

Participatory Artificial Intelligence for Climate

AI as Media for Collective Sensemaking and Climate Action

Petra Ahrweiler
Blanca Luque Capellas
Dario Brockschmidt
TISSS Lab
Johannes Gutenberg University Mainz
Mainz, Germany
petra.ahrweiler@uni-mainz.de
bluqueca@uni-mainz.de
dbrocksc@uni-mainz.de

Marco Guglielmo
Oscar Barberà
DIGIPOL
University of Valencia
Valencia, Spain
marco2.guglielmo@uv.es
o.barbera@uv.es

Stephan Böhm
RheinMain University of Applied Sciences and Arts
Wiesbaden, Germany
stephan.boehm@hs-rm.de

Marta Maciejasz
Institute of Economics and Finance
University of Opole
Opole, Poland
marta.maciejasz@uni.opole.pl

Lauri Frank
Faculty of Information Technology
University of Jyväskylä
Jyväskylä, Finland
lauri.frank@jyu.fi

Júlio Monteiro Teixeira
Knowledge Media area
Federal University of Santa Catarina
Santa Catarina, Brazil
juliomontex@gmail.com

Abstract— Artificial Intelligence (AI) plays an increasing role in climate research and governance, yet many AI-based climate systems remain expert-driven and insufficiently aligned with societal needs. Their outputs - forecasts, simulations, dashboards, and recommendations - often fail to communicate uncertainty and implications in accessible and culturally meaningful ways, limiting trust and uptake. This idea paper introduces *Participatory AI for Climate* as a research paradigm that conceptualizes AI systems as media infrastructures mediating between climate models and diverse publics. Positioned within AI Media research, the paper conceptualizes climate AI outputs as communicative artefacts that shape interpretation and collective climate action. The paper sketches a doctoral research agenda centered on participatory methods, addressing participatory data generation, governance and fairness of climate AI, and socio-cultural adaptation of AI systems. In addition, it proposes media-focused doctoral projects on AI-mediated climate communication and participatory media interfaces. Recent advances in generative AI create opportunities to support climate communication by translating scientific outputs into accessible formats, adapting them to different audiences and channels, and enabling interactive dialogue. The contribution outlines a training-oriented research program aimed at strengthening European capacity for democratic, trustworthy, and environmentally just climate AI.

Keywords: *Participatory AI, Climate AI, AI Media, Climate Communication, Generative AI, Participatory Media, Collective Sensemaking, Trustworthy AI*

I. INTRODUCTION

Artificial Intelligence (AI) has become a central tool in climate research and governance, supporting applications such as extreme weather forecasting, disaster management [1][2][3], resource monitoring, and socio-ecological simulation [4]. However, many AI-based climate systems remain expert-driven and insufficiently aligned with societal needs. They often fail to communicate uncertainty and implications in ways accessible to local decision-makers and affected communities across diverse cultural, linguistic, and institutional contexts [5]. As a result, trust and effective uptake of AI-supported climate interventions remain limited [6].

II. PARTICIPATORY AI FOR CLIMATE

This idea paper introduces *Participatory AI for Climate* as a research paradigm that conceptualizes AI systems not only as analytical or decision-support tools, but as media infrastructures mediating between complex climate models and heterogeneous publics [7]. Participatory AI for

Climate differs from conventional human-centered AI approaches by conceptualizing AI systems specifically as communicative socio-technical infrastructures through which climate knowledge is interpreted, negotiated, and collectively acted upon. From an AI Media perspective, climate AI systems are not merely analytical tools but mediating infrastructures whose outputs - forecasts, simulations, dashboards, and recommendations - shape interpretation, collective sensemaking, and climate action across diverse publics. Their design therefore raises fundamental questions of participation, representation, transparency, and accountability [8].

Recent advances in generative AI, including chatbots and Large Language Models (LLMs) [9][10], create new opportunities for participatory climate communication by translating scientific knowledge into accessible formats, adapting outputs to different audiences, and enabling interactive dialogue and scenario exploration. At the same time, simplification, hallucinations, bias, and misinformation risks may obscure uncertainty and undermine trust [11]. This raises critical questions concerning representation, uncertainty communication, and communities' ability to interrogate and contest AI-generated outputs. One exemplary use case involves AI-supported flood-risk communication, where multilingual generative AI interfaces enable local communities to explore climate scenarios, interrogate uncertainty, and co-interpret adaptation strategies together with scientific experts and public authorities.

Domain-specific systems such as ChatClimate demonstrate how grounding generative AI in scientific sources can support informed dialogue [9], while tools such as ClimateBERT enable analysis of climate discourse and public narratives [12]. Together, these developments position generative AI as a component of participatory media ecosystems shaping inclusion, legitimacy, and collective climate action.

