

# The IEA Energy in Buildings and Communities R&D Programme

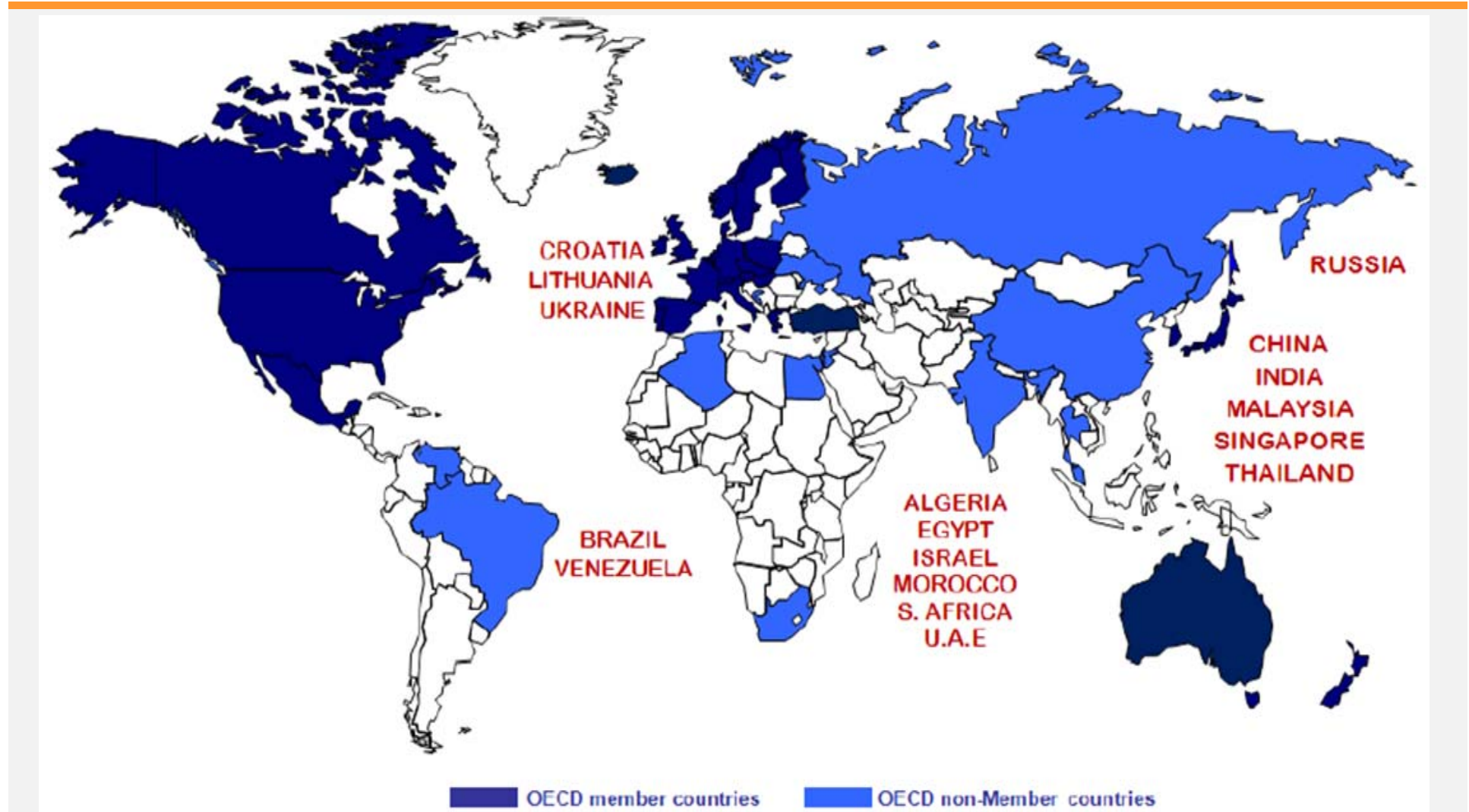
Peter Wouters  
IEA EBC Executive Committee Member , Belgium

IEA EBC Annex Proposal Workshop: 'Building Energy Performance Assessment Based on Optimized in-situ Measurements', 18<sup>th</sup> – 19<sup>th</sup> April 2016

## The International Energy Agency (IEA)

- Founded in response to the 1973/74 oil crisis: initial role was to secure oil supply through the release of emergency oil stocks.
- Today the IEA works to ensure reliable, affordable and clean energy for its 29 member countries and beyond.
- Main areas of focus: energy security, economic development, environmental awareness, and engagement worldwide.

