Loughborough University

The Edge and BRI Debate:

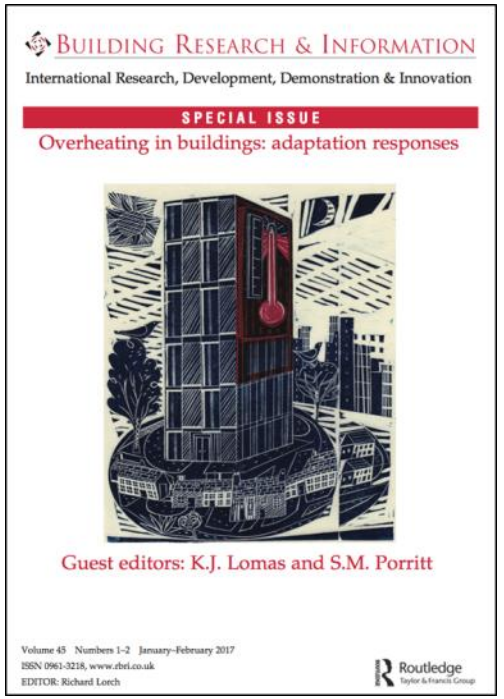
Overheating in UK buildings – a disaster waiting to happen?

Professor Kevin Lomas
guest editor with
Dr Stephen Porritt,
for

BRI Special Issue
Overheating in Buildings: Adaptation Responses

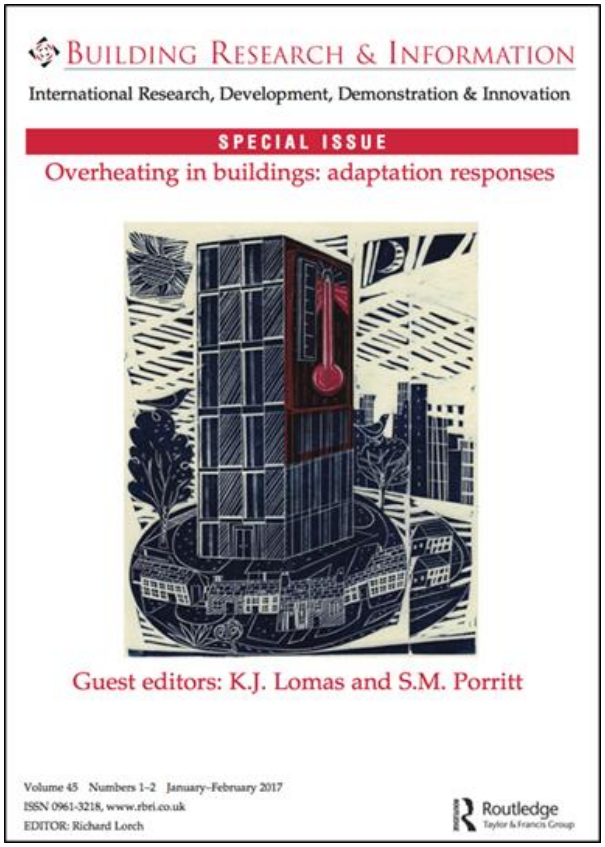
The extent of overheating

- The Special Issue of BRI reports 8 field studies.
- Overheating has been measured in dwellings across England, Scotland and Northern Ireland.
- Especially in the South East.
- New and existing homes.
- Overheating is a serious and growing public health issue.



Four Questions for this Edge Debate

- Why do UK buildings overheat in summer?
- Who is affected by it?
- What should we do about it?
- Who should do it?



Why do building overheat in summer?

1. Energy efficiency and decarbonisation

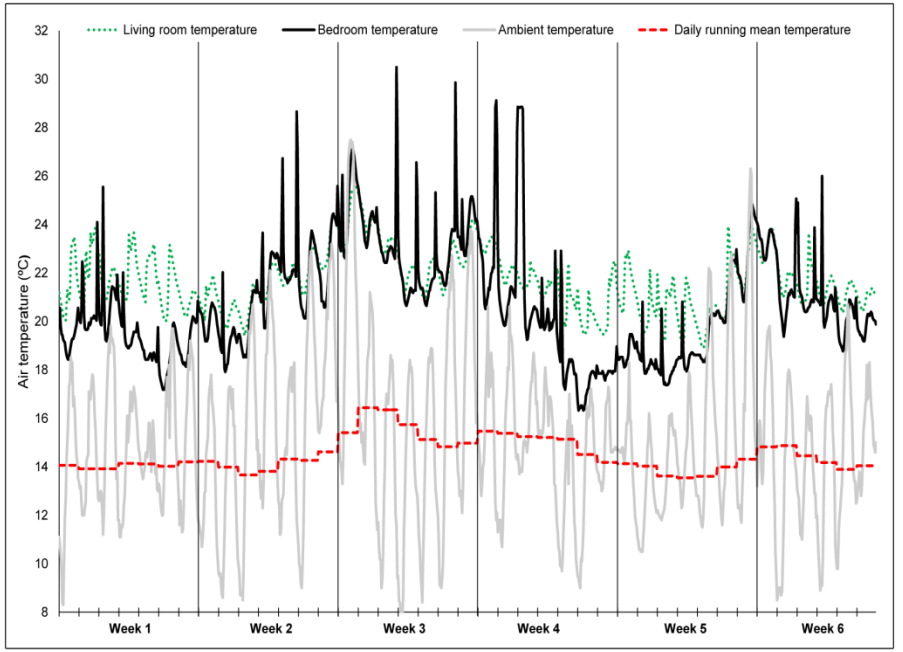
- Historically homes poorly insulated
  Windows for light and ventilation
  (for air quality not summer cooling).
- New homes better insulated and air tight.
- Refurbishment: insulation, new windows,
- Remodelling: extensions, conservatories.

