

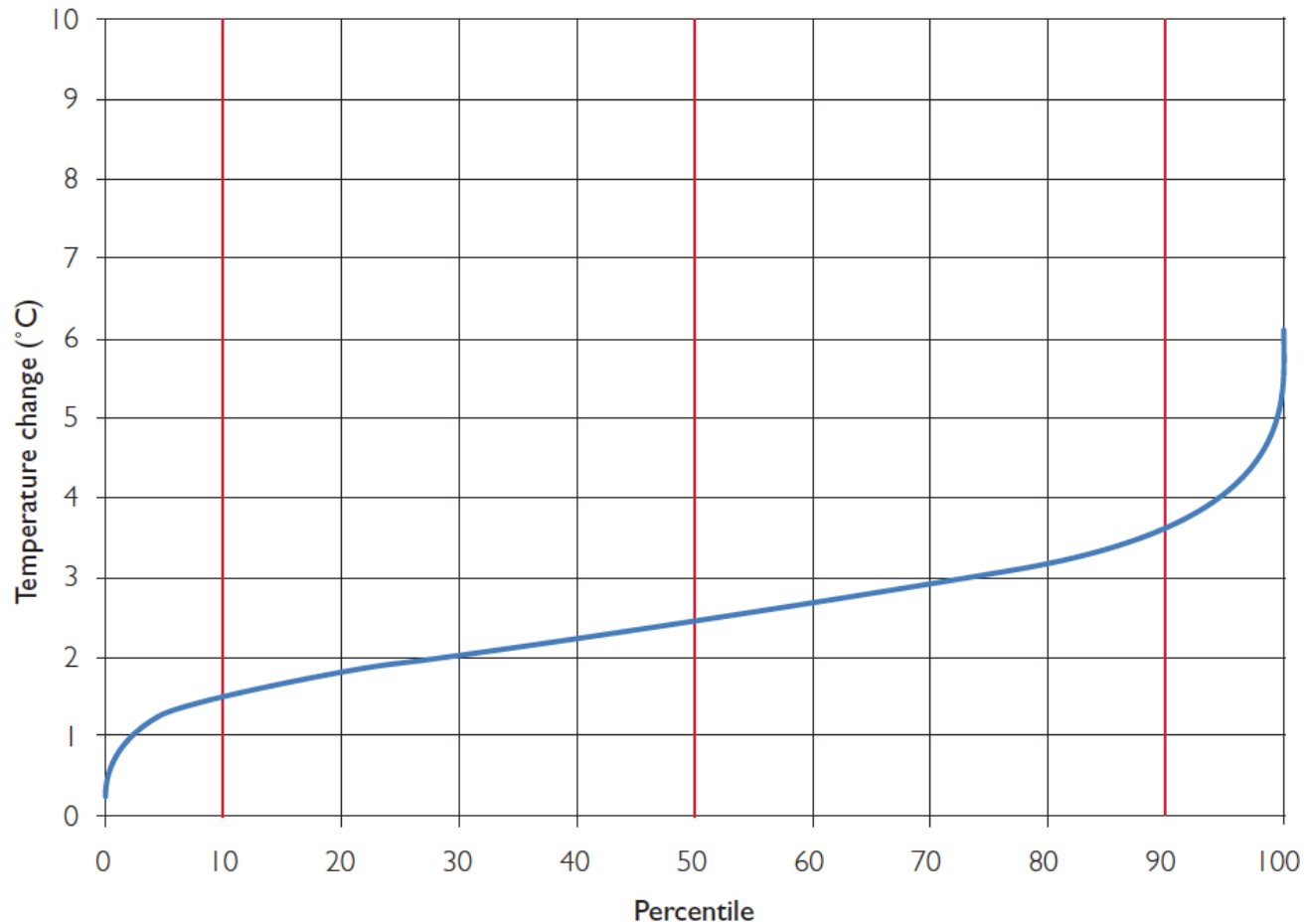
Zero Carbon Retrofit Adaptation Strategies in the Context of Climate Change

