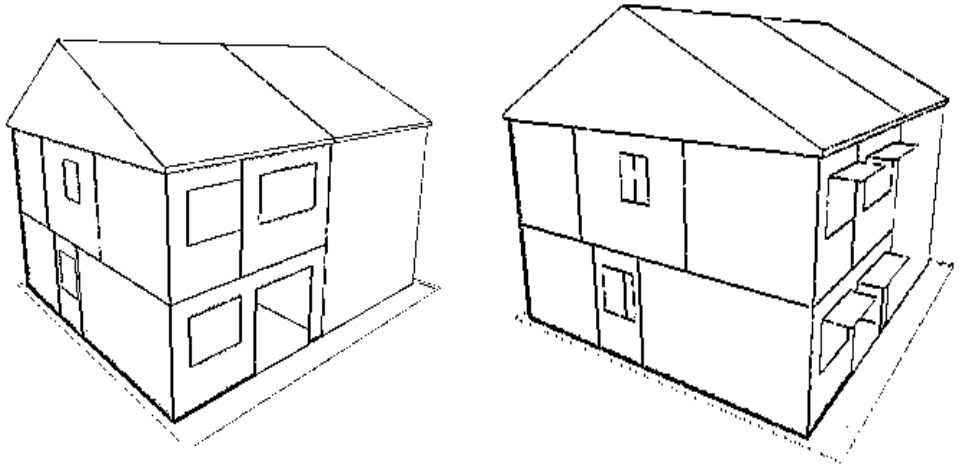
Regulating for Climate Change Related Overheating Risk in Dwellings



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Background & Research Aims

Background

- Building regulations in cool climates optimise dwellings for heat retention
- Evidence that some dwellings already experience significant overheating - likely to get worse over time due to climate change
- Current approach (in regulations) to overheating assessment may not be *fit for purpose* as they are largely based on historic data, take a simplistic (steady state) approach, allow for unrealistic user adaptations and are focused on the point of handover
- Potentially more accurate dynamic simulation methods may be problematic due to the level of resource and training required

Research Aims

- Consider the level of potential overheating risk in dwellings, in cool climates associated with climate change
- Develop an alternative industry focused, risk based approach that can account for building configuration, location, predicted climate change and incorporate adaptation planning

Methodology

- ‘Typical’ (UK) Semi-Detached dwelling modelled in Ecotect and exported to HTB2
- Construction specification (5) (heat retention), construction method (3) (mass), orientation (2) and window opening (4) varied to consider a range of specifications (reflecting recent and emerging regulations and standards)
- Models ‘run’ using weather files based on UKCP09 predictions and developed as part of the PROMETHEUS* project at the University of Exeter
- 50th percentile ‘medium’ scenario predictions chosen based on Design Summer Year (DSYs) for a base case and the 2030s, 2050s and 2080s
- Resultant operational temperatures measured against adaptive thermal comfort criteria to predict levels of overheating
- Outputs used to develop a ‘risk matrix’ corresponding to construction specification, mass, orientation etc…. allowing for the level of risk associated with the given configuration to be visualised.

*See: Eames M., Kershaw T. and Coley D. (2011). “On the creation of future probabilistic design weather years from UKCP09.” *Building Services Engineering Research and Technology* 32: 127-142.

Findings

- Level of predicted overheating increases over time;
- and as heat retention parameters increase (more insulation and air tightness etc.)
- Passivhaus compliance may offer some protection compared 'advanced fabric' options alone
- Thermal Mass and increased ventilation offer benefits but both have limitations
- Metrics a cause for concern particularly in relation to overnight temperatures and thermal mass

