Cold Comfort for Kyoto:
the role of actors in reducing demand for domestic air conditioning

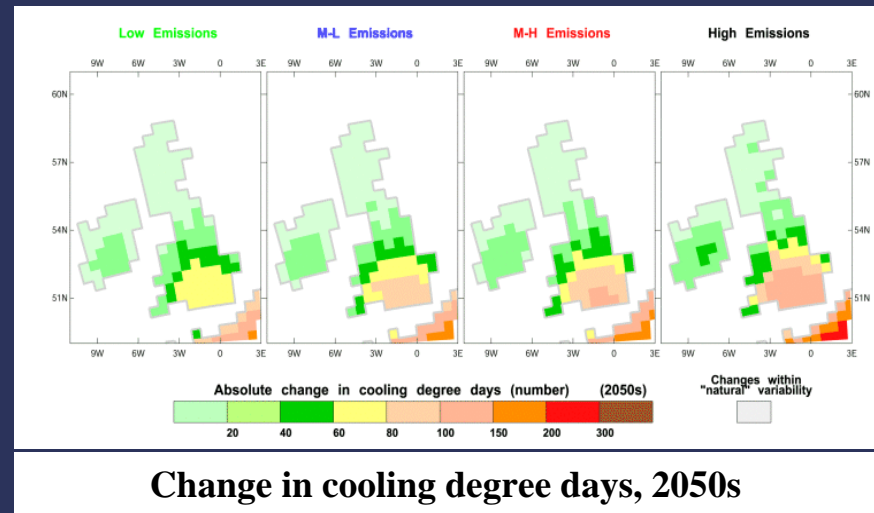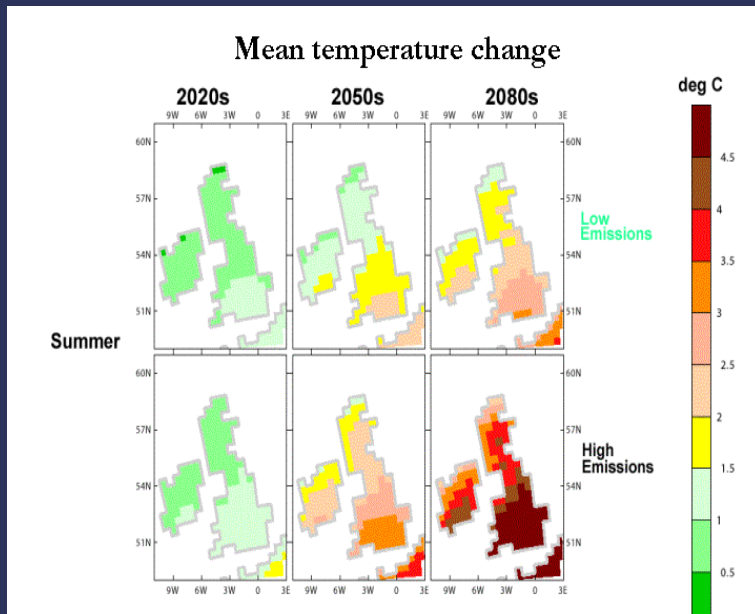Jacky Pett

NCEUB Windsor July 2008

Pett Projects

Outline

- Climate change and forecasts
- Cold Comfort for Kyoto?
  - Modelling rise in air conditioning
  - Rise in carbon emissions
  - Application in Comfort Scenarios
  - Options and policies
- Actor involvement
- What's the question?