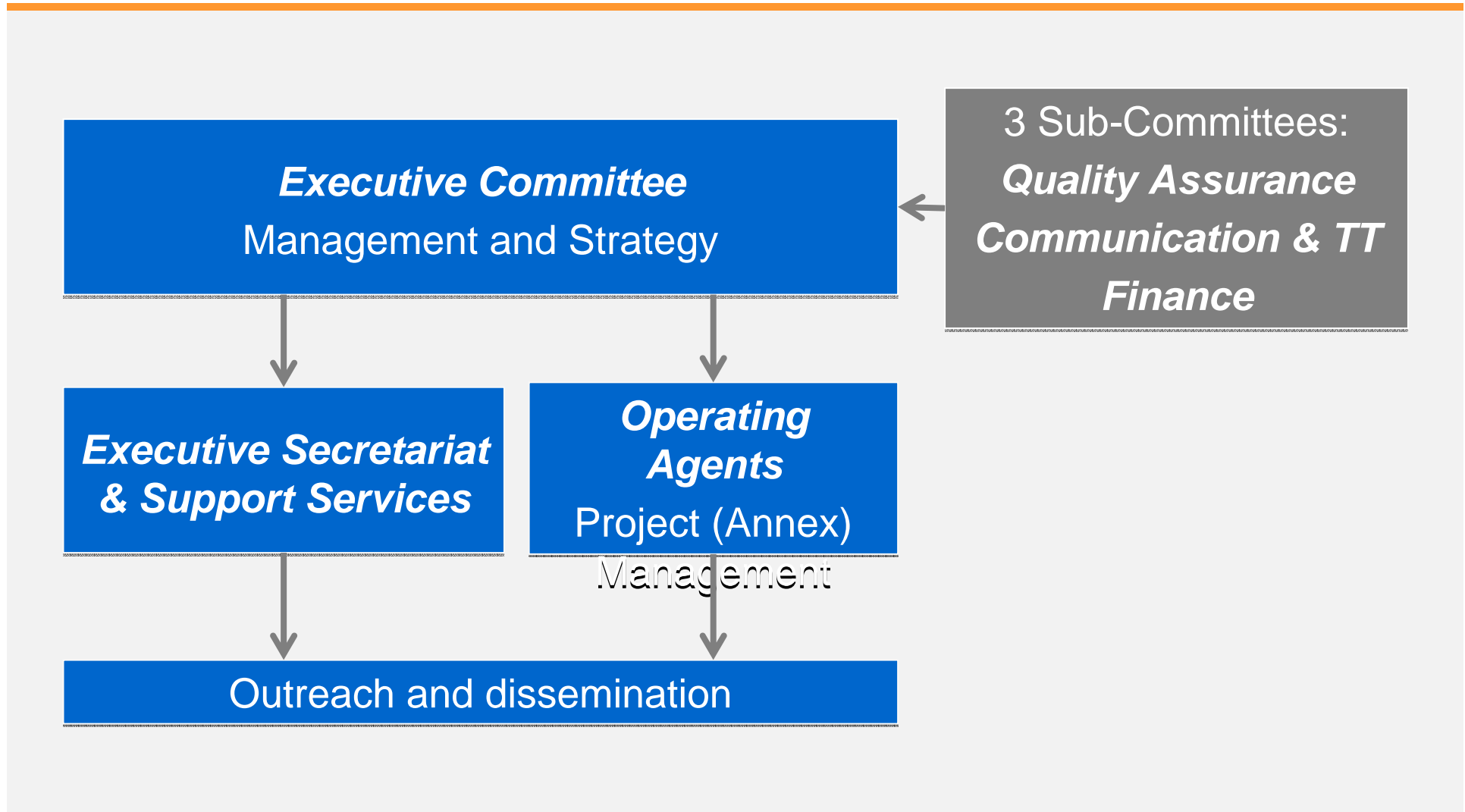
# The International Energy Agency (IEA)