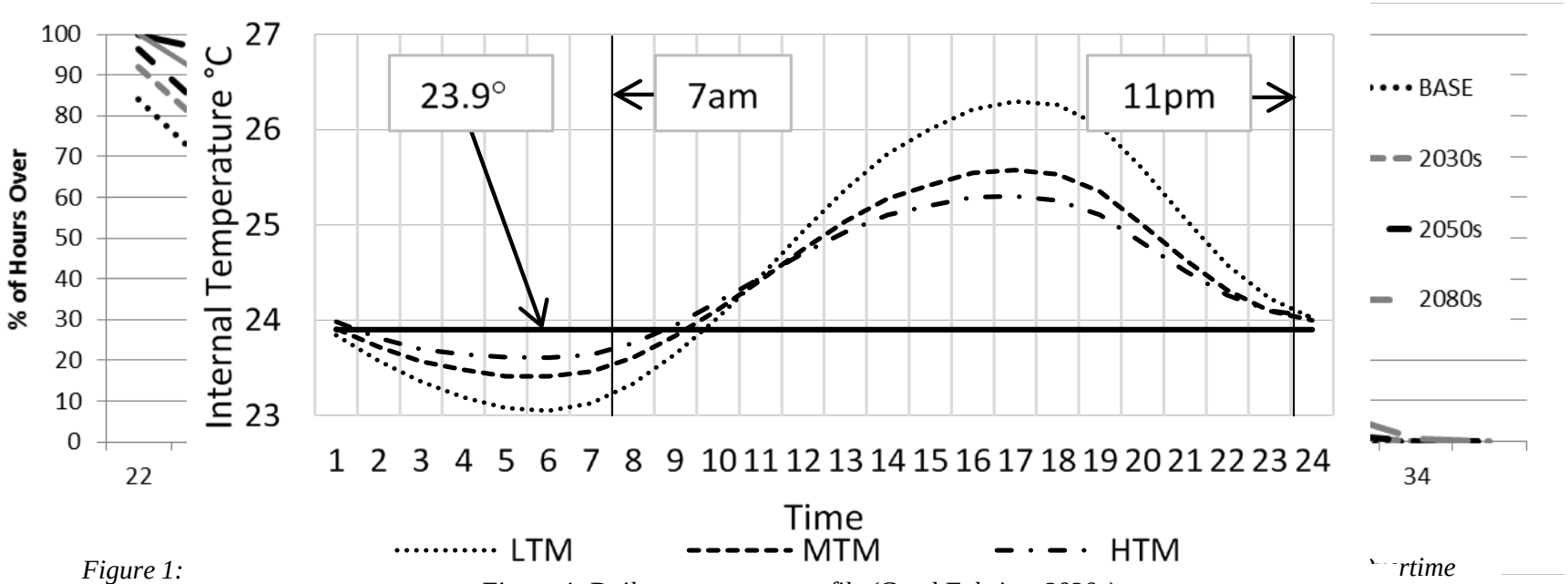
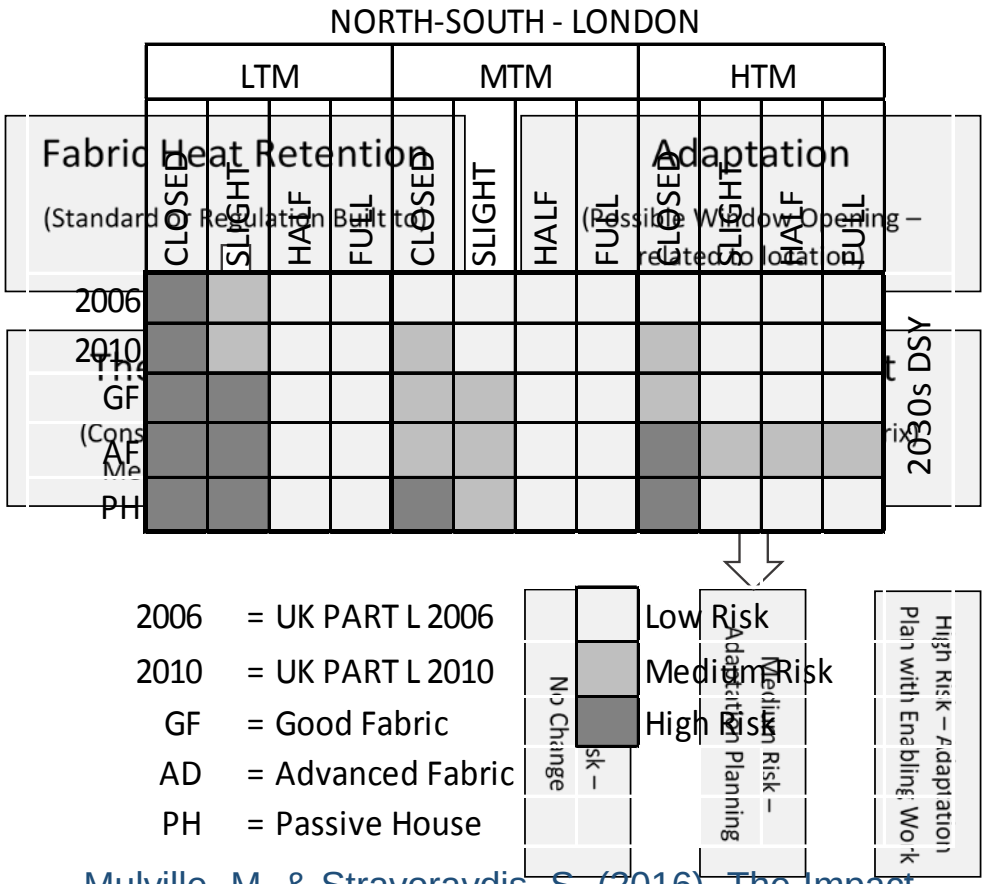


Figure 1:

Figure 4: Daily temperature profile (Good Fabric – 2030s)

Proposed Approach

- Attempts to consider a range of possible dwelling configurations and to look beyond the point of handover
- Considers potential user adaptations
- Allows for the level of risk to be visualised
- Interventions made now to reduce future overheating risk may increase short term energy use – an approach linked to adaptation planning is proposed
- Focused on delivering whole of life performance



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Conclusions

- Current approach to overheating risk assessment may not be *fit for purpose*
- Potential for significant climate change related overheating
- Proposed approach is industry focused and allows for a range of building configurations/ specifications to be considered
- A whole of life approach incorporating adaptation planning to avoid near term energy use increases in favour of reducing predicted overheating risk

- Further exploration of window opening behaviour during warm periods particularly in urban areas would be of benefit
- The appropriateness of overheating metrics could also be further explored, particularly in relation to overnight temperatures and the impacts of thermal mass
- What defines a ‘typical’ building requires careful consideration
- A range of buildings that fall outside the ‘typical’ definition would remain and these would require more resource intensive dynamic simulation to predict the level of risk

Thank You

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