

From the IAUC President

Dear Urban Climate Community,

As 2025 draws to a close, I am grateful for another year of remarkable energy, innovation, and collaboration across our global urban climate community. It was wonderful to see so many familiar faces (and many new ones!) from around the world in Rotterdam earlier this year for the 12th International Conference on Urban Climate. ICUC-12, held in the dynamic setting of a delta city at the forefront of climate adaptation, was our largest gathering yet, with 860 onsite and 69 online participants representing 49 countries.

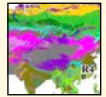
The conference theme, "Heritage as an Urban Climate Challenge: Evidence, Policy, Design & Agency," invited us to view climate adaptation as a form of stewardship, working with what cities inherit to create more resilient and equitable futures. This framing carried through the week's rich scientific program, which spanned five thematic tracks, twenty community-proposed special sessions, more than 130 oral sessions, and 200 posters. A well-attended panel on the upcoming IPCC

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ICUC12 in Rotterdam, July 2025 (Photo: Robert Kroonen)

Urban Climate Walk: Baixa & Alfama, Lisboa | 29 October 2025

Urban climate effects arise in all cities. What differs is how they are expressed, shaped by geography, built form, dominant functions, and patterns of use. The City of London **Urban Climate Walk methodology**¹ was designed to make these effects legible *in situ*, reading the city itself as a climatic system rather than treating climate as an abstract or external variable.

The ICUC12 Climate Workshop in Rotterdam (2025) marked a key moment in formalising these recurring observations into the Urban Climate RULES, not as a site-specific model, but as a transferable framework for embedding urban climate science into built-environment practice. The Lisbon walk forms part of this wider programme, but with **its own agenda and emphasis**, shaped by Lisbon's geography, history, and contemporary pressures.

Walk Leadership and Collaboration

The Lisbon walk brought **Dr Julie Fitcher** (Urban Generation) and **Tiago Silva** (Universidade de Lisboa) together with members of Lisbon's Urban Climate Research Group, including **Professor António Manuel Saraiva Lopes** and **Márcia Alexandra Neves Matias**, alongside researchers and practitioners from Lisbon's wider urban climate community Ana Bonifácio, Paula Matos and Eleni Oikonomaki. The walk was intended to broaden the conversation, engaging across research, practice, and governance but as a condition produced through built form, function, and everyday use.

Reading Climate Through Inherited Urban Form

The route moved from the **Pombaline Baixa** to the medieval fabric of **Alfama**, tracing transitions in urban morphology, topography, and microclimate. Along this route there is little new development; climatic behaviour is governed largely by **inherited infrastructure**, street networks, plot structures, materials, and public spaces, shaped long before mechanical ventilation or fossil-fuelled energy systems.

Lisbon's layered urban fabric demonstrates how successive morphologies have embedded **environmental intelligence** in response to constraints. From the compact, shaded streets of Alfama to the regularised grid of Baixa, urban form continues to regulate the exchange of **heat, air, and moisture** across diurnal and seasonal cycles.

Geography, Hazard, and Dual Resilience

Lisbon's urban climate cannot be separated from its **geographic setting**. Steep topography, Atlantic exposure, the Tagus estuary, and **seismic risk** have co-shaped settlement patterns and urban form. The 1755 earthquake represents a pivotal moment, not only as a structural catastrophe but as a spatial and climatic reset.



Start of the Lisbon Urban Climate Walk at the Tagus riverfront. The open square and expansive sky view provide a reference condition for solar exposure, ventilation, and thermal perception, against which more enclosed street environments encountered later in the walk can be read. (Source: Márcia Alexandra Neves Matias)

The Pombaline reconstruction illustrates a dual **logic of resilience**:

- **Structural resilience:** addressing seismic risk through regulated block layouts and construction systems
- **Bioclimatic resilience:** through controlled street widths, building heights, and orientation that moderate solar exposure and support ventilation. Not only to moderate thermal conditions, but to refresh the dense urban core by dispersing odours and pollutants, reflecting an early concern for urban hygiene as well as comfort

