

**COMPLEX BUILT
ENVIRONMENT
SYSTEMS**

Integrated decision-making about housing, energy and wellbeing (HEW)



Welcome

- Complex Built Environment Systems group (CBES) at UCL
 - Bartlett School of Graduate Studies
 - UCL Energy Institute
- EPSRC Platform Funded Group – ‘Unintended Consequences of Decarbonising the Built Environment’
- HEW project is a small pilot project – seed funded by the Platform Grant
- Recap
- What have we been doing since the first workshop in June?
- Housekeeping

Our starting point

- What will be the overall impact of policies aimed at reducing the energy demand and carbon emissions of dwellings?
- We know from history that single focus policies lead to ‘unintended’ effects
- Lots of examples




What can we learn from such examples?

- It is inevitable that policies such as the Green Deal and Energy Company Obligation (ECO) will lead to ‘unintended consequences’
- Some will be positive and others negative



- Shrubsole C, Macmillan A, Davies, M., May N. 100 unintended consequences of policies to improve the energy efficiency of the housing stock. *Indoor and Built Environment* (under review).

Example: consequences of increasing dwelling airtightness

A	B	C	D	E	F	G	H
No	Policy Impact on Buildings			Impacts on People/ Nature		+/-	Reference
				Unintended Consequence	Domain		
1	Airtightness		Quieter Environment	Peace/Wellbeing / Security	Mental Health Psychological Well Being	+	Sanz et al., 1993. Van Kempen 2012 D,E,F
2	Airtightness		Quieter Environment	Isolation/ Disconnection	Mental Health Psychological Well Being	-	Lorenc et al., 2012 D,E,F
3	Airtightness		Quieter Environment	Anxiety: real and perceived threats	Psychological Well Being	-	Lorenc et al., 2012 D,E,F
4	Airtightness		Quieter Environment	Reduction in Noise	Mental Health	+	Evans, 2003; Kempen et al., 2012. D,E,F
5	Airtightness		Quieter Environment	Absence of sound	Mental Health	-	Evans, 2003; Kempen et al., 2012. D,E,F
6	Airtightness		Quieter Environment	Improvements in physical health; social, emotional, and behavioural outcomes	Child Development	+	Leventhal and Newman 2010 D,E,F
7	Airtightness	Lower air change rate	Increased RH Timber decay	Increase in HDM and mould, severity of asthma and allergies.	Physical Health	-	Ucci et al., 2011. Viitanen et al., 2010 B,C,D,E,F
8	Airtightness	Lower air change rate	Increased RH Clothes drying issues	Increase in and exposure to microbiological pathogens. And infectious diseases	Physical Health	-	Porteous et al., 2012; Ucci et al., 2011 B,C,D,E,F
9	Airtightness	Lower air change rate	Drying out times (wet trades) Increased RH	Mould-microbiological growth	Physical Health	-	ADF 2010 B,C,D,E,F
10	Airtightness	Lower air change rate	Changes in indoor air quality (IQA)	Increased exposure to indoor sourced pollutants. Decrease in external sourced pollutants (e.g. PM _{2.5}).	Physical Health	+/-	Wilkinson et al., 2009; Bone, 2010; Shrubsole et al., 2012. B,C,D,E,F
11	Airtightness	Additionally More water tight	Prevention of impacts from excess rainfall	Mitigation benefits, less water damage, mould risk	Physical Health	+	SNACC, 2012 B,C,D,E,F





“...progress on sustainable construction is slipping behind on all fronts – largely because there is lack of drive and focus in the Government, with clear tensions and differing priorities between The Department of Energy and Climate Change, Department for Communities and Local Government, Department for Business, Innovation and Skills and Treasury...” p.12

So, how to proceed?

- How to predict the possible future states of such complex systems?
- A different approach
- One that will provide insights regarding decarbonisation
- But, vitally, moving beyond this ‘single issue’ to also allow insights regarding integrated decision making about the wider system of housing, energy and ‘wellbeing’.



HEW:

Integrated decision-making about **Housing**, **Energy** and **Wellbeing**

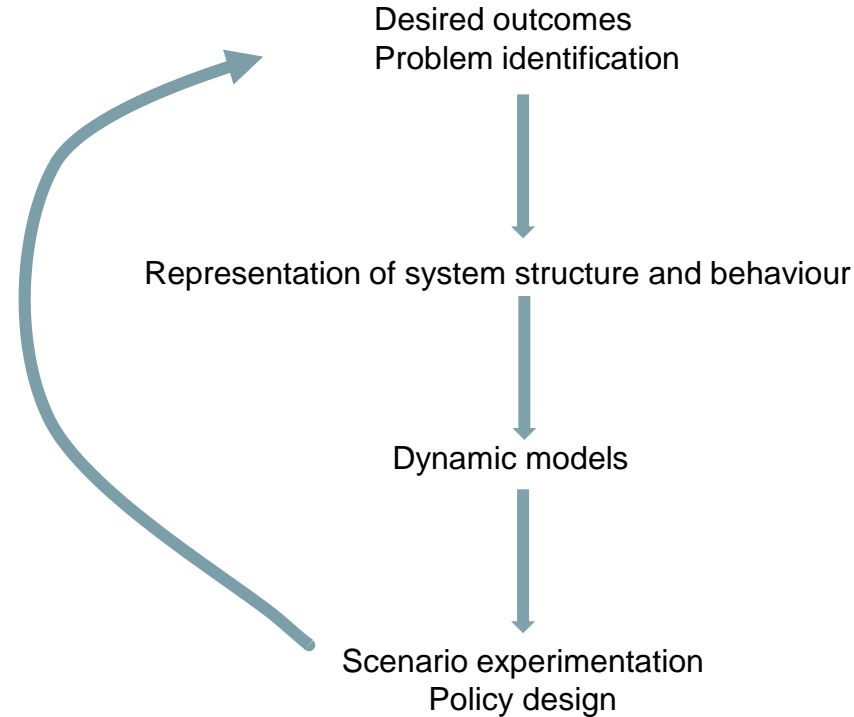
“When we point to outside shocks and side effects to excuse the failure of our policies, we think we are describing a capricious and unpredictable reality. In fact, we are highlighting the limitations of our mental models. . . .What thwarts us is our lack of a meaningful systems thinking capability.”

Sterman 2002

- A useful set of integrated maps and policy simulations
- And a policy assessment tool to support decision-making



