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EDITORIAL

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Towards Generative Governance: Co-Creation With Emerging Technologies to Address Climate Challenges in Cities

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Abstract

This thematic issue explores how co-creation processes, facilitated by emerging technologies, can help cities in addressing complex climate adaptation challenges. Drawing on seven interdisciplinary contributions, this issue examines the roles of digital tools, participatory methods, and institutional innovations in fostering inclusive and collaborative governance. The contributions highlight diverse approaches, ranging from computational planning support systems and interactive lighting simulations to community-based toolkits and scenario evaluators, that are implemented across various urban contexts. Collectively, they reveal both the opportunities for and the tensions of integrating emerging technologies into co-creation processes. This editorial identifies four key enablers of co-creation as generative governance—interactions, tools, processes, and institutions—and offers directions for future research at the intersection of digital innovation, collaborative governance, and climate adaptation. Together, the contributions provide a deeper understanding of how cities can design and support co-creation initiatives that are inclusive, adaptive, and capable of building long-term capacities to address climate change challenges.

Keywords

cities; climate adaptation; co-creation; digital tools; generative governance

1. Introduction

Cities around the world are facing the growing impacts of climate change (Casiano Flores et al., 2023; UN-Habitat, 2024). Consequently, cities have been taking the lead in developing strategies to facilitate adaptation and boost resilience (Mehryar et al., 2022). These strategies often rely on approaches to collaborative governance that are context-sensitive and forward-looking, enabling cities to adapt and build resilience effectively. As part of these approaches, co-creation has gained traction as a governance strategy that mobilises local expertise and fosters innovation through shared problem-solving (Torfing et al., 2019).

Co-creation refers to the collaborative process among public, private, and civil society players for solving shared public problems or completing shared tasks. This process involves exchanging resources to co-initiate, co-design, and/or co-implement visions, strategies, policies, regulatory frameworks, or technological solutions (Hofstad et al., 2022; Rodriguez Müller et al., 2025). Co-creation is increasingly recognised not only as a participatory method but also as a governance strategy, particularly well-suited to address complex and uncertain societal challenges.

In the context of climate adaptation, co-creation holds the promise of grounding solutions in local realities, enhancing legitimacy, and enabling continuous learning. However, there is still a limited understanding of how co-creation can happen when using emerging technologies, which may empower new forms of participation but also result in exclusion or asymmetries (Rodriguez Müller et al., 2021; Tan & Rodriguez Müller, 2024). This requires an analysis of how emerging technologies can support co-creation and participatory governance models (Rodriguez Müller et al., 2024).

To understand the academic landscape on this topic, we conducted a search on Scopus, combining terms related to co-creation, emerging technologies, and climate challenges in urban contexts. This search identified 41 relevant documents, with a sharp increase in publications over the last decade. The countries contributing most to the identified research include Australia, Austria, Germany, Spain, and the United Kingdom, with the European Commission emerging as the main funder. While this confirms strong interest in Europe, the dynamics explored are highly relevant globally, especially as cities worldwide seek to integrate inclusive innovation into climate governance.

This thematic issue, "Co-Creation With Emerging Technologies to Address Climate Challenges in Cities," contributes to the growing field of research in this area. It provides both empirical and conceptual insights into how digital tools, participatory methods, and innovative institutional approaches can work together to support urban climate adaptation. It also outlines directions for future research at the intersection of co-creation, emerging technologies, and climate adaptation.

2. Contributions to the Thematic Issue

The contributions to this thematic issue offer rich empirical and conceptual insights into how co-creation processes, coupled with emerging technologies, are being mobilised to address climate-related urban challenges. Together, they explore the promises and tensions of embedding digital tools into participatory governance processes across diverse urban settings.

Five of the contributions focus on specific urban cases in Europe—occurring in the Netherlands (Chiappini & Coenen, 2025), Austria (Forster et al., 2025), Poland (Cudzik et al., 2025), Slovenia (Jukić & Vrbek, 2025), and Finland (Votsis et al., 2025)—while the remaining two adopt a broader urban approach that can be applied beyond specific European national contexts (Nath, 2025; Vermeulen et al., 2025). In terms of methodologies, the contributions reflect interdisciplinary and multidisciplinary approaches that combine qualitative methods, such as interviews, with quantitative methods, including computational modelling, surveys, and scenario simulations.

The contributions cover a wide variety of co-creation tools: a web-based tool for transformative community-based climate change adaptation (Nath, 2025), a modular lighting optimisation algorithm (Cudzik et al., 2025), a computational planning support system (Votsis et al., 2025), a decision support model for assessing co-creation (Jukić & Vrbek, 2025), and an adaptive design evaluator for sustainable impact co-assessment (Forster et al., 2025). Across the contributions, emerging technologies support and enable co-creation. However, these tools do not operate in a vacuum. The surrounding governance and institutional settings deeply shape their transformative potential.

