Nici Zimmermann

HEW PROJECT PURPOSE, TRAJECTORY AND RESULTS

Team members unable to be here today

Shane Carnohan

Robert Muetzelfeldt

Alex Macmillan

Summary of HEW

Aims

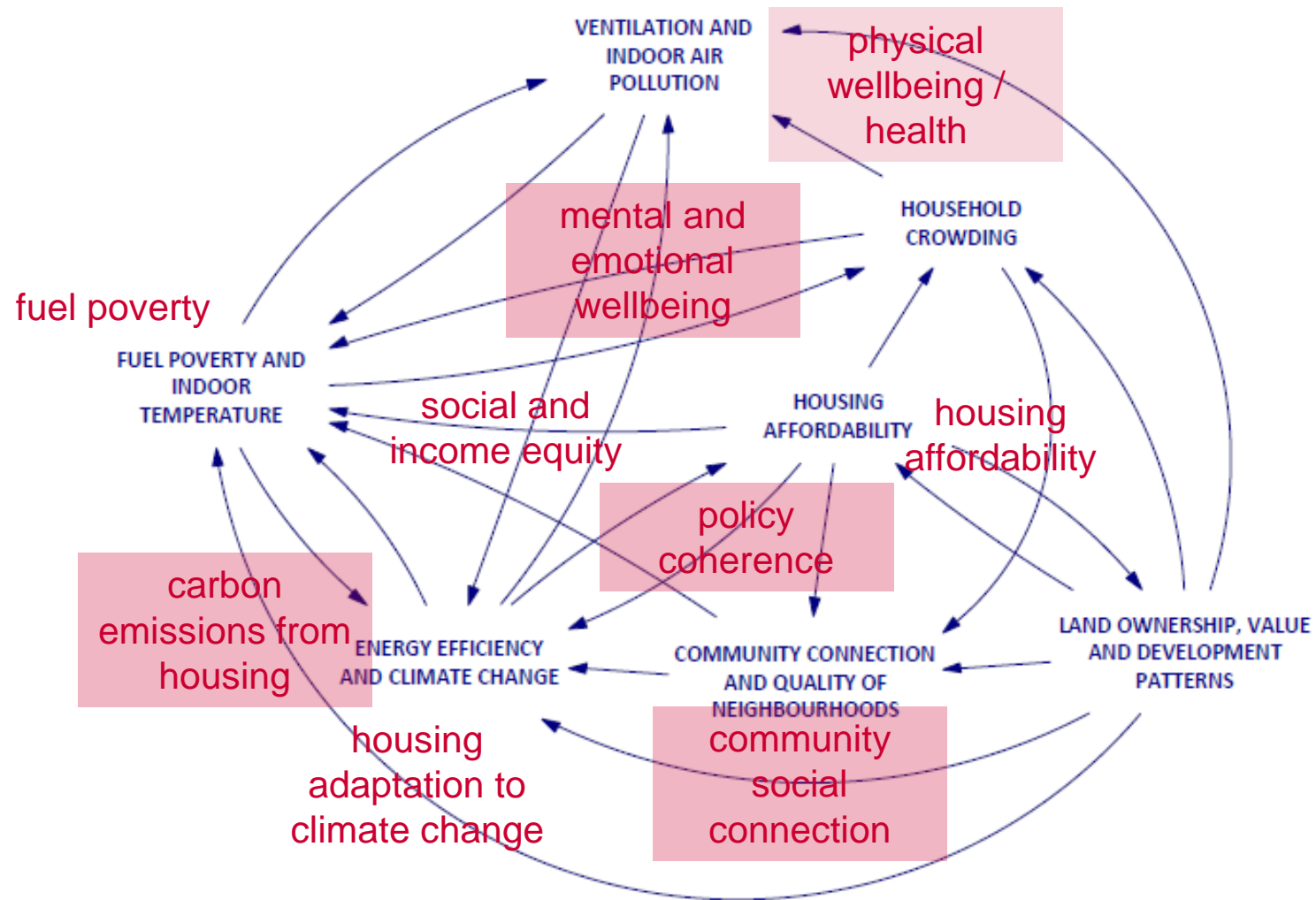- Addressing dynamic complexity
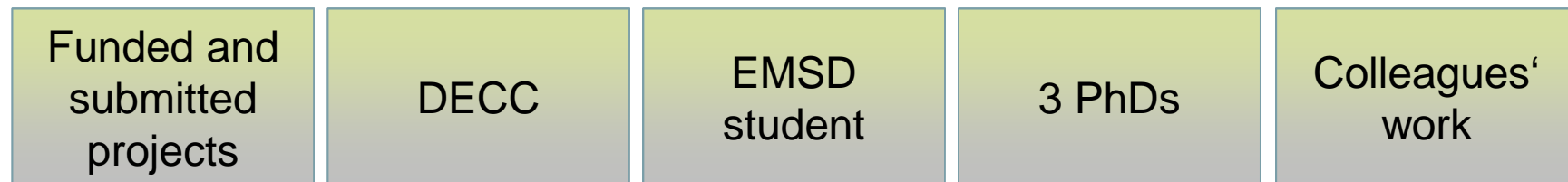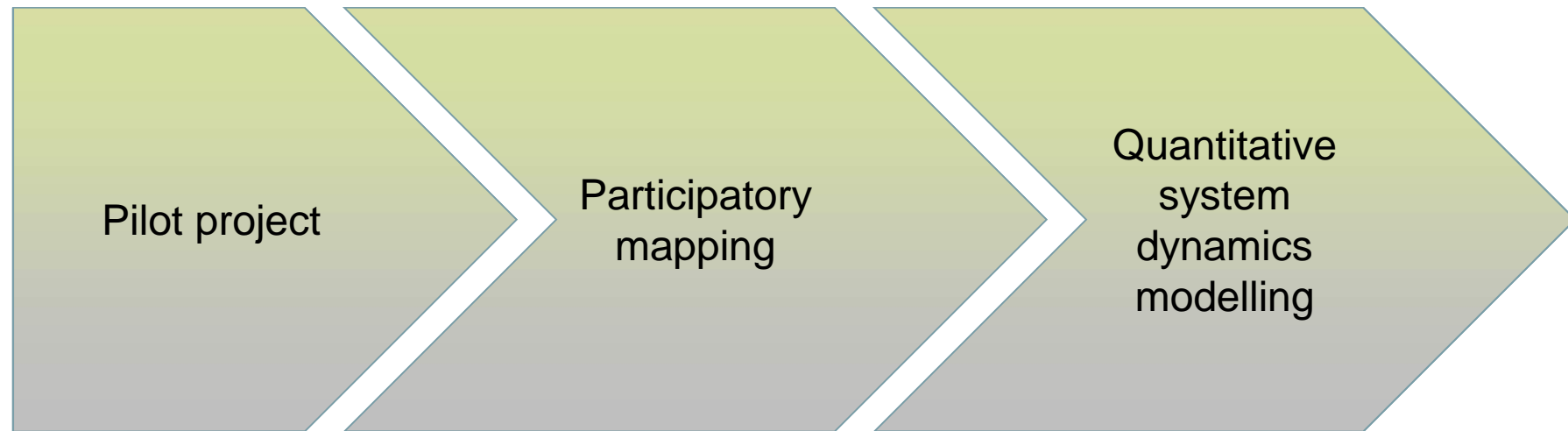- Getting to futures we want