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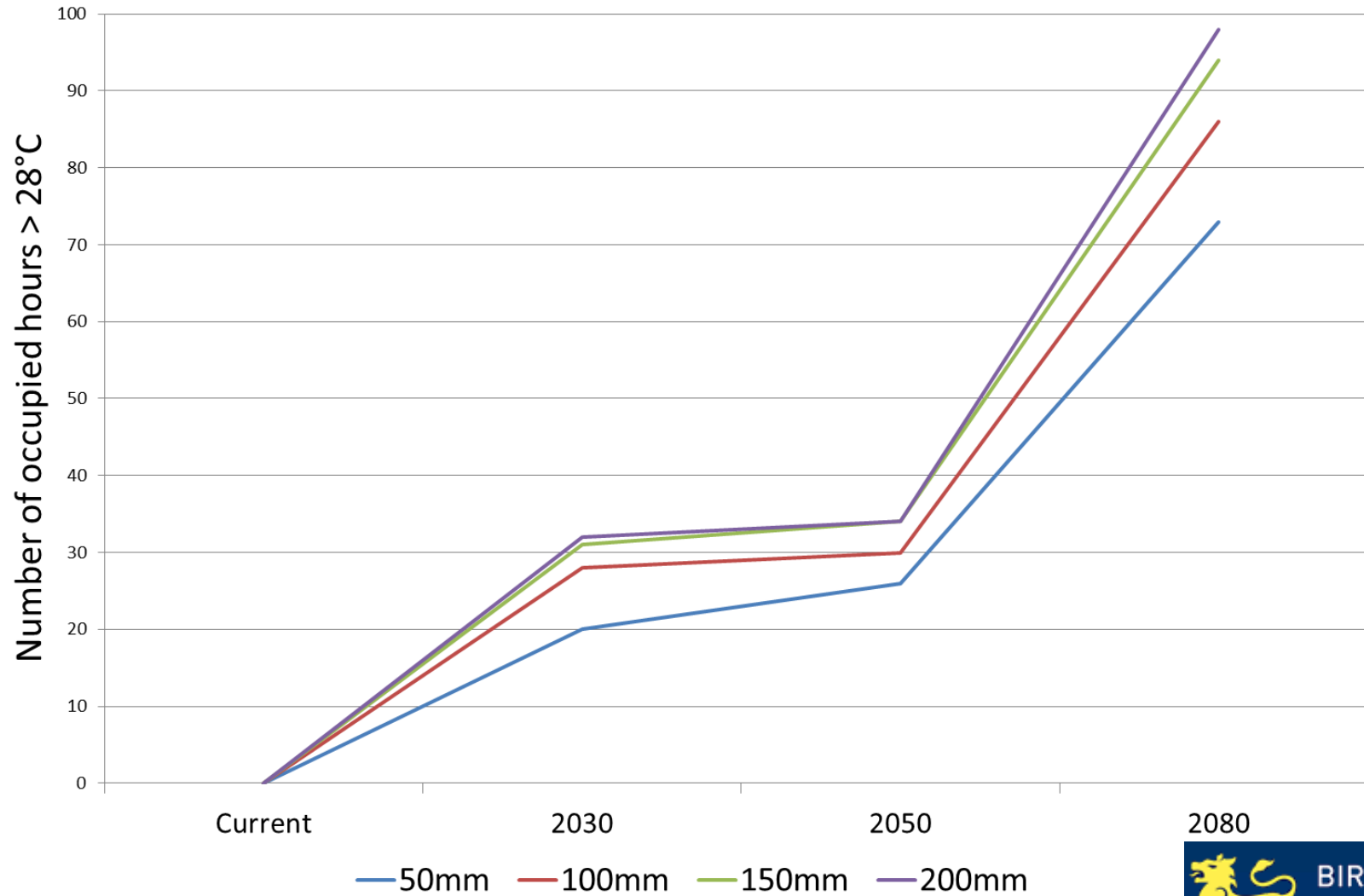