Developing the maps, the simulation and the assessment tool



Adapted from Saeed 1992 System Dynamics Review

“Wellbeing” and housing

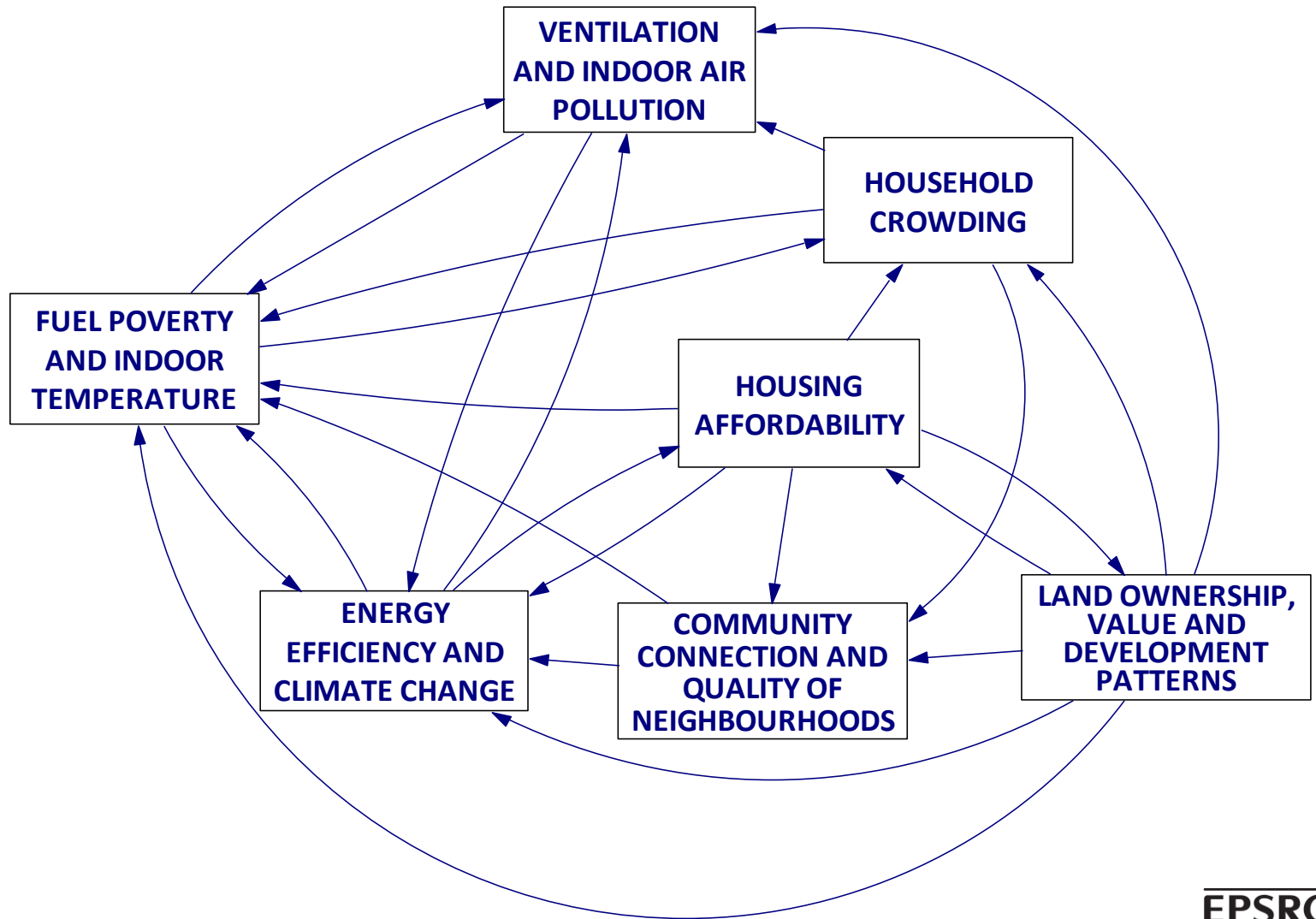
- Social and cultural wellbeing and community connection
- Physical health
- Mental health, homeliness and happiness, stress
- Local economic thriving, household income and employment, a stable economy
- Adaptation and mitigation of climate change
- Sustainable resource use

Fair distribution of these, including by income, ethnicity and generation/life stage

Criteria for assessing policies about housing

1. carbon emissions from housing
2. community social connection
3. fuel poverty
4. housing adaptation to climate change
5. housing affordability
6. mental and emotional wellbeing
7. physical wellbeing / health
8. policy coherence
9. social and income equity

Themes from the interviews



Workshop 1



What have we done since Workshop 1?

- Listened to feedback in order to shape today
 - e.g. spend some time considering the draft collaborative maps and the draft report
- Refined the collaborative maps
- Developed a simplified overall model
- Developed and circulated the draft report
- Finalised and agreed policy assessment criteria
- Begun to scope out data sources to develop concept models
- Started to get the concept modelling underway
- Continued to bring in new stakeholders

Stakeholders

AECOM	Department for Communities and Local Government	New Economics Foundation
Affinity Sutton	Department for Environment, Food and Rural Affairs	Parity projects
Age UK	Department of Energy and Climate Change	Positive Money
ARUP Consultancy	Department of Health	Public Health England
Centre for Regional Economic and Social Research, Sheffield Hallam University	EDF Energy	Sheffield City Council
Centre for Sustainable Energy (CSE)	Energy Institute, University College London	Shelter
Centre for Sustainable Planning and Environments University of the West of England	Environmental Change Institute and UKCIP, University of Oxford	Sustainable by Design
Chartered Institute of Building Services Engineers	Good Homes Alliance	Sustainable Healthcare Network/Sustainable Development Foundation
Community roots group	Government Fuel Poverty Advisory Group	Usable Buildings Trust
Consumer Focus	Greater London Authority	Willmott Dixon
Core Cities	Homebuilders Federation	Zero Carbon Hub
Department for Business, Innovation and Skills	Leeds Sustainability Institute, Leeds Metropolitan	

Shape of the day

1:30 Welcome and recap

2:00 Developing recommendations for the report

2:45 What can we learn from small simulations?

3:15 Break for tea, coffee and snacks

3:30 Using the collaborative maps to assist with decision-making

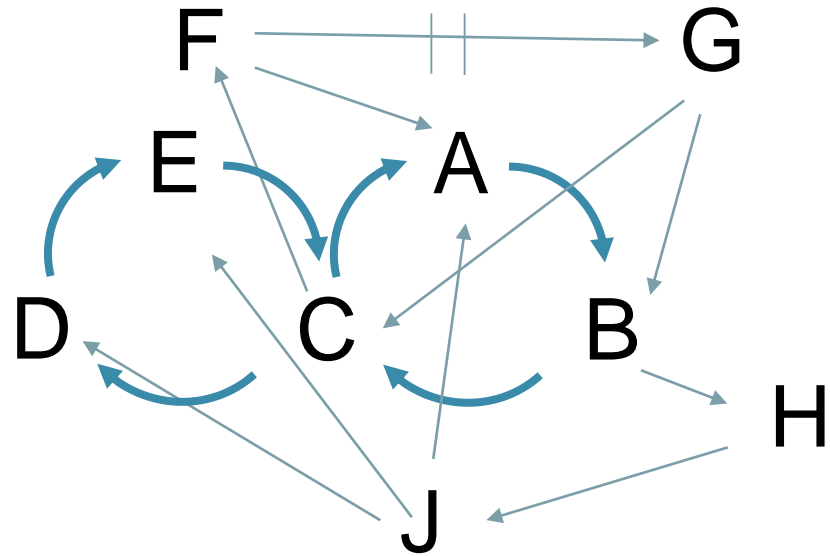
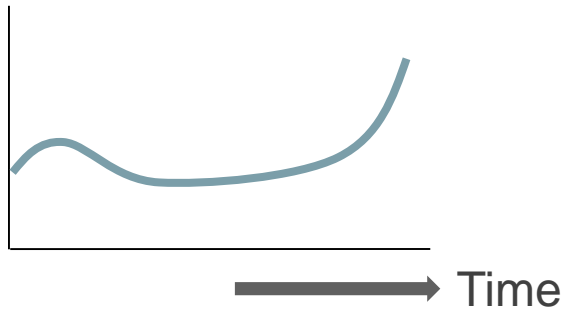
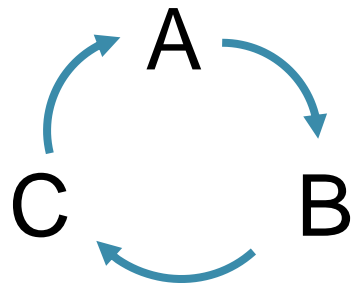
4:50 Summary, evaluation, next steps

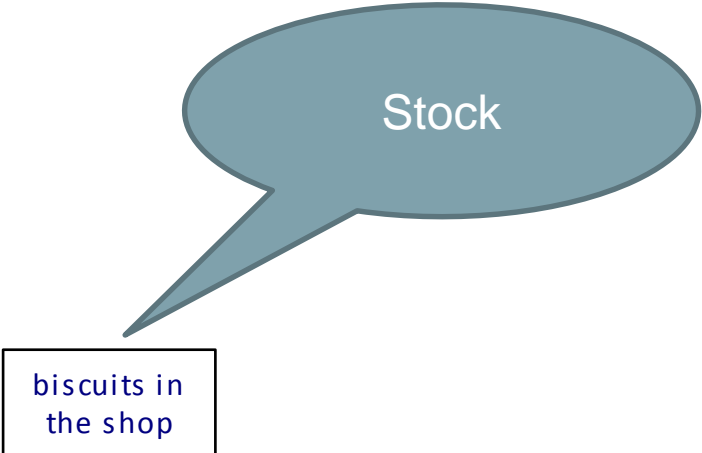
5:00 Join us for drinks and networking until 6:00

