EBC
Energy in Buildings and Communities Programme

Meeting Recap: Eighth meeting of the Building Energy Codes Working Group – Assessing Cost-Benefit and Affordability Implications of Building Energy Codes Part I

IEA-EBC Working Group on Building Energy Codes

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1 Summary

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- **Health Benefits of Energy Upgrades:** Mahsan Sadeghi presented international evidence that residential energy upgrades can reduce healthcare use and costs, improve health outcomes, and generate economic benefits, while participants including Sally Semple, Tristan Grant, Richard London, and Michael Dodd examined how those findings can inform research and regulation.
    - **Study Objectives:** Mahsan explained that the CSIRO team developed an Australian housing-stock model, applied energy upgrades and other interventions, and compared heating and cooling loads between upgraded and reference scenarios. The broader research also reviewed health and productivity benefits for cost-benefit analysis.
    - **Australian Evidence:** The Victorian Healthy Homes Program studied 984 households and applied measures including underfloor and ceiling insulation, ceiling fans, LED lighting, curtains and blinds, and servicing or improving heating and cooling systems. Regression results generally showed that intervention households used fewer Medicare services, incurred lower medical charges and out-of-pocket costs, and experienced fewer hospitalizations than control households, although results varied by year and were less pronounced in 2020.
    - **Economic Outcomes:** The Victorian study reported approximately $887 per person in winter healthcare savings, an estimated 10-year net saving of $4,783 from energy and health benefits, and more than $10 in health savings for every dollar saved in energy. Average upgrade cost was approximately $2,809, with three-month winter savings of about $887 in healthcare and $85 in energy; the reported payback period was under seven years.
    - **International Research:** Mahsan summarized New Zealand research in which insulation upgrades generated approximately NZ$3,347 in annual health and energy savings per household against intervention costs of NZ$1,800, producing a net benefit of NZ$1,574 and a benefit-cost ratio of 1.87:1. Other studies estimated health benefits from moving homes from five- to six-star ratings, evaluated heating and carbon scenarios, and estimated productivity benefits from nighttime ventilation cooling at approximately $11.70 per person per day, with modeled benefit-cost ratios from 32:1 to 120:1.
    - **Research Limitations:** In response to Sally, Mahsan said international dollar values cannot be directly compared because intervention types, healthcare costs, energy prices, and local conditions differ between and even within countries. The studies can be compared for their methodologies, but applying their final monetary results elsewhere requires local assumptions.
- **Standardizing Health Impact Assessment:** Tristan proposed relating changes in heating or cooling loads to changes in health incidence rates, while Mahsan, Richard, and Sally discussed the methodological, longitudinal, and indoor-environment challenges that must be addressed before benefits can be compared across locations.
    - **Load-Based Method:** Tristan asked whether research links an intervention's reduction in peak heating or cooling load relative to a baseline with corresponding changes in asthma, hospitalization, mental-health, or other health incidence rates. Their proposed approach would allow incidence and cost relationships to be translated across geographies rather than transferring country-specific benefit figures.
    - **Available Evidence:** Mahsan said they had not found a study using that specific load-reduction-to-incidence methodology, but considered it a potentially useful approach for addressing geographic comparability.
    - **Thermal Comfort Metrics:** Mahsan explained that the Australian and New Zealand overheating work uses SET* (standard effective temperature), which incorporates air temperature, humidity, air speed, clothing, metabolic rate, and radiant conditions. CIBSE TM59 primarily uses operative temperature, which combines air temperature and mean radiant temperature, so the differing indices complicate direct comparison.

- **Long-Term Health Effects:** Richard noted that chronic conditions such as asthma may create healthcare and productivity effects over decades, including during the final five to ten years of working life. These effects are difficult to quantify because they require long-term trajectories and assumptions about morbidity, mortality, life expectancy, and future healthcare costs.
- **UK Health Modeling:** Sally described UK work using radon as a relatively direct, measurable link between indoor conditions and health, alongside broader models using quality-adjusted life years to combine morbidity and mortality. The research indicates that adding insulation without adequate ventilation can negatively affect health, demonstrating that retrofit measures must be evaluated as a connected system.

