UK Urban Environmental Quality Partnership

Open call for evidence and new members to advance urban digital planning and modelling for climate resilient, healthier urban areas and buildings.

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About UKUEQ

The UK Urban Environmental Quality (UKUEQ) partnership has been set up to gather, generate and disseminate best available technologies and design practices leading to better understanding of, and designs for, the urban environment leading to an improvement in air quality and increased climate resilience.

UKUEQ is a joint working group of the CIBSE Resilient Cities Group and the UK Wind Engineering Society with a primary focus on modelling wind, thermal and air quality environments. It is made up of over 20 organizations from industry and academia.

The group is hosted by CIBSE and is a publications focused group. It has a uniting interest across the partners involved, regarding the computational fluid dynamics (CFD) interface with other tools and techniques and potential advancements.

Activities to date

- **Held first meeting September 2022**
- **Ran a session at Build2Perform 2023**
- **Meet monthly online**

Get involved!

UKUEQ is working to produce best practice/guidance and is seeking input from across CIBSE Special Interest Groups as well as up-to-date evidence for planned and future topics. If you would like to get involved, contact the appropriate publication lead or Darren Woolf:

2024 publications and lead author contacts:

1. CFD Modelling of Urban Vegetation Systems
darren.woolf@wirthresearch.com
- July 2024 first finalised draft ready for the start of the BBAA conference, Birmingham. Includes launch for comment to the international wind community during the dedicated mini-symposium
- Second engagement opportunity at the WES2024 Conference in Southampton (beginning of September) UKUEQ will be presented to members of the UK WES.
- Publication date Q4 2024/Q1 2025

2. Computational Modelling of Outdoor Thermal Comfort
rubina.ramponi@arup.com

3. UK City Wind Microclimate Guidelines
rob.rowsell@wirthresearch.com

4. Modelling of Outdoor Air Quality
jenny.stocker@cerc.co.uk

The following topics are under review for future publications, (with a focus on interrelationships with buildings and other environmental factors that form the urban environment experienced):

- Urban heat island
- Lighting & acoustics
- Microclimate modelling of building-level green infrastructure

To submit for consideration evidence (academic papers and grey literature welcomed), research projects, group publications/contacts, please add your suggestions here:
https://bit.ly/CIBSE-UKUEQ-Contribute

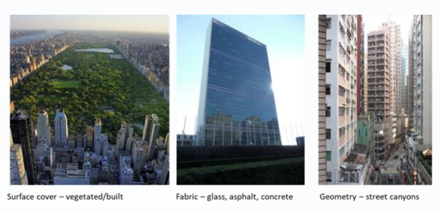
Context

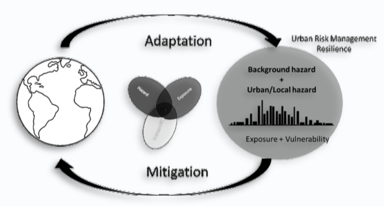
An urban environment can be thought of as an ecosystem made up of biotic or living components (all plants, animals, and microorganisms) and abiotic or non-living components such as temperature, light, moisture, and air currents, all of which impact the ecosystem to some degree. The relationships and interconnectivity between these components will ultimately define the resource efficiency, comfort, health, and well-being as well as the productivity and value of the overall system. In addition, the urban environment can be considered an ecosystem made up of a hierarchy of systems applied at building within city within region within global scales all of which can be directly or indirectly impacted by our designs.

Building engineers have opportunities to understand and manipulate these components through the design process to drive improved environmental performance whilst exceeding minimum (compliance) targets required for the planning process. The additional insights derived from studying the urban environment holistically can lead to multiple benefits, such as cooler and cleaner air to counter urban heat island and pollution effects, and significant savings, such as reduced demand requirements for installed systems through moderating external extremes.

Climate resilience and urban environmental quality

Climate resilience is the ability to cope with the impacts of current and future hazards –this includes the enhanced/created urban hazards. Urban form alters the natural exchanges of energy and water between the surface and air.





