

Bringing together science, policy and design: case study from the City of Leeds

Dr Thomas Knowland

Head of Sustainable Development, Leeds City Council

Dr Catherine Bale

Research Fellow, University of Leeds

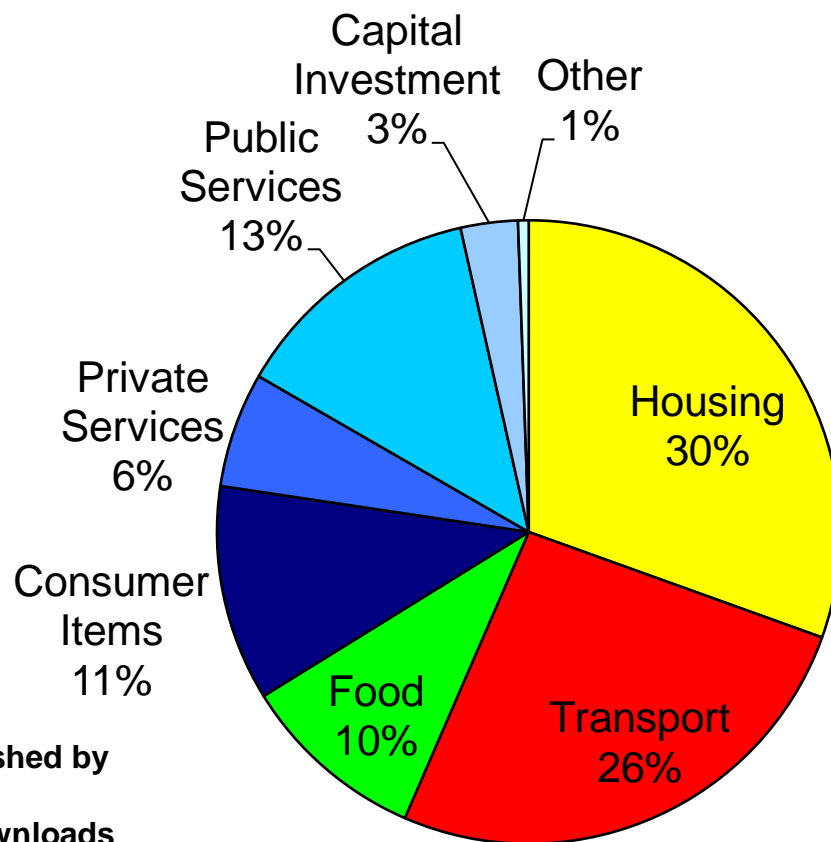
Overview

- ▶ Introduction
 - ▶ City energy decision-making
 - ▶ Research project
 - ▶ Use of complexity science methods
 - ▶ Application of agent-based modelling
 - ▶ Domestic sector
 - ▶ Leeds CC projects
 - ▶ Energy Leeds
 - ▶ Skills for planners
 - ▶ Retrofit for housing
 - ▶ Refuelling (bio) station for large fleet operators
 - ▶ Key points
-

Leeds

- ▶ > 700,000 population
- ▶ 550 km²
- ▶ Second largest metropolitan council
- ▶ 34,380 ha greenbelt – highest in country
- ▶ 7 wards in the 10% most deprived wards in England

2004 carbon footprint (tonnes of CO₂ per capita)

