effects differ systematically from human-authored messages. Moreover, critical analyses should investigate whether and how organizations deliberately employ AI to amplify climate misinformation.

4 | Intermediaries of CCC and Their Use of AI: Climate Journalists, Influencers and Others

CCC depends heavily on intermediaries who select, frame, and disseminate content to wider publics. Climate journalists long occupied this role, but are now flanked by novel intermediaries—including influencers, content creators, and celebrities.

4.1 | Climate Journalism: Increasing Yet Assistive Use and Cautious Experimentation—With Human Oversight

Climate journalism is the professional practice that gathers, evaluates, selects, and presents news and information, guided by journalistic criteria and/or editorial principles, and distributes them via technical means to a (potentially) wide range of general and specialist audiences (Schäfer and Painter 2021: 2). Climate journalists include not only core climate or environmental journalists, but also general or freelance reporters who cover climate intermittently (Brüggemann and Engesser 2014). Scholarship on climate journalism has grown in recent years, with studies from communication science, sociology, political science, geography, etc. focusing on organizational contexts, working routines, and the individual values and characteristics of journalists (Engesser 2017; Schäfer and Painter 2021). In contrast, research on the use of AI in newsrooms is still young, with most journal articles published since 2023, and while scholarship on the broader impacts of AI on newsrooms is varied and growing (e.g., Broussard et al. 2019; Simon 2024), its impact on specialist journalism such as health, finance, environmental, or science desks is less well documented. This is particularly true for climate journalism, which contains certain elements that distinguish it from general reporting such as the complexity and uncertainty of climate science, the political contestation in many countries, the need for transparency of sources, and the need for the interpretation of new science or policy. Research on AI in newsrooms is expanding rapidly, but evidence on climate journalism remains sparse. Therefore, we will largely draw on general newsroom research and adjacent evidence from science journalism.

Existing studies on journalism in general show that *AI is used across the journalistic workflow.* Across the newsgathering, production, and dissemination stages, studies show broadening AI use. A global survey of 105 news and media organizations in 46 countries found wide deployment at each stage; notably, 85% had at least experimented with GenAI in the production phase—for instance for writing code, generating images, and authoring summaries—and AI support for fact-checking and proofreading was common (Beckett and Yaseen 2023). Results indicate a rapid diffusion of assistive functions, especially for routine or time-saving tasks (cf. Guenther et al. 2025).

Complementing survey evidence, interviews with more than 150 news workers and experts in Germany, the UK, and the US document a similarly wide range of uses: audience analytics, story ideas and information discovery at newsgathering; reformatting for multiple platforms and transcription of audio/video at production; and personalisation and recommendations at dissemination (Simon 2024, 2025). Simon's taxonomy underscores that *adoption concentrates on augmenting inputs and formatting rather than replacing core editorial judgment* (Simon 2024). *Reported benefits include efficiency gains, improved personalisation, and support for data reporting; risks include misinformation and ethical concerns* (Verma 2024; Borchardt 2025).

Individual and organizational factors have been shown to shape the uptake of AI: e.g., journalists' role perceptions (e.g., entertainment vs. watchdog) correlate with attitudes toward GenAI (Møller et al. 2025). Newsrooms are also piloting GenAI-driven personalisation and chatbots to answer user questions (Arguedas 2025), including in the climate domain, where the Washington Post has trialed a chatbot on climate questions based on its own reporting. But climate-specific examples seem scarce: Among 211 newsroom use cases of AI worldwide, just one concerned environmental reporting (a fact-checking tool developed by the Earth Journalism Network; Beckett and Yaseen 2023).

Studies of science journalists—many also covering climate—show selective adoption. Studies with German science journalists provide detailed insights into their attitudes and practices (Guenther et al. 2025). Distinguishing selection, production, distribution, they report a varied but coherent pattern: Journalists are open to "applied AI" for specific, back-end problems in production and distribution (like translations, transcriptions, or spellchecks), a pattern also observed in other countries (Dijkstra et al. 2024). Crucially, science journalists report not using AI for news selection, nor do they use GenAI to produce publishable content—a stance that seems to contrast with broader tendencies toward automated journalistic work (Newman et al. 2025).

Motivations for this selectivity are consistent. *Most science journalists emphasize human oversight, verification, and quality control, citing transparency concerns*. They report low trust in AI, particularly for controversial topics or for reliably conveying traditional news factors like relevance, proximity, or emotion (Guenther et al. 2025). Dijkstra et al. (2024) similarly record worries about lower adherence to rigor, integrity, and transparency of sources. Tool-oriented studies reflect the same logic: semi-automation to diversify sources (Maiden et al. 2023) and interviews on the usefulness of computational news discovery (Nishal et al. 2024) target support functions rather than authorial substitution.

