

Call for Contributions and Papers

## Urban Digital Twins for a Sustainable Transformation of Cities

International Research Conference in Hamburg, Germany (hybrid: online and onsite)

Deadlines for Proposal Submission: 17 November 2024

Date of Conference: 02 to 03 April 2025

Considering current crises and their impacts on cities, such as segregation, demographic shifts, refugee migration and extreme weather events linked to climate change, it appears necessary to transform cities towards sustainability and resilience (Frantzeskaki et al., 2017; Hamstead et al., 2021). Although the call for radically new approaches to foster such a transformation has been increasingly discussed and promoted by scientists and practitioners since the 1970s, necessary changes (e.g. urban mobility transitions, circular economies, equal living conditions, adaptive governance structures etc.) have not yet taken place to a sufficient extent. Among others, power structures, cultural values and built infrastructures lead to lock-ins and path-dependency, which make the transformation of urban systems an extremely complex task with uncertain trajectories and outcomes (Elmqvist et al., 2019; Loorbach, 2022).

As a relatively new approach to manage urban complexity the integration of urban digital twins in a city's governance is being promoted and discussed widely (Liu & Tian, 2023). Urban digital twins typically build upon spatial data, sensor networks and diverse digital tools to create a digital replica which allows to model and simulate processes of the original system (Batty, 2018). We advocate a broad definition of urban digital twins (as to be specified in DIN SPEC 91607, see Kelnberger & Schonowski, 2022) whereas the feedback loop between the digital realm and the real world doesn't necessarily need to be immediate and whereas urban digital twins can serve a diverse range of purposes for modeling, communication, co-design, visualization etc. (Batty, 2021; Schubbe et al., 2023).

Although definitions and design choices of urban digital twins vary, scholars point out that the main driving force behind such developments often is technology-centered and focused on more efficient forms of urban governance and planning (Allam & Dhunny, 2019; Nochta et al., 2021). The complexity of the underlying urban system is then reduced to measurable and one-dimensional indicators that can be optimized algorithmically, usually with the focus on purely technical aspects of traffic flows, energy efficiency, wastewater systems, etc. (Ferré-Bigorra et al., 2022). Thus, it remains questionable if the implementation of urban digital twins can actually support transformative processes to foster sustainability and increase urban resilience or if they are going to lead to marginal and manageable improvements to the existing situation rather than opening up new development paths (Loorbach, 2022).

**The conference is dedicated to the question of *how* urban digital twins can foster a transformation of cities towards sustainability and resilience:** How can they initiate and

accelerate processes of urban transformation? How can the technical, institutional and political challenges of implementation be managed? How can urban digital twins help to build transformative capacity among actors of sustainability? How can effective technologies and governance settings be transferred to other cities? etc.

We are looking for contributions that discuss such questions from a scientific perspective and welcome critical approaches. Participants are expected to hand in an extended abstract (1000 - 2000 words) and present their research at the conference. Furthermore, we appreciate the perspectives of practitioners. They are encouraged to also submit their digital twin artifact together with a talk that discusses its transformative effect or potential. **All conference contributions should reflect on the aspect of urban transformation on a social, technical or ecological dimension** and have to refer to one or more of the following conference tracks: Smart City Governance (A), Modeling, Simulation and AI (B), Citizen engagement (C) and Transformative Research Methods for Actionable Knowledge (D).

## Conference tracks

### A: Smart City Governance

Implementing digital twins is usually contextualized by an comprehensive smart cities framework, which local politicians and decision makers consider a guiding vision for future urban development (Yigitcanlar, 2015). While in some cities the aim to become a smart city is promoted with a focus on optimization and efficiency, others aim to achieve more fundamental goals like enhanced living conditions, a sustainable transformation of urban systems or managing urban resilience (Angelidou et al., 2018; Therias & Rafiee, 2023). However, public engagement to transform governance structures and make city administrations capable of developing smart city projects holistically for the benefit of urban residents seems to be lacking. As a result, the transformative potential of digital technology for sustainable urban development cannot unfold in many smart city processes (Mora et al., forthcoming; Mora et al., 2023).

### B: Modeling, Simulation and AI

Simulation models of complex urban processes can be powerful engines of future sustainable change. Whenever social behavior is represented digitally, the incorporated assumptions, levers and resulting metrics do not merely capture the underlying 'real' system, but in turn influence what is perceived realizable (Thompson, 2022). As an integral part of every urban digital twin (Dalibor et al., 2022), the range of incorporated models determines which scenarios can be run, which indicators assess the state of the system, and, eventually, which planning decision is taken. The inherent black box character of novel AI models adds another layer of hidden biases to the evolving "suite of specialized models" in urban digital twins (Nochta et al., 2021). While the modeling process and the usage of simulation models can lead to the (re-)negotiation and adoption of existing complex urban systems (Cuppen et al., 2021), specific effects of modeling, simulation and AI towards a sustainable transformation of cities need more thorough investigation.