Journey

- A process of transparent and collaborative learning together
- Bring together different kinds of knowledge
- Set of causal diagrams for learning together about the system
- Strategic pieces of simulation to support integrated policy-making
  - Green Deal
  - Heating, ventilation and rebound
- ***Exploring methods of change***

HEW themes and policy criteria

Causal loop diagrams

Housing affordability: regional rental

theme of causal loop	direction		
carbon emissions from housing stock	(iffy)		weak impact
housing affordability (regional rental affordability)			
housing affordability (home ownership)			
physical and mental wellbeing (household crowding)			
community social connection	8/10	3.5/10	

The project's trajectory

Pilot project → Participatory mapping → Quantitative system dynamics modelling

| Funded and submitted projects | DECC | EMSD student | 3 PhDs | Colleagues' work |

Integrated decision-making about Housing Energy and Wellbeing (HEW)

4th stakeholder workshop

Papers directly related to the HEW project from 2016

Accepted submissions: International System Dynamics Conference 2016
1. System dynamics model of heating, ventilation and <u>rebound</u>
2. <u>Fragmentation</u> in housing construction and retrofit
3. <u>Group model building and simulation platforms</u> in the built environment
4. What are <u>system dynamics insights</u>?
5. PhD colloquium: Socio-economic structure of the London <u>housing crisis</u>
6. PhD colloquium: Homeowners' energy efficiency <u>renovation decisions</u>

Journal
- **Submission**: Using textual data in system dynamics <u>model conceptualization</u>
- **Publication**: Integrated decision-making about <u>housing, energy and wellbeing</u>

Working paper
- Framework and method for <u>housing policy</u>

UCL System Dynamics Group

Mentoring on work in progress, 13.00–14.00 every other Monday

11/03 *Nici Zimmermann*   Group initiation meeting

21/03 *Katya Bobrova*   Homeowners' decision-making

11/04 *Shane Carnohan*   Interactive simulation environment

25/04 *Kalliopi Fouseki*   Heritage retrofit

09/05 *Bernard Tembo*   Investment decisions in the copper industry

23/05 *Lucy Campbell*   Vicious cycles in NHS vending machine services

06/06 *Daniela Flor*   Water efficiency in households

20/06 *Kaveh Dianati*   UK/London housing crisis

DECC Demand Reduction Obligation (DRO)

- Supported DECC in investigating the DRO idea
- Small participatory system dynamics workshop
- DECC's decision: not to pursue
- Work revealed
  - Complexity of the issue
  - Difficulties in setting the target
  - Risks to suppliers
  - Possibility to increase bills

Interest in similar work?

- Greater London Authority (GLA)

- CO Impact Group

- Moisture central to IAQ and unintended consequences in the HEW project

- CBES funded Neil May to establish centre

- UK Centre led by UCL, BRE, Heriot Watt, LSHTM

- Advisory working groups from industry, government, academics, public interest bodies

- Participatory organisation based on systems thinking

- Practical aims and engagement: improving moisture safety of UK built environment

