

Are you sitting comfortably?

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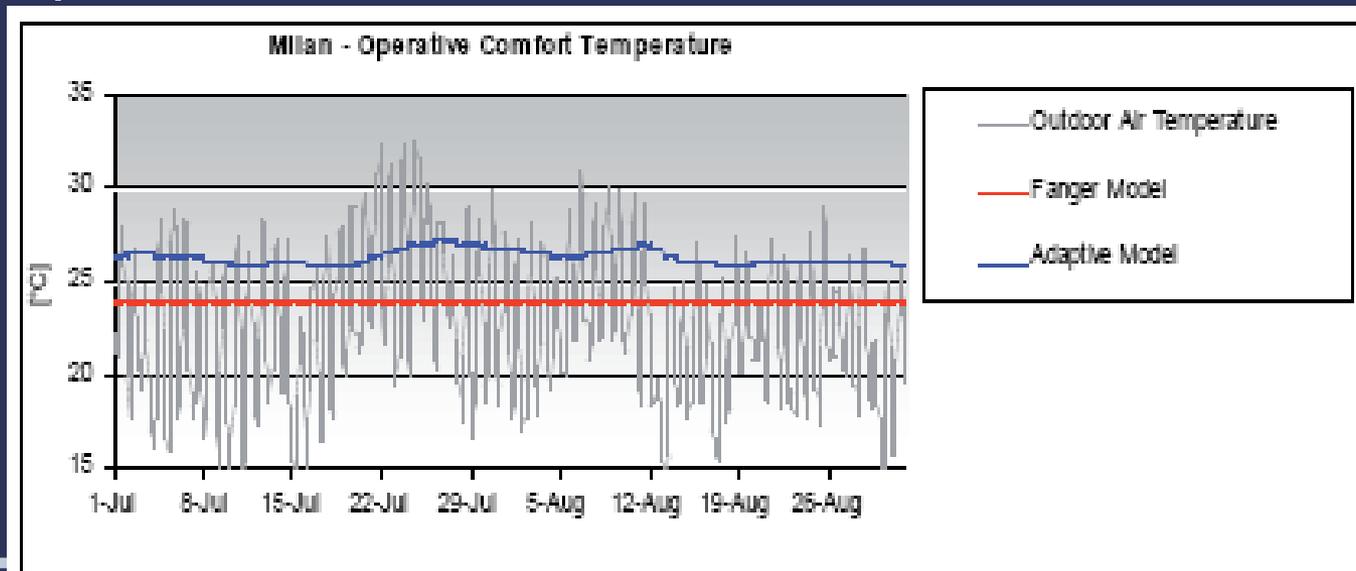


Outline

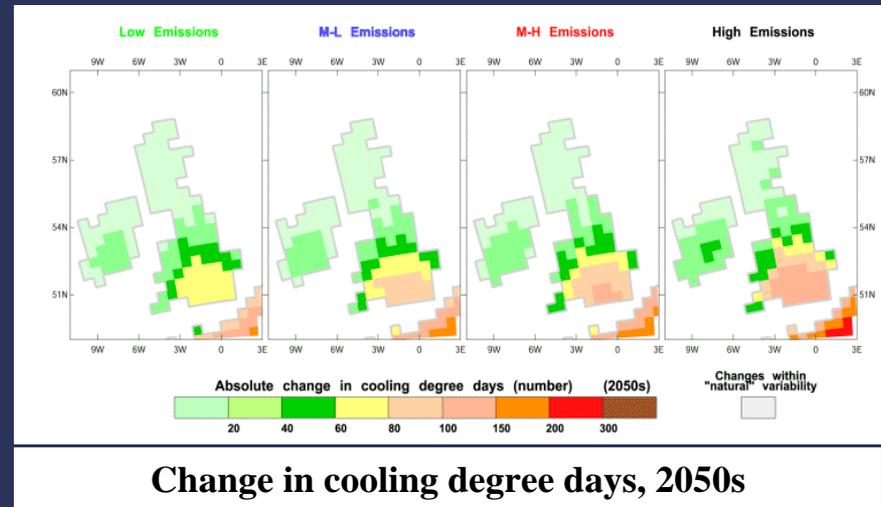
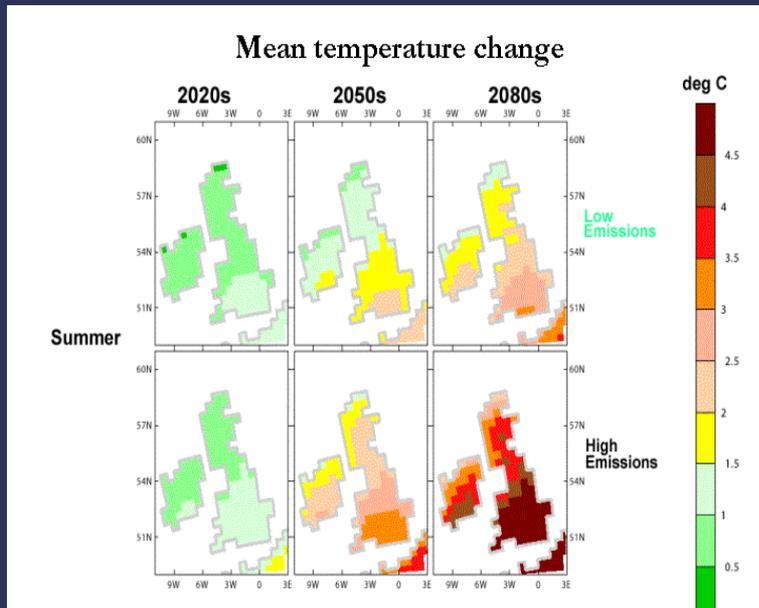
- Controlling indoor temperatures
- Climate change and forecasts
- Cold Comfort for Kyoto?
 - Rise in air conditioning
 - Rise in carbon emissions
 - Application in Comfort Scenarios
- Future options and policies