## The IEA EBC R&D Programme

- Energy in Buildings and Communities (EBC)
- International technology collaboration programme
- Energy research + innovation, development, demonstration and dissemination
- Open innovation approach
- 22 member countries
- 70 Annexes and 3 Working Groups established
- 16 Annexes ongoing, **1 under preparation**

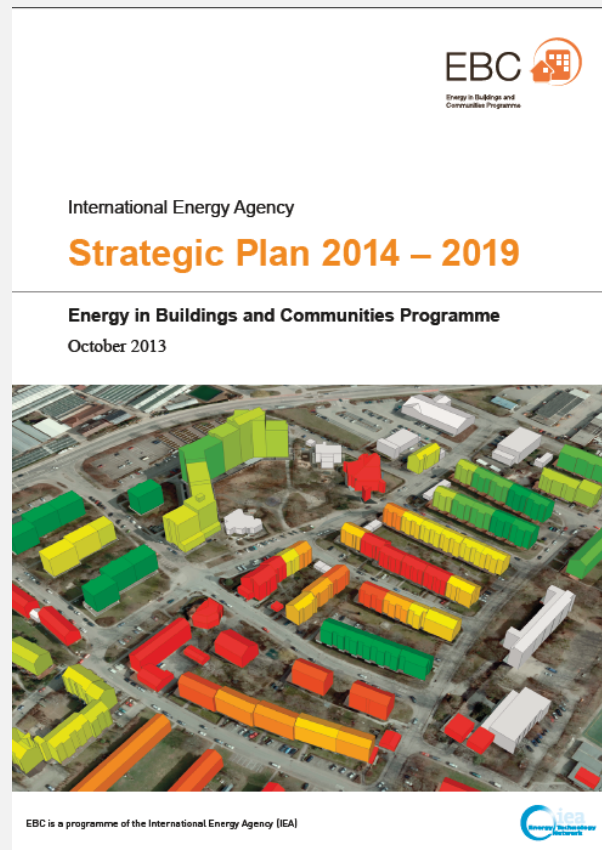
# Programme Governance



## 22 Participating Countries

- Australia
- Austria
- Belgium
- Canada
- P.R. China
- Czech Republic
- Denmark
- France
- Germany
- Ireland
- Italy
- Japan
- Republic of Korea
- Netherlands
- New Zealand
- Norway
- Portugal
- Spain
- Sweden
- Switzerland
- UK
- USA

# EBC Mission



→ Energy efficiency is key

To accelerate the transformation of the built environment towards more energy efficient and sustainable buildings and communities, by the development and dissemination of knowledge and technologies through international collaborative research and innovation.