In sum, evidence suggests a division of labour in which AI/GenAI is accepted for back-end tasks, while editorial authorship and judgment remain human—consistent with journalism's general norms of verification and accountability, which may be especially salient among climate and science journalists given their attention for accuracy, uncertainty and politicization. Gaps in scholarship remain, however: Specific studies onthe use of AI in climate journalism are scarce. The literature is skewed toward the Global North, which mirrors broader biases in the field (Schäfer and Painter 2021) but needs to be remedied in light of indications that audiences and media businesses in other world regions, like Asia, are less skeptical about AI in news production. Topically, several technical domains merit attention: newsroom uses of computer vision (De Lima Santos and Salaverría 2021) and the potential to combine AI with satellite imagery to enhance reporting; or deploying AI to combat mis- and disinformation (Costello et al. 2024; Komendantova and Erokhin 2025). These areas intersect with climate journalism's long-standing commitments to accuracy and transparent communication, while also raising questions about disclosure, auditing, and model governance.

A further underexamined dimension is the governance layer around newsroom AI use: internal policies and external constraints such as platform rules or emerging regulations shape what is permissible and disclosed. In addition, platform "trust and safety" infrastructures—labeling, provenance, ranking interventions, etc.—can affect the visibility of climate content and the conditions under which AI-generated material circulates. Empirical work on these governance arrangements and their impact on CCC remains scarce (Machen and Pearce 2025).

4.2 | Increasing Intermediation via AI-Enabled Personalisation and Recommender Systems

Beyond production, *AI increasingly shapes the distribution of and exposure to climate-related content through recommender systems, audience analytics, and personalization*. Newsrooms can use AI to tailor formats and target segments, while platforms algorithmically rank and recommend climate-related content (Kevin-Alerechi et al. 2025; Simon 2024), creating opportunities for relevance and engagement, but also risks of microtargeting, uneven reach, and opaque amplification of polarizing or misleading material (Beckett and Yaseen 2023). These dynamics raise governance questions for CCC intermediaries, including disclosure of automation, fairness and transparency of targeting, and how editorial responsibility intersects with platform-level ranking and recommendation systems (Shi and Sun 2024).

4.3 | Influencers, Celebrities and Climate Creators as New Intermediaries—and a Black Box in Terms of AI Use

Intermediaries in CCC nowadays extend well beyond newsrooms to include influencers, celebrities, activists, and other creators who engage with climate-related issues "as a central part of their public persona as well as their presentation of the self on social media" (Haastrup and Marshall 2024; Wright and Nyberg 2022). Their relevance is evident: While television and mainstream news remain the main sources of climate information, one in five people rely on social media, with higher figures in countries such as India and Pakistan, and 11% turn to influencers, celebrities, and activists (Newman et al. 2022; Ejaz et al. 2025). These actors increasingly perform para-journalistic functions—producing original stories, explainers, and interviews—with considerable impact (Newman 2024; Citrawijaya and Jannah 2025).

They also shape discourse on platforms like TikTok, YouTube, and Instagram, where they can both foster engagement and spread climate misinformation (Schäfer 2025).

Despite their growing prominence, *research on influencers and celebrities in CCC remains scarce and often confined to niches such as sustainable fashion* (Jacobson and Harrison 2022; Rathore 2019). But existing conceptual and empirical studies highlight their communicative strategies and influence (Doyle et al. 2017; Thomas and Fowler 2021; Hai 2024; Haastrup and Marshall 2024) and could be expanded to CCC. Some recent work explores how AI integrates into influencer practices (Díaz-Soloaga and Pelzer-Peinado 2024; Sharma and Singh 2025), including the rise of AI-generated or "virtual" influencers. These studies touch on climate-related issues and analyze communicative strategies such as affective appeals, competence displays, credibility building, and social signaling to enhance their impact (Wan et al. 2025; Feng et al. 2024; Manzo et al. 2025) as well as their economic strategies (Andersen and Krutrök 2024; Ballestar et al. 2022). Experimental evidence also suggests that AI-mediated creators could shape correction dynamics in politicized issue contexts. Von Sikorski et al. (2026) find that on polarized topics like climate change, corrections delivered by AI-generated influencers reduce misperceptions significantly more than human content creators.

Yet this area remains underdeveloped. Useful distinctions between macro-influencers (e.g., activists, film stars) and micro-influencers (e.g., entrepreneurs) are only beginning to be applied (Haastrup and Marshall 2024), and distinctions between human creators and AI-based influencers need to be added. Conceptual and empirical foundations are still needed, especially typologies of climate influencers beyond traditional media organizations—ranging from general news providers including climate to non-partisan specialists, partisan mobilizers, and visually driven "climate infotainment." Future work should systematically assess how different types of influencers adopt AI in producing, curating, and disseminating climate content. It should also study them in tandem with newsroom work, as creators often repackage, reinterpret, or contest journalistic climate coverage, while newsrooms increasingly adopt social- and video-native logics that blur lines with para-journalistic content.

