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CALL FOR PAPERS: special issue

Alternatives to air conditioning: policies, design, technologies, behaviours

Guest Editors:

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Deadline for abstract submission: 12 APRIL 2021

Buildings and cities have become highly dependent on air-conditioning and mechanical ventilation. Recent discussions about 'build back better' after the Covid-19 pandemic afford an opportunity to reconsider many contemporary practices in the built environment. In addition, many countries have stipulated that new buildings must be carbon neutral. Climate change will create an increasingly warmer world – impacting on summer overheating in buildings. This is an urgent concern for both mitigation and adaptation: how can thermal comfort be provided during hotter summers without the GHG emissions? 'Conventional' air conditioning will soon be technologically redundant. Can our cities and buildings be designed to have little or no mechanical intervention?

The alternatives to conventional air conditioning embrace much more than a technological issue – they require holistic design thinking and include social aspects (expectations, behaviours, practices) which may challenge the ways in which work, leisure and other activities are pursued.

This special issue explores alternative approaches to providing thermal comfort and ventilation in different climatic zones across the world at the scales of building, neighbourhood and city. It considers the implications of these alternatives across a range of issues: health, wellbeing, air quality and heat stress; technical / design solutions; social expectations and practices; climate change; policy and regulation; supply chain and procurement; education and training. It includes a range of disciplines: geography, sociology, anthropology, behavioural sciences, architecture, engineering, public health, economics, energy and environmental assessment. A detailed list of topics is below.

In urbanised areas, there is an opportunity to break the current dependency on air conditioning. The design of cities, neighbourhoods and buildings can ensure ventilation and thermal comfort by climate friendly means. Retrofit opportunities for the existing building stock can make existing buildings comfortable without increasing energy demand. The design of new buildings and their environs can reduce or eliminate the need for air conditioning.

Equally important are the responses of the many different actors that promote or inhibit adoption - policy makers, clients, construction professions and the supply chain (development and procurement). Key questions include:

- What constitutes a national cooling action plan?
- How resilient should buildings and cities be to a warmer world?
- How resilient to heat should buildings be if energy supply is disrupted?
- What role do design and construction professionals and the supply chain have in implementing change?

Last year China and India introduced national cooling action plans, and France committed to the 'Biarritz Pledge' for fast action on efficient cooling. In 2019 the Global Cool Cities Alliance also issued their 'Million cool roofs challenge'. City scale action plans are vital. Ahmedabad published its first heat action plan in 2013 and there is now evidence that it is beginning to save lives among those who are most vulnerable. The Kigali Cooling Efficiency Program (K-CEP) is another example of energy-efficient, climate-friendly, and affordable cooling solutions to refrigeration and cooling.

Background: why are alternatives needed?

- **Health and wellbeing.** (not only Covid-19 and potential future pandemics) Re-circulation of untreated air may no longer be acceptable. The linkages between ventilation (100% fresh air) and health are increasingly identified as important. The pattern of air movement may be significant.
- **Physiological need** for thermal variation and ventilation.
- **Adaptive measures** to maintain thermal comfort.
- **Energy demand and negative environmental impacts** of refrigerants, waste heat, materials, etc (projected energy demand from a/c is not sustainable – new peak demands)
- **Economics and equity** (poorest people are made vulnerable)
- **Changing social expectations and rapid urbanisation** (increased demand)
- **A changing climate** (hotter - humid and/or more extreme)

Possible topics

Urban design issues - planning (building height, configuration, materials, external shading, over-shadowing, urban heat island, vegetation and open spaces, etc), effects on ventilation and cooling

Neighbourhood design - particularly microclimates (scale, shading, air movement, open space, trees and vegetation, urban 'oases').

Building design – spatial configurations of buildings to help achieve comfort, the performance and outcomes of new build and retrofit across a range of building types and technologies (see below), their design integration aspects, their impact on building morphologies, occupant agency (see below) and feedback. Reduction of loads e.g. shading, buffer zones, orientation, optimal window opening sizes, etc), advanced natural ventilation, wind tower systems, etc. Building materials and techniques.