Nath (2025) presents a web-based, mobile-accessible tool that empowers under-resourced communities to take ownership of climate adaptation through inclusive decision-making. The tool serves as a boundary object, integrating local data and reflexive facilitation mechanisms to help navigate power asymmetries. Similarly, Cudzik et al. (2025) introduce an algorithmic framework that can help to optimise urban lighting by integrating user feedback into a co-creation process. In this case, technology is not just about efficiency; it is a medium for co-designing public spaces in ways that consider safety, environmental goals, and lived experiences. Meanwhile, Votsis et al. (2025) demonstrate how a computational planning support system can be adapted to reflect sociospatial complexity. They achieve this by enriching existing models with urban commons data and integrating the models into co-design workflows.

Other contributions also explore the institutional conditions needed to support co-creation processes. Jukić and Vrbek (2025) introduce a decision support model enabling public organisations to assess the co-creation processes involved in a city's climate initiatives. Their model acts as a practical tool for the organisations, encouraging them to critically reflect on their roles in co-creation initiatives, identify areas for improvement, and enhance their capacity as co-creators of future urban climate policies. In another contribution, Vermeulen et al. (2025) propose the creation of a transition planning office with the capabilities needed to institutionalise co-creation across urban subsystems. Drawing on experiences from urban transition management and strategic spatial planning, the authors advocate for sustained involvement in long-term planning and the linkage of short-term projects with long-term transition agendas.

The contribution by Chiappini and Coenen (2025) highlights the interplay between digital literacy and socio-spatial disparities. The authors argue that the efficacy of co-creation technologies is contingent not only on their design but also on the varying levels of digital literacy and trust in government among citizens. The scope of implementation, type of engagement with residents, level of digital literacy, and opportunities for co-creation activities are key elements in achieving a more inclusive outcome in digitalisation. Finally, Forster et al. (2025) present a flexible tool that enables sustainability co-assessments in medium- and small-scale projects, challenging the rigidity of standard certification schemes. The tool's integration of visuals, stakeholder feedback, and dynamic modelling exemplifies how co-creation and technological adaptability can converge in the early stages of project planning to foster sustainable outcomes.

3. Looking Ahead: Co-Creation, Technology, and the Path Towards Generative Governance

Amid growing uncertainty and urgency, cities are shifting away from linear, top-down planning models and towards more adaptive, participatory, and context-sensitive modes of governance that favour integrated approaches (Buylova et al., 2025). This shift is particularly evident in how urban actors respond to complex climate-related challenges. Covering diverse urban contexts, the contributions to this thematic issue shed light on how co-creation, often supported by digital tools and platforms, is being mobilised to experiment with participatory formats, develop context-sensitive solutions, and institutionalise more inclusive governance practices.

Recent studies have begun to frame this changing landscape as *generative governance* (Ansell & Torfing, 2021a, 2021b). Unlike traditional governance models, which aim to deliver predefined outcomes, generative governance focuses on creating conditions that foster innovation. It relies on four interdependent enablers: trust-based and productive interactions; creative, inclusive digital and material tools; structured yet adaptive co-creation processes; and institutional frameworks that foster experimentation and continuity (Ansell & Torfing, 2021b).

Below, we explore how the contributions to this thematic issue enrich our understanding of each dimension of generative governance, while identifying gaps and opportunities for future research.

3.1. Generative Interactions

The term "generative interaction" refers to the behavioural and relational dynamics among participants that enable creative collaboration, such as trust, mutual respect, and a shared aim to innovate. Several contributions to this issue demonstrate how co-creation can foster such dynamics, while also revealing the challenges of sustaining them in technology-enabled processes addressing climate challenges.

For example, the Bee Path Project demonstrates how community-driven processes can generate trust and sustained participation over time through adaptive feedback and reflection mechanisms. The model supports public organisations in identifying areas where co-creation is succeeding, thereby enhancing their capacity as co-creators (Jukić & Vrbek, 2025). Similarly, Chiappini and Coenen (2025) uncover the tensions that can emerge when actors with varying levels of digital literacy and divergent expectations and behaviour engage in co-creation. While digital technologies open up new spaces for engagement, they also risk reinforcing existing power asymmetries if inclusive facilitation strategies are not adopted. Therefore, to achieve behavioural change, it is important to embed the use of technologies in a trust-based co-creation process involving residents. In this context, Nath (2025) emphasises the importance of accessibility, usability, and the incorporation of local knowledge, as trust is also a product of iterative co-learning and inclusive design.

Future research could explore the specific mechanisms that help build and sustain generative interactions when co-creating with emerging technologies to address urban climate challenges. It could also investigate how power asymmetries affect collaborative creativity in tech-enabled processes, and what kinds of governance arrangements and facilitation practices best support long-term, trusting engagement among parties with diverse interests and competencies.