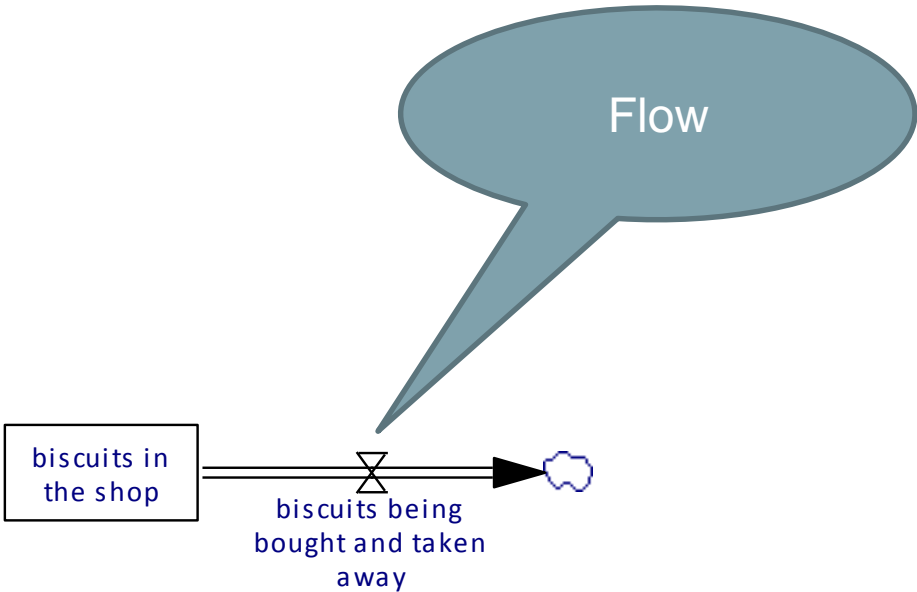
Guidelines for today

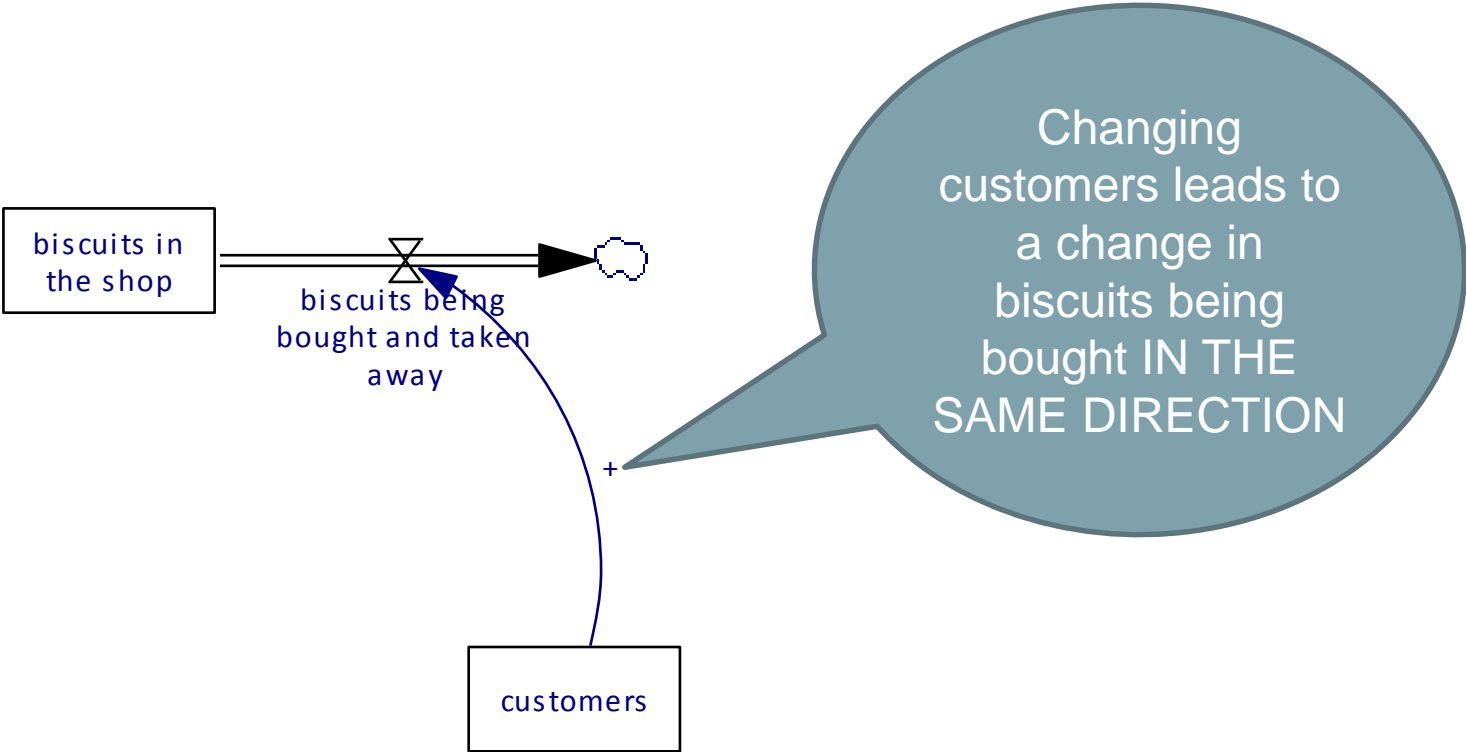
1. We will stick to time
2. Please switch your mobile off
3. We would like everyone to participate
 - Short contributions, one at a time
4. All ideas are valid
 - a. we want to hear a wide range of opinions
 - b. Listen to each other – disagree agreeably
5. We will use the discussion
 - a. We want to capture the essence of what you have to say
 - b. We will summarise the workshop on the website and to stakeholders
 - c. Everyone should feel free to use and debate things discussed today **but** without attaching what's been said to any individual