5 | AI-Generated Representations of Climate Change

This section shifts the focus from stakeholders and intermediaries to AI-generated representations of climate change. Specifically, it considers how AI, particularly foundation models including LLMs, is used both to generate climate-related content (e.g., interactive visualizations aimed at raising awareness) and to analyze and classify information (e.g., adaptation measures in scientific publications).

Scholarship has primarily concentrated on *textual* and *visual* AI-generated content, whereas audio and multimodal formats remain underexplored. Most studies rely on general-purpose LLMs, predominantly different versions of OpenAI's GPT models (e.g., GPT-3.5, GPT-4, InstructGPT), although other systems such as Google's PaLM 2 or the open LLM Falcon-180B are occasionally used. At the same time, *climate-specialized systems* are increasingly emerging, such as the AI Climate Impact Visualizer (Luccioni et al. 2021), ChatClimate (Vaghefi et al. 2023), ClimateCheck (Ahmad et al. 2025), ClimateGPT (Thulke et al. 2024), and OceanChat (Pataranutaporn et al. 2025). The field remains *predominantly Anglophone*, with limited attention to other languages like Chinese (Zhou et al. 2024), French (Meddeb et al. 2022), or multilingual contexts (Thulke et al. 2024). *Methodologically, the field is highly heterogeneous*. Studies vary in model choice, version, output generation, documentation, prompting strategies, access mode (e.g., API or app), and parameters (e.g., temperature or response length). In addition, models vary systematically in their safety constraints and editorial policies, which can shape outputs on contentious climate topics and complicate comparability across systems. Reporting on these details is often inconsistent, making direct comparisons and reproducibility difficult. Frequent model updates and opaque versioning further complicate generalizability. Validation practices range from automated performance metrics to expert or lay evaluations, adding additional variability. Overall, the field is *highly interdisciplinary*, spanning computer science, climate science, communication and political science, climate finance, and related domains.

5.1 | Generating Climate-Related Content With AI: Creative and Engaging, but Nuances and Context Remain Challenges

GenAI offers stakeholders, intermediaries, and citizens new opportunities to create climate-related information, stories, and communication across textual, visual, audio, and multimodal formats.

With regard to *textual content*, research indicates that *LLMs can produce basic climate information*, yet challenges remain regarding accuracy, completeness, and contextual nuance. Bulian et al. (2024) find that AI-generated responses to climate-related questions often exhibit higher presentational quality (clarity, style, tone) than epistemological quality (accuracy, completeness, specificity, uncertainty). Similarly, Atkins et al. (2024) demonstrate that while ChatGPT generally provides accurate information on climate hazards, its outputs can still contain biases and factual inaccuracies. Studies on story generation further suggest that prompting models with topic-specific keywords leads to more coherent narratives, whereas unprompted generation produces inspirational but less structured stories (Gursesli et al. 2023). Sommer and von Querfurth (2024) find that such stories often follow a uniform "hope and redemption" structure aligned with scientific consensus, but neglect vulnerabilities to climate impacts or climate justice issues. More broadly, generating context-sensitive and locally relevant climate content remains difficult, with gender and LGBTQ+ perspectives, for example, frequently overlooked (Nguyen et al. 2025). One response to these limitations is the *development of specialized models*, such as ClimateGPT (Thulke et al. 2024; Zeydan 2025) and ChatClimate (Vaghefi et al. 2023), which support climate-specific information generation and multilingual communication. Both automatic and expert evaluations indicate that these models outperform general-purpose LLMs in terms of accuracy and contextual relevance.

With regard to *visual content*, research shows that *AI can translate abstract climate data into immersive depictions*, such as flooded neighborhoods (Fakouri and Smith 2024). At the same time, communicators often struggle to generate coherent or solution-oriented imagery, and editing AI-generated visuals remains challenging (Lc and Tang 2023). Schmidt et al. (2019) demonstrate the potential of personalized visualizations, showing that GenAI can produce vivid street-view images of extreme events, with 70% of flooded-houses visualizations judged realistic. More broadly, scholarship on visual framing emphasizes that AI-driven production and circulation of images raises new questions about interpretive agency, multimodal meaning-making, and accountability—salient issues for climate visuals as well (Dimitrova et al. 2025).

With regard to *audio* and *multimodal content*, experimental studies suggest that *AI-generated voices can be as effective as human voices* in eliciting risk perception and encouraging pro-environmental behavior, although effectiveness depends on the perceived identity of the speaker and the emotions conveyed (Ni, Wu, and Huang 2023). *Climate-specialized systems*, such as the AI Climate Impact Visualizer (Luccioni et al. 2021) and OceanChat (Pataranutaporn et al. 2025), show that *interactive visualizations and character-based dialogues can increase emotional involvement, behavioral intentions, and sustainable action preferences*. Nonetheless, evidence of deeper impacts, such as increased policy support or reduced psychological distance, remains limited (Pataranutaporn et al. 2025).