Climate change in the UK

Mean temperature change

Change in cooling degree days, 2050s

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

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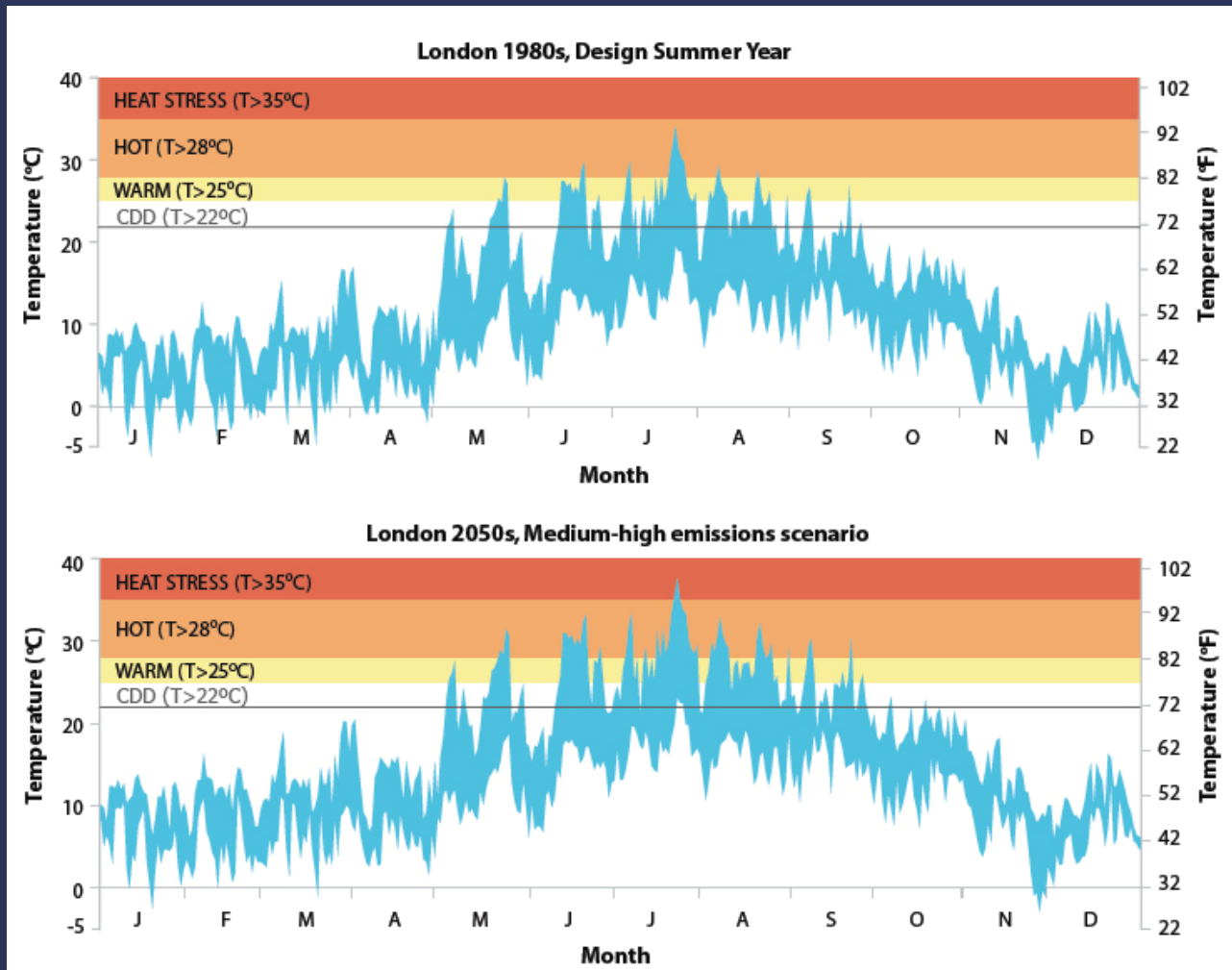
Source: Hacker et al (2005) Beating the Heat, UKCIP

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

Ref: Shove & Chappell (2004) Future Comforts... Univ Lancaster

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)

Year	Scenario I (26°C)		Scenario III (22°C)		Scenario IV (20°C)	
	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)

Year	Scenario I (26°C)		Scenario III (22°C)		Scenario IV (20°C)	
	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 indoor environment – the technological approach
- Changing our attitudes to our indoor environment – cultural diversity
- Where do policies intersect to control CO_2 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