Indoor comfort ranges

- Fanger comfort model
 - Assumes people need steady state
- Adaptive comfort
- Relationship with outside temperatures
- Requires technical intervention

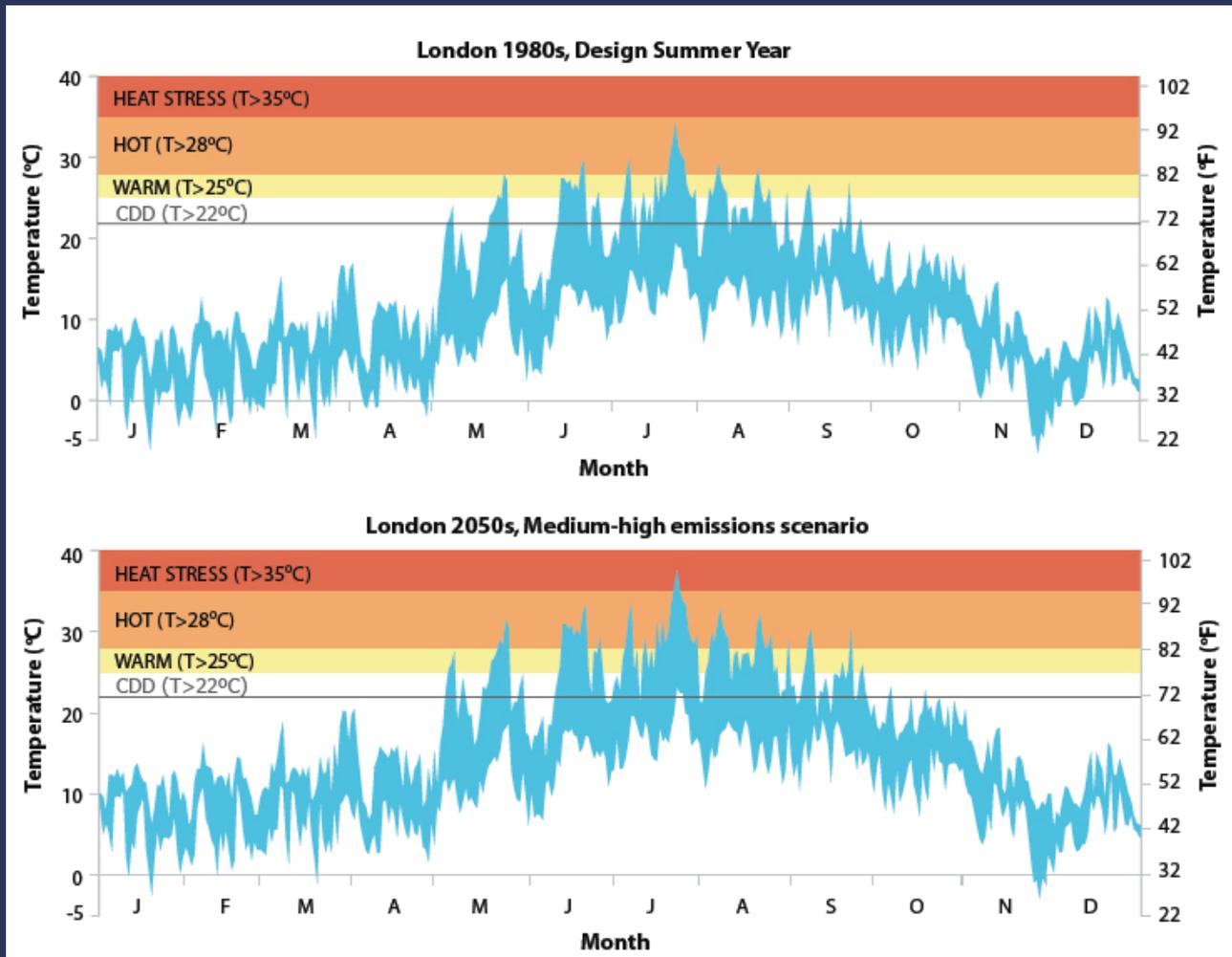


Climate change in the UK



- Forecasts from UKCIP
- SE, SW England particularly hit
- Summer 'heat waves' normal