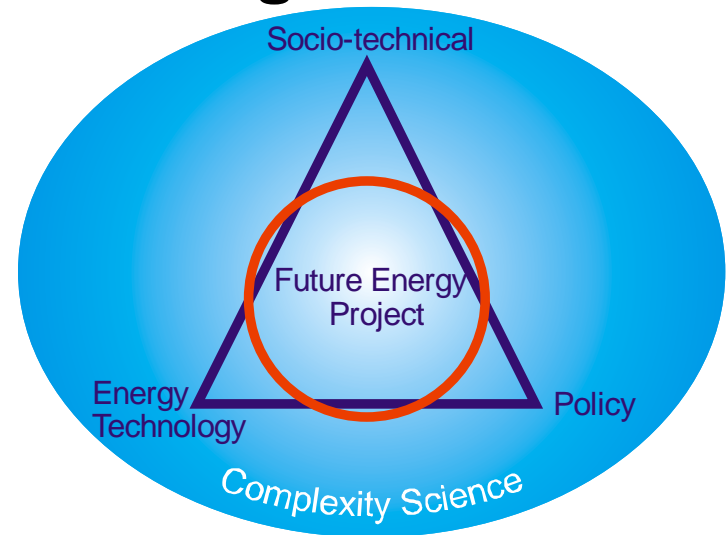


Source: REAP v2 Experimental release: 15-10-08. Published by SEI 2008.
Available at <http://www.resource-accounting.org.uk/downloads>

Research project

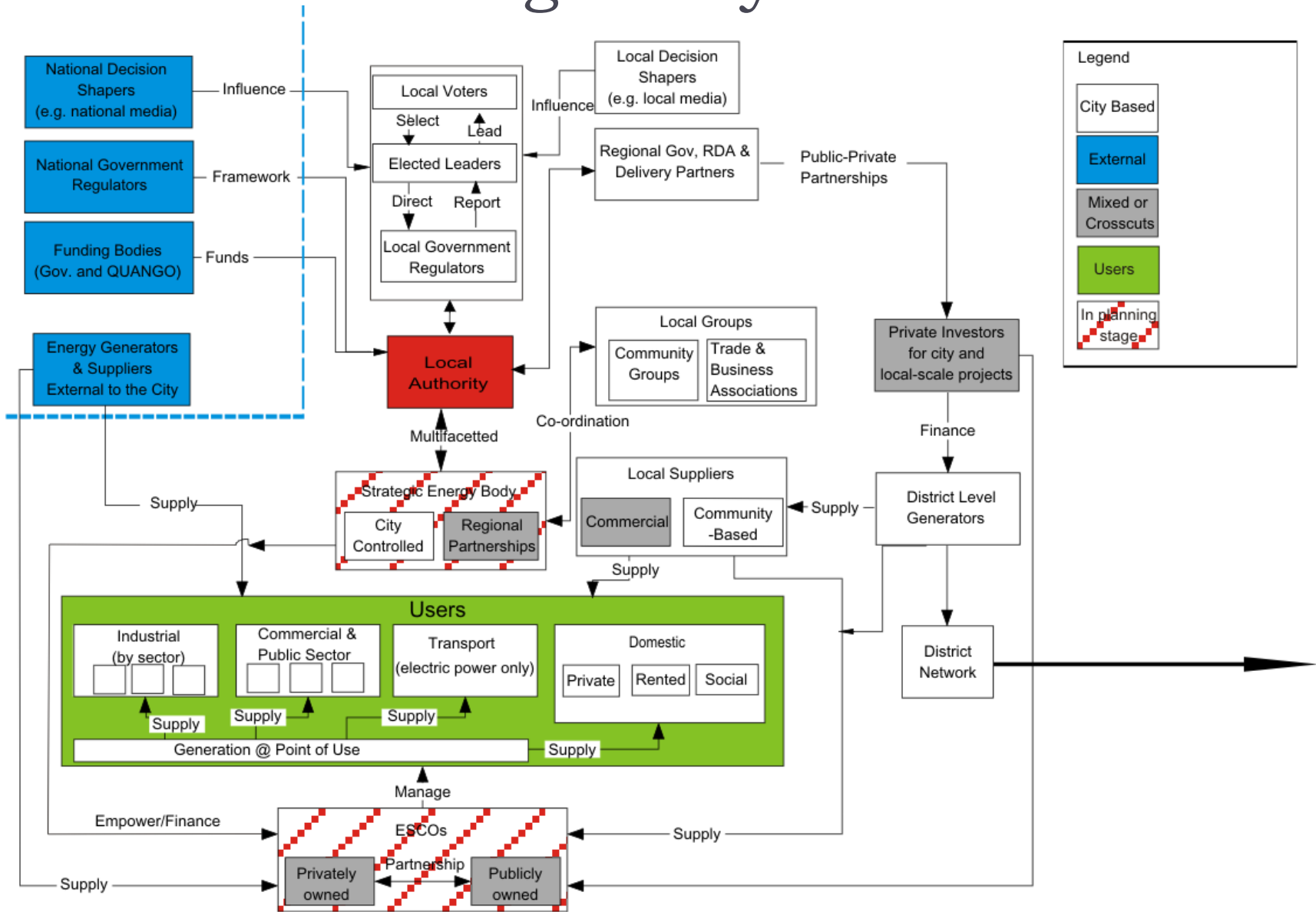
- ▶ ***Future energy decision-making for cities - can complexity science rise to the challenge?***

