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UrbanAIR: a digital twin of the urban atmosphere for decision support

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The urban atmosphere plays a vital role in the complex interactions with other Earth and societal systems. Extremes in urban heat and air pollution affect the population of cities. The interactions of atmospheric variables with human interventions in the urban environment influence the health and well-being of urban dwellers and the liveability of our cities. The complexity of these interactions makes it challenging for existing infrastructures to provide robust evidence to support stakeholders who make these decisions. Thus, bringing together internationally disparate expertise and high-quality research infrastructures in a digital twin tailored to stakeholder needs may facilitate decision making in urban problems involving heat and air quality.

UrbanAIR[1] will include a cascade of atmospheric models, ranging from the global scale, linking via the mesoscale to very high-resolution simulators at the neighbourhood or street level. By starting from the perspective of the decision-maker and fostering co-creation, we will configure the models to generate scenarios that address key dilemmas and support a balanced evaluation of decision criteria. In this presentation, we present our plans for integrating the different simulation and decision-making components. We will pay specific attention to the integration of observations into the simulator and to uncertainty quantification through emerging data assimilation and machine-learning techniques.

The resulting tools will be integrated into the Destination Earth infrastructure[2]. By testing the tools in a variety of real-world settings, the research infrastructure of UrbanAIR will pave the way for effective climate adaptation and hazard mitigation in a more general sense, transforming urban planning and design into a proactive, tool-based, approach for a safer, healthier, and more resilient future.

[1] UrbanAIR is part of HORIZON-INFRA-2024-TECH-01-03: New digital twins for Destination Earth.

[2] <https://destination-earth.eu/>