# Scope of the EBC Programme

R&D Projects

Knowledge Deployment  
and Demonstration

R&D Strategies

Buildings

Communities





# The Buildings & Communities Sector

Energy = 30% to 40%

CO<sub>2</sub> emissions = +30%

Solid Waste = 25% to 40%

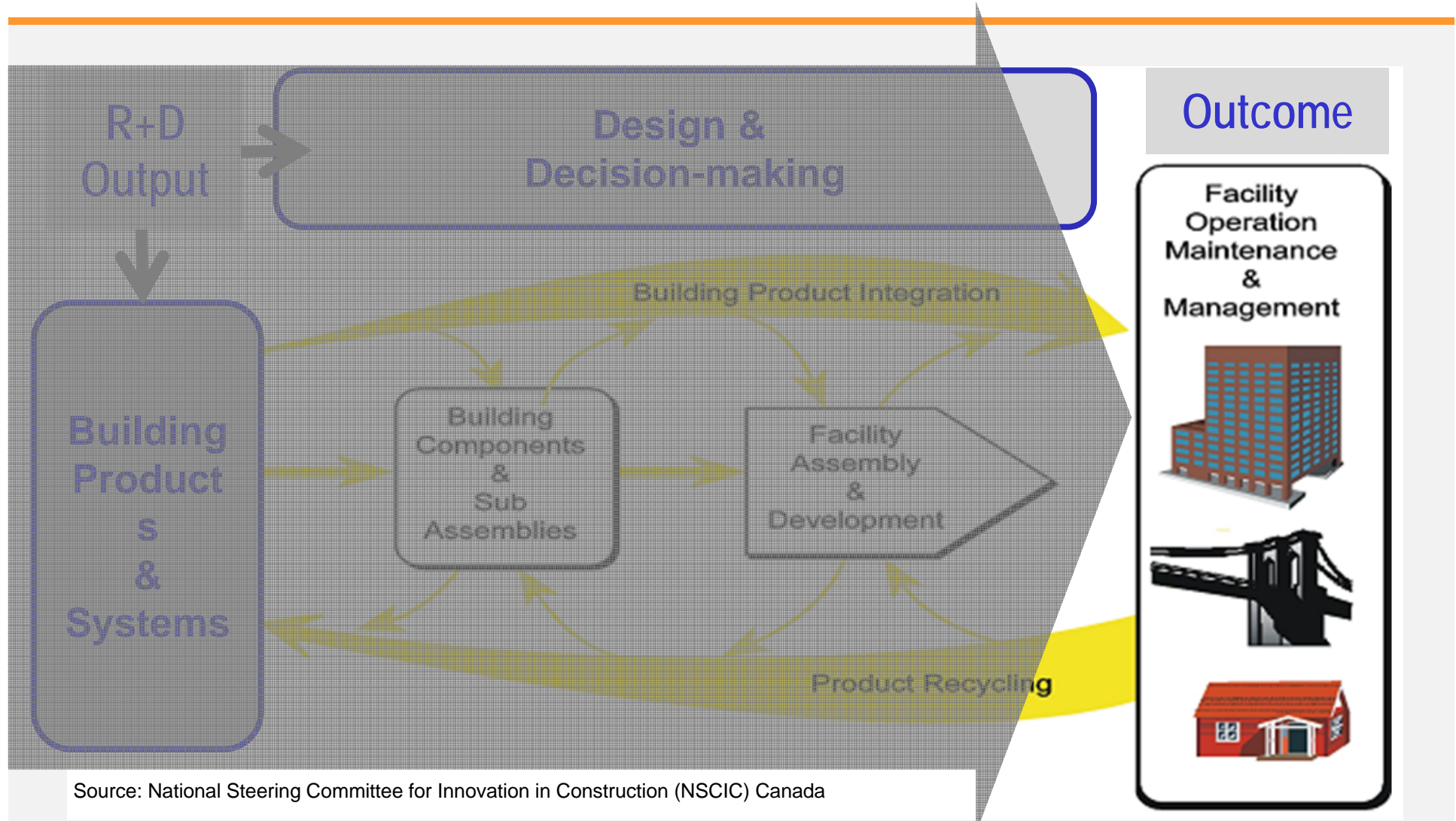
Primary Resources = +50%

GDP = 10% to 15%

Fragmented sector



# Value Chain in Construction Market



Source: National Steering Committee for Innovation in Construction (NSCIC) Canada

# Scope of Research & Innovation Technology Readiness Levels



Level		Definition
TRL 9	System Operations	System proven and for ready full commercial deployment
TRL 8	System Commissioning	Actual system completed and qualified through test and demonstration
TRL 7	System Commissioning	Full-scale, similar (prototypical) system demonstrated in relevant environment
TRL 6	Technology Demonstration	Engineering / pilot-scale, similar (prototypical) system validation in relevant environment
TRL 5	Technology Development	Laboratory scale, similar system validation in relevant environment
TRL 4	Technology Development	Component and / or system validation in laboratory environment
TRL 3	Research to Prove Feasibility	Analytical and experimental critical function and / or characteristic proof of concept
TRL 2	Basic Technology Research / Research to Prove Feasibility	Technology concept and / or application formulated
TRL 1	Basic Technology Research	Basic principles observed and reported