In sum, studies indicate that AI can generate climate-related content that is engaging, coherent, and emotionally resonant, with specialized models improving factual accuracy and contextual relevance. Yet significant challenges persist. AI-generated content often overlooks local context, nuanced issues like climate justice, and marginalized perspectives, raising questions about whether AI can adequately represent the diverse realities of communities most affected by climate change. Moreover, methodological heterogeneity, rapid LLM evolution, and inconsistent reporting of prompts, model versions, and parameters complicate reproducibility and generalization.

5.2 | Analyzing and Classifying Climate-Related Content With AI: Enhancing Insight While Grappling With Complexity

Beyond content generation, LLMs are increasingly applied to analyze and classify climate-related content, including news articles, social media posts, scientific publications, and policy documents, supporting evidence-based communication and decision-making by structuring complex information and identifying patterns at scale.

In *textual analysis*, research has evaluated *LLMs' ability to classify scientific uncertainty, evidence, and misinformation*. Pan et al. (2025) introduced ClimateX, a dataset of climate science statements annotated with expert-assessed levels of uncertainty, and evaluated four recent LLMs for classification. While newer models outperformed earlier ones, overall classification accuracy remained modest (~51%). Similarly, Joe et al. (2024) reported that GPT-4o performed well on simple evidence-synthesis tasks, such as identifying geographic locations, but less reliably on complex assessments, like stakeholder mapping. Domain-specialized models appear more promising: ClimateBERT, pretrained on climate-related texts, improves masked language modeling by 48% and reduces downstream task error rates by 4%–36% (Webersinke et al. 2022). Likewise, ClimateCheck (Ahmad et al. 2025) and Climinator (Leippold et al. 2025) enhance the verification of climate claims, while targeted "unlearning" algorithms can reduce model susceptibility to intentional misinformation (Fore et al. 2024). Notably, these efforts are not limited to English-language contexts: Meddeb et al. (2022) classified French climate news articles as "fake", "biased", or "true" with ~84% accuracy.

LLMs have also been applied to the analysis of climate policies, adaptation measures, observed impacts, and public opinion. Drawing on three illustrative use cases, Yu et al. (2025) discuss how AI can be leveraged to better understand the drivers of public resistance, improve policy communication, and support the design of more effective, human-centered climate policies. Complementing this work, You (2024) identified 63 interventions associated with carbon reductions, averaging 19% per intervention. Sietsma et al. (2024) constructed an evidence map of publications evaluating adaptation measures, finding substantial geographic disparities, with extensive documentation in higher-income countries and sparse evidence in lower-income regions. Using BERT to classify impact attribution, Callaghan et al. (2021) found that anthropogenic climate change affects around 80% of global land, impacting regions inhabited by roughly 85% of the world's population; however, a pronounced "attribution gap" persists, with robust evidence of human causation more common in high-income than low-income countries. Extending LLM applications to public opinion, Lee et al. (2024) find that GPT-4 can predict survey responses on global warming beliefs with 53%–91% accuracy while also revealing algorithmic biases, such as underestimating opinions among Black Americans. Finally, Anoop et al. (2024) and Kwon et al. (2024) employ LLMs to analyze public sentiment in climate change discourse, demonstrating that LLMs, particularly domain-specific models, consistently outperform traditional machine-learning classifiers, achieving classification accuracies between 90% and 96%.

In *multimodal analysis*, research demonstrates *LLM's ability to analyze and classify climate information across modalities*. Wang et al. (2024) presented MultiClimate, a dataset of annotated YouTube videos, and demonstrate that LLMs can detect stances toward climate change, with text-only models outperforming image-only models and multimodal fusion achieving the highest accuracy (~74%). Borah et al. (2025) introduced the Climate Alignment Quotient (CAQ) to evaluate LLM performance in identifying multimodal climate expressions on social media. Benchmarking different LLMs, they found consistently moderate to high performance, with CAQ scores between 0.70 and 0.74.

In sum, research suggests that LLMs—and particularly domain-specialized models—can support the analysis and classification of climate content across text, policy, public opinion, and multimodal domains. To advance the field, research should establish standardized benchmarks, examine whether models capture local and marginalized perspectives, and assess whether public opinion simulations genuinely reflect societal attitudes rather than reproducing or amplifying biases. Progress in this area will therefore depend not only on improving technical performance but also on demonstrating whether LLM-based analyses generate insights that are socially representative, trustworthy, and usable for decision-making.

6 | Use and Effects: The Role of AI for Citizens

GenAI has also changed CCC for citizens—how they use these technologies for learning, expression, and dialogue, and how such interactions influence their understanding, attitudes, and behaviors.