### **C: Citizen engagement**

With regard to smart city technologies and -governance, the involvement of citizens can be crucial in order to create acceptance and avoid discontent among citizens as well as to co-create innovative solutions to local challenges (Aurigi & Odendaal, 2021; Van Twist et al., 2023). Furthermore, digital technologies can support innovative forms of governance that help involve citizens and civil organizations in decision-making and foster multi-stakeholder collaboration (Castelnovo et al., 2016; Meijer & Bolívar, 2016; Pereira et al., 2018). However, although citizen engagement is a central aspect in smart city development, citizens often remain in the passive roles of 'consumers' or 'users' instead being enabled to actively contribute to urban development (Cardullo & Kitchin, 2019). Even in cases of active involvement in decision-making processes, the aim of public authorities might be to increase efficiency and create acceptance for planning decisions in urban development (Bradshaw & Kitchin, 2022), but not necessarily to promote sustainable urban transformation in collaboration with citizens. Scientists are therefore increasingly calling for citizens to be given more power in smart city development (Mora et al., forthcoming; Van Twist et al., 2023) and the UN is promoting citizen-centered governance approaches for smart cities worldwide (UN Habitat, 2023, UN Habitat n.d.).

### **D: Transformative Research Methods for Actionable Knowledge**

Knowledge about *how* to foster and manage societal change processes is lacking, even though it is relevant to promote sustainable urban transformation (Bentz et al., 2022; Loorbach, 2022). Despite numerous studies on smart city technologies, there is a lack of in-depth case studies and actionable knowledge on the implementation of new technology in urban governance (Mora et al., forthcoming; Bradshaw & Kitchin, 2022). To gain such knowledge and to promote sustainable transformations, researchers can engage relevant actors through transdisciplinary research in multi-stakeholder settings like living-labs, real-world experiments and real-world labs (Weber & Ziemer, forthcoming; Bergmann et al., 2021). Among other approaches, in such settings new digital tools can be tested (Ziehl et al., 2023) or future states of urban systems can be co-modelled (Herzog, 2023) while researchers are investigating the design of digital technologies and how their embeddedness in governance structures can be promoted to foster sustainable urban transformations.

## **Submission of Extended Abstract**

Please send your extended abstract (1000 - 2000 words, English) by 17 November 2024 to: [eva.stowasser@hcu-hamburg.de](mailto:eva.stowasser@hcu-hamburg.de)

We plan to contact all submitters till 20 December 2024 to inform them about the acceptance of their proposals.

## **Special Issue**

We are planning to publish a special issue on the conference at the end of 2025. We would like to invite speakers to publish their conference contributions as double blind peer-reviewed full text. Submission, review and acceptance of full papers will take place in a separate process after the conference.

## City Science Lab

The conference takes place at the City Science Lab of Hafencity University Hamburg. We apply a transformative research approach on the topic of Digital Cities and Urban Twins. Using this approach, we analyze the current and multifaceted challenges a city may face together with project partners, as well as develop innovative solutions and advocate for the sustainable transformation of urban spaces. The City Science Lab is a cooperation with the MIT Media Lab and the conference is organized by an interdisciplinary research team from the fields of computer science, modeling, spatial planning and sociology.

<https://www.citysciencelab.hamburg>

## Connected Urban Twins

The conference takes place within the framework of the Connected Urban Twins (CUT) project, which is funded by the German Federal Government as a Model Project Smart City. As part of the CUT project, the cities of Hamburg, Leipzig, and Munich are jointly developing Urban Data Platforms and Digital Twins for use in integrated urban development. In order to present solutions and approaches of the CUT project, the scientific conference (02 to 03 April 2025) will be complemented by a practice-oriented event on 01 April 2025: CUT Innovations – Solutions and Approaches from the Connected Urban Twins Project will take place at the Authority for Urban Development and Housing and will be organized by the project partners in Hamburg.

<https://www.connectedurbantwins.de/en>

## Location

The conference will be held in a hybrid format. Presenters are able to both join in person and online. For presenters attending in person, the conference will take place at:

Hafencity Universität Hamburg  
City Science Lab – A cooperation with the MIT Media Lab  
Hongkongstraße 8  
20457 Hamburg  
Germany

## Financials

Travel expenses must generally be covered by the speakers or their organizations. A conference fee will not be charged.

If you are planning to visit in person after the acceptance of your extended abstract and if you find yourself unable to travel without financial support due to special circumstances, please feel free to reach out.

## Contact

In case you have questions regarding format, scope or organizational issues please contact:  
[eva.stowasser@hcu-hamburg.de](mailto:eva.stowasser@hcu-hamburg.de)

## Conference website

Please check for conference updates and additional information:  
<https://www.citysciencelab.hamburg/twin-conference-2025>

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