Climate Change

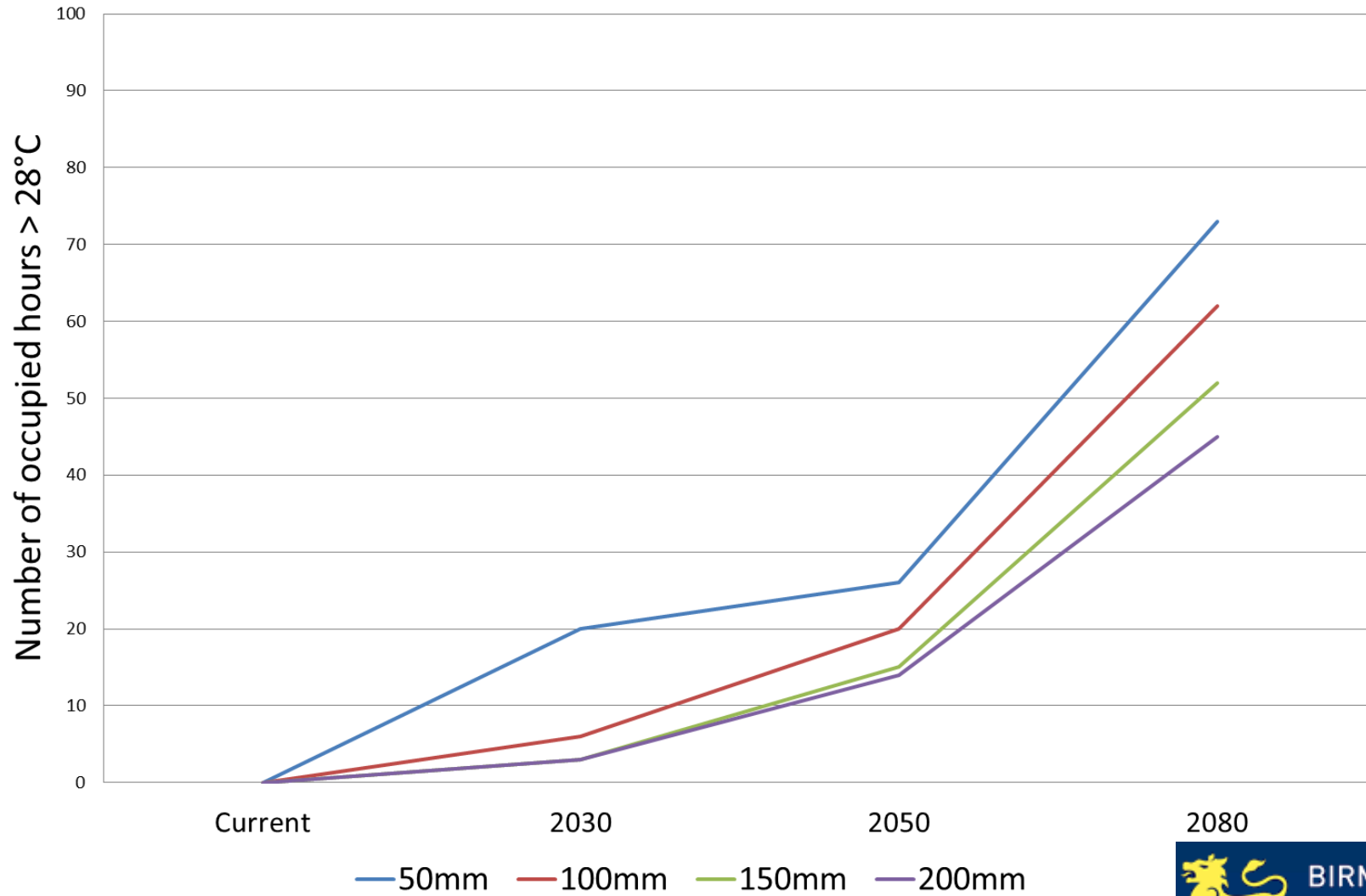


*Predicted annual average temperature change in Birmingham by 2050
- from 'Designing Zero Carbon Buildings' by Jankovic (2012)*