Five themes of UKCMB
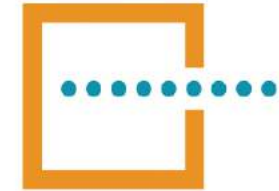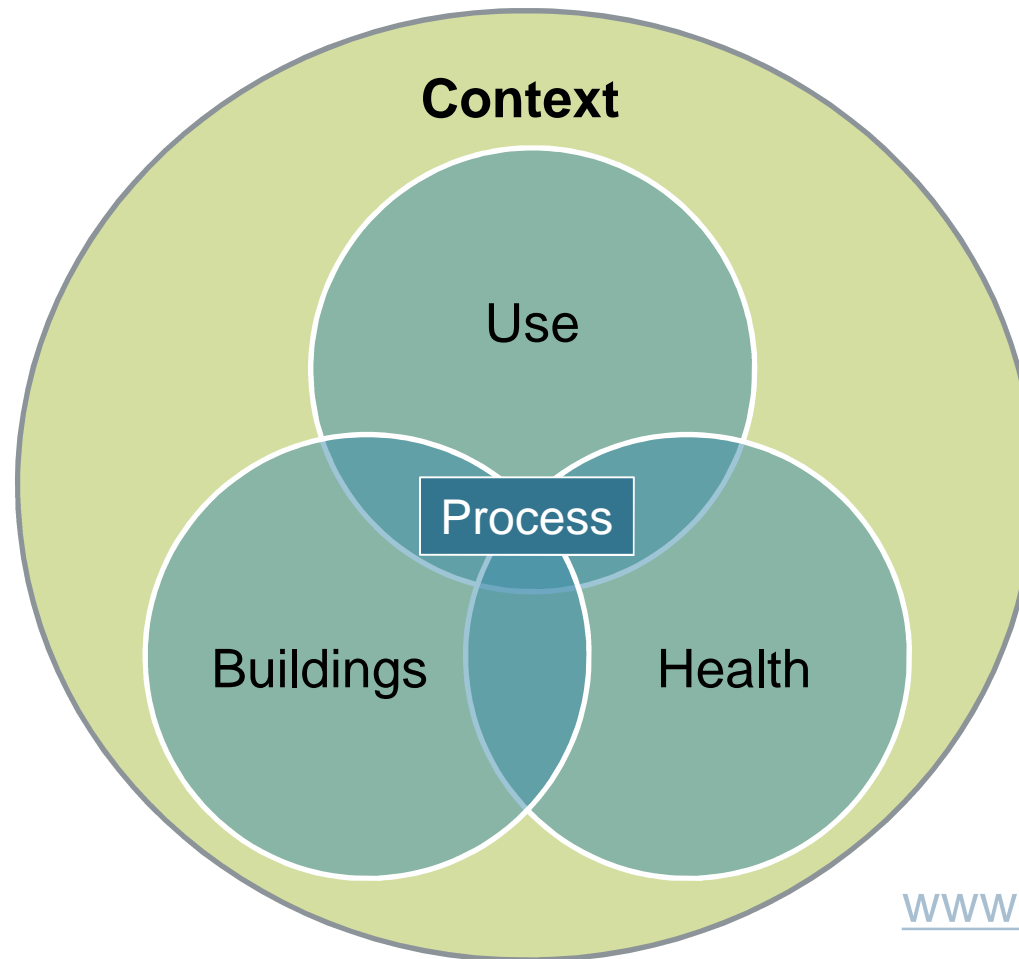
www.ukcmb.org

Housing Crisis Project

- CBES funded research paper on the context of the housing crisis and its effect on energy and well being: Miriam Morris and Neil May

- Complexity of the system not fully understood in public discourse (or academia)

- Impossibility of "solving" the crisis within this system

- Multiple and severe unintended consequences of Business As Usual
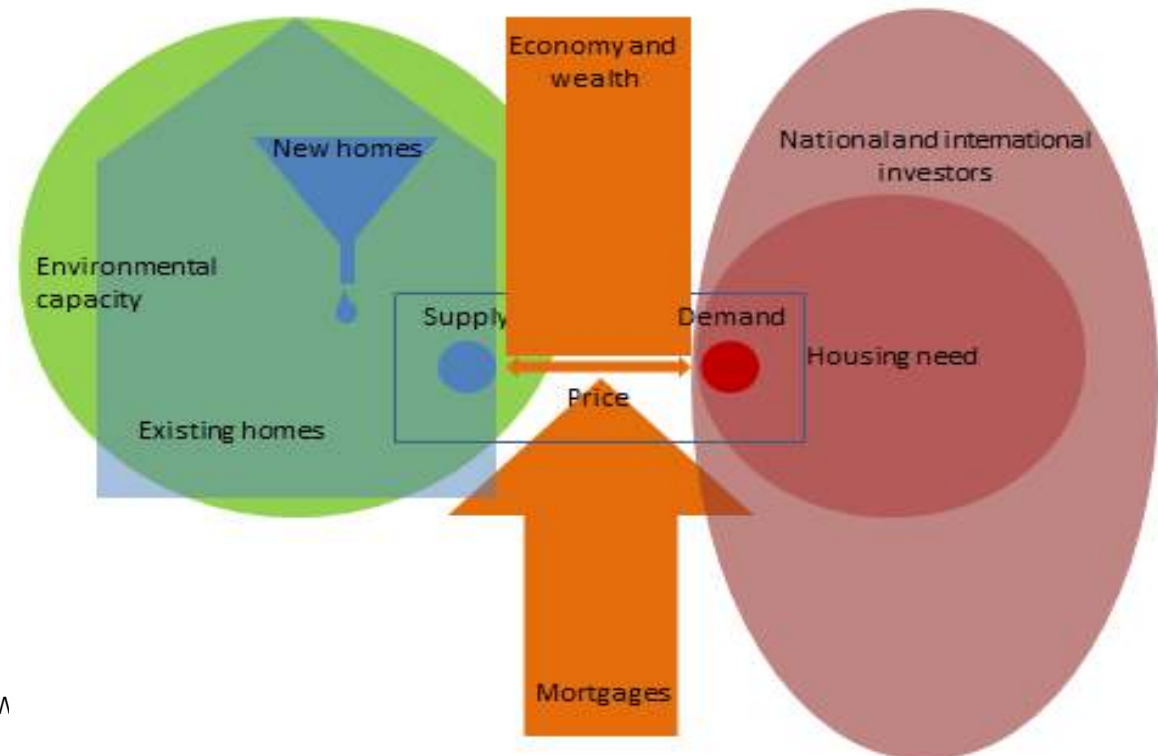
Housing Crisis Project