Social behaviours & Inhabitant agency – how people actually inhabit buildings and cities. Patterns of occupation and practices inside and outside buildings include seasonal and diurnal adaptation which impact the need for cooling (e.g. the traditional siesta), communication of appropriate information on how to operate the building.

Cooling technologies and their application – examination different technologies (performance, economics, whole life impacts, etc) and their integration: natural ventilation, evaporative cooling, radiant cooling, night time cooling, ice cooling, ground water cooling, thermal mass and cooling, negawatt cooling.

Demographics – analysis increasing demand for air conditioning due to affluence, disparities within countries of a/c unit ownership, people adversely affected / made vulnerable now or in future climate scenarios.

Economics – macro analysis of different thermal comfort scenarios (capital and operating costs vs societal costs e.g. health, environmental, social impacts).

Policy, regulation & standards - what shifts & incentives are needed at individual building, neighbourhood and city scales to encourage buildings without mechanical systems, to create appropriate internal temperature targets, to protect the "commons" (e.g. eliminate waste heat from a/c), to provide planning for appropriate shading, ventilation, green infrastructure at neighbourhood & city scales.

Public health – comparison of mechanical vs non-mechanical ventilation: airborne infectious transmission rates, air movement patterns in rooms and buildings, CO₂ concentration & air pollutants, the physiology of adaptive comfort, the influence of neighbourhood microclimate and the incidence/transmission of infectious disease

Energy use and environment impacts – impacts of a/c on energy demand, peak energy and GHG emissions.

Public attitudes – the anthropology of cooling, the current and changing expectations for cooling: thermal pleasure, cooling desire, air conditioning and 'development', public attitudes to cooling in warm places

Market transformation – analysis of current and alternative development & procurement models. Standard models reward developers for creating a/c buildings. What new models are needed for rewarding low energy alternatives, e.g. cooling as a service (CAAS)? The business case for alternative approaches.

Education & training - What are the roles of individual teachers / staff in leading change? What resistance and difficulties do they meet? How can educators overcome these barriers?

Certification - are different / alternative processes of certification required for alternative cooling systems? Do professionals and vocational workers need different / additional / alternative qualifications to show they have appropriate skills?

Briefing Note for Contributors

You are invited to submit an abstract for a journal paper in this special issue of *Buildings & Cities*. In the first instance, please send a **500 word (maximum) abstract defining the scope, methods and results** to **Richard Lorch** richard@rlorch.net by **MONDAY 12 APRIL 2021**. The initial submission must include:

- the author's and all co-author's names, affiliations and contact details
- the question(s) and topics in this Call for Papers that the abstract and intended paper addresses
- the abstract (300 - 500 words maximum) which should include a description of methods and key findings

The journal publishes the several different types of papers: research, synthesis, policy analysis, methods, & replication. Details on their scope and length: <https://www.buildingsandcities.org/about/aims-and-scope.html>

Abstracts will be reviewed by the editors to ensure a varied, yet integrated selection of papers. Authors of accepted abstracts will be invited to submit a full paper which then undergoes double-blind peer review.

Timeline

Deadline for abstract submission:	12 April 2021
Full papers due:	01 September 2021
Referees' comments:	01 December 2021
Final version due:	01 February 2022
Publication:	April 2022

Note: papers are published as soon as they are accepted and therefore some papers will progress faster and appear in advance of the whole issue.

Buildings & Cities

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Questions?

If you have a question, please contact: **Richard Lorch** richard@rlorch.net (editor in chief), **Brian Ford** brian@naturalcooling.co.uk, **Dejan Mumovic** d.mumovic@ucl.ac.uk, **Rajan Rawal** rajanrawal@cept.ac.in

Key reading

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