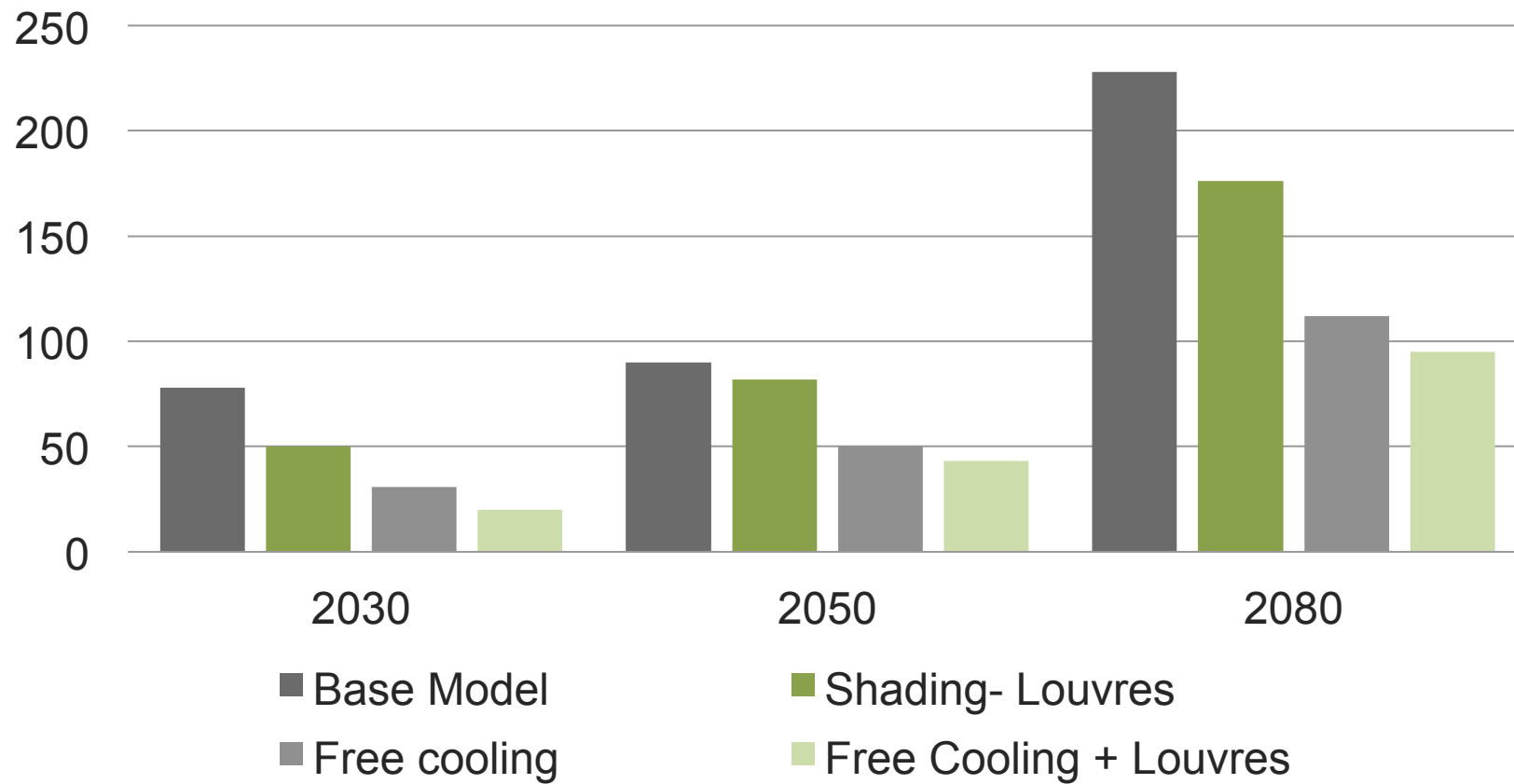
Thermal insulation & Overheating



Thermal mass & Overheating



Zero Carbon House

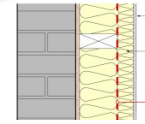


1990 2000 2010 2020 2030 2040 2050 2060 2070 2080 2090

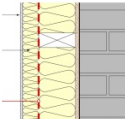
Fabric enhancement

Internal Insulation

163

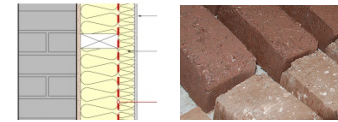


External Insulation



Internal insulation & thermal mass

232



Occupied hours above 28 °C

Mitigation and adaptation

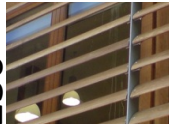
Victorian retrofitted house

176

Addition of external shading

112

230



Evaporative cooling



Shading + evaporative cooling

95



Thermal Comfort and IES

Environmental Factors

Air temperature

Relative humidity

Mean radiant temperature

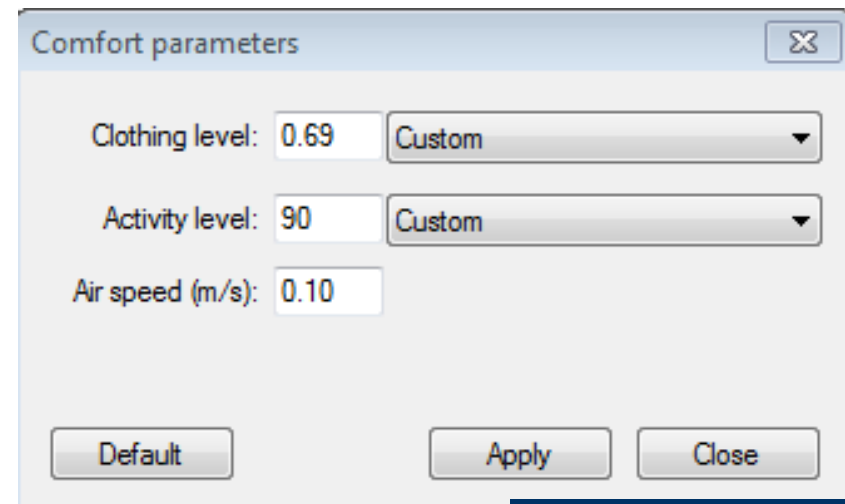
Air movement and specifically
air velocity

Single fixed values for
entire year and applied in a post-
processing mode
during the review of simulation
results.