- Seminar Sept 2015 with IEDE, EI and School of Planning
- UCL Grand Challenges adopts work
- London public seminar April 2016
- Paper: Prof N Gallent, D Durrant, N May
- Kaveh Dianati PhD: SD model of housing crisis
- Seminar programme with Institute for Global Prosperity using "regeneration" of East London to explore housing system, effects, paradigms and options for change
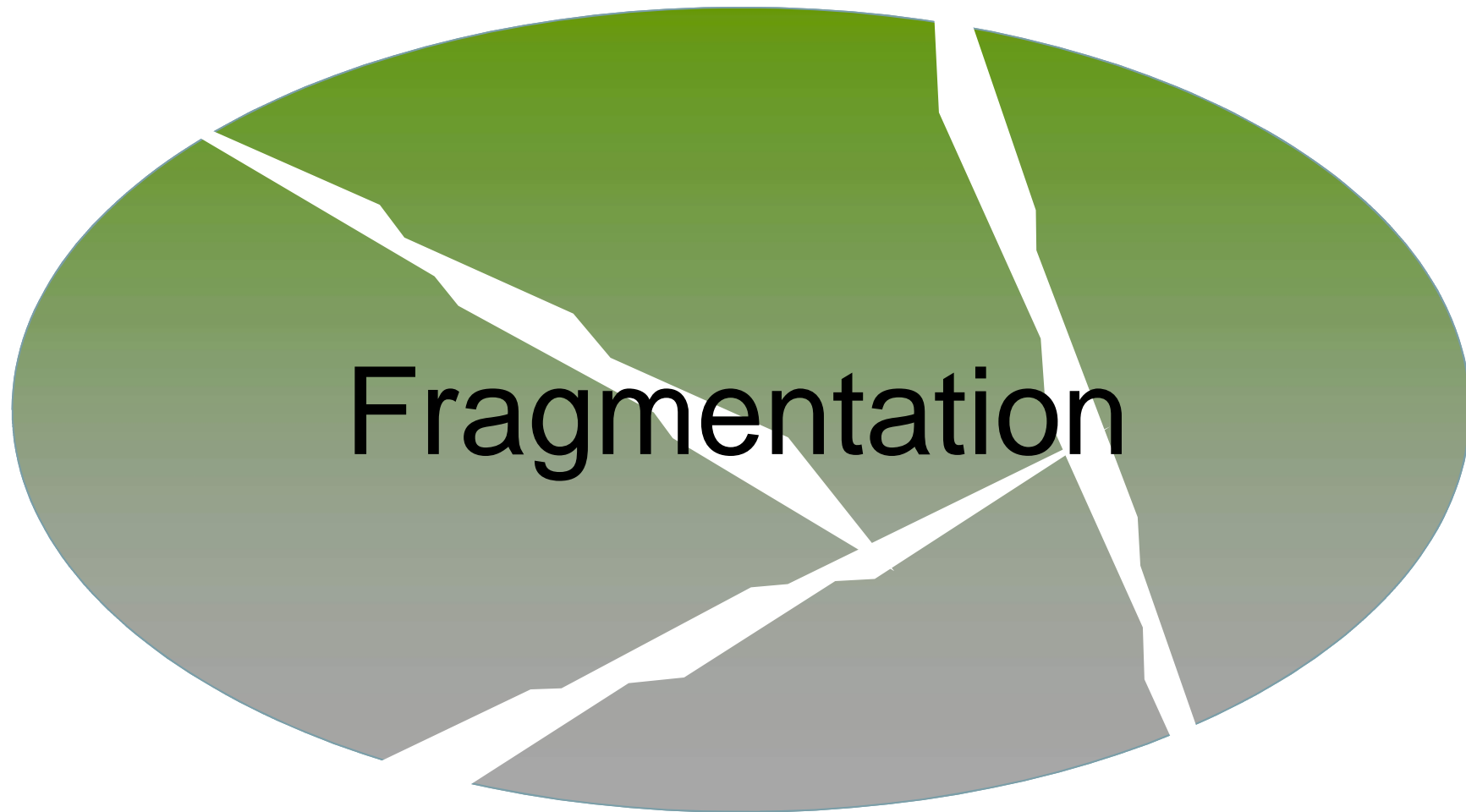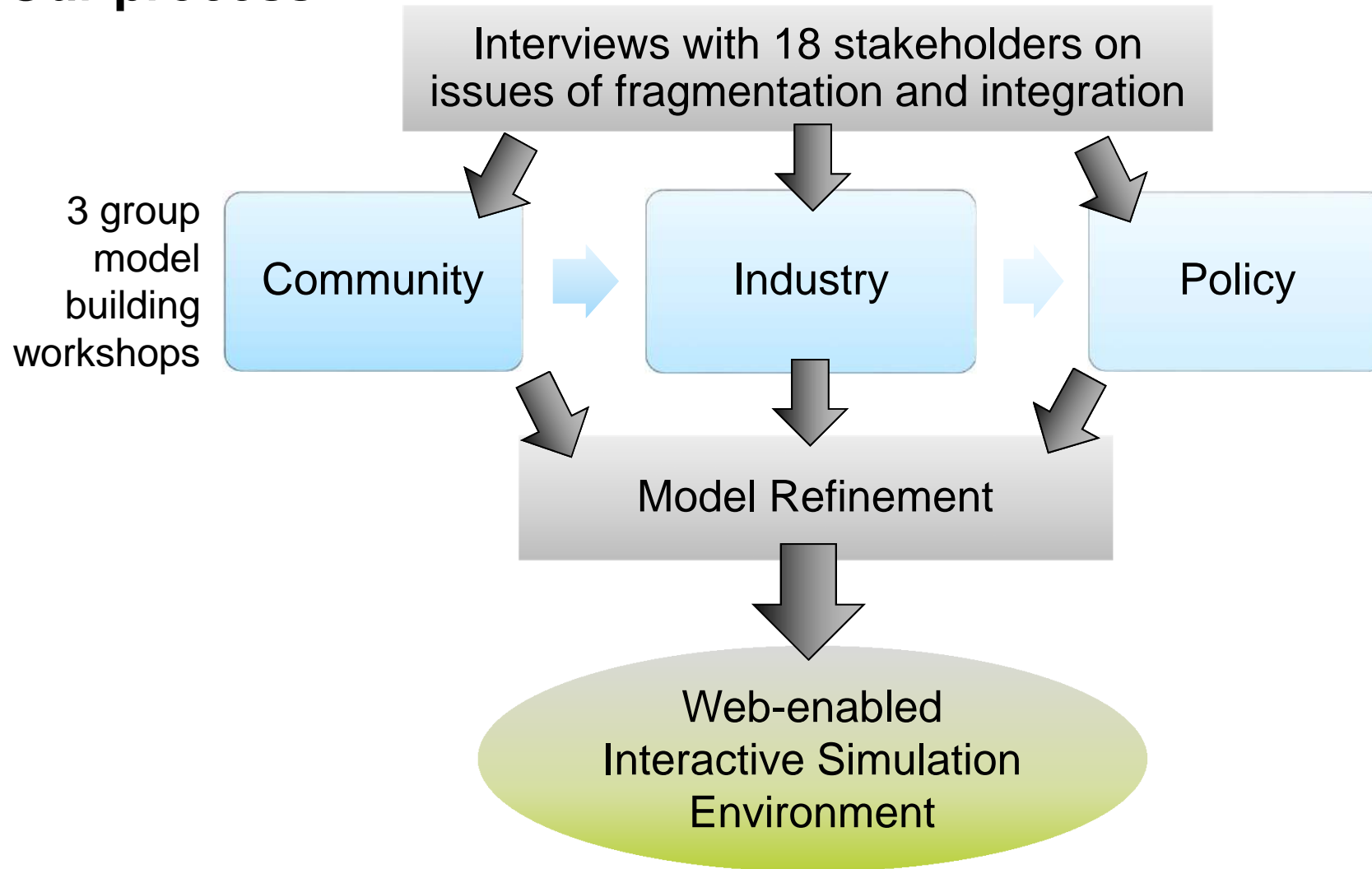- Centre of Housing and Change?