<http://ima.ac.uk/energy>



- ▶ How can individual cities play their vital role in the implementation of ambitious future UK energy sustainability policies between now and 2020, whilst mitigating conflicts with the local imperatives that until now have dominated local government decision making?

Decision-making at city level



Complexity science

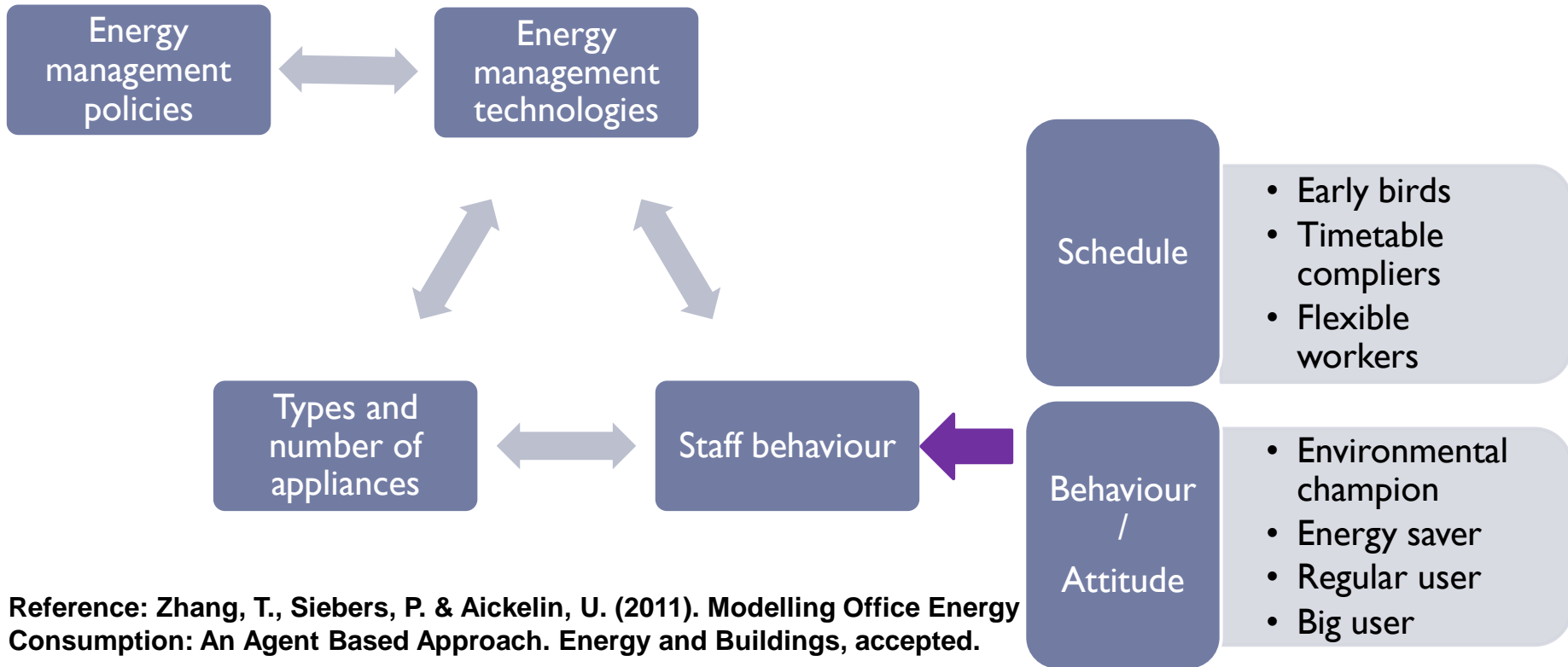
▶ Agent-based models:

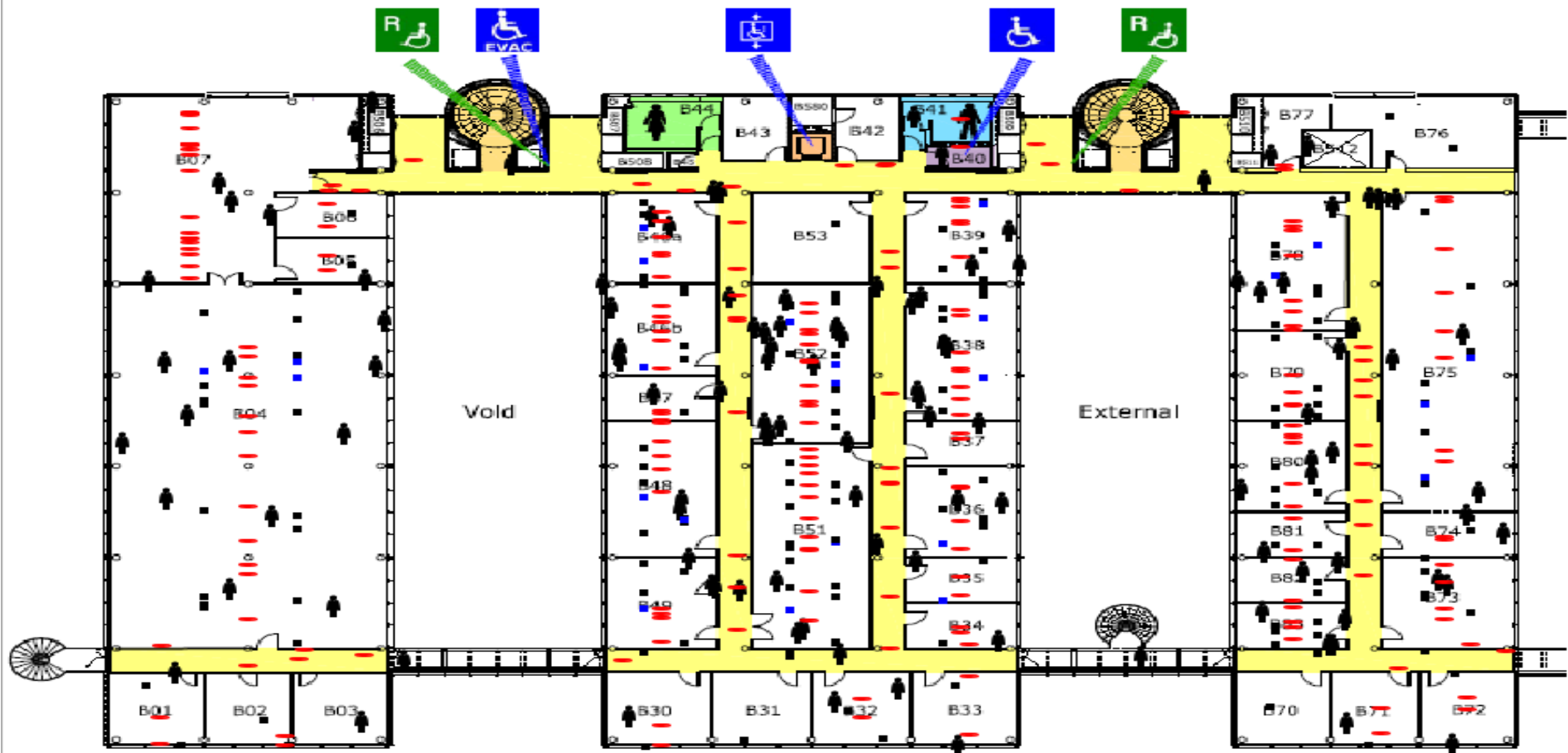
- ▶ Simulate the actions and interactions of autonomous agents;
- ▶ Attribute simple behavioural rules to agents;
- ▶ Use simulation to look at the emergence of system-level behaviour.