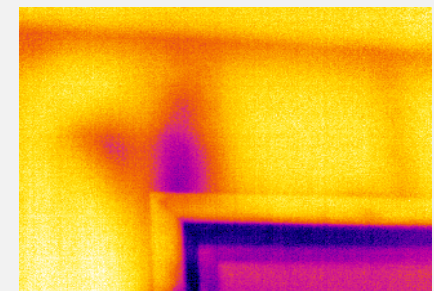
## High Priority Themes

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- Theme #1: Integrated planning and building design
- Theme #2: Building energy systems
- Theme #3: Building envelope
- Theme #4: Community scale methods
- Theme #5: Real building energy use

# #1: Integrated planning and building design

- Indoor Air Quality Design and Control in Low Energy Residential Buildings (Annex 68)
- Energy Flexible Buildings (Annex 67)
- Business and Technical Concepts for Deep Energy Retrofit of Public Buildings (Annex 61)
- Cost effective Energy and CO<sub>2</sub> Optimization in Building Renovation (Annex 56)
- Reliability of Energy Efficient Building Retrofitting Probability Assessment of Performance & Cost (Annex 55)





## #2: Building energy systems

- Ventilative Cooling (Annex 62)
- New Generation Computational Tools for Building and Community Energy Systems (Annex 60)
- High Temperature Cooling & Low Temperature Heating in Buildings (Annex 59)
- Air Infiltration and Ventilation Centre AIVC (Annex 5)



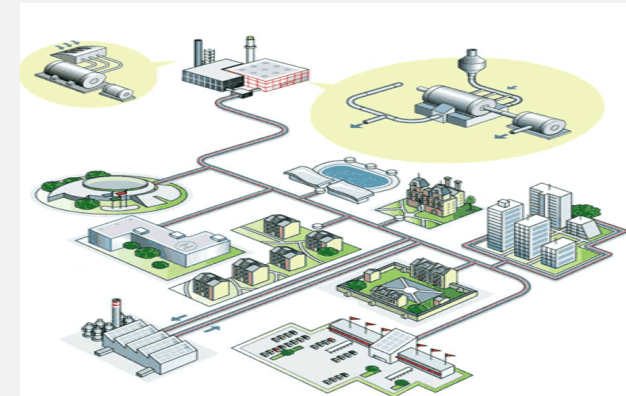
## #3: Building envelope

- Long-Term Performance of Super-Insulating Materials in Building Components and Systems (Annex 65)
- Reliable Building Energy Performance Characterisation Based on Full Scale Dynamic Measurements (Annex 58)



## #4: Community scale methods

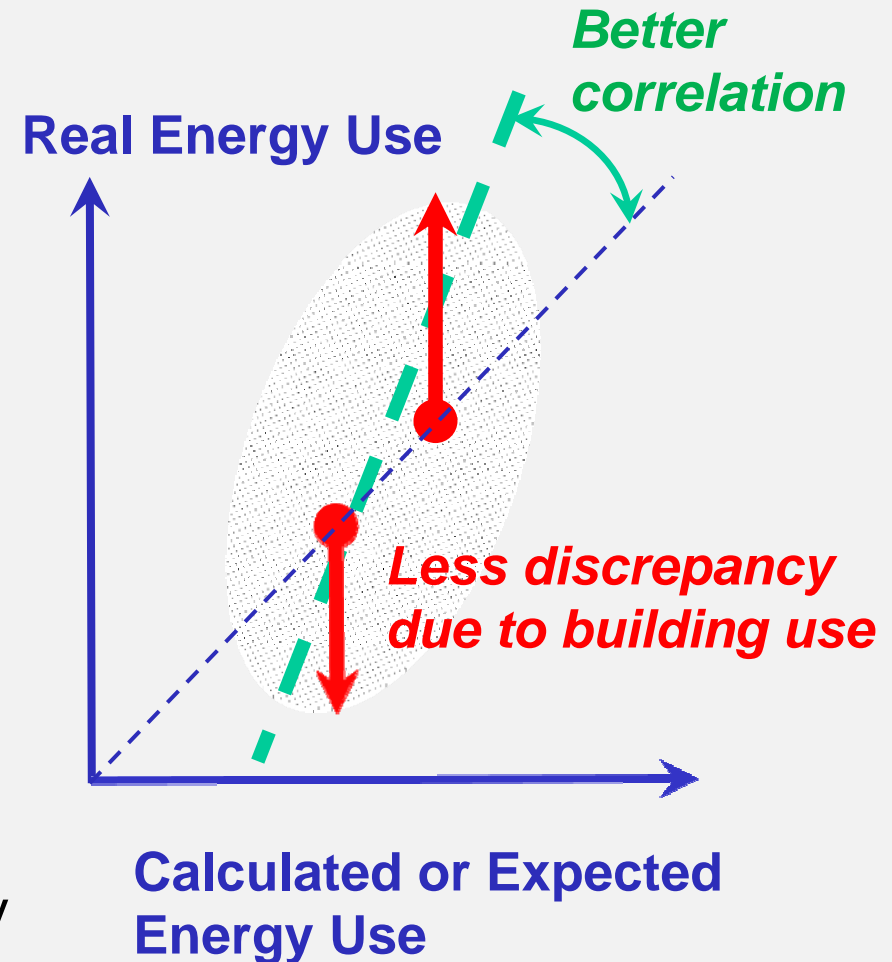
- LowEx Communities - Optimised Performance of Energy Supply Systems with Exergy Principles (Annex 64)
- Implementation of Energy Strategies in Communities (Annex 63)