- **Integrated Retrofit and Moisture Management:** Richard and Sally emphasized that insulation, ventilation, airtightness, overheating, moisture, and indoor air quality must be assessed together because improving one building characteristic can create condensation, mold, or health problems elsewhere.
  - **Building Interdependencies:** Richard described a Healthy and Energy Efficient Buildings program examining multiple building-physics parameters and their interactions. They cautioned that improving insulation or airtightness can affect ventilation, overheating, moisture movement, and other performance outcomes, so interventions should not be evaluated in isolation.
  - **Condensation Risks:** Richard explained that insufficient ventilation or unintended changes in airtightness can cause interstitial condensation when humid air enters colder spaces. Moisture accumulation can affect surface-condition indicators, increase condensation risk, and support mold or spore growth even when visible water is absent.
  - **Construction Details:** Richard noted that in-frame insulation, particularly in timber construction, can create moisture-migration and drying challenges compared with externally applied insulation and masonry construction. The group is therefore coordinating overheating research with indoor-environment-quality and condensation-management work.
  - **Regulatory Application:** In response to Louis Bourru, Richard said New Zealand studies have been used as evidence supporting a regulatory response, but implementation is proceeding carefully to remain proportionate and avoid unintended consequences. Michael added that Australian condensation-management provisions introduced in the 2022 and 2025 building-code updates considered this type of building-performance issue.
- **Affordability And Benefit Allocation:** The group examined how affordability is defined, who pays for energy upgrades, who receives health and energy savings, and how these split incentives affect retrofit decisions, code development, and public support.
  - **Affordability Definitions:** Mahsan said affordability was outside the scope of the reviewed health-cost-benefit literature. Richard noted that New Zealand commonly uses housing-cost-to-income metrics but lacks a single comprehensive definition. Sara Azimi cited the Canadian rule of thumb that housing should represent about 30% of gross income, while Tristan noted US thresholds of roughly 30% for housing and 10% for energy burden.
  - **Deep Retrofit Economics:** Sara explained that deep retrofits can require substantial investment, especially in homes in poor condition. Although health and tenant benefits may be significant, the building owner who pays the capital cost may not directly receive the healthcare savings, making the financial case difficult without a mechanism to allocate or capture those benefits.
  - **Value Capture:** Tristan described the split between owners, occupants, insurers, governments, and individuals who pay for improvements or receive savings. They suggested that insurance markets may provide a model: where building improvements reduce insurance incidence, regulators can require insurers to reflect the reduction through lower premiums. A similar mechanism could potentially help health systems return healthcare savings through incentives, although fragmented US healthcare financing makes this difficult.
  - **Fuel Poverty Targeting:** Sally explained that UK policy often assumes improving Energy Performance Certificate ratings will reduce fuel poverty, but research does not show a direct relationship between EPC ratings and fuel poverty. They noted that wealthier occupants may live in older, inefficient homes, meaning broad grant programs based only on building ratings can subsidize households that are not fuel-poor; Scotland reportedly introduced a rule excluding castles from one grant program after this issue arose.

  - **Canadian Incentives:** Iain Macdonald said Canadian code cost-benefit procedures have traditionally focused on direct first costs and generally excluded healthcare savings. They also noted that a recently launched Canadian heat-pump incentive program ties the incentive level to household income, giving lower-income households greater support.

- **Cost-Benefit Methods for Building Codes:** Louis, Michael, Iain, and Richard compared regulatory assessment practices in France, Australia, Canada, and New Zealand, highlighting the continued emphasis on direct or upfront costs and the difficulty of incorporating long-term health and life-cycle benefits.
  - **French Assessment:** Louis said France requires economic impact assessments for many new regulations, but the analysis is generally performed after performance levels are established and focuses on whether additional costs are technically acceptable to professionals. It does not typically use life-cycle costs or a full benefits assessment.
  - **Australian Regulation:** Michael said the Victorian Healthy Homes results were not used in the most recent Australian energy-efficiency regulation impact analysis, although there was criticism that health benefits were not included more extensively. Michael clarified that such evidence can fall within the scope of a future regulatory impact analysis.
  - **Canadian Procedure:** Iain said they would need to verify the current Canadian procedure because it has changed, but traditionally the analysis considered first costs and direct costs only. They gave grab bars as an example: the installation cost could be counted, while avoided hospital costs from preventing falls generally could not.
  - **New Zealand Perspective:** Richard said New Zealand assessments increasingly focus on upfront costs and whether those costs represent a tolerable burden, even though housing affordability also depends on land costs, density, and other components. They noted that the public health system makes health benefits relevant to the policy discussion, but translating those benefits into monetary values remains difficult.
  - **Long-Term Building Value:** Richard emphasized that buildings are generally expected to last at least 50 years, while policy decisions often focus on short-term costs. They described undertaking a deep retrofit of their own century-old home to improve efficiency, health, and long-term functionality, while acknowledging the substantial personal cost.

2 Action items

- **Future Presentations:** Provide names of presenters for February and later meetings so the agenda can be updated. (Meli)
- **Next Meeting Scheduling:** Coordinate with Sally and Vincenzo to identify dates and times for the late-November meeting, then circulate the options or confirmed schedule. (Meli)

3 Attendees

Name	Affiliation	Country
Sara Azimi	Natural Resources Canada	Canada
Louis Bourru	Cerema	France
Ryan Colker	International Code Council	USA
Giulia D'Angiolini	International Energy Agency	France
Michael Dodd	Australia Capital Territorial Government	Australia
Tristan Grant	New Buildings Institute	USA
Brodie Hobson	Natural Resources Canada	Canada
Arnold Janssens	University of Ghent	Belgium
Danielle Krauel	Environment and Climate Change Canada	Canada
Roberto Lamberts	Federal University of Santa Catarina	Brazil
Richard London	Ministry of Business, Innovation & Employment	New Zealand
Iain Macdonald	National Research Council Canada	Canada
Mahsan Sadeghi	CSIRO	Australia
Takao Sawachi	Building Research Institute	Japan
Sally Semple	Health and Safety Executive	UK
Meli Stylianou	Natural Resources Canada	Canada