❖ **Human behaviours and interactions are key to understanding complex systems.**

Application of ABM

- ▶ Modelling energy consumption in a university office.



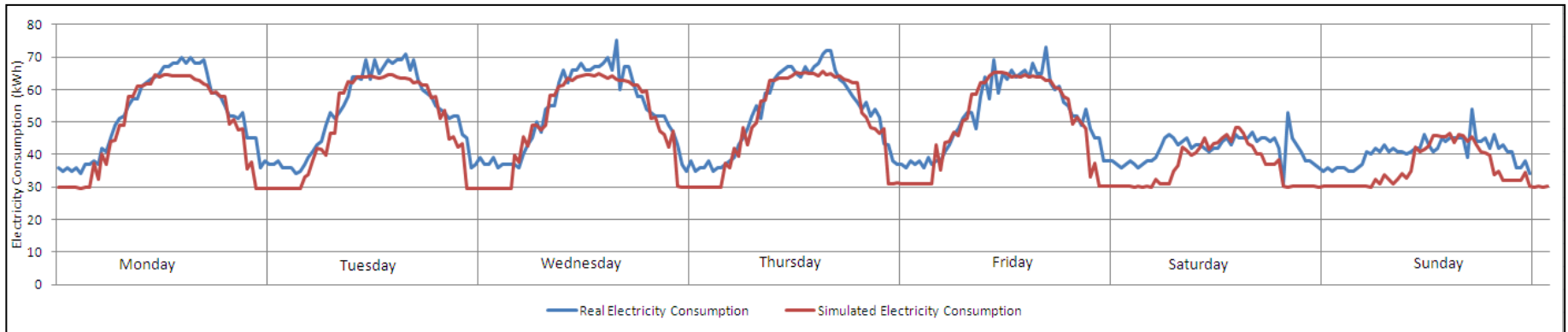


Date: May 12, 2010 5:17:55 PM

- simulationTime 5.199
- hourlySchoolEnergyConsumption 889,812.762
- movesCounter [49]
- dissatisfied 50
- satisfied 38
- offices Office [49]
- users User [213]
- environment 213 agents
- scenario automated threshold 5
- automaticSwitchOffTime 20
- verySatisfied 125
- lights Light [239]
- computers Computer [180]
- dailyEnergyConsumption 24 samples ... [16, 889,812.762]
- initModelStructure
- findOffice
- energyConsumptionCalculation 0.017
- userSatisfactionCount 0.017

Application of ABM (2)

Results of simulation



Can these methods be applied at a city level?

Reference: Zhang, T., Siebers, P. & Aickelin, U. (2011). Modelling Office Energy Consumption: An Agent Based Approach. Energy and Buildings, accepted.

Domestic users: What are the challenges?

- ▶ Socio-technical considerations
- ▶ How do people actually use energy in the home?
 - ▶ Are there specific socio-technical barriers to reducing domestic energy use?
 - ▶ Is it just about education and information? Or wider issues of control and motivation?



How does implementation affect technology adoption?

- ▶ Street-by-street installation of a technology.
- ▶ Focus on hubs (e.g. community centres, influencers) to induce a critical mass of adopters.
- ▶ Random assignment of installation (e.g. respondents to particular campaign).
- ▶ Word-of-mouth propagation (incentive to recommend a friend).