Post workshop 3

Workshop 3

Integrated decision-making about Housing Energy and Wellbeing (HEW)

4th stakeholder workshop

Since workshop 3

Integrated decision-making about Housing Energy and Wellbeing (HEW)

4th stakeholder workshop

Since workshop 3

Fragmentation

Our process

Interviews with 18 stakeholders on
issues of fragmentation and integration

3 group
model
building
workshops

Community

Industry

Policy

Model Refinement

Web-enabled
Interactive Simulation
Environment

Confirmatory and disconfirmatory dots → problem space

Integrated decision-making about Housing Energy and Wellbeing (HEW)

4th stakeholder workshop

Confirmatory and disconfirmatory dots → problem space
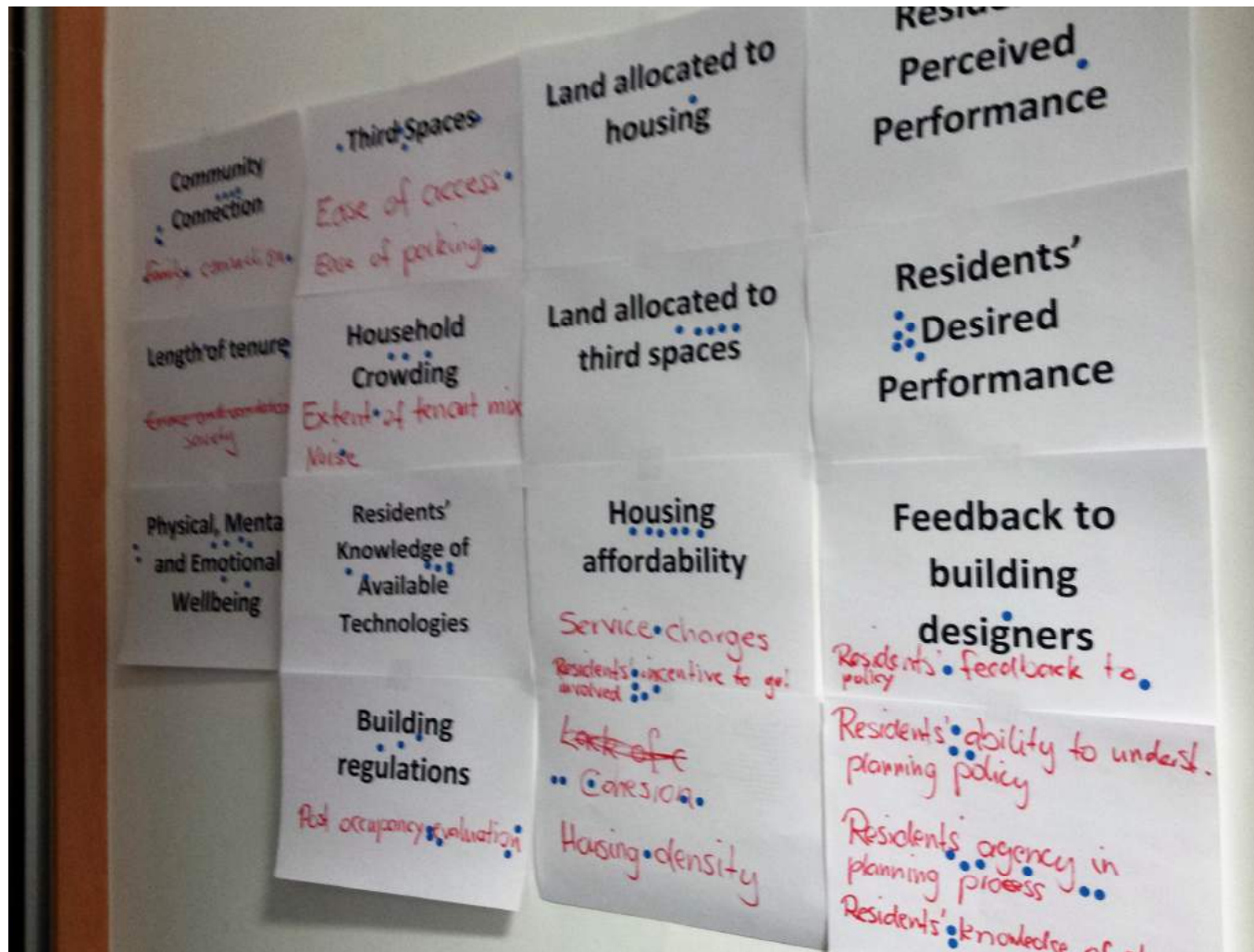
More structure elicitation

