



# RCUK Centre for Energy Epidemiology

## Energy Epidemiology: A New Best Practice Building Energy Model Report Guideline

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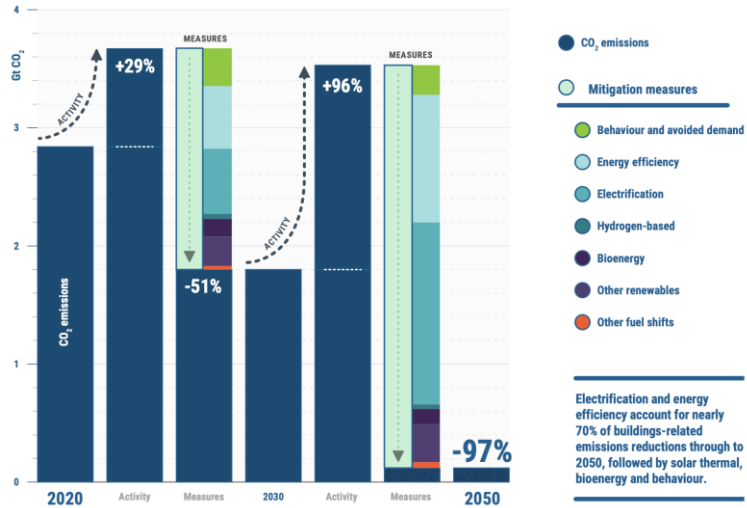
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### Buildings sector energy use continues to rise

Global direct CO<sub>2</sub> emission reductions by mitigation in building in the net zero energy scenario 2050



- CO<sub>2</sub> emissions
  - Mitigation measures
    - Behaviour and avoided demand
    - Energy efficiency
    - Electrification
    - Hydrogen-based
    - Bioenergy
    - Other renewables
    - Other fuel shifts
- Electrification and energy efficiency account for nearly 70% of buildings-related emissions reductions through to 2050, followed by solar thermal, bioenergy and behaviour.

Notes: Activity = change in energy service demand related to rising population, increased floor area and income per capita. Behaviour = change in energy service demand from user decisions, e.g. changing heating temperatures. Avoided demand = change in energy service demand from technology developments, e.g. digitalisation. Sources: IEA 2021c. All rights reserved.

### Why change our current research and practice?

Many countries have plans to **significantly reduce energy use** or **improve energy intensity** from the building stock.

Much of this reduction needs to come through more **energy efficient built environments**, which are responsible for almost 36% of global emissions.

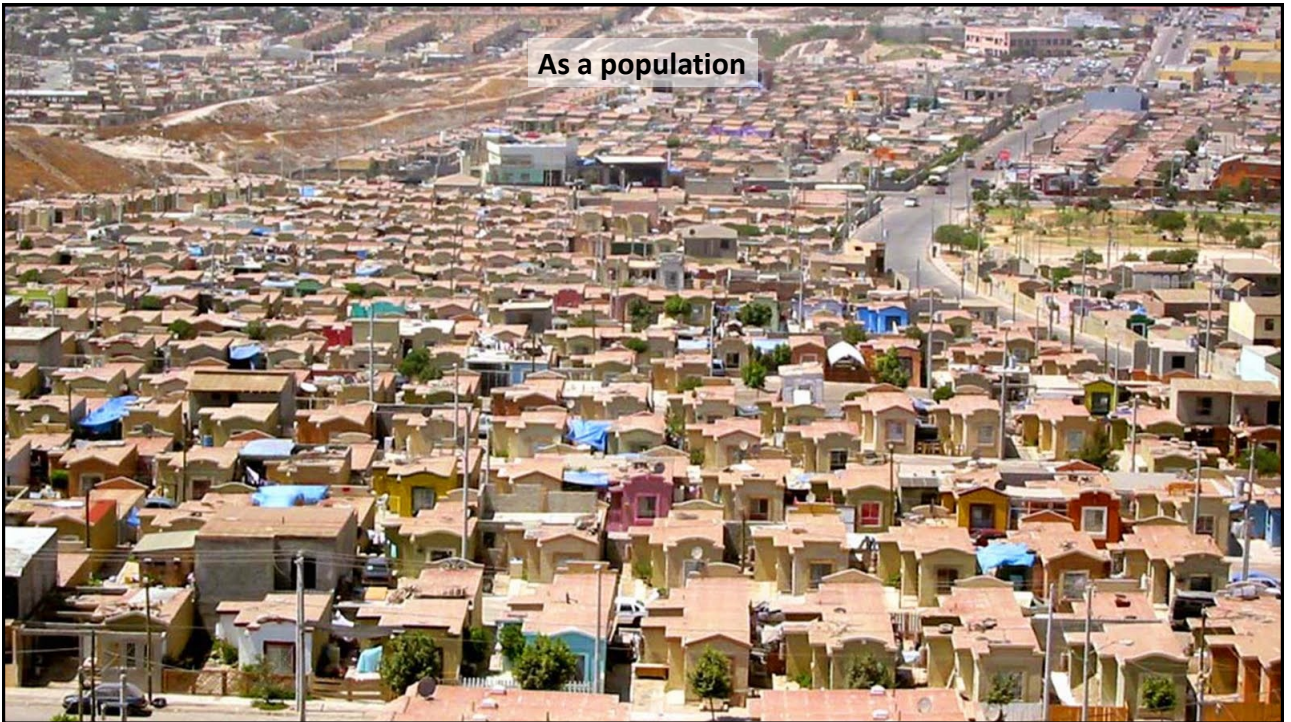
Globally energy efficiency refurbishment is estimated to result in the **investments of trillions of dollars**.