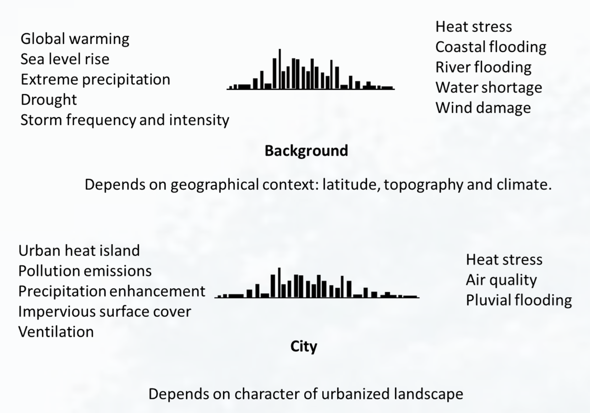


Image credits: Gerald Mills, University College Dublin

Beyond the building: the influence of *built form* on urban environmental quality

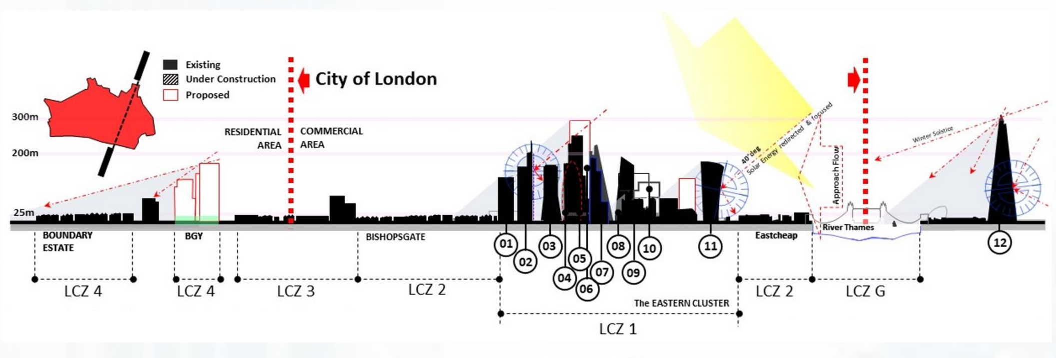


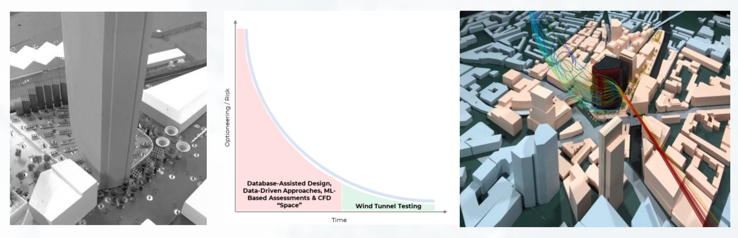
Image credit: Julie Futcher, RIBA

Conceptual section of the City of London through the Eastern Cluster reveals the influence of built form on urban microclimates and air quality.

LCZ = Local Climate Zone classification –this is an urban land cover category based on their *'approximate ability to modify local surface climates due to their fabric, land cover, structure and metabolism'* (Stewart and Oke, 2012).

Beyond comfort and discomfort: the pedestrian *experience* of urban microclimate

We are working to evolve and update the City of London Wind Microclimate Guidelines to apply to cities UK-wide.
These can be found at:
https://www.cityoflondon.gov.uk/services/planning/planning-application-requirements/microclimate-guidelines



Hybrid CFD + Wind Tunnel Testing Approach -wind tunnel testing technology and computer simulations should be an integral part of the design process.

Image credit: Stefano Cammelli, WSP

Numerical simulations can be used to estimate urban microclimate conditions and identify areas that need possible interventions.

Image credit: Rubina Ramponi, Arup

Key areas of integrated design and tools usage UKUEQ will be investigating

- ❑ **Single platform delivery including, for example, odour transport (e.g. kitchen exhaust design), drainage / flash flood resilience and wind-driven rain.**
- ❑ **Air dispersion Gaussian-based methods with CFD.**
- ❑ **Experimental and computational wind engineering tools.**
- ❑ **Surface albedo together with wind mitigation designs to influence material selection.**
- ❑ **Detailed local façade wind pressure coefficients in support of natural ventilation designs.**

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CIBSE
Resilient Cities Group

Wind Engineering Society

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