Integrated decision-making about Housing Energy and Wellbeing (HEW)

4th stakeholder workshop

Results of the modelling process

- The added value of modelling for understanding
  - ✓ useful and efficient to understand the problem and gain insights
  - • neutral about the clarity of the causes of the problem

- Consensus building

  - ✓ the integration of diverse opinions of the participants *(especially WS 3)*
  - ✓ reaching a consensus

- Take-home

  - ✓ supporting the conclusions of the meetings in their organizations
  - ✗ applicability of this approach in their organizations

Group model building vs. normal meetings

- Insight
  - ✓ *more* insight
  - Positive on *quicker* insight in WS 1, neutral in WS 2, full agreement except 1 participant in WS 3

- Communication and shared vision
  - ✓ *better* communication
  - ✓ *better* shared vision
  - ✗ but not necessarily *quicker*

- Commitment
 - neutral about both *more* and *quicker* commitment

Modelling

- Larger model
  - Tool for triggering discussion
  - Tool for testing our thinking
  - This tool is not supposed to make predictions
  - Tool for scenario analyses

- Condensed model for our Web-enabled Interactive Simulation Environment (WISE)
  - Tool for triggering discussion
  - Tool for testing our thinking
  - This tool is not supposed to make predictions
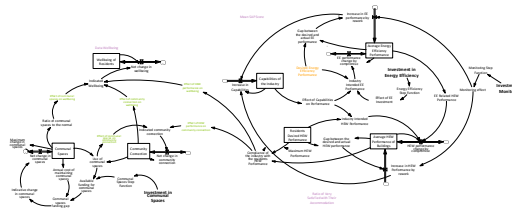 - Easier to understand tool
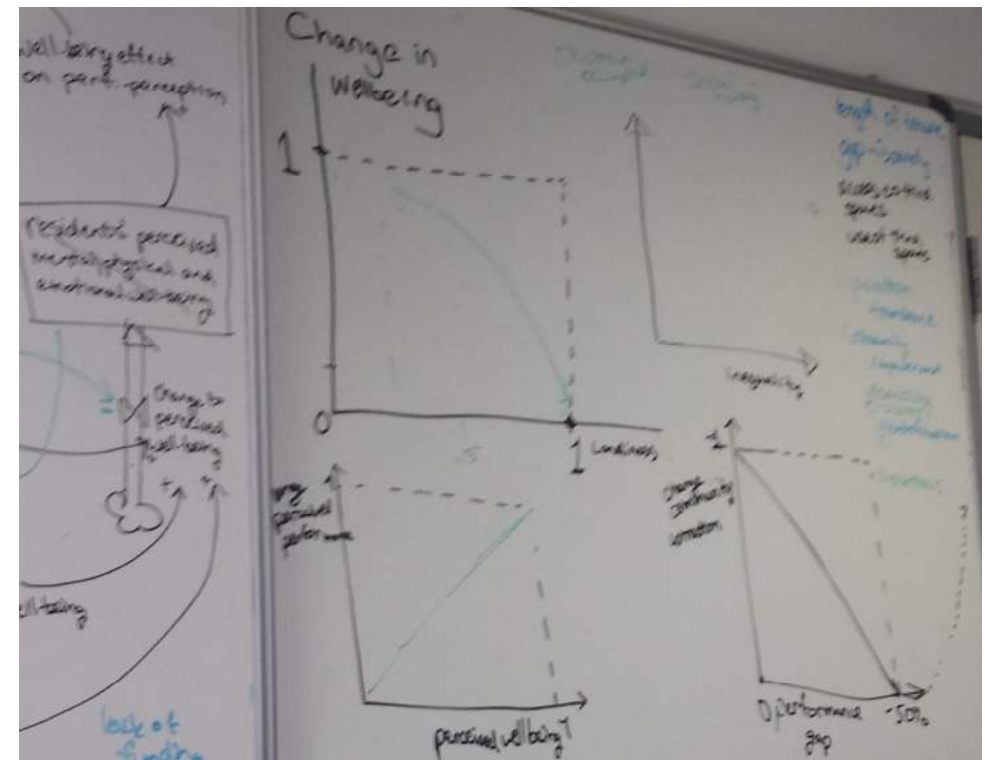
Modelling