Design Summer Years



Source: Hacker et al (2005) Beating the Heat, UKCIP



Cold Comfort for Kyoto?

- Project at the *Association for the Conservation of Energy*
- funded by *Pilkington Energy Efficiency Trust*
- Aim
 - to identify the potential impact on energy use and carbon emissions due to growing demand for air conditioning



Rise in air conditioning

- Assumptions
 - People would demand air conditioning because of exposure in offices, shops, cars, etc.
 - Rise would mirror adoption in the USA
 - Once turned on (trigger point), conditioner would be left on, potentially to a lower point than reasonable
 - Without policy intervention active air conditioning would become the norm

Use of 4 Comfort Scenarios

- Comfort zone extends
 - People become more tolerant of a wider range of temperature variation
- Indoor climates diversify
 - People adapt to the new climates with no adoption of active air conditioning [*no modelling*]
- Standardised efficiency (baseline)
- Escalating demand
 - People expect to be warmer in winter and cooler in summer

Who would adopt a/c? 4 groups

- All households in the worst affected regions
 - Those who can afford air-conditioning:
 - Based on households in council tax bands D to H, assuming they adopt air-conditioning as a lifestyle option.
 - Urban versus rural:
 - Assumes that rural dwellers experience a 'fresher' temperature and are more resistant to air-conditioning than urban dwellers. (English House Condition Survey 2001 regional data).
 - Experience:
 - Assumes that people decide to use air-conditioning based on whether their work environment is air-conditioned.
- [little difference between these last two]*



How much would they use them?

- Model used:
 - Number of households in the key regions, with population/household growth
 - Comfort zones for each of the comfort scenarios
 - Trigger point based on normal distribution of 'intolerable' temperature (discomfort), giving estimated cooling degree day demand

Resulting carbon emissions (i)

| | Scenario I (26°C) | | Scenario III (22°C) | | Scenario IV (20°C) | |
|------|-------------------|---------------------------------|---------------------|---------------------------------|--------------------|---------------------------------|
| Year | Energy/ TWh | Emissions/ MtCO ₂ | Energy/ TWh | Emissions/ MtCO ₂ | Energy/ TWh | Emissions /MtCO ₂ |
| 2020 | 3.8 | 1.6 | 7.6 | 3.3 | 11.0 | 4.9 |
| 2050 | 4.6 | 2.0 | 9.1 | 3.9 | 14.0 | 5.9 |

Whole population

General agreement with MTP

III Offsets 60% of the gains due to the Building Regs 2002 & 2006

Resulting carbon emissions (ii)

| | Scenario I (26°C) | | Scenario III (22°C) | | Scenario IV (20°C) | |
|------|-------------------|---------------------------------|---------------------|---------------------------------|--------------------|---------------------------------|
| Year | Energy/ TWh | Emissions/ MtCO ₂ | Energy/ TWh | Emissions/ MtCO ₂ | Energy/ TWh | Emissions /MtCO ₂ |
| 2020 | 1.7 | 0.7 | 3.5 | 1.5 | 5.2 | 2.2 |
| 2050 | 2.1 | 0.9 | 6.9 | 1.8 | 10.0 | 2.7 |

Population that can afford it.....

About half the emissions level of the previous group



Policy options

- Changing our environment
- Changing our attitudes to our environment
- Need to determine where policies intersect to control CO₂ emissions



Diversifying temp

II. Indoor climates diversify

Major lifestyle changes, eg siestas

Basic passive cooling eg solar shading

Using alternative ways to keep cool, eg more relaxed clothing

Reducing air-conditioning use in offices and cars

I. Comfort zone extends

Passive cooling only
Vernacular building design

Set thermostat higher

Information and labelling about low energy cooling

Close windows and doors
Using air-con only when occupied

III. Standardised efficiency

Maximum use of passive cooling with some low energy solutions, eg evaporative cooling, ceiling fans, night ventilation