The emerging literature on the uses and effects of AI in citizens' CCC is characterized by rapid experimentation and methodological diversity. Most studies have appeared since 2023, partly as preprints (e.g., Czarnek et al. 2025). Methodologically, the literature is diverse: large-scale randomized controlled trials with thousands of participants (e.g., Bago et al. 2025; Czarnek et al. 2025; Costello et al. 2024), survey studies spanning single or multiple countries (Schäfer et al. 2024; Greussing et al. 2025), evaluation studies comparing human and AI-generated responses (Ayers et al. 2023), content audits of AI outputs (Urzedo et al. 2024; Nguyen et al. 2024), and classroom-based or workshop interventions with students (Pun et al. 2025; Liu and Château 2025; Lc and Tang 2023).

At the same time, the strength and generalizability of evidence vary considerably. Many findings derive from controlled experimental or simulated environments focusing on short-term outcome measures or rapidly evolving model versions, which complicates replication and comparison across studies. While randomized experiments provide growing causal evidence, results remain sensitive to platform design, prompting strategies, and LLM versions, raising questions about durability and reproducibility as systems evolve. Furthermore, studies rarely benchmark GenAI communication against non-AI equivalents like human-written messages under comparable exposure conditions. As a result, scholarship reflects a field in consolidation, suggesting that findings should be interpreted as early but informative evidence rather than settled conclusions.

Many of the respective studies have been conducted in the US (e.g., Bago et al. (2025); Czarnek et al. 2025), with some expansions to Europe (Schäfer et al. 2024), East Asia (Greussing et al. 2025), and analyses of structural biases that capture Global South scholars' perspectives through the lens of AI-generated content (Urzedo et al. 2024).

Thematically, these studies reflect the disciplinary orientation of their authors: for example, communication scholars and psychologists focus on persuasion and attitudinal change; computer scientists examine technical adaptation and design; and education researchers test classroom uses of GenAI. Many studies on the use and effects of GenAI in CCC focus on information seeking; engagement and storytelling; misinformation and bias; and psychological and behavioral impacts—foci we will elaborate further now.

6.1 | Information Seeking: GenAI Broadens Access but Challenges Epistemic Evaluation

One line of research investigates how citizens turn to GenAI for information on climate-related topics. These studies suggest that while GenAI can broaden access to climate knowledge, its epistemic affordances require care to avoid superficial or misleading interpretations.

Cross-national survey data from seven countries revealed that by 2024, a majority (62%) of ChatGPT users relied on it for science-related inquiries, reporting higher trust in GenAI than non-users, alongside heightened awareness of its epistemic limitations (Greussing et al. 2025). Similarly, the 2023 German Science Barometer and the 2025 Swiss Science Barometer showed that trust in ChatGPT as a source for science-related information was modest and largely conditional on citizens' general trust in science, which itself was shaped by science literacy and perceived benefits of science (Schäfer et al. 2024; Schäfer and Metag 2026b).

Educational contexts offer a critical testbed for understanding how citizens learn to interpret and evaluate AI-generated information. Pun et al. (2025) show that junior secondary students interpreting AI-generated multimodal climate materials demonstrated uneven epistemic evaluation and often confused GenAI with Internet search engines or human authors. Liu and Château (2025) find that university students exposed to text- and image-based GenAI modules reported greater hope and competence in climate action, suggesting that structured pedagogical interventions may cultivate constructive uses. Yet, as Nguyen et al. (2024) caution, when prompted to simulate underrepresented voices, GenAI responses often reproduced stereotypes, for example, portraying certain communities primarily as undocumented or framing disabilities only as obstacles to overcome and omitted colonial histories and systemic drivers of vulnerability. When citizens rely on such outputs for information, these biases can shape how climate impacts are understood, narrowing whose perspectives are visible and influencing trust and learning across social groups.

6.2 | Engagement and Storytelling: GenAI Encourages Imagination but Reveals Design Frustrations

Studies also explored to what extent GenAI may support empowerment and perceptions of climate solutions by providing novel modes of storytelling and imagination. Lc and Tang (2023) ran design workshops across Hong Kong, Japan, and the United States, where participants used ChatGPT to envision climate futures, but reported frustrations with opacity and limitations of AI tools, such as lacking transparency in prompting generation or difficulty translating ChatGPT suggestions into satisfying images. Ferreira (2025) highlighted the potential of classroom co-creativity with GenAI that encouraged students to question anthropocentric assumptions in environmental justice education, while Richards et al. (2024) illustrated the use cases of how to use GenAI technology for data synthesis and report writing on land use and on interacting with users to visualize nature-based solutions for climate change. Plechatá et al. (2026) find that AI-driven CCC can be more engaging than text-based materials, particularly among less climate-curious audiences—highlighting the importance of audience segmentation and meaningful baselines when assessing CCC effectiveness.

6.3 | Misinformation and Bias: GenAI's Corrective Promise Meets Persistent Risks

A critical concern among scholars is whether GenAI exacerbates misinformation and epistemic distortions. Urzedo et al. (2024) analyze 30,000 ChatGPT responses on environmental conservation and find systematic overrepresentation of Western male academics while marginalizing Global South and indigenous knowledge. Nguyen et al. (2024) similarly document how GPT-4 responses replicate stereotypes and neglect colonial narratives. While these findings highlight risks of bias and exclusion, other research points to more promising potentials of leveraging GenAI to correct misinformation and climate skepticism.