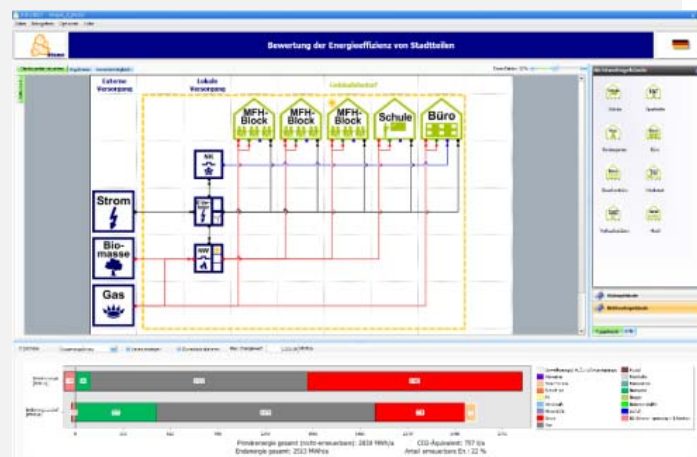
## #5: Real building energy use

- Adaptive Thermal Comfort in Low Energy Buildings (Annex 69)
- Occupant Behavior Simulation (Annex 66)
- Evaluation of Embodied Energy & CO<sub>2</sub> Equivalent Emissions for Building Construction (Annex 57)
- Building Energy Epidemiology: Analysis of Real Building Energy Use at Scale (Annex 70)



# Project Results

- Full Scientific Reports
- Summary Reports
- Factsheets
- Handbooks
- Tools



**Definition and Simulation of Occupant Behavior in Buildings**  
ANNEX 66


Occupant behaviour, which is a key issue for building design optimization, energy diagnosis, performance evaluation, and building energy simulation, contributes significantly to building energy consumption, while the understanding of influences of occupant behaviour is quite insufficient both in building system design and energy retrofit scenarios, leading to limited understanding and inappropriate non-optimization. Existing studies on occupant behaviour, mainly from the perspective of sociology, lack in-depth quantitative analysis.

Although there are many group worldwide studying occupant behaviour individually, to date the behaviour models created so far have often been inconsistent, with a lack of consensus in common languages, in good experimental design and in modelling methodologies. Due to the complexity and the great discrepancies in behaviour often encountered, it is prerequisite for researchers to work together to define and simulate occupant behaviour in a consistent and common way. International cooperation is extremely important for

**Project details**  
2010-2012  
Sponsoring agency  
Dr Yu Yan, Tsinghua University, P.R.China  
Dr Elizabeth Wang, Lawrence Berkeley National Laboratory, USA

