Energy Epidemiology: using building data to support energy and carbon policy in Latin America

Introduction

Professor Paul Ruyssevelt
UCL Energy Institute
Context

• Brazil and the UK face emissions reductions targets and the challenge of improving energy performance in the built environment

• Energy efficiency in buildings promises large savings with negative costs

• Combined with strategies, efficiency promises to reinvent the power sector and has potential for deep emissions cuts

• However, sector fragmentation makes the development and evaluation of policies and cost reduction programmes a complex challenge
Workshop Overview

• The overall aim of the workshop is to develop strategies that enable a low carbon transition of the Brazilian building sector

• Focusing on improved energy performance and energy efficiency through better access and use of energy and building stock data.

• An opportunity for early career and established researchers from the UK and Brazil to present and discuss

• Review methodologies and evidence for policy makers to prioritise energy in buildings and demand reduction
Workshop challenge themes

- Monitoring and Evaluation (M&E)
  - what are the metrics of success for demand-side energy actions and how can ongoing data gathering be structured for feedback and evaluation?

- Benchmarking
  - how can building energy data be captured and structured to provide useful information to building owners, users and policy makers?

- Regulations
  - what are the key enabling factors for development of successful regulatory regimes related to building energy consumption?

- Data analytics
  - what enabling factors can allow improved data availability to be used to improve energy performance?

- User influence on performance
  - how do different user expectations and service levels – such as increasing expectations of comfort and environmental quality – affect consumption?
Acknowledgments

• This workshop is supported by a Researcher Links grant, ID [2017-RLWK8-10616], under the jointly funded Brazil-UK partnership
What is ‘Epidemiology’ and why is it relevant to energy use in buildings?

- $epi = $ upon  $demos=people logia=study$
- Defined as the study of:
  - ‘the distribution and determinants of health-related states or events in specified populations, and application of this study to the control of health problems’
    

- Data driven, emphasis is on empirical evidence, distribution of a condition, understanding of factors: what is affecting the spread and severity of a condition, implications for policy
Simplified approaches in health research

- Socio-behavioral / psychological
- Epidemiology
- Environments & exposures
- Bio-medical / physiological
Conceptual framework for energy epidemiology
Studying the house... as a group
As a population
IEA EBC Annex 70
Building Energy Epidemiology: Analysis of real building energy use at scale
Introduction to Annex 70 – Building Energy Epidemiology

What is Annex 70?

Annex 70 is an international collaboration of researchers, industry and government from across the globe who are working to develop methods for improving the empirical evidence on energy demand in the building stock.

Annex 70 will focus on identifying, reviewing, evaluating and producing leading edge methods for studying and modelling the building stock including: data collection techniques on energy use, building features and occupant features, and building morphology; analysis of smart meter energy data, building systems, and user behaviour; and modelling energy demand among sub-national and national building stocks.
Introduction to Annex 70 – Building Energy Epidemiology

Vision

To develop an **empirically grounded and robust evidence base on energy and the building stock** through established data collection, study methods and modelling techniques to better inform decision-making and policy to achieve a transition to a low carbon built environment.

Aim

To work in an international collaboration to identify **user needs** around energy demand in buildings and to **establish best practice methods and harmonized approaches** for data collection, analysis and modelling.
Annex 70 Participating / Interested Countries

Australia
Austria
Belgium
Canada
China
Denmark

France
Germany
Hong Kong
India
Ireland
(Mexico)
Netherlands

Portugal
(Singapore)
Sweden
Switzerland
UK
USA
Conceptual flow of data, models and users

**Data**

- **Data support mechanisms**
  - Data procurement
  - Data management
  - Data storage
  - Data protection
  - Funding
  - Legislation

  **Data foundation**
  - Empirical buildings, energy, technology data for national stock, populations
  - High-quality field trials
  - Detailed subgroup surveys

**Models**

- **Policy & programme development**
- **National Building Stock Models & Analysis**
  - National transition pathways
  - Deep energy and carbon reduction pathways

  **Knoweledge transfer**

- **Technology & Product Manufacturers**
- **Market analysis**

**Users Needs**

- **Policy makers**
- **Global stock modelling**

Subtask B: Data and methods

- Building stock modelling and analysis.

Subtask A: User engagement

Subtask C: Building stock modelling and analysis.

Deep energy and carbon reduction reporting requirements
Annex 70 proposed Outputs

Subtask A - Proposed outputs:
• Report on: the key issues for different stakeholders; frameworks and best practice for energy and building data collection and uses; use cases; scenario planning and renewable energy deployment; and smart meter roll-out status across participating countries.

Subtask B - Proposed outputs:
• Report on the classification for energy and buildings data;
• Registry of identified energy and building stock data registry;
• Reports on the data evaluation
• Special issue on energy and buildings data in emerging economies.

Subtask C - Proposed outputs:
• Classification of building and energy stock models
• Registry of energy and buildings stock models
• Software or plug-ins to analyse building stock energy data
• Best practice on energy and building stock model validation and reporting
• Data book for participating countries building energy use