MEPs on air-conditioning

Passive cooling with very high efficiency air-conditioning

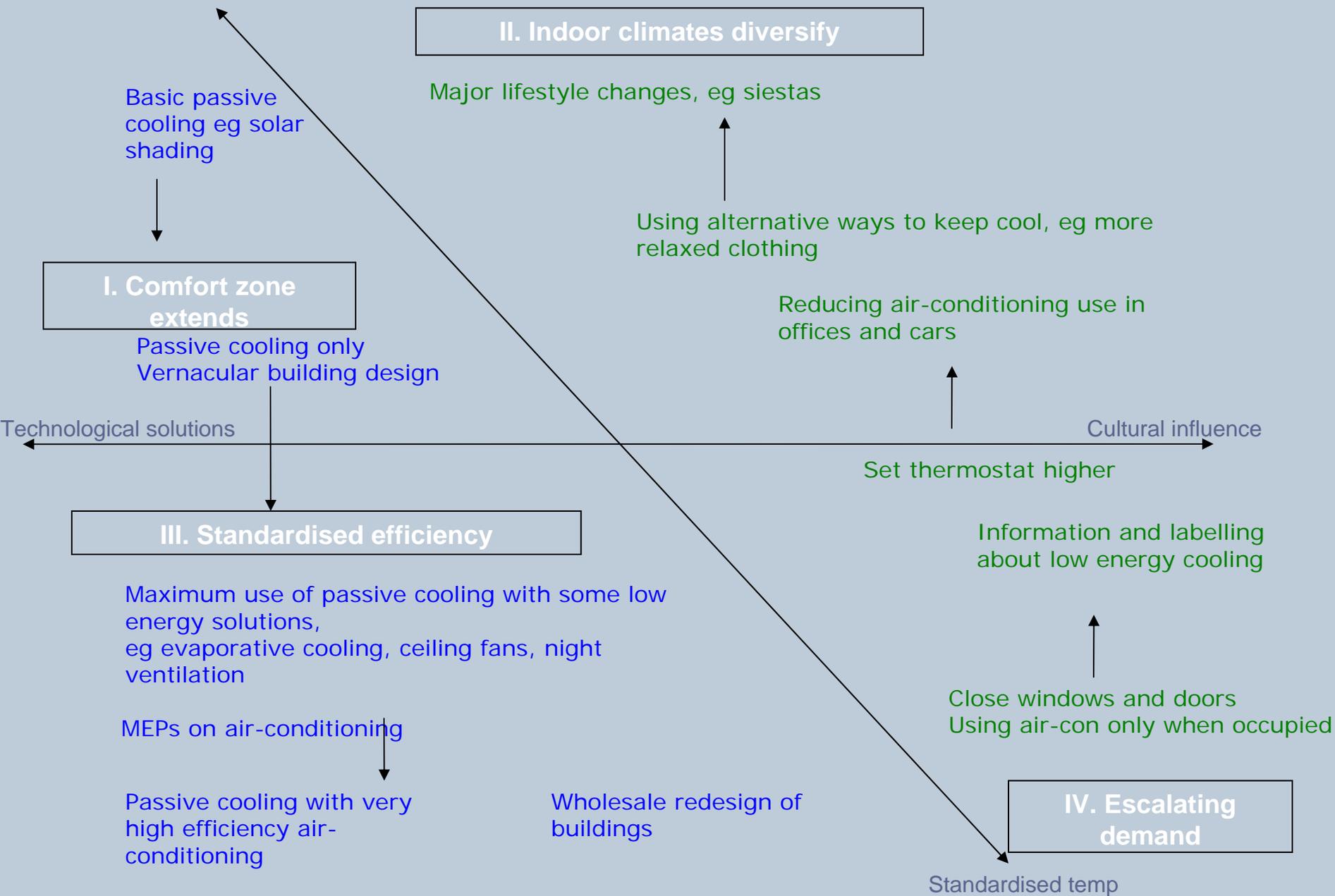
Wholesale redesign of buildings

IV. Escalating demand

Standardised temp

Technological solutions

Cultural influence



Policies or culture?

- Technologies can be manipulated to give us the lowest emissions achievable from Scenario 3 – standardised efficiency (a BAU type scenario)
 - But 3.9 MtCO₂ by 2050 is surely too much...
- Pressing concern not to slip into Scenario 4
- Potential for N-S divide in England if cultural options adopted e.g. siestas
- Need for personal awareness supported by culture influencing organisations and industries

Need for action?

- If we don't control this growth – we WILL get the high emissions scenario
- It's a positive feedback effect....
 - “ Can we avoid people using it at all? ... there is a need for some sort of market avoidance policy. I do not know how one develops that because it becomes a bit of a hair-shirt sort of philosophy...”

Ray Gluckman, Institute of Refrigeration

Q: Should we restrict our indoor temperatures to a narrow range?

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