UrbanAIR

Funded by the European Union

1ST PRESS RELEASE

4 MARCH 2025

Europe Develops Digital Twins for Cooler and Cleaner Cities

European cities are experiencing increasingly severe heatwaves and rising air pollution, posing major risks to public health and urban liveability. In 2024, record-breaking temperatures affected Europe, prompting cities like London and Milan to introduce emergency measures against dangerous pollution levels. In response, **UrbanAIR**, a new EU-funded initiative, is collaborating with European cities to develop decision-support tools that integrate neighbourhood- and street-level atmospheric models with real-time temperature and wind observations. By incorporating behavioural insights through agent-based modelling and engaging directly with cities, UrbanAIR addresses challenges in urban design, planning, hazard response, and climate adaptation.

Supported by the **Horizon Europe** programme, UrbanAIR brings together 18 leading partners from eleven European countries to develop an innovative decision-support tool. This tool will provide urban planners and policymakers with real-time data, data-driven forecasts, and actionable insights to design cooler, cleaner, and more climate-resilient cities.

Five Cities Leading the Way

UrbanAIR will develop and refine its technology in close collaboration with five cities:

- **Antwerp and Barcelona** – Developing and enhancing digital twin technology to model climate solutions before real-world implementation.
- **Bristol, Paris, and Rotterdam** – Testing and expanding findings to ensure applicability across different urban settings.

> With urban heatwaves and air pollution reaching critical levels, we need smarter, data-driven and physics-based approaches to protect public health and enhance city resilience. This EU-funded project will provide cities with the tools to implement effective solutions, from urban greening strategies to emissions reduction policies.
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> **Dr. Femke Vossepoel,** Professor of Earth System Simulation at TU Delft and scientific coordinator of UrbanAIR

Bridging Climate Science, Urban Planning, and Human Behaviour

UrbanAIR's unique strength lies in its **integration of physics-based modelling with decision support, uncertainty quantification, and agent-based simulation of human behaviour**, all developed through co-creation with cities. This comprehensive digital twin simulates climate conditions and reflects how communities interact with their environment.

Key Features of the Virtual Model

- **Climate Modelling –** Physics-based and data-driven simulations will predict how heat and air pollution affect different parts of a city, generating meaningful scenarios and quantifying uncertainties to help planners design targeted, effective interventions.
- **Community Engagement –** Resident feedback will be systematically integrated to develop practical, human-centred urban planning strategies.
- **Decision Support –** The tool will equip city officials with the means to balance environmental, social, and economic factors when developing urban projects.

A Europe-Wide Alliance for Urban Climate Solutions

Aligned with the European Green Deal and the EU Mission for Climate-Neutral and Smart Cities, UrbanAIR will help cities identify the optimal cooling strategies, predict and manage air pollution and support sustainable urban development. Over the next four years, UrbanAIR will unite top experts from research, industry, and government, coordinated by Delft University of Technology. Renowned centres such as NORCE, VITO, CERFACS and Barcelona Supercomputing Center, along with meteorological institutes like KNMI (Netherlands), METEO France and SMHI (Sweden), will work closely with industry stakeholders such as Arup and distinguished universities including Technical University Ilmenau, Leibniz University Hannover, Imperial College London, Université Toulouse III, University of Freiburg, Bern University of Applied Sciences. Additionally, the UK Science and Technology Facilities Council (STFC) will develop the decision-support tool interface, while Resilient Cities Network will ensure public participation in the tool's development. Future Needs will lead outreach and awareness efforts and contribute to UI/UX research expertise.

> Understanding how people interact with their environment is key to designing cities that are not only resilient but also liveable. Through this project, we are ensuring that the latest fluid-dynamic modelling and uncertainty quantification developments are combined with behavioural insights. By making them accessible to policymakers and urban planners, real, tangible improvements can be achieved in urban resilience.
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> **Vasilis Bouronikos,** Communication & Dissemination Manager, Future Needs, Dissemination & Exploitation Leader of UrbanAIR project

From Research to Real-World Impact

UrbanAIR is scaling up climate modelling by leveraging Destination Earth—a global digital twin of the planet—and applying it to street-level meteorological models. Unlike traditional climate models, this tool will deliver localised, real-time insights, empowering cities to make targeted and effective decisions to combat extreme heat and pollution.

Ultimately, UrbanAIR aims to improve urban planning and design, develop solutions for climate adaptation, and support robust hazard response in cities.

This €14.3 million, four-year project is funded under HORIZON-INFRA-2024-TECH-01-03: New Digital Twins for Destination Earth call, directly supporting European policies on climate adaptation, urban sustainability, and public health. UrbanAIR launched on 1 January 2025, with a kick-off meeting held on 3-4 February 2025.

Follow the latest project news, publications, and results at **urbanair-project.eu** and through UrbanAIR's **LinkedIn** and **Bluesky** channels.

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