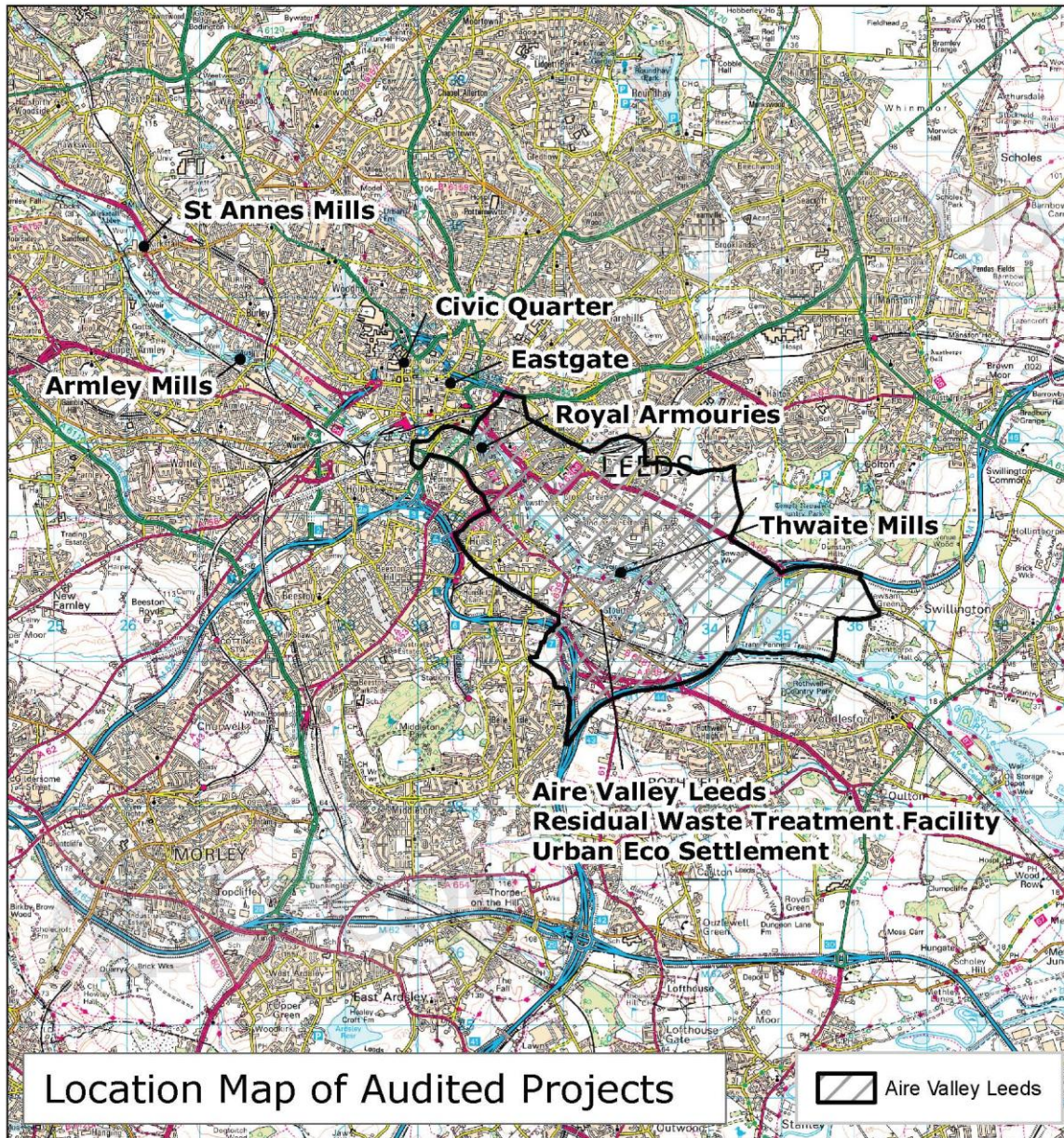
Leeds case studies

- ▶ Illustrate drivers and barriers to implementation
 - ▶ Energy Leeds
 - ▶ Skills for planners
 - ▶ Housing retrofit projects
 - ▶ Refuelling station for biofuels

Energy Leeds: Need

- ▶ No local energy policy
- ▶ No local agency with responsibility
- ▶ Low carbon energy future





This map is based upon the Ordnance Survey's Digital Data with the permission of the Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution of civil proceedings. Crown Copyright. All rights reserved. Leeds City Council O.S. Licence No. - 100019567 - 2010. SCALE 1:83000 @A4