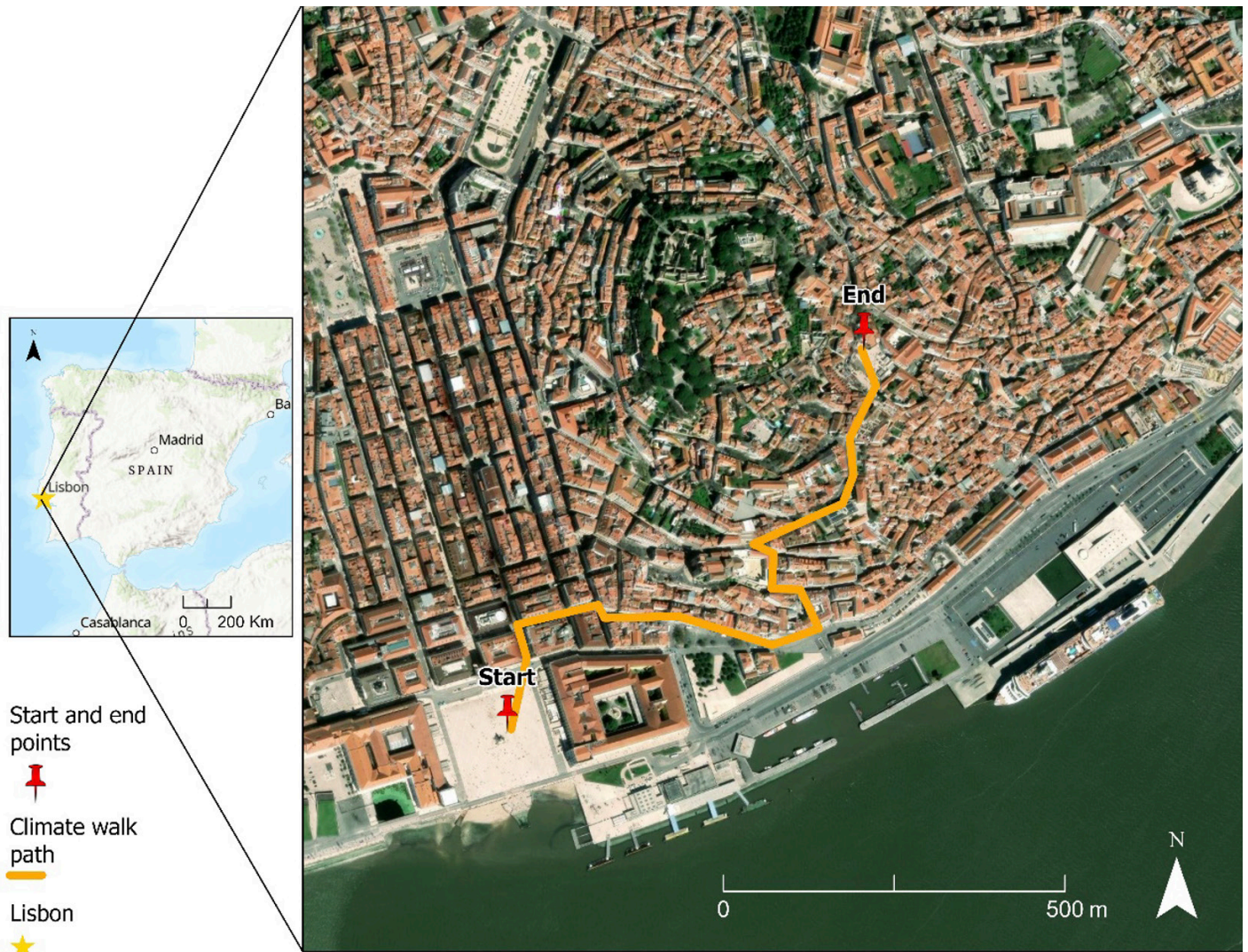
Resilience here is not single-issue or technological, but **spatially embedded**, integrating hazard response, environmental moderation, and civic order within the same urban system.

Airflow, Topography, and the Urban Commons

In Baixa, the orthogonal grid interacts with dominant **northerly winds** and episodic Tagus **estuary breezes**, supporting adiabatic cooling as air moves between higher ground and the waterfront. In contrast, Alfama's dense, irregular fabric limits airflow and sky exposure, stabilising daytime temperatures while retaining warmth at night.

A key observation along the waterfront was the influence of large cruise ships, which, alongside their

¹ Co-created by Dr Julie Fitcher and Professor Gerald Mills (2014)



Lisbon Urban Climate Walk route from Baixa to Alfama. The route connects contrasting urban morphologies and topographic conditions, supporting situated observation of how street geometry, ventilation, solar exposure, and materials shape microclimatic behaviour across neighbourhood scales.

resource demands and supporting infrastructure, act as temporary vertical barriers. These vessels function as **moving walls**, disrupting pressure gradients and limiting the inland penetration of cooling breezes. Their impact extends beyond the port itself, highlighting how **transient infrastructure linked to tourism** can modify airflow and affect shared climatic conditions.