Experimental studies provide mixed evidence. Bago et al. (2025) demonstrate that LLM-modified headlines in simulated social media feeds increase skeptics' engagement (e.g., bookmarks, upvotes) and modestly shift beliefs toward consensus. Czarnek et al. (2025) show that personalized dialogues with LLMs reduce climate reservations more effectively than static consensus messaging, with effects persisting at the one-month follow-up. Similarly, Chen et al. (2024) find that while climate skeptics reported worse user experiences in conversations with GPT-3 compared to their counterparts, they nonetheless exhibit larger attitudinal shifts toward acknowledging climate change after engaging in conversations with GPT-3. Costello et al. (2024) show that brief multi-round dialogues with GPT-4 could reduce belief in conspiracy theories by roughly 20%, with effects persisting after 2 months. By contrast, Hornsey et al. (2025) find comparable though weaker effects among climate skeptics: short conversations with ChatGPT modestly increase pro-environmental intentions and reduce skepticism, but gains were inconsistent and faded over time.

Most of these experimental studies account for potential confounds by controlling for participants' demographic characteristics and/or prior knowledge on using chatbots. However, only a subset examines persistence over time, and findings diverge, suggesting that GenAI-mediated persuasion may prompt short-term reflection without reliably producing durable belief or behavioral change (Huang and Wang 2023). Notably, follow-ups typically span weeks to a few months; longer-term evidence on repeated real-world use remains scarce, limiting conclusions about durable change.

As Schäfer (2025) warned, the proliferation of low-quality GenAI content on social media may overwhelm citizens and undermine credibility judgments, adding new layers to the misinformation challenge. Taken together, this literature underscores a central paradox: GenAI holds promise for countering falsehoods while simultaneously risking the reproduction of epistemic inequalities and unstable persuasion effects.

6.4 | Psychological and Behavioral Impacts: Shaping Emotions and Beliefs but Not Sustained Action

Existing scholarship also examined how GenAI affects citizens' psychological orientations and behaviors. Jeng et al. (2025) find that GPT-assisted reframing of news summaries in fear–hope terms increased pro-environmental intentions. Similarly, a pilot study testing GPT-3–generated moral arguments shows that AI-authored messages appealing to compassion, fairness, and legacy were the most persuasive across audiences, including politically conservative participants who are typically resistant to climate messaging (Nisbett and Spaiser 2023). Liu and Château (2025) document increases in hope and perceived competence among students after GenAI-based interventions. By contrast, Doudkin et al. (2025) observe that while simulated agents were easily persuaded by AI, real humans show minimal behavioral change—a “synthetic persuasion paradox.” This points to the limitations of laboratory simulations and the challenge of translating short-term attitude shifts into durable action.

6.5 | Remaining Gaps: Toward a Comparative, Longitudinal and Theoretical Research Agenda

Overall, studies show that GenAI is reshaping how citizens access, interpret, and engage with climate information. It can enhance literacy, foster creativity, and counter misinformation, yet its effects remain uneven—often limited to short-term attitudinal or emotional shifts rather than sustained behavioral change.

Several gaps persist: First, cross-national comparisons are still scarce. Early evidence of national variation in adoption (Greussing et al. 2025) highlights the need for comparative research, especially across the Global South and marginalized communities. Second, most research focuses on short-term attitudinal outcomes, leaving open whether GenAI can sustain behavioral change over time. The “synthetic persuasion paradox” (Doudkin et al. 2025) illustrates the challenge of extrapolating from simulations to lived human practice. Third, research rarely theorizes GenAI as a social actor (Kessler et al. 2025). Classic frameworks such as Reeves and Nass's (1996) *Media Equation* and Sundar's (2008) MAIN model show that people often treat technologies as social partners, responding to cues of modality, agency, interactivity, and navigability. Early evidence of dialogic engagement with GenAI (Czarnek et al. 2025; Chen et al. 2024) underscores the need to test these mechanisms. Finally, questions of media effects remain unresolved: following Iyengar's (2017) typology, does GenAI amplify persuasion, agenda-setting, and framing effects, or will its influence remain limited in a fragmented media environment (Iyengar and Massey 2019)?

7 | Conclusion and the Way Forward

This overview maps the rapidly emerging body of research at the intersection of CCC and AI. While the broader CCC field has matured over three decades into a diverse and interdisciplinary domain (Comfort and Park 2018; Schäfer and Schlichting 2018; Shrivastava and Swartz 2025), scholarship on AI in CCC is still young, albeit expanding swiftly since 2022 (Kessler et al. 2025; Lee et al. 2024).