Technological solutions

Cultural influence

Set thermostat higher

III. Standardised efficiency

Information and labelling about low energy cooling

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

MEPs on air-conditioning

Close windows and doors
Using air-con only when occupied

Passive cooling with very high efficiency air-conditioning

Wholesale redesign of buildings

IV. Escalating demand

Standardised temp

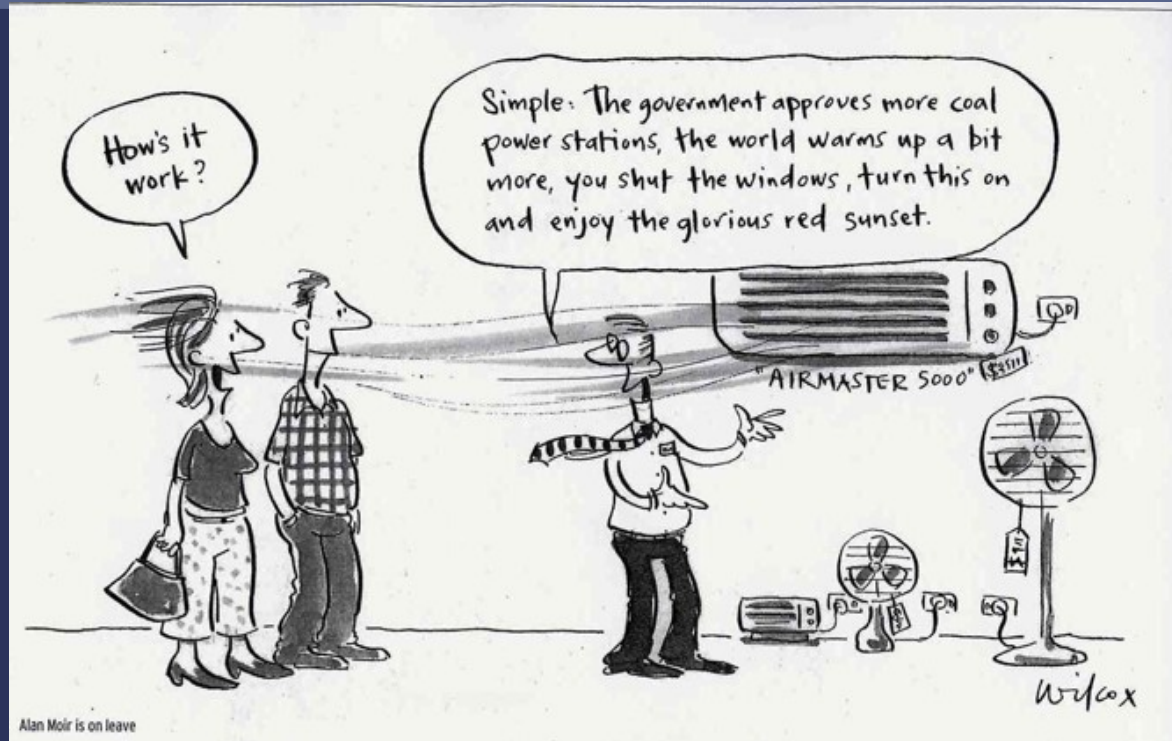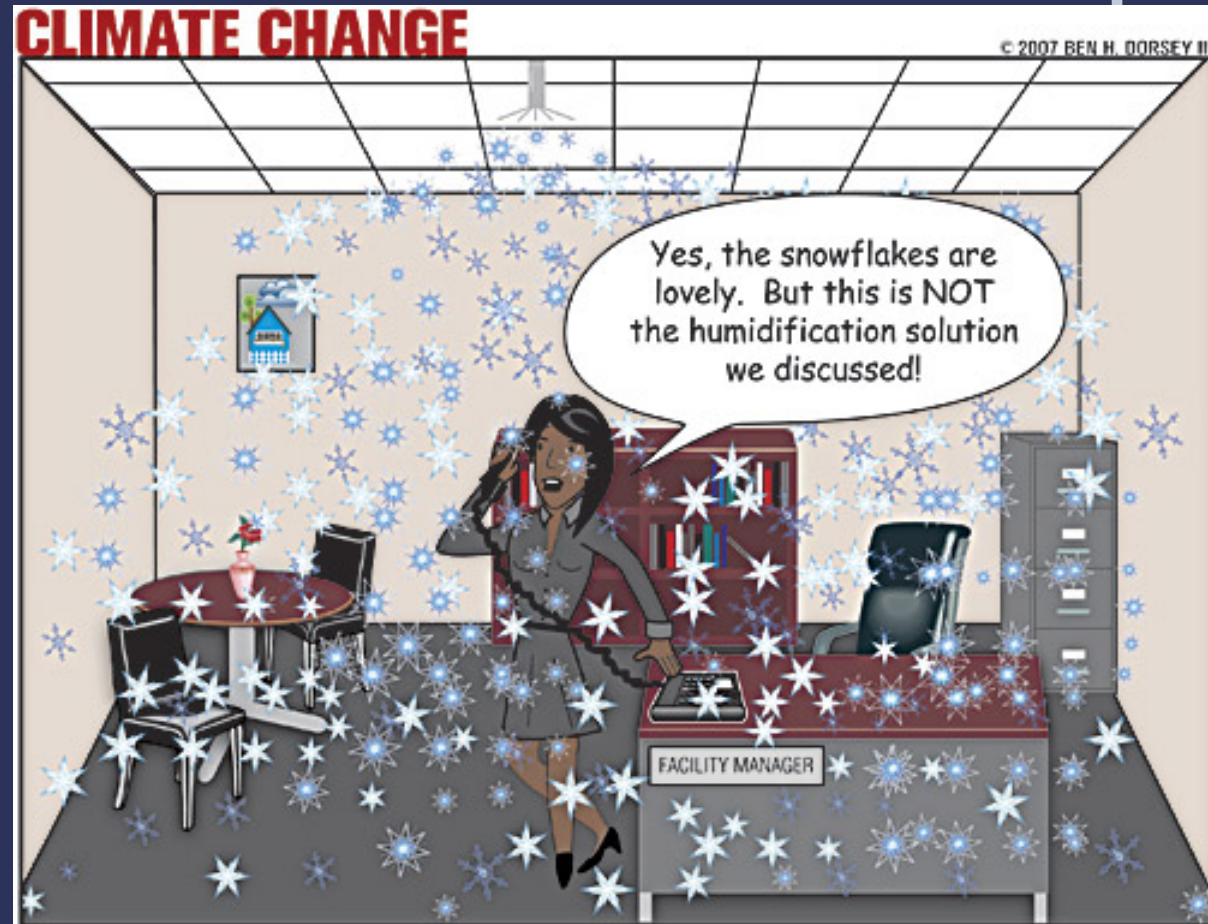# Policies or culture?

- Technologies lead Scenario 3 – standardised efficiency (a BAU type scenario)

  - But 3.9 MtCO2 by 2050 is surely too much...

Policies or culture?

- Pressing concern not to slip into Scenario 4

- Need for personal awareness supported by culture influencing organisations and industries

Who decides?

- Existing actors – determining best practice
  - Electrical efficiency
  - Passive cooling
  - Architects, designers and engineers
  - Manufacturers
- Not in contact with domestic adopter

Who influences householders?

- Media, advertisers
- NGOs
- Retailers
- Energy suppliers
- Local workforce
- Friends, neighbours and family
- Government campaigns

What's the question?

- Do we want energy efficient air conditioning?
- Or do we want to live and work in comfort?
- What changes are acceptable to society?
- Why don't we discuss it?

During the heatwave, 'Naked Fridays' replaced the more traditional 'Casual Fridays'.

Response to demand

- Companies sell stand-alone a/c units because people want them
- But….Nobody sells passive measures for retrofit so nobody knows they can have them
- Education is an important issue

Deliberative approach

- Need for wide debate
- Define the question as well as discuss the ideas
- Allow for major changes
  - What will cost more – change or climate change?
  - Adaptation or mitigation?
  - Not an either/or – both needed

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*

Adaptation in action

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