This raised discussion around the **urban climate commons**, ventilation corridors, clean air, and thermal relief, as shared, spatially produced resources that are vulnerable to cumulative obstruction, whether permanent or temporary.

Materials, Radiation, and Thermal Exposure

Participants examined Lisbon’s material palette, terracotta tiles, lime mortars, tiled façades, and pale limestone paving, and their role in moderating diurnal temperature swings through **high reflectivity and thermal inertia**.

Particular attention was paid to the **radiative impact of light-coloured limestone cobblestones** in unshaded areas. These surfaces reflect short-wave radiation upwards as well as downwards, increasing pedestrian heat load in a manner comparable to snow glare. This effect is especially pronounced in open plazas and wide streets, with clear implications for outdoor thermal comfort.

Water, Moisture, and Biotic Indicators

Rainfall and moisture were discussed as critical mechanisms for thermal reset. Permeable limestone surfaces and historic drainage systems promote infiltration and evaporative cooling following rain events. In Alfama, shaded tiled façades retain thin moisture films that sustain short-term cooling.

The presence of **mosses and lichens** on shaded, moisture-retentive walls provided visible biotic indicators of persistent humidity, limited solar exposure,

and slow drying potential. These observations anchored discussion of how **water availability, ventilation, and surface conditions** co-produce microclimates, while also prompting reflection on **air-quality persistence** in enclosed urban settings.

Function, Economy, and Climate Performance

A recurring theme of the walk was how changing economic functions interact with inherited urban form to shape climate outcomes. Lisbon's historic districts are increasingly driven by **tourism**, with short-term accommodation replacing long-term residential use. These shifts alter occupancy patterns, ventilation regimes, internal heat gains, and energy demand.

These observations reinforced a core Urban Climate RULE: **Buildings are Not Energy Islands**, but part of a shared urban energy ecology. Historic urban form remains fixed, continuing to mediate sunshine, shading, airflow and water, but changing economic uses increasingly operate at odds with these passive conditions. As a result, operational energy demand and waste heat intensify and interact across buildings, streets, and neighbourhoods, reshaping local microclimates and gradually eroding inherited resilience.

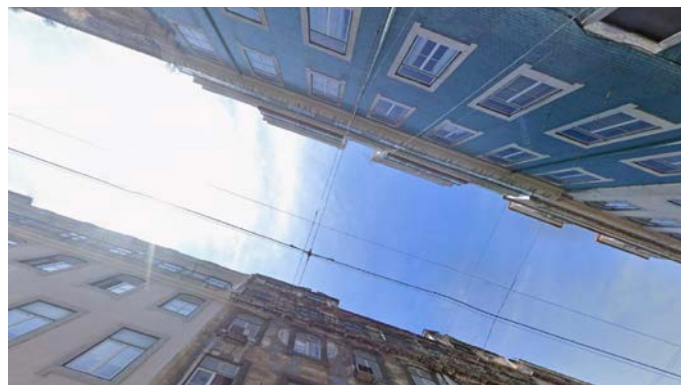
Reflection and Next Steps

The Lisbon Urban Climate Walk demonstrated the value of situated collective observation in understanding how cities function climatically. Rather than seeking novelty, the walk focused on reading how inherited urban form continues to operate as climate infrastructure under contemporary pressures, revealing both enduring climatic intelligence and points of emerging risk.