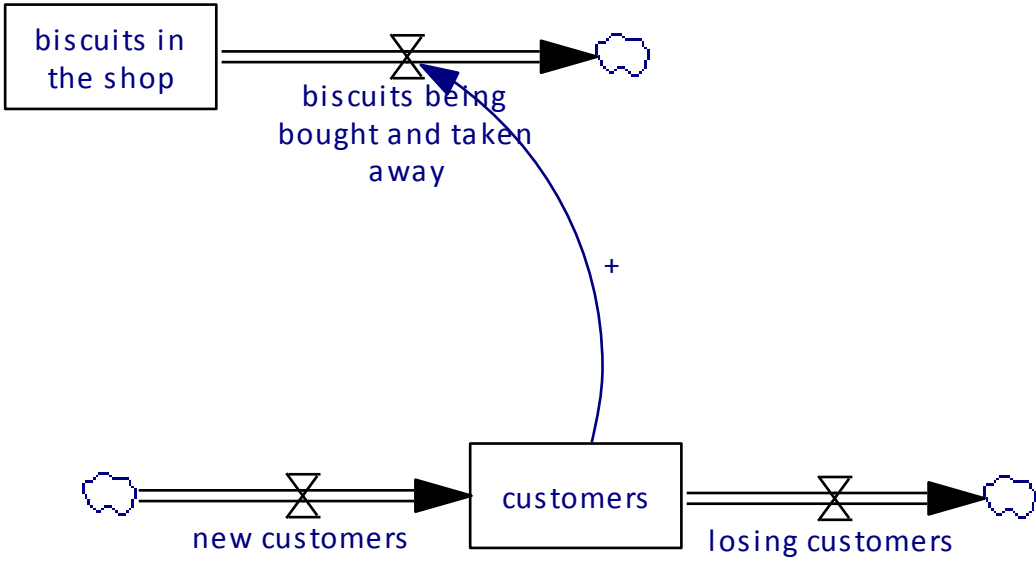
Dynamic systems thinking

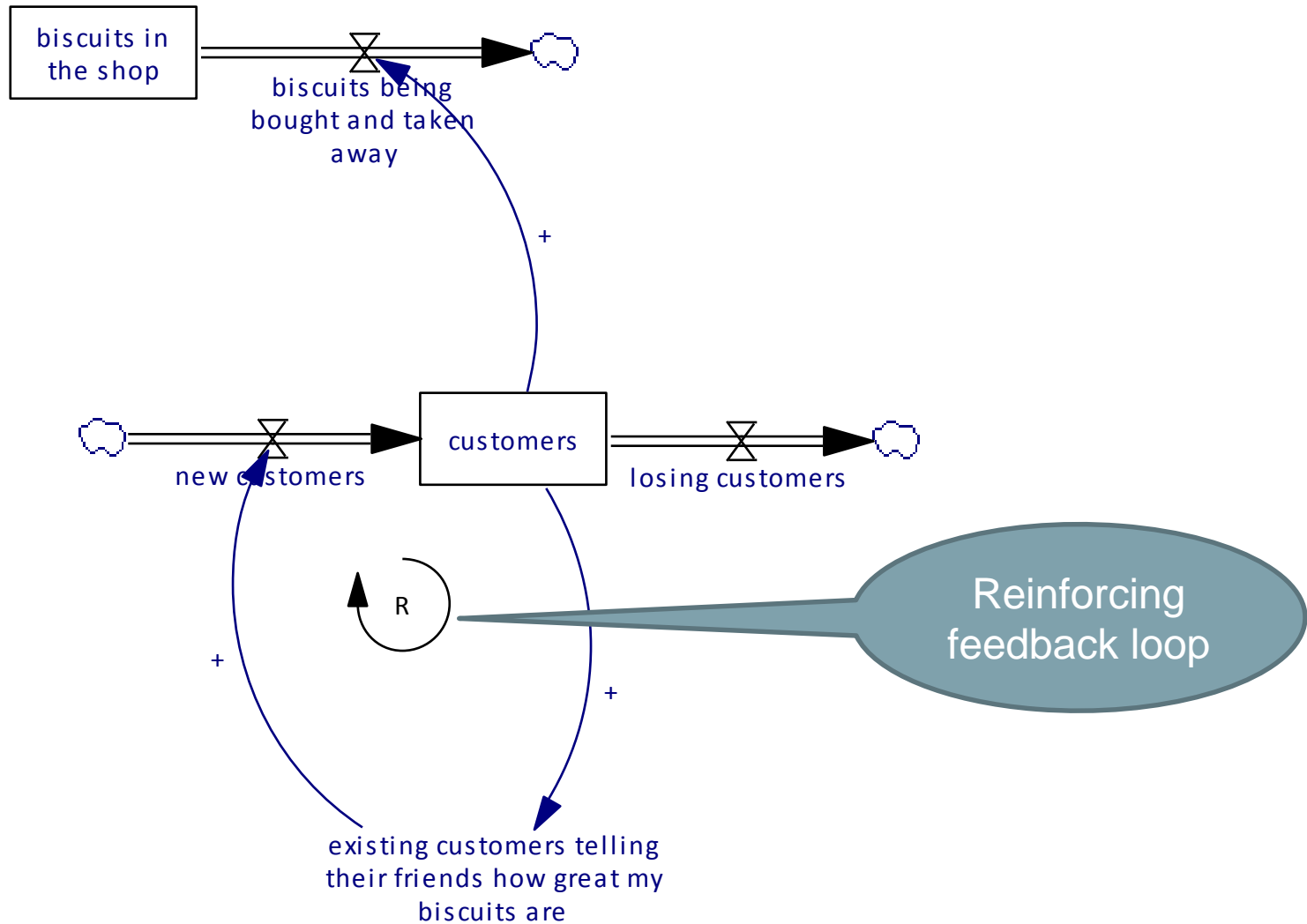


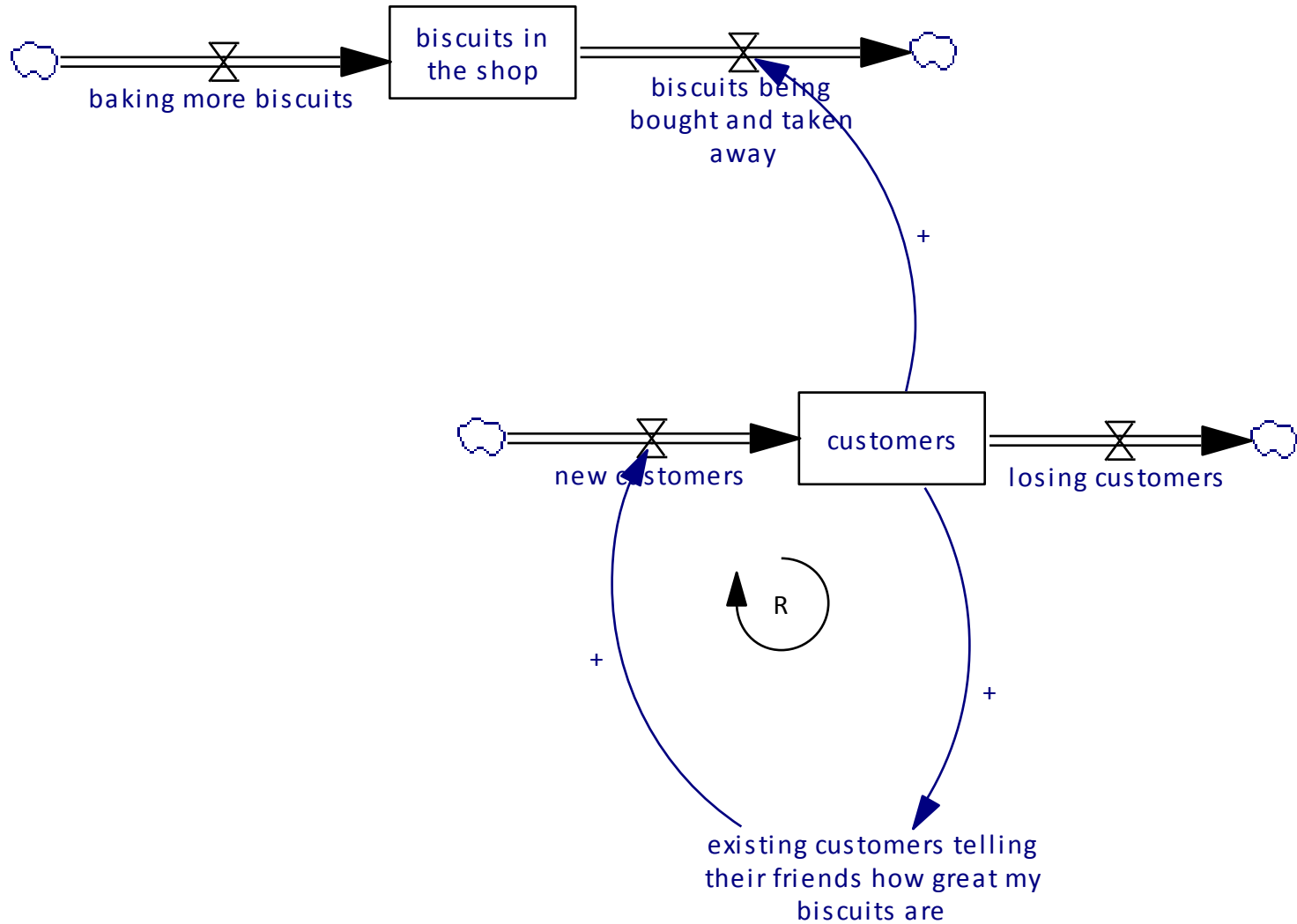




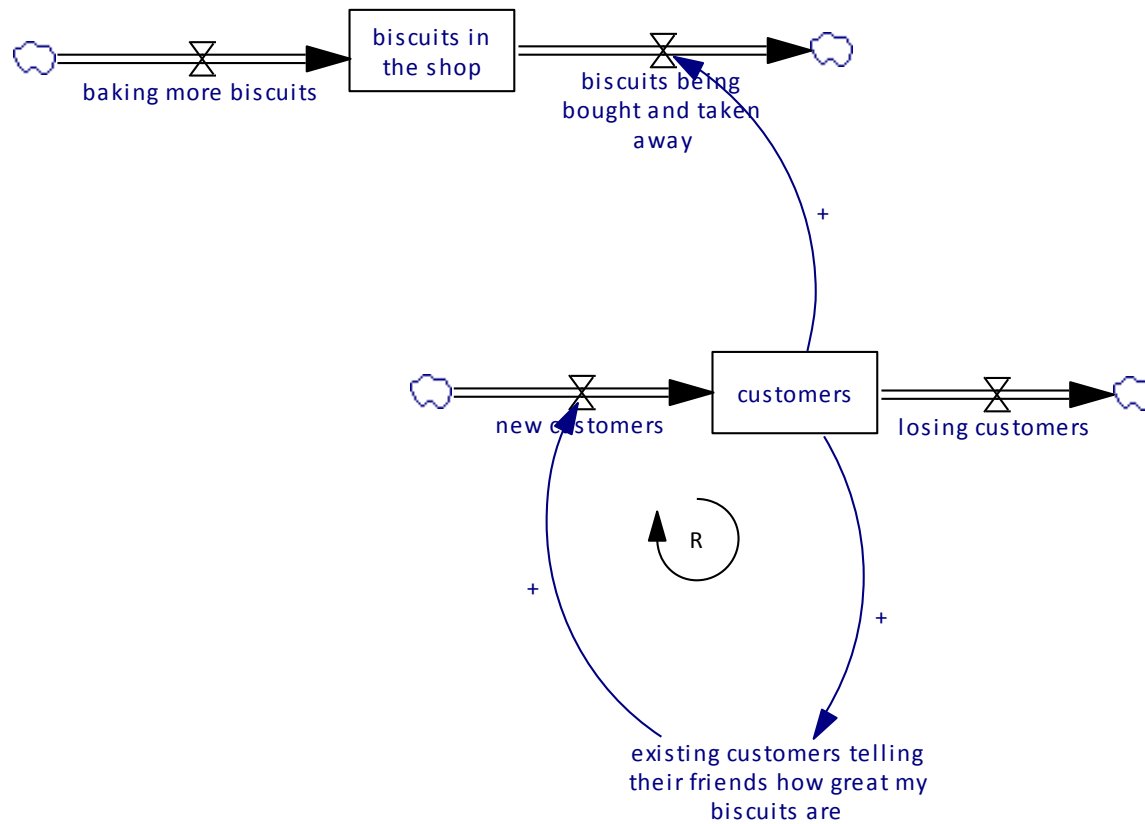


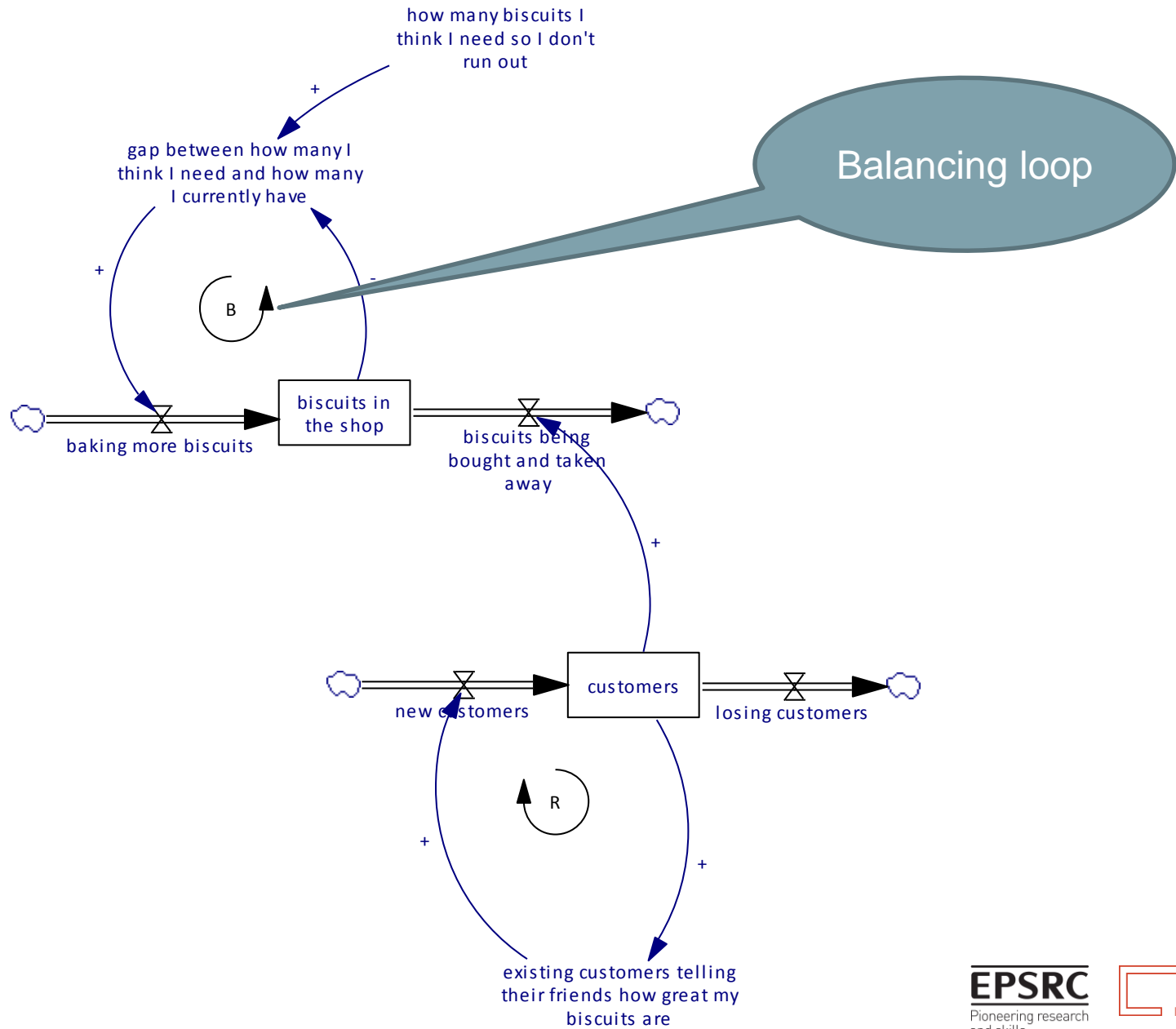




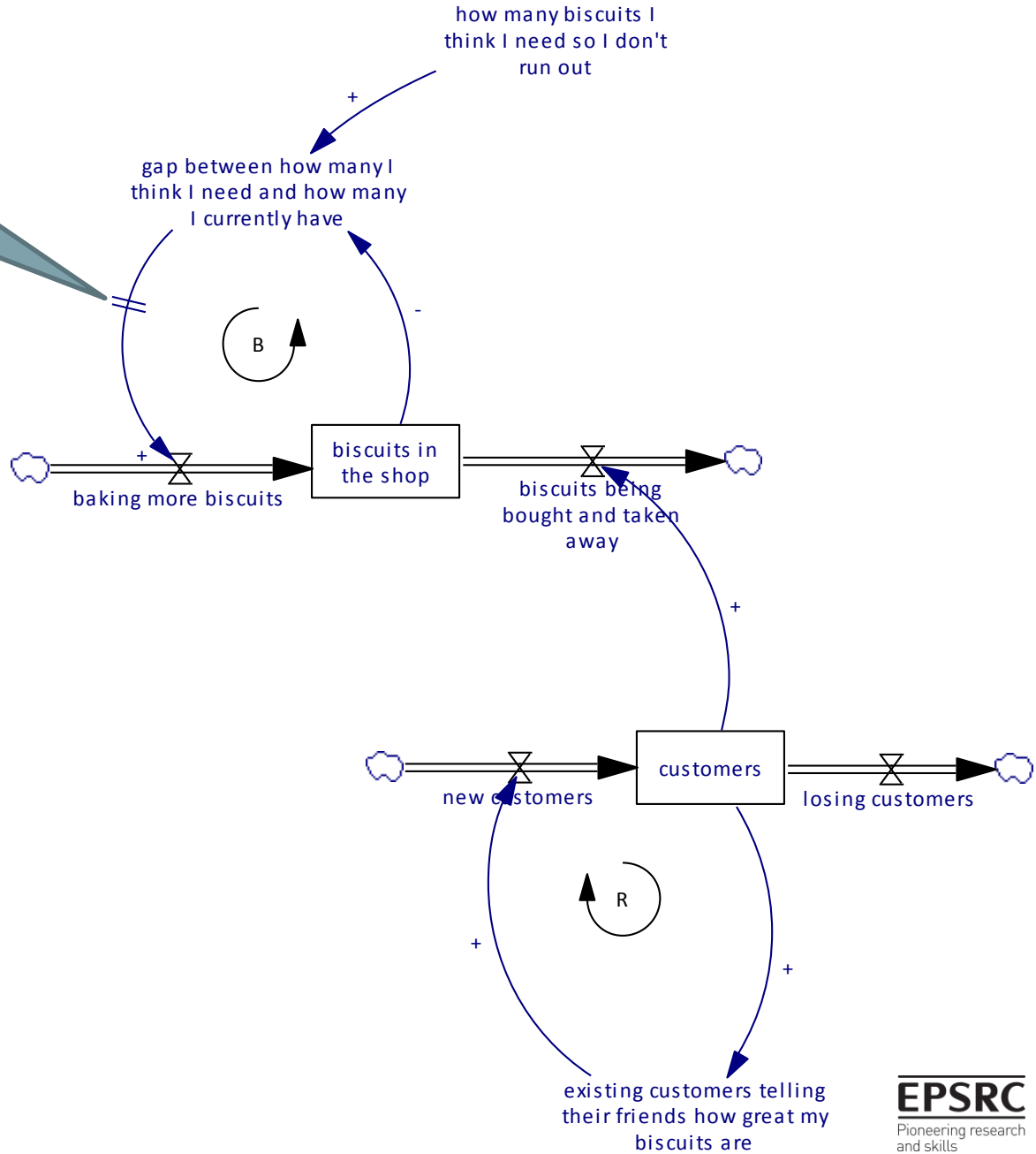


how many biscuits I think I need so I don't run out





Delay





Session 2

Developing recommendations for the report



Places to intervene in a system

5. Numbers, constants and rates of flow
4. Feedback loops, time and information delays