Personal Factors

clothing level

activity level (metabolic heat)



Comfort parameters

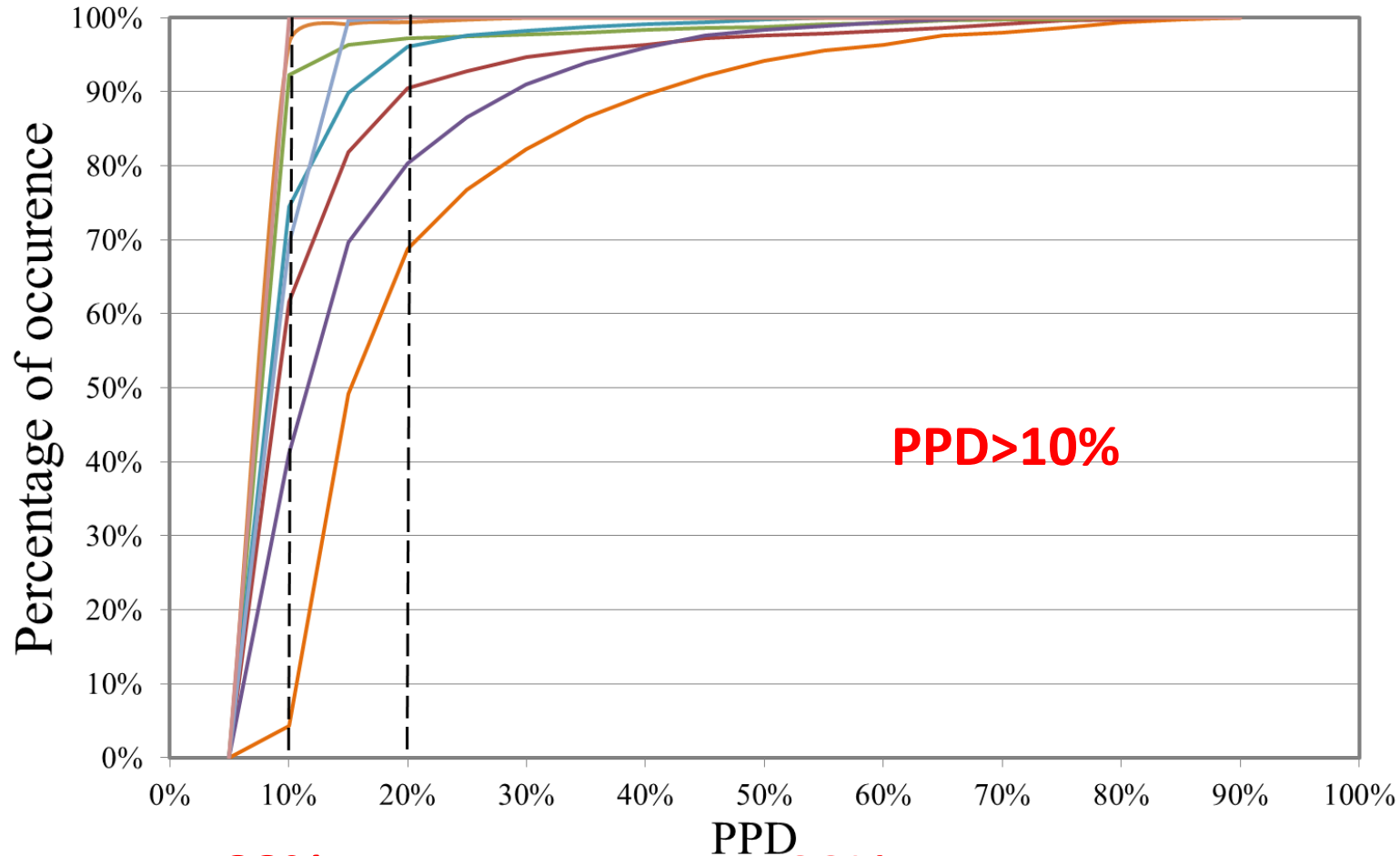
Clothing level: 0.69 Custom

Activity level: 90 Custom

Air speed (m/s): 0.10

Default Apply Close

PPD Comparisons (2080)



— Shading **88%**

— Free cooling **59%**

— Air conditioning **31%**

— Clothing **38%**

— FC + Clothing **26%**

— AC + Clothing **0%**

— Clothing + Metabolism **8%**

— FC + Clothing + Metabolism **4%**

Conclusions

- Physical adaptation and mitigation strategies are essential to reduce energy demand
- Taking into account the changes in climate building will go through over the years
- Understanding how the model takes into account people behaviour to avoid misleading results

Thank you for listening!

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