Across the research fields summarized above, several patterns stand out (see Table 1): Stakeholder communication shows that scientists and scientific institutions, NGOs, social movements, and companies are beginning to adopt AI tools to convey climate-related information, though uptake and evidence remain uneven (Bag et al. 2025; Vaghefi et al. 2023). Most applications are pragmatic, supporting access to information, monitoring discourse, or enhancing engagement, but systematic research on how these tools are received and whether they impact climate-related knowledge, attitudes, and behavior is still lacking. Studies of corporate contexts suggest that AI is used to structure and map climate-related disclosure content at scale (Raghupathi et al. 2023), underscoring both the promise of automated monitoring and the need for evidence on real-world uptake and effects.

Work on intermediaries, particularly journalists and influencers, points to a cautious and assistive use of AI. In newsrooms, automation often supports routine tasks such as transcription, summarization, or reformatting (Beckett and Yaseen 2023; Simon 2024), while as of now, editorial judgment and responsibility seem to remain largely human-led. Climate desks show particularly careful adoption, reflecting the epistemic demands and resulting caution of science reporting (Guenther et al. 2025; Dijkstra et al. 2024). Beyond production, AI shapes CCC distribution and exposure through personalization and recommender systems, raising concerns about microtargeting, uneven reach, and opaque amplification dynamics. Meanwhile, influencers and creators increasingly shape climate discourse on digital platforms (Newman 2024; Schäfer 2025), but their uses of AI and the role of AI-mediated creators (Von Sikorski et al. 2026) remain under-researched.

Research on AI-generated representations of climate change has highlighted new opportunities for producing and evaluating climate-related content through AI, from text and visuals to multimodal forms (Bulian et al. 2024; Vaghefi et al. 2023). Yet studies so far have concentrated on English-language, text-based outputs, with limited attention to audio, interactive, or cross-cultural applications (Zhou et al. 2024; Meddeb et al. 2022). While tools like *ClimateGPT* or *ChatClimate* show the promise of domain-specific models (Thulke et al. 2024; Vaghefi et al. 2023), the long-term effects of these innovations, their capacity to engage broad and diverse publics, and their ethical implications remain uncertain. Moreover, comparisons across studies are often constrained by inconsistent reporting of prompts, model versions, and parameters, limiting reproducibility and temporal generalization.

Studies of citizen uses and effects underscore both the potential and the limits of AI as an information intermediary. Citizens use generative AI to seek information, co-create stories, and engage in dialogue (Czarnek et al. 2025). At the same time, biases, misinformation risks, and the difficulty of detecting errors constrain its reliability (Urzedo et al. 2024; Nguyen et al. 2024), and many citizens are aware of that (Schäfer et al. 2024). Experiments show that persuasive effects—like reducing skepticism or improving climate literacy (Chen et al. 2024)—are possible but uneven (Bago et al. 2025; Costello et al. 2024) and can differ across audience segments (e.g., Plechatá et al. 2026; Schäfer and Metag 2026b). Thus, equity concerns remain pressing, as AI systems often reproduce exclusions of Global South and marginalized voices (Urzedo et al. 2024; Ejaz et al. 2025).

Taken together, the overview at hand suggests that AI is—at least for now—less a wholesale disruptor of CCC than an assistive layer added onto existing communication practices. It accelerates, personalizes, and broadens certain processes, but rarely replaces human agency or responsibility entirely. The main gaps in the field are thematic and structural and mirror those in the broader field analyzing CCC: research is concentrated in the Global North (Agin and Karlsson 2021), heavily focused on text, and largely limited to short-term or technical evaluations (Schäfer and Hase 2023). Critical issues such as long-term trust, behavioral change, ethical design, and equitable access are underexplored (Dwivedi et al. 2023; Van Dis et al. 2023).

For research on CCC, the implications are clear: A dedicated agenda is needed at the intersection of AI and CCC. It should combine computational audits with traditional methods, prioritize comparative and cross-cultural perspectives, and embed reflections about responsible, transparent, and ethical use (Kessler et al. 2025). Rather than asking whether AI will transform CCC, scholars should examine under what conditions and for whom it enhances or undermines climate awareness, trust, and action. Where possible, studies should also benchmark AI-mediated communication against non-AI communication such as human-written messages or conventional consensus messaging.

Finally, our overview suggests that politics and governance are not yet proportionately represented in scholarship on the AI–CCC nexus (Machen and Pearce 2025). Regulatory and governance debates and decisions—dealing with questions of transparency, auditing, and platform integrity—will shape CCC in the future as much as the AI models themselves. Accordingly, scholarship at the intersection of CCC and AI policy should become a research priority and examine how governance choices distribute communicative power, risks, and accountability across stakeholders, intermediaries, and audiences (Cortez 2023).

For practical implications, scientists, journalists, NGOs, and companies can use AI responsibly to simplify complex knowledge, extend reach, and reduce costs, but only with transparency, disclosure, and ongoing critical evaluation (Bender et al. 2021; Weidinger et al. 2022). Such practices will also be shaped by political and regulatory conditions and trust-and-safety approaches, which may vary across tools and jurisdictions, but are important. Without these safeguards, AI risks amplifying greenwashing, misinformation, and biases, ultimately eroding credibility and trust in climate science with detrimental consequences for climate-relevant behavior (Moodaley and Telukdarie 2023).