3. The system rules
2. Capacity of actors to change and evolve
1. Paradigms and ideological constraints



Example recommendation

With a specific focus on the decarbonisation of the housing stock:

The rapid establishment of a cross Government group (including at least DECC, DCLG, BIS and Treasury) to enable the development of a relevant and meaningful systems thinking capability. The group would be supported by an Advisory Committee which could perhaps fall under the Green Construction Board (if it is to continue*).

- Process recommendation to government departments
- Recommendation for within the next 4-6 months
- Increases the capacity for policy actors to change and evolve

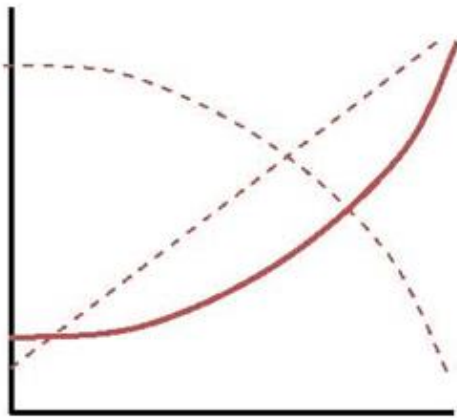
* *“If it is to continue, the Green Construction Board needs to be reconfigured and given real teeth in order to genuinely impact policy.”* (APPG for Excellence in the Built Environment, 2013)



Session 3

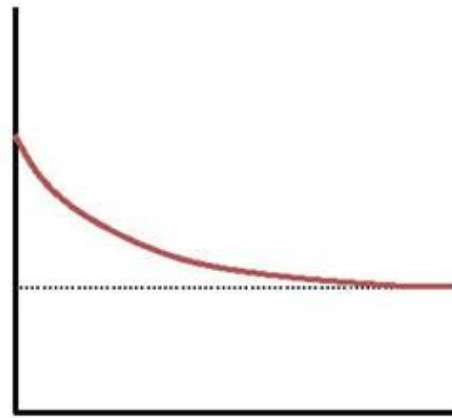
What can we learn from small simulations?