III. FUTURE WORK: DOCTORAL RESEARCH PROGRAM

Building on an interdisciplinary European initiative, the paper sketches a doctoral research agenda structured around participatory methods and media-oriented AI design. The proposed agenda combines participatory workshops, co-design approaches, stakeholder-centered interface evaluation, and qualitative analysis of trust, accessibility, uncertainty communication, and collective sensemaking processes.

Proposed projects address participatory data generation, community-centric forecasting, governance and fairness of climate AI, socio-cultural adaptation of AI systems, AI-mediated climate communication, and participatory media interfaces for multilingual and culturally adaptive engagement with climate AI systems.

By framing climate AI as participatory media infrastructure, the paper contributes to AI Media research and outlines a training-oriented research program aimed at building European capacity for socially robust, democratic, and environmentally just AI development [13].

ACKNOWLEDGMENT

Authors gratefully acknowledge EU funding provided by the FORTHEN University Alliance as “ambitious project”.

REFERENCES

- [1] S. K. Abid et al., “Toward an integrated disaster management approach. How artificial intelligence can boost disaster management”, *Sustainability*, 13, pp. 1–20, 2021. doi.org/10.3390/su132212560
- [2] M. Arfan, Z. Khan, N. Qadri, M. H. Hameed and A. R. Amir, “Role of artificial intelligence (AI) in combined disaster management”, *Organizational Theory Review*, 3, pp. 97–121, 2019. doi.org/10.32350/OTR.0302.05
- [3] R. I. Ogie, J. C. Rho, and R. J. Clarke, “Artificial Intelligence in Disaster Risk Communication. A Systematic Literature Review”, *Proceedings of the 5th International Conference on Information and Communication Technologies for Disaster Management (ICT-DM)*, Sendai, December 2018, pp. 1–8. doi.org/10.1109/ICT-DM.2018.8636380
- [4] M. Etienne (Ed.), *Companion Modelling. A Participatory Approach to Support Sustainable Development*. Heidelberg / New York: Springer, 2013.
- [5] J. Cows, A. Tsamados, M. Taddeo and L. Floridi, “The AI gambit. Leveraging artificial intelligence to combat climate change — Opportunities, challenges, and recommendations”, *AI & Society*, 38, pp. 283–307, 2023. doi.org/10.1007/s00146-021-01294-x
- [6] P. Ahrweiler, “Cultural beliefs and participatory AI. Unlocking untapped catalysts for climate action”, *Sustainability*, 17, pp. 4172–4186, 2025. doi.org/10.3390/su17094172
- [7] A. Ovalle et al. (Massachusetts Institute of Technology, Computer Science and Artificial Intelligence Laboratory 2023). “Queer In AI: A Case Study in Community-Led Participatory AI”, *Proceedings of the 2023 ACM Conference on Fairness, Accountability, and Transparency*, June 2023, pp. 1882–1895. doi.org/10.1145/3593013.3594134
- [8] R. Vinuesa et al., “The role of artificial intelligence in achieving the Sustainable Development Goals”, *Nature Communications*, 11, pp. 1–8, 2020. doi.org/10.1038/s41467-019-14108-y
- [9] S. A. Vaghefi et al., “ChatClimate: Grounding conversational AI in climate science”, *Communications Earth & Environment*, 4, 480, 2023. doi.org/10.1038/s43247-023-01084-x
- [10] S. Saleem and M. Mehrotra, “Emergent Use of Artificial Intelligence and Social Media for Disaster Management”, in: M. Saraswat, S. Roy, C. Chowdhury and A. H. Gandomi (Eds.), *Proceedings of the International Conference on Data Science and Applications. Lecture Notes in Networks and Systems*, 287, Singapore: Springer, 2022. doi.org/10.1007/978-981-16-5348-3_15
- [11] M. Leippold et al., “Automated fact-checking of climate claims with large language models”, *npj Climate Action*, 4, 17, 2025. doi.org/10.1038/s44168-025-00215-8
- [12] N. Webersinke, M. Kraus, J. A. Bingler and M. Leippold, “ClimateBert: A Pretrained Language Model for Climate-Related Text”, 2021. doi.org/10.48550/arXiv.2110.12010
- [13] Microsoft / PWC (2018): *How AI Can Enable a Sustainable Future. Report in the Wake of the World Economic Forum* [Online] Available from <https://www.pwc.co.uk/sustainability-climate-change/assets/pdf/how-ai-can-enable-a-sustainable-future.pdf>