- Larger model for analyses
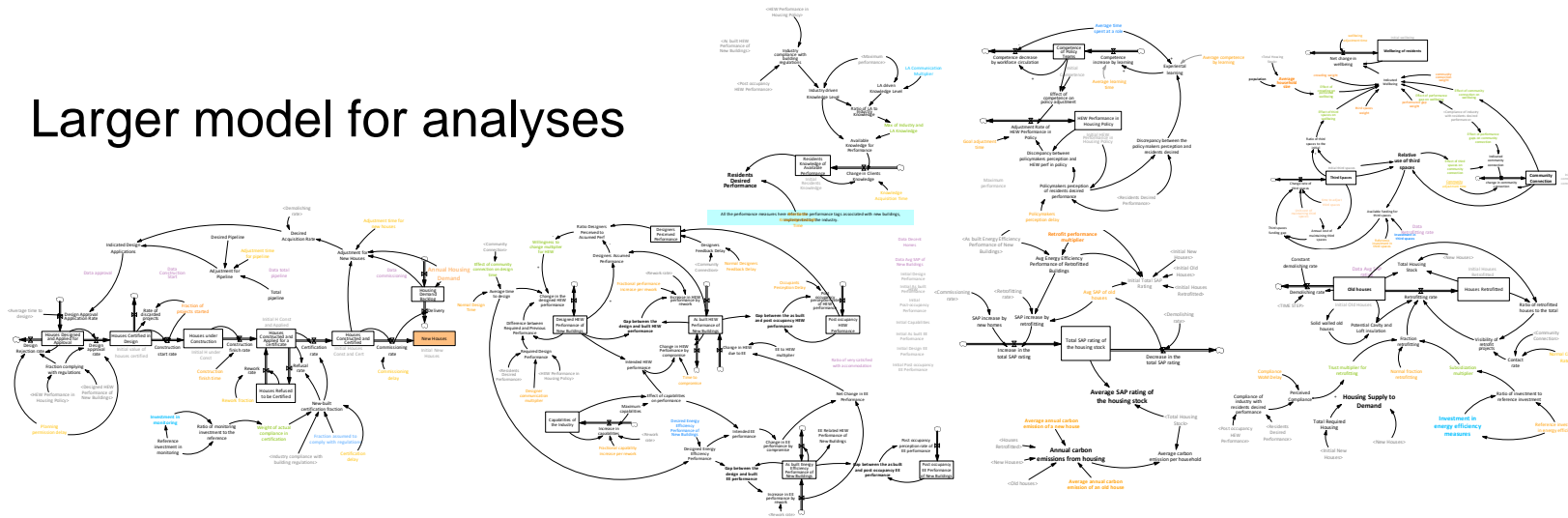
- Small model for interactive learning environment

Data sources

- Literature

- Longitudinal data (especially for comparison and initial values)

- 3 group model building workshops

BAU simulation: Comparison to historical data
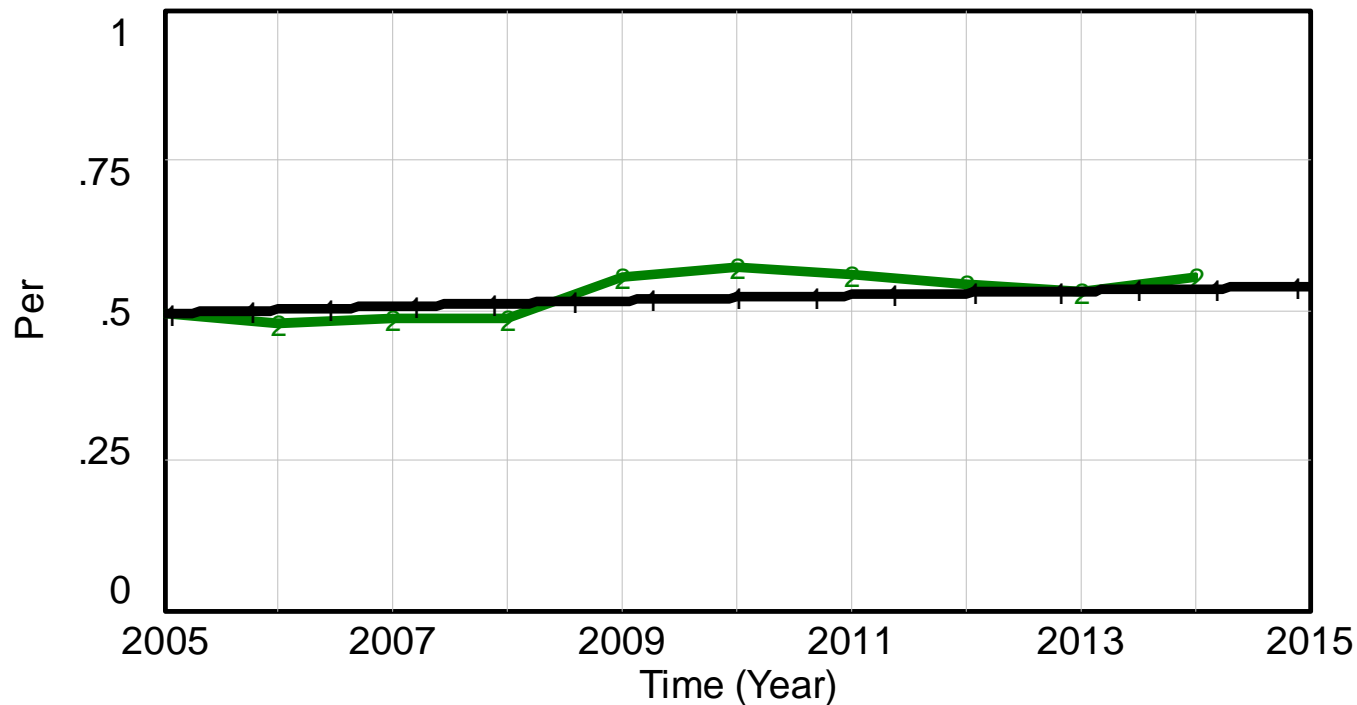# Average Energy Efficiency Performance