Behaviour over time



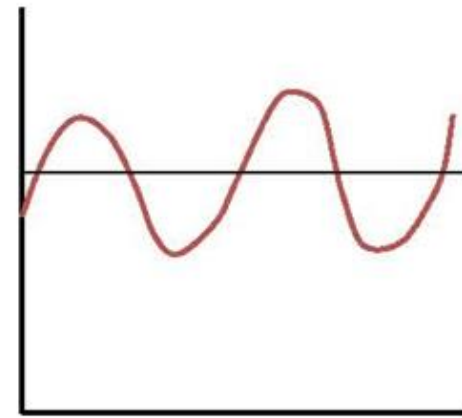
Time

Exponential growth



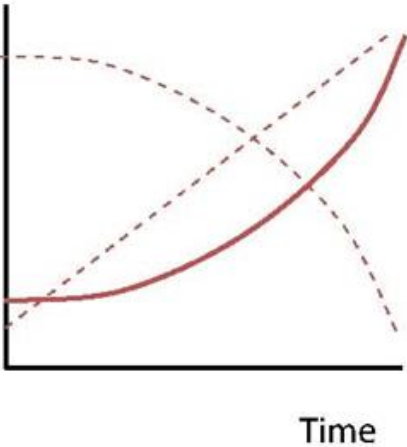
Time

Goal-seeking

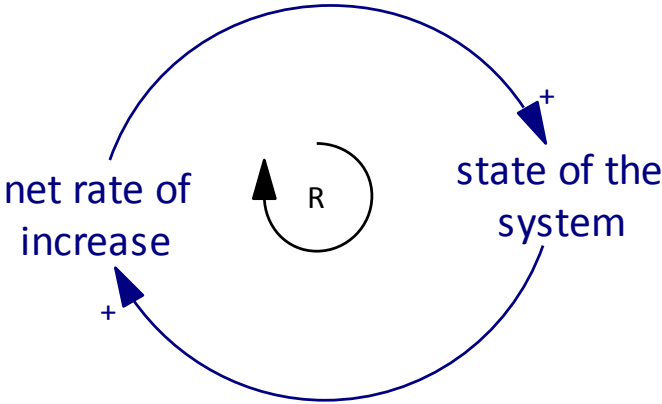


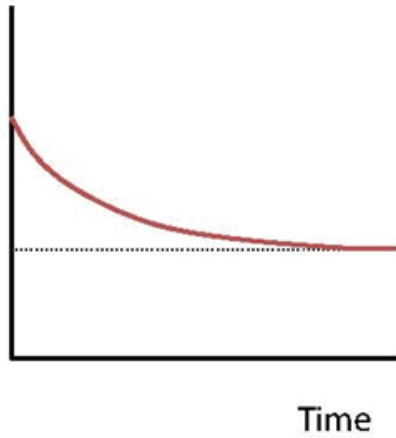
Time

Oscillation

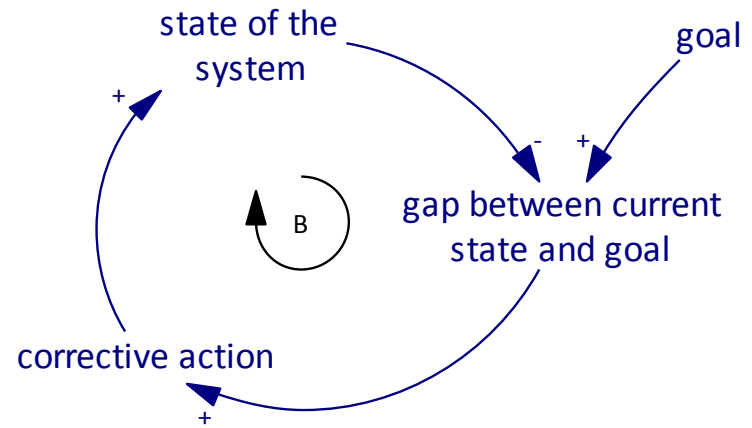


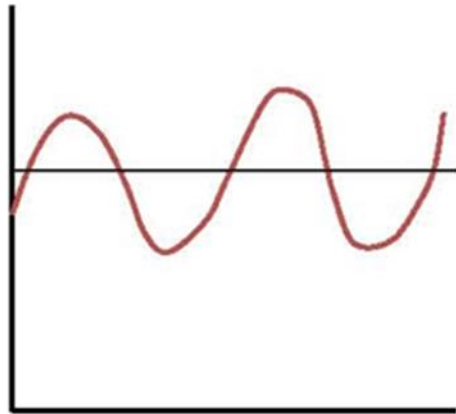
Exponential growth





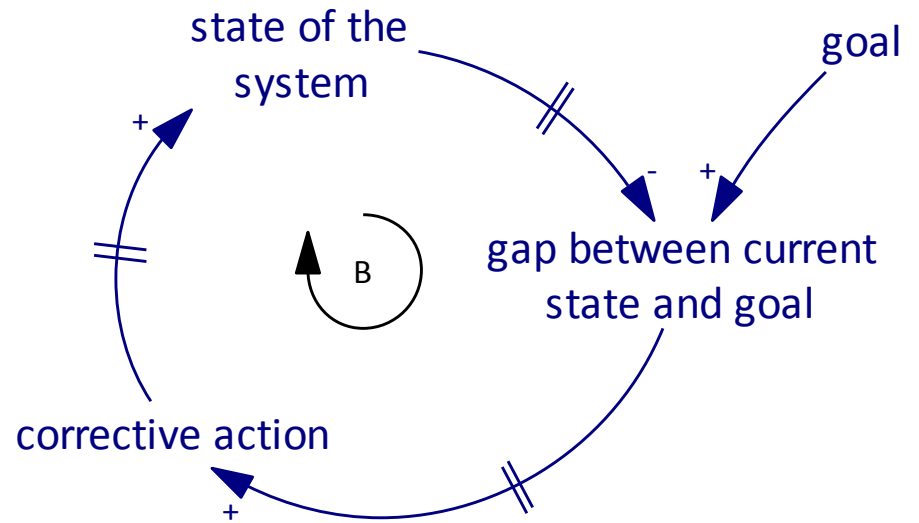
Goal-seeking





Time

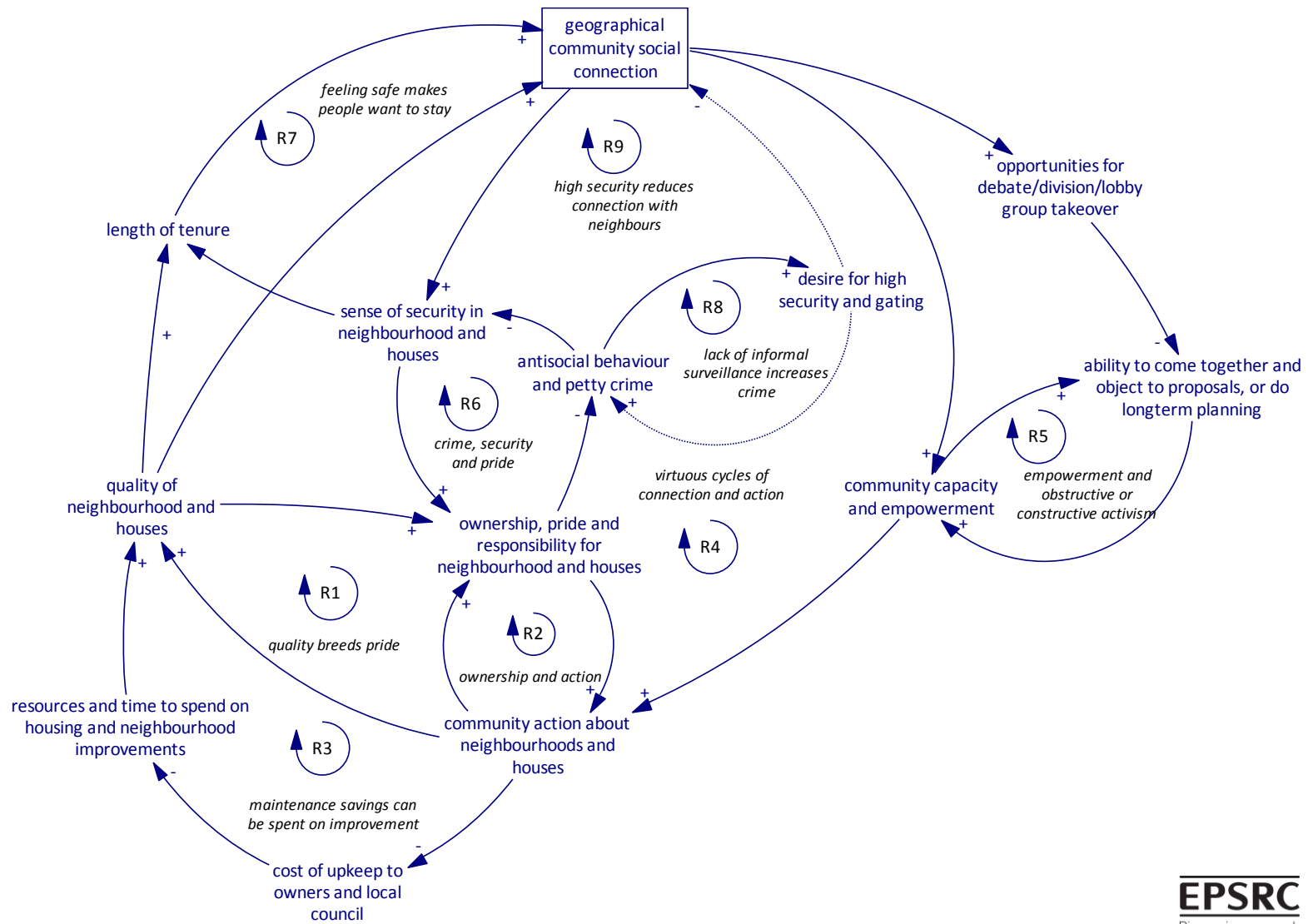
Oscillation



Predicting (divining stick)
Convincing (big stick)
Explaining (pointing stick)
Exploring (walking stick)