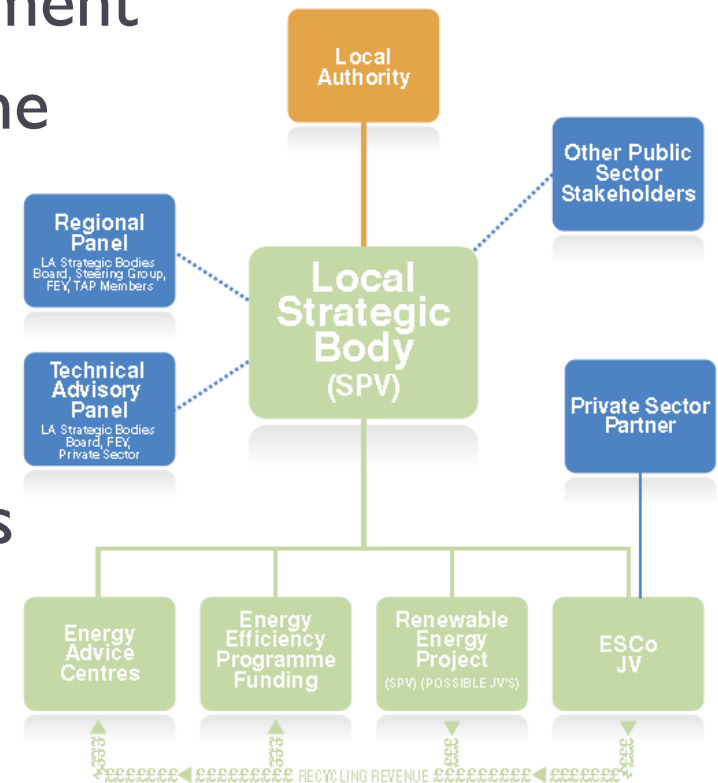


Energy Leeds: Aims

- ▶ **Strategic**
 - ▶ Leadership
 - ▶ Co-ordinate projects and policy
 - ▶ Research and develop infrastructure
- ▶ **Technical**
 - ▶ Advice and guidance
 - ▶ Supporting planners

Energy Leeds: Aims (2)

- ▶ **Financial**
 - ▶ Channel for funding and investment
 - ▶ Attract, hold and recycle income
 - ▶ Brokering and providing advice
- ▶ **Project Management**
 - ▶ Initiate and develop projects
 - ▶ Establish partnerships and SPVs
 - ▶ Recycle revenues



Energy Leeds: Barriers / Risks

- ▶ Financial
- ▶ Expertise
- ▶ Attracting finance for projects
- ▶ Opportunity cost

Energy Leeds: Way forward

- ▶ Continue to develop concept and project
- ▶ Seek funding
- ▶ Explore delivery options (in house, shared service, joint venture?)

Climate Change Skills Fund: Need

- ▶ National fund to accompany PPS I
- ▶ Facilitating delivery of renewable energy
- ▶ Training for local authorities
- ▶ Promoting community engagement

Skills: Aims

- ▶ Four project areas:

- ▶ Leadership, skills and support service
- ▶ Best practice hub
- ▶ Heritage assets and low carbon renovation
- ▶ Community engagement programme

Skills: Barriers

- ▶ Questionnaire identified
 - ▶ Lack of consistent approach between disciplines
 - ▶ Need to inform implementation / construction of renewable energy projects
 - ▶ Planning for low carbon economy
 - ▶ Viability
 - ▶ Lack of technical expertise

Skills: Way forward

- ▶ Develop and commission training modules
- ▶ Continue to research and publish best practice
- ▶ How to resource technical expertise?

Housing retrofit

- ▶ Schemes to improve carbon performance of housing stock through installation of solar PV panels on council-owned homes and provision of free insulation
- ▶ Feed In Tariffs
- ▶ Utility CERT funding



Housing retrofit: Aims

- ▶ Reduce emissions from housing stock
- ▶ Reduce fuel poverty
- ▶ Improve home energy efficiency
- ▶ Contribute to low carbon energy infrastructure
- ▶ Job creation and retention of money in local economy

Housing retrofit: Barriers / Risks

- ▶ Time limited FIT payments
- ▶ PV not suitable for all properties
- ▶ Procurement
- ▶ Council contributions