AI offers powerful new tools for climate communication, but its role will depend on how it is applied, governed—and also studied. Ensuring that it contributes to equitable and effective communication about one of the defining challenges of our time will require robust scholarship, ethical reflexivity, and a commitment to shared responsibility across all communicative actors.

TABLE 1 | Core findings, characteristics of the research field and future needs.

Domain	Core findings	Methods	Example studies	Future needs
Stakeholder communication (e.g., scientists, scientific organizations, NGOs, companies, AI developers)	AI tools increasingly used to provide access to climate knowledge, monitor discourse, detect misleading claims, support engagement. Adoption uneven: corporate uptake better documented than scientific or NGO uses. Equity, trust, and long-term impacts underexplored.	Case studies; tool development and evaluation; surveys and interviews (esp. on corporate communication); content analysis; conceptual papers.	Vaghefi et al. (2023); Bingler et al. (2022); Bag et al. (2025); Hsu et al. (2024); Chmielewska-Muciek et al. (2024); Raghupathi et al. (2023).	Specific studies of climate actors (esp. scientists, NGOs, social movements); comparative and/or Global South perspectives; research on trust, transparency, and real-world uptake/effects.
Intermediaries (journalists, influencers, creators)	In journalism, AI mainly supports routine/back-end tasks, while editorial judgment often stays human-led. Climate/science journalists particularly cautious, citing epistemic demands. Influencers increasingly shape climate discourse, but AI use under-researched.	Global newsroom surveys; expert interviews; small-N and qualitative case studies; typologies of journalists and influencers.	Beckett and Yaseen (2023); Simon (2024, 2025); Guenther et al. (2025); Dijkstra et al. (2024); Haastrup and Marshall (2024).	Climate-specific newsroom studies; comparative research beyond Global North; analyses of influencer AI practices; attention to technical innovations (e.g., computer vision), analyses of AI-enabled personalisation or recommender systems bridging news and platform ecosystems.

(Continues)

TABLE 1 | (Continued)

Domain	Core findings	Methods	Example studies	Future needs
AI-generated representations	LLMs used to generate, analyze, classify climate content. Advances in climate-specialized models (e.g., *ClimateGPT*). Mostly on English text; little on multimodal, or non-Western contexts. Engaging content, but linguistic nuances remain challenging; comparability limited by model, version and prompt variability.	Content audits; benchmarking of models; qualitative and survey-based evaluations; computational analysis.	Bulian et al. (2024); Atkins et al. (2024); Thulke et al. (2024); Vaghefi et al. (2023); Meddeb et al. (2022); Zhou et al. (2024).	Greater focus on audio, interactive, and multimodal content; systematic cross-cultural work; comparative benchmarks and performance metrics; long-term effects and ethical implications (bias, misinformation, transparency).
Uses and effects	Citizens use GenAI as information intermediaries, for co-creation, dialogue. AI can reduce skepticism, improve literacy, foster engagement, but biases, misinformation risks, and equity gaps persist. Tested effects are often short-term and uneven.	Large-scale RCTs; surveys and survey experiments; classroom/workshop interventions; audits of AI outputs.	Chen et al. (2024); Greussing et al. (2025); Czarnek et al. (2025); Costello et al. (2024); Nguyen et al. (2024); Plechatá et al. (2026); Urzedo et al. (2024).	More cross-national comparative research (esp. Global South); long-term studies of attitudinal/behavioral change; theory-driven analyses (e.g., social actor models); focus on equity and inclusion in design.

Author Contributions

Mike S. Schäfer: conceptualization (lead), investigation (lead), methodology (lead), project administration (lead), supervision (lead), visualization (lead), writing – original draft (lead), writing – review and editing (lead). **Kaiping Chen:** conceptualization (equal), data curation (equal), investigation (equal), writing – original draft (equal), writing – review and editing (equal). **Daniela Mahl:** conceptualization (equal), data curation (equal), investigation (equal), writing – original draft (equal), writing – review and editing (equal). **James Painter:** conceptualization (equal), data curation (equal), investigation (equal), writing – original draft (equal), writing – review and editing (equal). **Sophia C. Volk:** conceptualization (equal), data curation (equal), investigation (equal), writing – original draft (equal), writing – review and editing (equal).

Acknowledgments

The authors thank Yoojin Kim for her assistance in compiling information for this article. In parts of the manuscript, GenAI (ChatGPT) was used for language refinement and stylistic alignment. Open access publishing facilitated by Universitat Zurich, as part of the Wiley - Universitat Zurich agreement via the Consortium Of Swiss Academic Libraries.

Funding

No funding was received for this research.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Related WIREs Articles

The social media life of climate change

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