Data comparison energy efficiency

Average Energy Efficiency Performance : BAU
Mean SAP Score : BAU
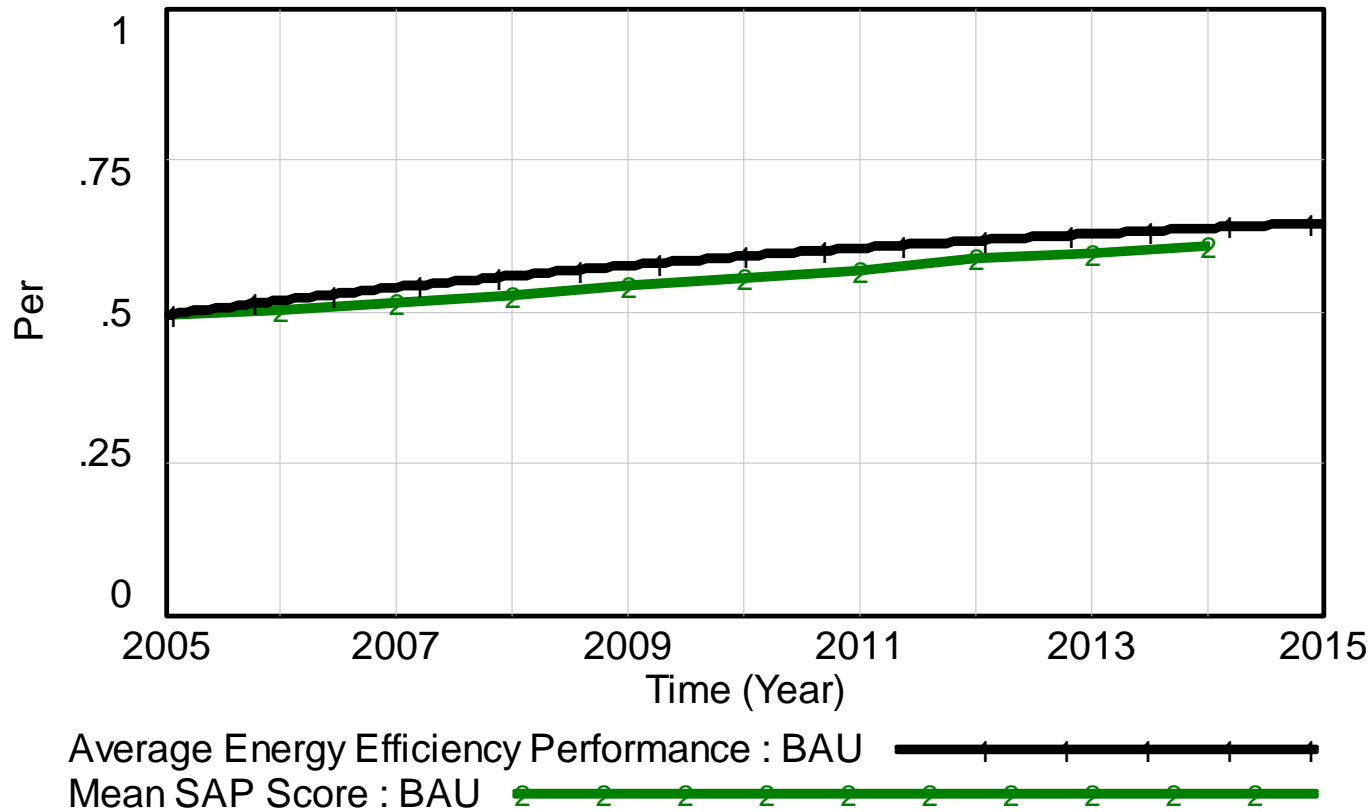
BAU simulation: Comparison to historical data
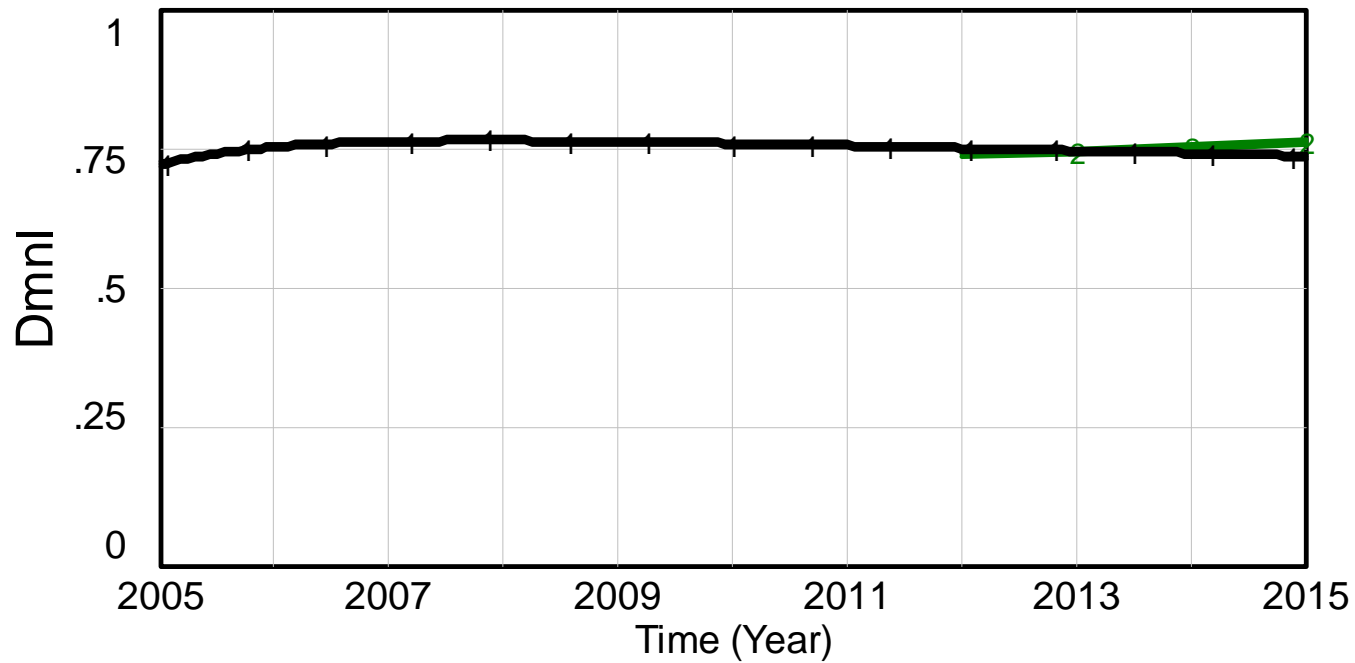# Average HEW Performance of Buildings

Data comparison HEW performance

Average HEW Performance of Buildings : BAU
Ratio of Very Satisfied with Their Accommodation : BAU

BAU simulation: Comparison to historical data
Wellbeing of Residents

Data comparison wellbeing of residents

Wellbeing of Residents : BAU
Data Wellbeing : BAU