Housing retrofit: Way forward

- ▶ PV scheme to commence March 2011 and complete before April 2012
- ▶ Insulation scheme more difficult to secure funding
- ▶ Scope for wider, Yorkshire approach

Biofuel refuelling station: Aims

- ▶ Trial of gas powered RCVs
- ▶ Delivering annual savings of 60% CO₂ and £4.5k over diesel alternatives
- ▶ Need a permanent refuelling facility
- ▶ Potential to attract other large fleet operators

Biofuel refuelling station: Barriers / Risks

- ▶ Funding for refuelling station
- ▶ Opportunity costs associated with grants
- ▶ Not learning from pilot experience
- ▶ Costs of replacement or reconverting vehicles

Biofuel refuelling station: Way forward

- ▶ Decision taken to procure refuelling station
- ▶ Opportunity to develop facility for other large fleet operators
- ▶ Opportunity to generate biofuels from city waste

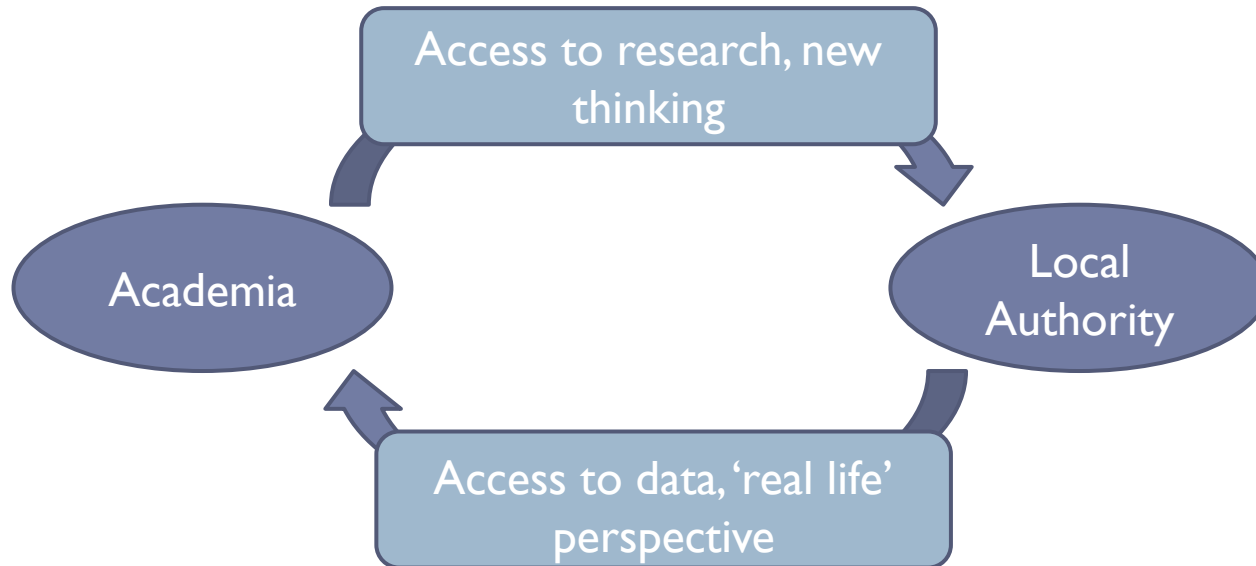


Key messages

- ▶ Development is still opportunistic ⇒ Need for strategic planning and coordination.
- ▶ Harder to invest in new programmes in financially constrained world.
- ▶ There is currently a gap between policy and implementation – not historically the case.
- ▶ Solutions will not come from technology alone ⇒ Need to use whole-systems approach.

Bringing together science and policy

- ▶ Collaborative work is mutually beneficial.



- ▶ Multi-disciplinary element is key.
 - ▶ Need to bring together engineers, social scientists, mathematicians, policy officers, planners.....

Dr Thomas Knowland

Head of Sustainable Development
Leeds City Council

thomas.knowland@leeds.gov.uk

www.leeds.gov.uk

Dr Catherine Bale

Research Fellow
University of Leeds

c.s.e.bale@leeds.ac.uk

www.personal.leeds.ac.uk/~chmcseb