**Participating countries (alphabetical)**  
Australia, Austria, Belgium, Canada, P.R. China, Denmark, Finland, France, Germany, Italy, Japan, Korea, Netherlands, Norway, Poland, Spain, Sweden, Switzerland, UK, USA

**Further information**  
www.iea-ebc.org





EBC is a programme of the International Energy Agency (IEA)

**International Energy Agency**  
**Methodology for Cost-Effective Energy and Carbon Emissions Optimization in (Annex 56)**

**EBC**  
Energy in Buildings and Communities Programme

**International Energy Agency**  
**Energy Efficient Communities: Case Studies and Strategic Guidance for Urban Decision Makers (Annex 51)**

**Project Summary Report**

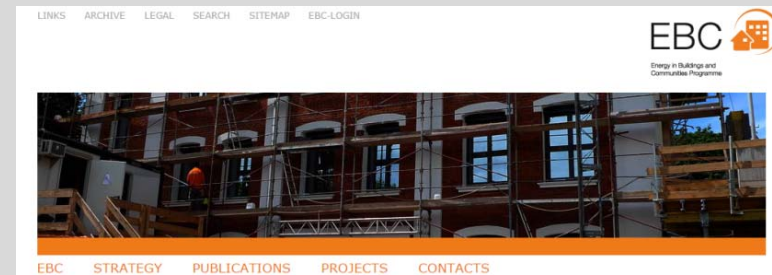



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# Dissemination & Outreach

**www.iea-ebc.org**

- Scientific Reports (website and Bookshop)
- Newsletter
- Annual Report
- Conferences / seminars
- Demonstration
- AIVC



Welcome to the International Energy Agency's Energy in Buildings and Communities Programme

The IEA-EBC Programme is an international energy research and innovation programme in the buildings and communities field. It enables collaborative R&D projects and

– High quality

Contact

EBC Secretariat (ESSU)

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## Participating in EBC Projects (1)

- An idea for a new international project (an ‘Annex’) can be proposed to the EBC Executive Committee (‘ExCo’) as a short ‘Project Concept’ **[Completed]**
- An Annex will need to align with the current EBC Strategic Plan 2014 - 2019
- At EBC ExCo request, an international workshop is held to develop a project idea into a formal Annex proposal, produced as a draft ‘Annex Text’ **[This workshop]**
- The Annex Text should identify the research need and the target audience(s) for the eventual outcomes

## Participating in EBC Projects (2)

- The draft Annex Text is used by the EBC ExCo to decide whether to approve the new international project
- The EBC ExCo gives formal approvals to:
  - Start the Annex preparation phase (1 year duration)
  - Start the Annex working phase (2 - 3 year duration) after agreement on the final Annex Text
  - Publish official Annex deliverables (~ 4 or 5 deliverables), following the reporting phase (1 year duration)

## Participating in EBC Projects (3)

- In all cases, formal EBC Annex participation is legally binding
- Organisations will need to provide their own funding to participate
- An organisation must deliver what it promises at the outset during drafting of the Annex Text
- An organisation interested to participate in an EBC Annex should initially discuss this with their national ExCo Member  
([www.iea-ebc.org/contacts](http://www.iea-ebc.org/contacts))

## Participating in EBC Projects (4)

- One or two (co-)project managers (an ‘Operating Agent’) are appointed by the EBC ExCo
- Several deputy project managers (‘Subtask Leaders’) are also appointed by the EBC ExCo
- Being an Operating Agent or Subtask Leader is a major commitment  
(Do not agree to this without confirmed funding!)

## Participating in EBC Projects (5)

### Important content for an EBC Annex Text (~10 pages)

- Short description of the research need
- Objectives
- Scope (be realistic!)
- Methodology
- Planned deliverables with target audience(s) and deployment plan for each deliverable
- Time schedule (preparation-, working- and reporting phases)
- Specific obligations and responsibilities of the (Co-)Operating agent, Subtask Leaders, and all Participants
- Information and intellectual property agreement between participants
- Identification of (Co-)Operating agent, Subtask Leaders, and all Participants



## Further Information

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[www.iea-ebc.org](http://www.iea-ebc.org)

**Thank you**