Source: Google

Why do building overheat in summer?

2. Changing climate

- Warmer summers and more variability.
- More frequent, longer and more intense heat waves.
- National alert system in place.



Hourly air temperature variations in a home in Leicestershire. After Beizaee et al. 2013

Why do building overheat in summer?

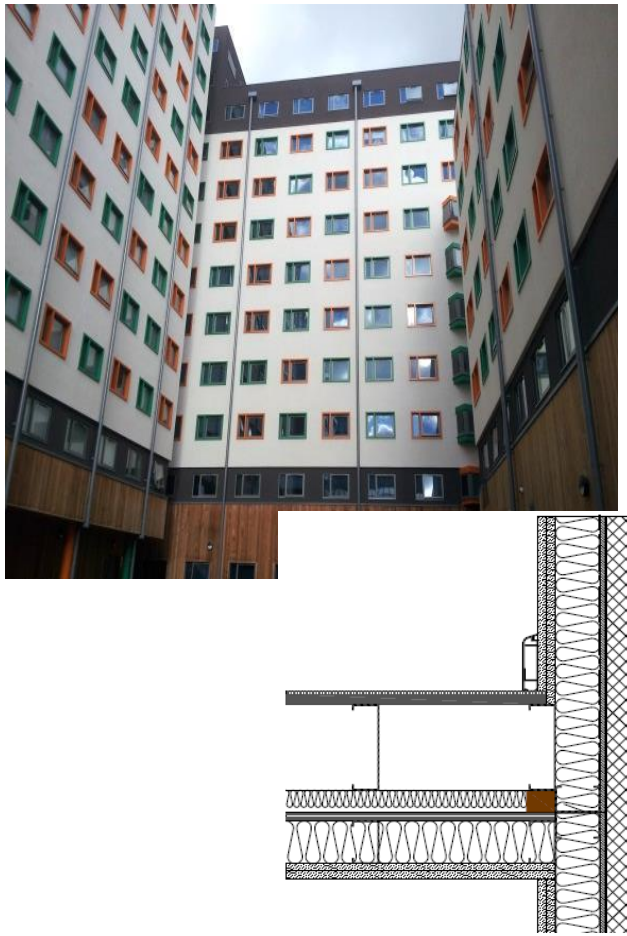
3. Urbanisation

- Urban heat island
- Noise, pollution, security risks
- Reduced effectiveness and likelihood of window opening.

Why do building overheat in summer?

4. Reducing construction cost

- Faster, less time on site
  - ‘Modern methods of construction’
  - Prefabrication = light weight – steel, plasterboard, plastic, wood.
  - No external shading.
  - ‘Simple’ windows.
- Cost cutting
  - Cheap, noisy ventilation devices
  - ‘Value engineering’



Why do building overheat in summer?

5. Increasing land prices

- High rise – solar gain, hot air rises, piped hot water.
- Window opening restrictors.
- Single aspect, low ceilings, blind corridors.
- ‘Compact’ homes and flats.

Why do building overheat in summer?

6. An aging population

- More than 20 million over 60 by 2030.
- More affected by heat.
- Less able to sense heat.
- Less able to regulate body temperature.
- Medication further impairs thermo-regulation.
- Physically less able to operate windows, trickle vents etc.
- Cognitively less capable of understanding what to do.
- At home during the day.

Why do building overheat in summer?

7. Aesthetic preferences

- External shading is rare.
- External shutters are rare.

Windows on outer leaf, open outwards.

- Carpets and soft furnishing.
- Keeping warm is our motivation.

Matched pair test houses Loughborough University

Why do building overheat in summer?

8. Social and cultural knowledge

- People do not know what to do if hot weather is imminent.
- Construction companies do not (know how to) design to avoid overheating.
- Regulations don’t demand overheating mitigation measures.
- SAP Appendix P is a poor predictor of overheating risk.

Why do building overheat in summer?

9. Our ability to identify the problem

- Small, low cost sensors
- Smart meters
- The connected home
- Phone Aps.
- Big data
- Data analytics

Hobo pendant temperature loggers used for indoor temperature monitoring

Why do building overheat in summer?

1. Energy efficiency and decarbonisation
2. Changing climate
3. Urbanisation
4. Reducing construction costs
5. Increasing land prices
6. An aging population
7. Aesthetic predisposition
8. Social and cultural knowledge
9. Our ability to identify the problem

Overheating: the 'perfect storm' of technical, economic, demographic, cultural and personal factors.

Thank you