Studying the building... as a group



As a population



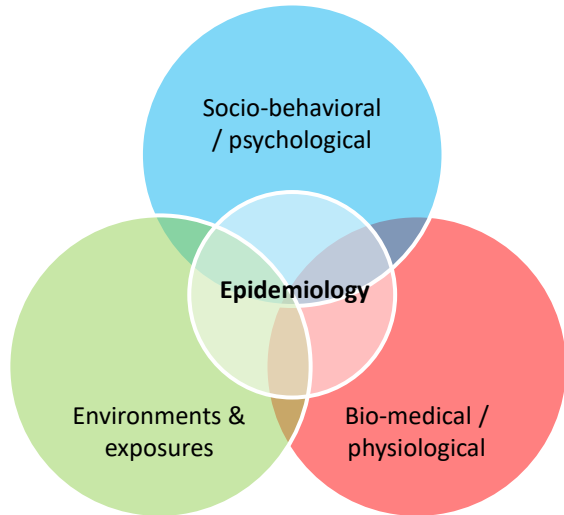
## What is 'Epidemiology' and why is it relevant to energy use in buildings?

Epidemiology...

Is **data driven**, emphasis is on empirical evidence, distribution of a condition, understanding of underlying / driving factors

Focuses on understanding what is affecting the **spread and severity** of a condition

Uses research findings to inform **past/future practices and policy**



## What is energy epidemiology?

**epidemiology** "epi" - upon; "demos" - the people; "ology" - logic, study. The study of what is upon the people – normally applied to the study of health.

### energy epidemiology

The systematic study of the distributions and patterns of energy use and their causes or influences in populations.



## How would the research landscape change, if decarbonizing the building stock was treated like a health risk?

Framework for **interdisciplinary** research

Large-scale **population studies** on the distributions of *prevalence and incidence*, and identifying and understanding the factors affecting these distributions, using **empirical data!**

Have established data collection **protocols**, analysis, and archiving as a shared resource, and place detailed studies in context.

Protocols for **feedback of findings** (e.g. failure rates, adverse outcomes, unintended consequences) and **systematic reviews** of evidence

Emphasis on **research translation and engagement** with policymakers and industry as part of an on-going progressive research programme.



### How can we better understand building stock models?

**Building stock energy models (BSMs)** offer a tool to assess the energy demand and environmental impact of building stocks, and can demonstrate and evaluate pathways for reducing their energy demand and respective GHG emissions.

**The problem:**

The heterogeneity of BSMs, together with a lack of consistency in the description and reporting of the models often hinders the understanding of the model, impeding an accurate interpretation and/or comparison of the results.

**The proposal:**

Annex 70 have developed reporting guideline in order to improve reporting practices in the field of building stock energy modelling.



### How can we better understand building stock models?

Topic	Subtopic	Topic	Subtopic
Overview	Aim and scope	Quality assurance	Calibration
	Modelling ap- proach		Validation
	System boundary		Limitations
	Spatio-temporal resolution		Uncertainty
Model Components	Building stock	Additional information	Sensitivity
	People Environment		Implementation Access
	Energy		Funding and contributors
	Costs Dynamics		Areas of application
Input and outputs	Other aspects		Key references
	Data sources		
	Data processing		
	Key assumptions		

## Building Stock Model reporting guidelines

Topic	Subtopic	Guiding questions
Model topics	Overview	Aim and scope What is the overall aim and scope of the model? What are the main use cases addressed?
	Modelling approach	ap- What is the general modelling approach and how is it structured? What are the main model parts and components included in the model and how do they relate to each other? What are the key steps in the modelling workflow?
		System boundary What are the system boundaries (temporal, geographical, building types, energy services, economic sectors, etc.) of the model?
	Spatio-temporal resolution What is the spatio-temporal resolution of the model?	

Detailed descriptions of the model

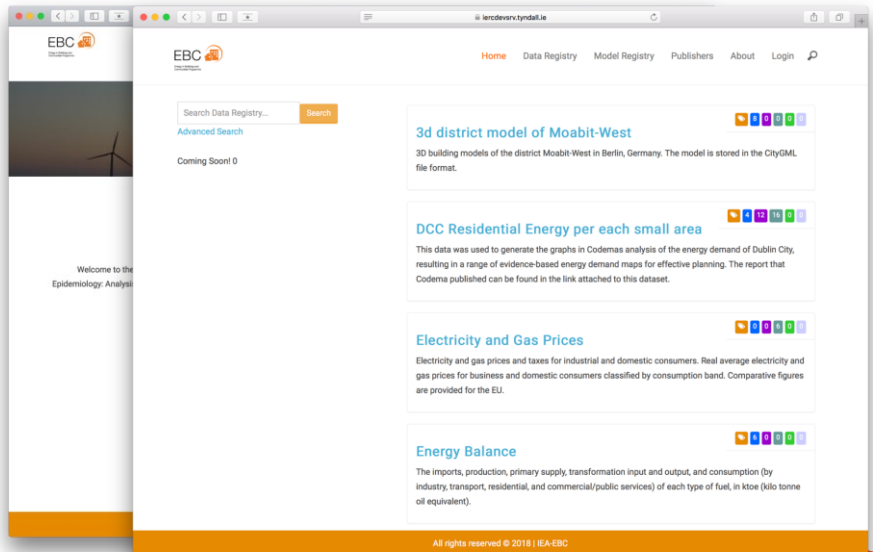
Key model features



## How can we better identify building stock data?

**Registry for Building Stock and Energy Data** provides a tool for identifying and knowing what data is available around the world among Annex 70 member countries.

The data registry contains information on over 1000 datasets and will be launched in 2022.



# THANK YOU

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