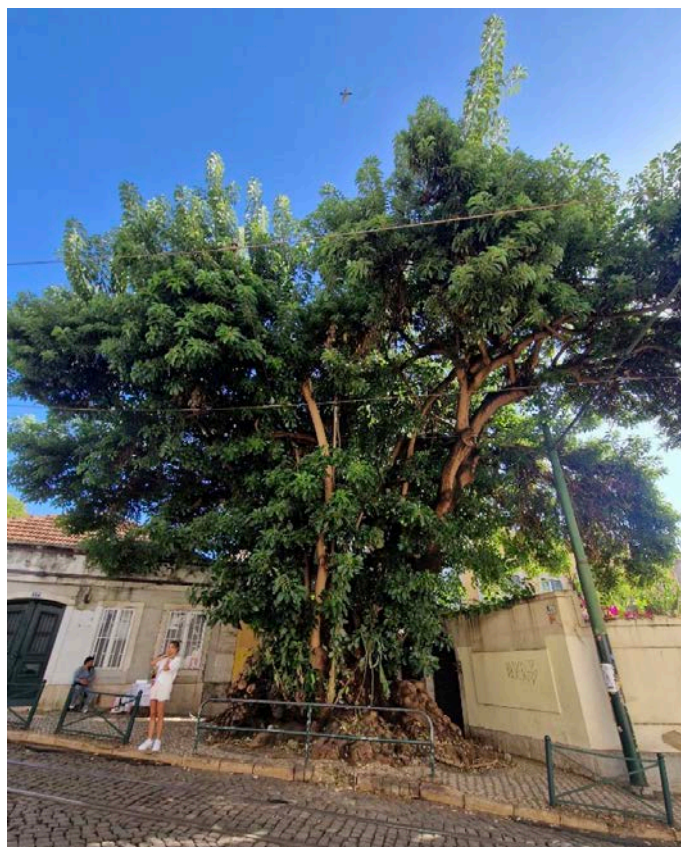
Read through the Urban Climate RULES, developed through the City of London Urban Climate Walks and formalised during the ICUC12 Climate Workshop in Rotterdam (2025), these observations reinforced that urban climate effects are spatial, temporal, and scale-dependent, shaped by the interaction of built form, function, and location.

Next steps include a Spring 2026 walk engaging city officials to examine built form as climate infrastructure and explore abiotic-biotic interactions in decision-making, alongside a reciprocal London walk reflecting on how different urban morphologies and economic functions shape climate processes under contrasting conditions.

Together, these directions reaffirm the purpose of the Urban Climate Walk programme: to build shared climate literacy across disciplines by making the spatial, material, and operational realities of cities legible as lived environmental systems, where climate effects are uneven, place-specific, and shaped by form and use.



Top: Rua dos Fanqueiros, Baixa, Lisbon. Bottom: Rua da Madalena, Alfama, Lisbon. Available at: Google (2025) Google Maps Street View. (Accessed: December 2025).



Mature street tree in Alfama, often cited as one of Lisbon's oldest



Participants congregating in shade during the Lisbon Urban Climate Walk. The collective use of shaded space demonstrates how solar exposure and thermal comfort are read experientially as part of the walk methodology (Source: Márcia Alexandra Neves Matias)



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Over the past decade, artificial intelligence (AI) and machine learning have rapidly advanced, becoming powerful tools in the fields of weather forecasting and climate studies. Currently, there are growing challenges and interests in combining urban climate research with machine learning and recent advancements in AI. This led to the first session solely dedicated to AI/machine learning for urban climate studies at the 12th International Conference on Urban Climate (ICUC12). Presentations during the session showed a wide variety of research in this rapidly emerging field. Models of different complexities have been developed to make frequent predictions at point locations and/or fine resolution predictions over a neighborhood, city, or many cities for one or multiple (bio)meteorological variables. Machine learning was also used in multiple ways to create boundary conditions for micro-scale models. Other studies applied AI or machine learning to produce different scenarios that study the impact of greenery or global warming levels on the urban climate to be able to find and design future outdoor cool spaces or to estimate individuals' thermal comfort.

Discussions during the session raised the need for a stronger network in AI/machine learning and urban climate. We believe we can improve, coordinate and accelerate ongoing research in this field by collaborating. For example, it is currently difficult to interpret and

compare how well an urban AI model performs as there is no standard procedure for the evaluation, and different datasets are being used over different spatial scales. Additionally, the field of AI itself is very broad and dynamic, so we see different paths for maturing the use of AI in urban climate research. This ranges from supporting the selection of suitable machine learning methods and architectures for a problem at hand to transferring the latest AI models into new urban climate AI models (e.g. foundation models or hybrid approaches), incorporating explainable and trustworthy AI concepts. Hence, by setting up an urban climate-AI community, we hope to bring people together who are interested in similar topics and enable collaboration. Therefore, we launched a questionnaire to get to know each other's interests, and the first online meeting will take place at 20:00 UTC on January 7th 2026 to discuss the outcomes of this questionnaire and shape the new AI for Urban Climate Working Group.

If you are interested in joining this newly developed **AI4UrbanClimate** community, you can send an email to listserv@lists.ugent.be with the following subject line:

subscribe ai4urbanclimate *Firstname Lastname*

(replace '*Firstname*' and '*Lastname*' with your own first and last names). Leave the message body blank, as the list is not a person but rather a mailing list management