


GBCSL Presentation, Colombo

Practical Aspects of Energy Conservation
in Buildings

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Presentation objectives

- To discuss aspects of energy conservation opportunities (ECOs) in buildings.


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 THE UNIVERSITY OF MELBOURNE | Outline

- Why we should conserve energy
- The role of good building design
- What we need energy for
- Technologies, trends and opportunities
- Policy and non-technical issues
- Some conclusions



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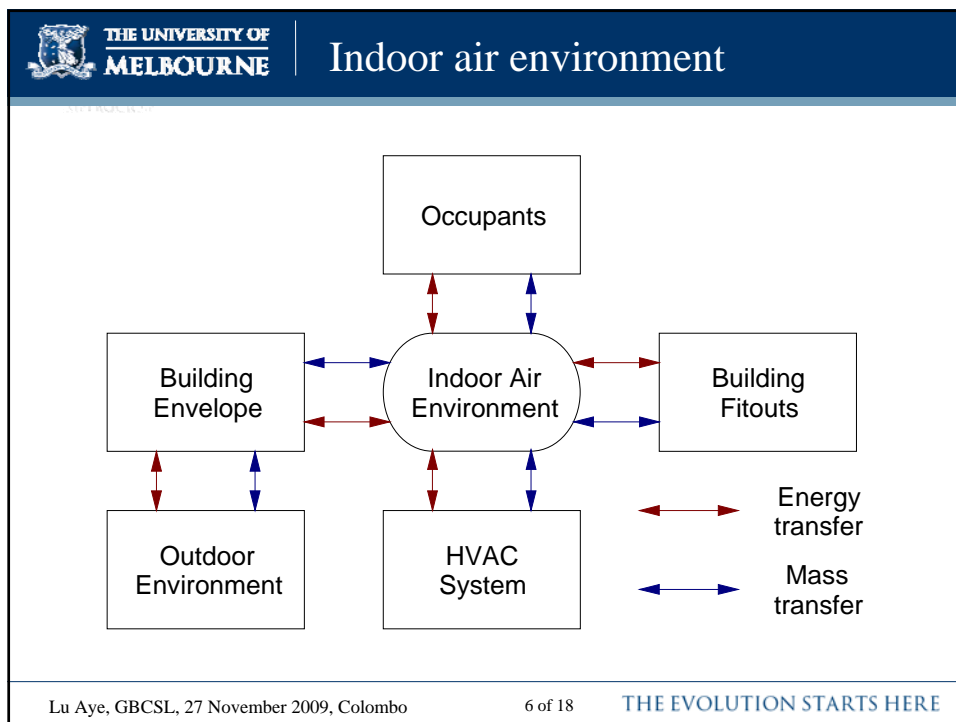
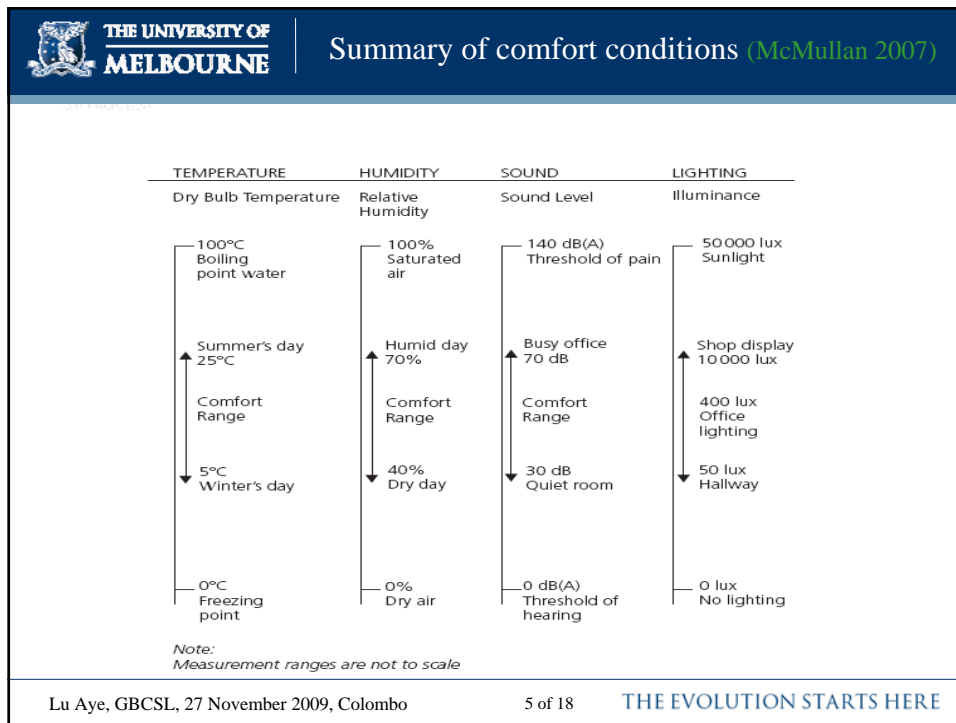
 THE UNIVERSITY OF MELBOURNE | Problems associated with poor IEQ