Increasing understanding
Supporting better action

Community connection and quality of neighbourhoods



Different kinds of information to help with simulations

Census

Community life survey/citizenship survey

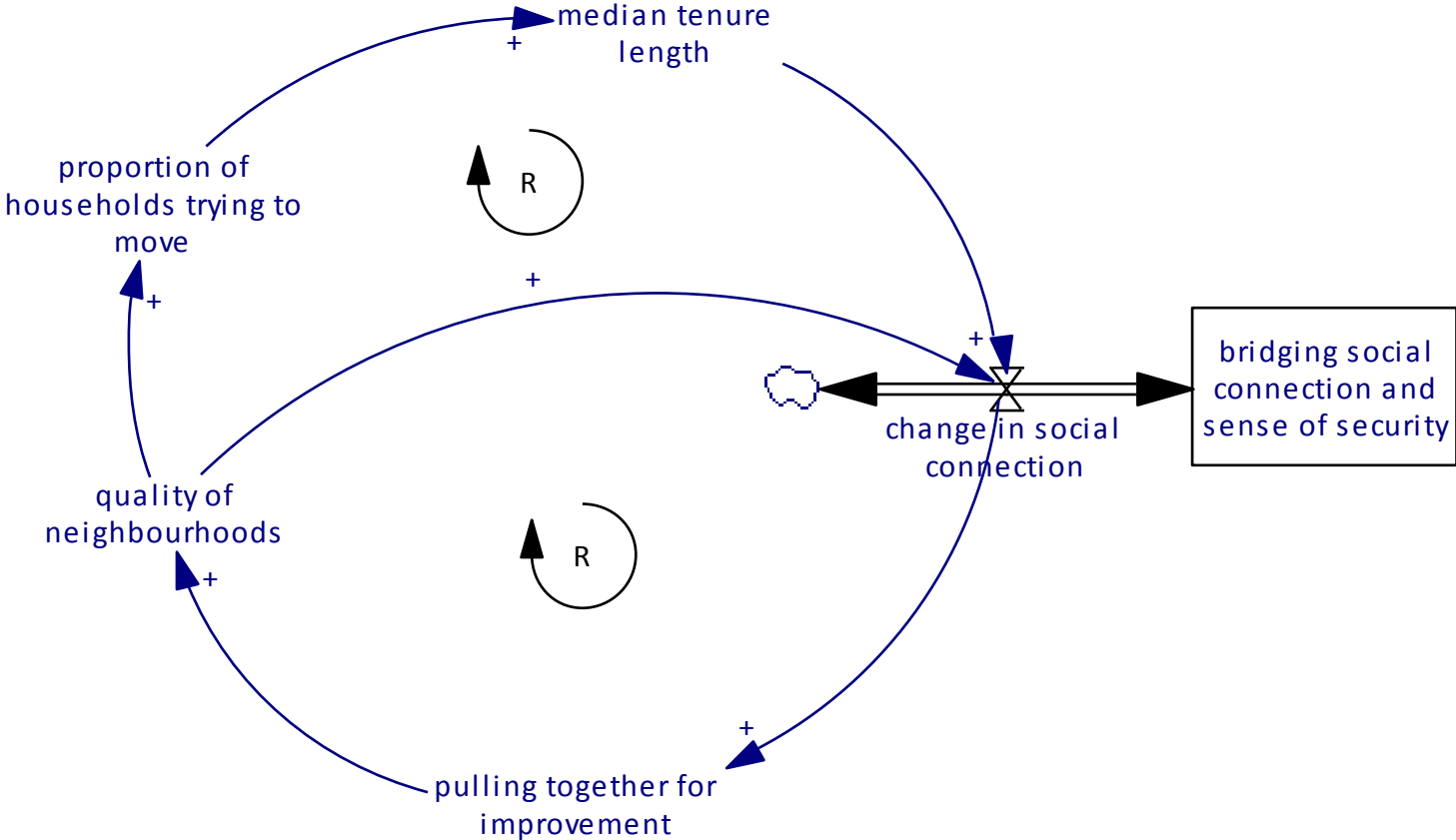
English housing survey

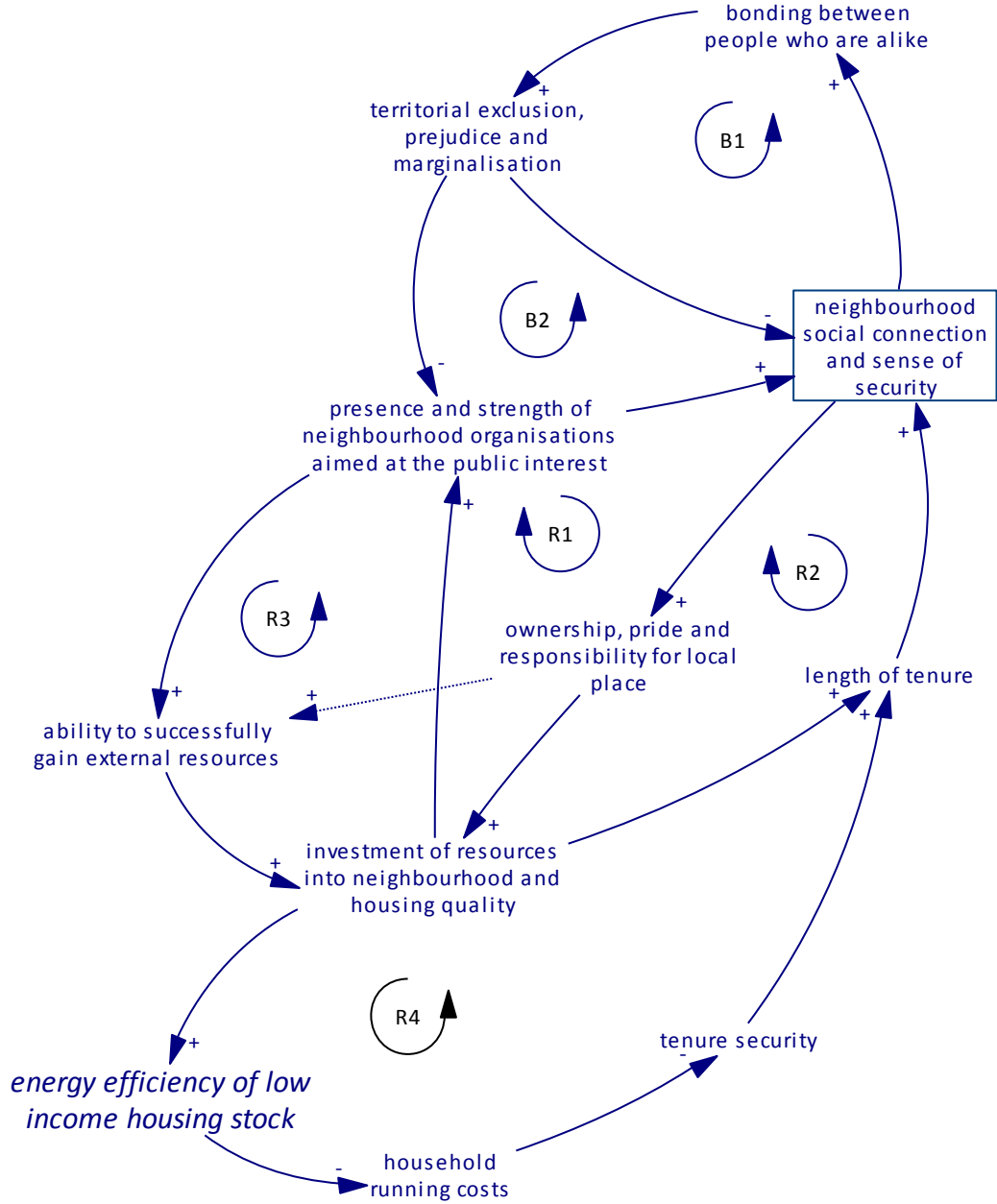
British household panel survey

Studies analysing these surveys

Different kinds of studies collecting and analysing new data

The small simulation model





What can be learnt from the community connection simulation so far?

- Missing balancing loops
- Links that could be refuted
- Strength of links based on current knowledge
- Gaps in knowledge

- Current trends in tenure length are likely to be working against what could potentially be helpful feedback loops for other housing objectives, including carbon emissions



Session 4

Practical use of the collaborative maps



Policy for consideration

“Outlaw” poor energy performing properties from being rented in the private rental sector

Announcement Jan 2014, with 12 months to bring into force

Starting with an energy performance rating below D

Summary of the day

- Revisited the project background
- Developed recommendations for the report
- Learnt about what we might use simulation for and how we would do it
- Explored how the current work can be used to support your roles and move onto a policy assessment tool



Next steps

- Producing the next draft of the report
- Continual causal map refinement
- Insightful pieces of simulation
- Policy development and assessment work 2014

- Using the work so far
-with specific stakeholder organisations

- Programme of research (putting together *transdisciplinary* groups – support from Stakeholders)

Thank you all for participating