3.2. Generative Tools

Generative tools are the technological or material instruments supporting the creation of new knowledge, ideas, or solutions. Contributions to this thematic issue show how digital platforms, data-driven simulations, and interactive toolkits can expand the reach and quality of co-creation processes to support climate adaptation. The computational model presented by Votsis et al. (2025) can serve as a boundary object, facilitating collaboration among stakeholders. Similarly, Nath (2025) presents a mobile-accessible, web-based tool that integrates climate data and participatory features to democratise adaptation planning in under-resourced communities, to actively shape adaptation strategies. Furthermore, Cudzik et al. (2025) introduce an interactive tool that can allow residents to co-assess the impact of lighting scenarios, and provide feedback, to make urban planning practices more adaptive, inclusive, and ecologically responsible.

These cases raise important questions about how emerging technologies can be designed and deployed to empower a broader range of participants to combat urban climate challenges. What makes a tool truly generative, beyond technical functionality, when addressing environmental risks? How do digital tools shape the framing of climate problems, the co-creation of solutions, and the legitimacy of different types of knowledge in participatory processes?

3.3. Generative Processes

Generative processes are structured co-creation methods, such as design thinking, scenario planning, or living labs, that guide participants through joint exploration and the collective development of solutions. Several contributions in this thematic issue apply, identify, or propose the use of these processes to organise collaboration and support urban climate adaptation, showing how co-creation can be embedded in various planning and governance settings.

Forster et al. (2025) operationalise participatory evaluation processes within early design phases, facilitating continuous feedback loops among stakeholders. These processes encourage early and continuous engagement, helping to identify trade-offs and improve transparency and awareness of cooperation. Likewise, Vermeulen et al. (2025) reflect on how institutional scaffolding and process design develop together in long-term sustainability transitions. They offer a typology of co-creation instruments, including urban living labs and virtual transformation labs, grounded in urban transition management and conceptualised through long-term processes.

Despite showing promise, generative processes are not inherently inclusive or effective. Future research could examine how the design of technology-supported co-creation efforts affects participation, decision-making, and the prioritisation of outcomes when addressing climate challenges. How can generative processes strike a balance between providing structure and flexibility while leveraging emerging technologies and digital methods? What kinds of facilitation practices and institutional support are needed to ensure co-creation efforts lead to transformative action rather than tokenistic consultation?

3.4. Generative Institutions

Finally, generative institutions refer to the formal and informal infrastructures that support and sustain co-creation over time and across projects. These institutions can provide the stability, legitimacy, and adaptability needed to embed co-creation in broader governance systems.

Vermeulen et al. (2025) propose the creation of a dedicated transition planning office to coordinate cross-sectoral collaboration and maintain continuity across short-term projects. By integrating co-creation practices into strategic planning frameworks, the office aims to link short-term interventions to long-term urban transformation. Additionally, Votsis et al. (2025) show how computational planning and co-creation processes that involve formal institutions and bottom-up informal processes can facilitate a more comprehensive and accurate mapping of society's vulnerability to climate change. Moreover, the Bee Path project (Jukić & Vrbek, 2025) and the web-based tool created by Nath (2025) show that institutional support enables successful co-creation and innovation.

Together, these contributions underline the importance of designing institutions that are both stable and adaptive to support co-creation with emerging technologies in urban climate governance. Future research could build on these ideas and explore what makes a co-creation platform resilient and adaptable in the face of digital transformation and climate-related uncertainty. In addition, how do political cycles, administrative cultures, and funding models shape the long-term viability of generative institutions in this domain? Longitudinal and comparative research is especially necessary to understand how the institutions change and how they shape urban resilience trajectories over time.

4. Conclusion: From Innovation to Institutionalisation

The integration of co-creation and emerging technologies is not merely a technical matter. It is political, relational, and institutional. The relevance of these interlinkages has been acknowledged at the international level by the European Commission, the Organisation for Economic Co-operation and Development (OECD), and the UN through the lens of a triple transition (digitalisation, environmental sustainability, and social responsibility), and this is reflected in efforts such as the new European Green Deal and the G20 flagship initiative "Lifestyles for Sustainable Development" (OECD, 2023).

The contributions in this thematic issue show that innovation must be embedded in inclusive processes, context-sensitive tools, and supportive institutional structures. By embracing the principles of generative governance, cities can navigate the uncertainties of climate change, through implementing collaborative processes that are as dynamic and diverse as the challenges they face.

Future research could deepen our understanding of the interplay between the four dimensions of generative governance: interactions, tools, processes, and institutions. How do (digital) co-creation tools and methods reinforce or undermine trust and participation? What institutional configurations are most conducive to experimentation and long-term impact? And, critically, how can co-creation processes be designed not only to manage current challenges but also to *generate long-term capacities* for sustained and inclusive climate adaptation?

As this thematic issue highlights, the value of co-creation with emerging technologies lies not only in enabling innovation, but also in building the long-term institutional capacities and facilitating the inclusive processes and trust-based interactions needed to tackle climate challenges systemically. Moving forward, we invite scholars, practitioners, and policymakers to engage with the insights provided in this issue and contribute to the developing conversation on how cities can co-create a more just, inclusive, and climate-resilient future.

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Conflict of Interests

The authors declare no conflict of interests.

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