- Too hot an indoor environment
- Unusual odours
- Improper lighting level
- Noise
- Vibration
- Air toxin and contaminant pollutions

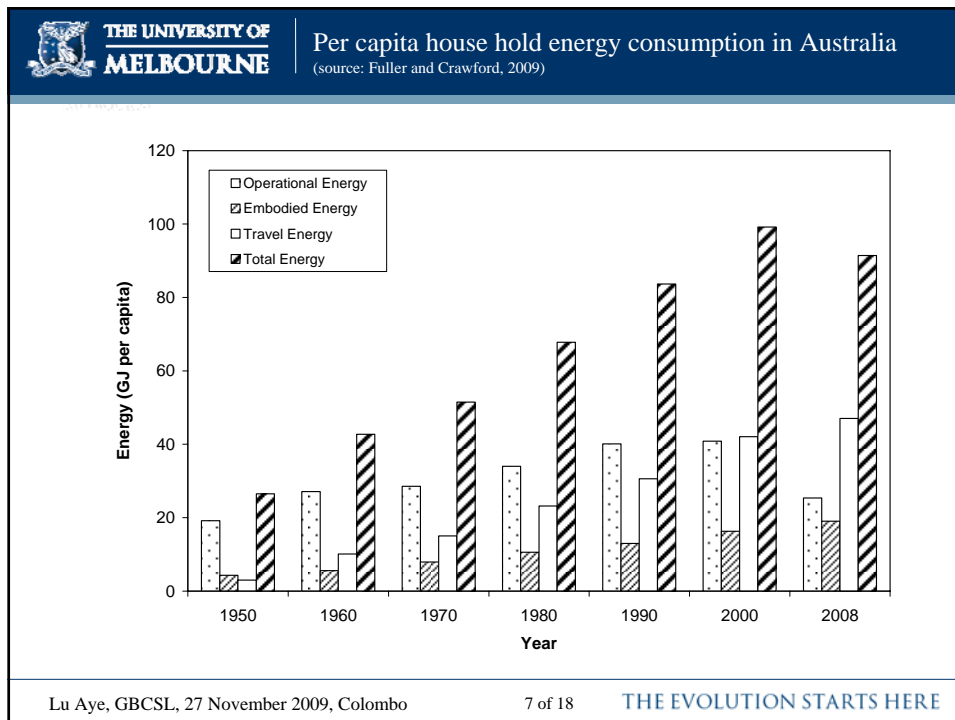
[We spent most of our time (>80%) indoor]


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Practical Aspects of Energy Conservation in Buildings



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Why and How


Why be more efficient?

- Reduce resource i.e. fossil fuels depletion
- Reduce size of plant
- Reduce harmful emissions
- Lower capital and running costs

How?


- Use passive systems where possible
- Maximise use of renewable energy
- control energy systems more accurately
- Minimise energy wastage zoning, settings & leaks
- Minimise unwanted energy gains – shade & insulate
- Use more efficient technologies
- Educate/penalise users

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What are our energy needs in buildings

- Lighting
- Heating
- Cooling
- Water heating
- Appliances
- Dishwashing
- Clothes dryer
- Cooking
- Fridge/freezer




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Design influences energy required to maintain comfort conditions



- Orientation
- Glazing (type, area)
- Insulation
- Thermal zoning
- Natural ventilation
- Shading, curtains
- Infiltration
- Thermal mass
- Size




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- Windows
 - *daylighting reduces artificial lighting but*
 - *5-25% of heat loss*
 - *25-35% of heat gain*
 - *double glazing halves heat loss*
- Skylights
 - *can cause overheating or extra heat loss*
- Light tubes
 - *limited size*
 - *can illuminate corners & tasks*
- Light coloured surfaces




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 THE UNIVERSITY OF MELBOURNE | **Artificial lighting**


- In Australia no incandescent light bulb sales from Nov 2009
- CFLs can save up to 70% energy
- Low voltage quartz halogen lamps have increased lighting energy use
 - *low efficiency, high density*
- LED technology may offer high efficiency in the future
 - *LED tubes save up to 70% energy*
 - *LED downlights save up to 80%*
- Install multiple switches and motion sensors




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 THE UNIVERSITY OF MELBOURNE | Water Heating


- Energy conservation
- Instantaneous water heaters
- Heat pump water heaters
- Solar water heaters



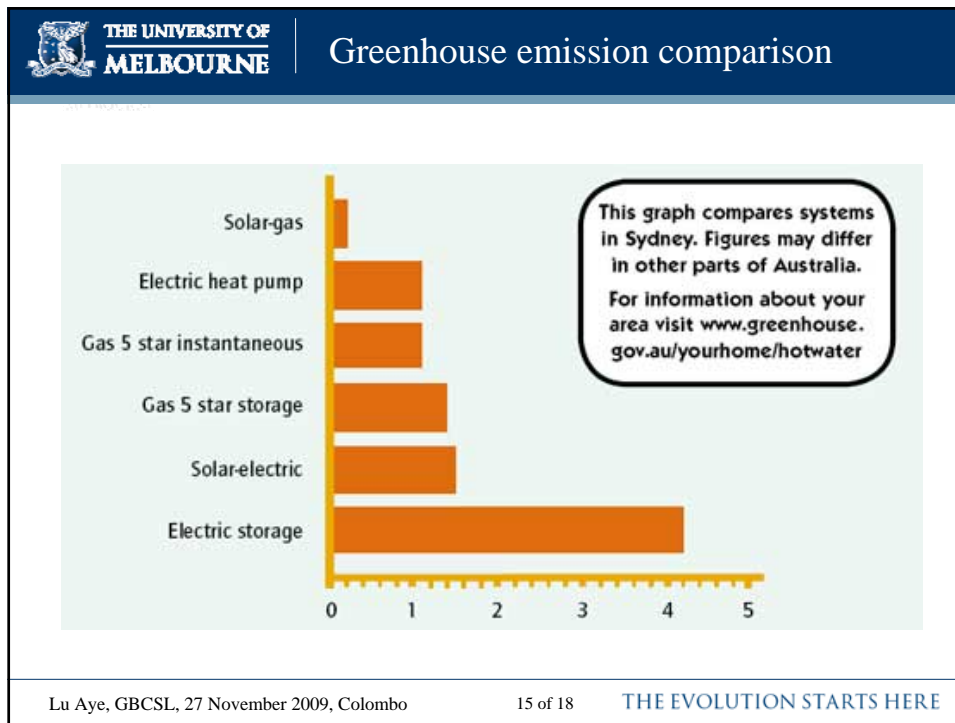
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- Locate system near main usage point
- Low flow devices
 - *reduce wastage*
- Storage temperature
 - *60°C*
 - *hot water supply for shower and hand washing: < 45 °C*
- Reduce storage & transfer losses
 - *one third of losses from tank and pipes*
- User behaviour
 - *maximise morning use with solar*
 - *cold washing*
 - *avoid 'mixer' taps*
 - *short showers*



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- THE UNIVERSITY OF MELBOURNE** | Policy and non-technical issues in Australia
- 5-star house rating
 - only effects about 2% of houses per annum
 - doesn't penalise home size much
 - Appliance ratings
 - 6-star scheme is 20 years old; well promoted
 - to be upgraded to 10-stars to reward innovation
 - Standby power
 - estimates of standby (phantom) power 8-12%
 - one watt systems in 2012 will reduce this greatly
 - Smart meters
 - allow personal and utility monitoring
 - will facilitate home energy packages
 - VEECs
 - similar to RECs, from Jan 09
 - aim to retire old appliances
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**THE UNIVERSITY OF
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- Residential energy use rising, particularly electricity, from appliances, cooling, TVs and IT equipment
- Opportunities exist to increase efficiencies
- Some experts believe that per capita energy use could decline by 2/3rds
- Energy will be or could be supplied in different ways
- Policy and legislative issues will be critical

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