Workshop 3d:

Building stock resilience to extreme weather events

Speaker: Briony Turner, King's College London
Chaired by: Winston Williams
Room: Charlecote Room

National Housing Maintenance Forum

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Building stock resilience to extreme weather events

NHMF workshop

22nd January 2014

Briony Turner

Image sources : MES Energy Services, City of Sound, Milton of Leys Primary School Blog, Link2 Portal and Isos

Introduction

English Partnerships · Olympic Delivery Authority · St George · Northwest · asc Academy for Sustainable Communities · Homes & Communities Agency

King's College London Geography BSc

Imperial College London cep MSc

King's College London

E·S·R·C Economic & Social Research Council

Contents

- Climate change –emerging challenges for the social housing sector
- What are social housing providers doing about climate change?
- What makes stock vulnerable?
  - Collective discussion about risk exposure
  - Case study: Drought
- How do you build stock portfolio resilience to multiple vulnerabilities?
  - Technical solutions
  - Industry change –barriers and enabling factors to implementation

Getting to know the audience

Who are you? Hands up for the…

- Asset Managers
- Property Services
- Contractors
- Who else….

Climate Change

Emerging challenges for the social housing sector

England's Housing Stock

Of the 22.3million dwellings standing today…

8.8million were built pre 1945

Street of **Victorian** Semi Detached **Houses**, Wandsworth, London

Street of **Edwardian** Semi Detached **Houses**, Wandsworth, London

Of which, 4.8millon were built before 1919

Oldest surviving tutor houses in London (Queen's House, Tower of London)

Georgian house

Less than 3 million new homes have been built since 1990

EcoSmart Show Village, Buckshaw Village

Colne & Mersea tower blocks late 1960s-70s –underwent climate change adaptation refurbishment completed last year

Data source: English Housing Survey 2011

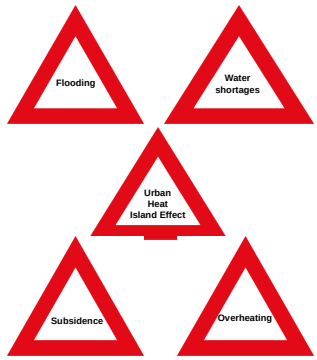
23% existing buildings are owned and managed by England's social housing sector, housing some of the most vulnerable members of society

Image sources from top left: The Guardian (2012 & 2010), Barrow (2012), Balleina (2012) and Findapropery.com (2012)

Climatic risks posed to housing stock

Climate Change Risk Assessment (Defra, 2012)

Problems to prevent/be prepared for

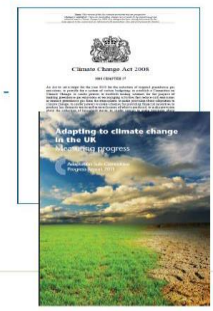


Climate Change Risk Assessment (Defra, 2012)

At the governance level:

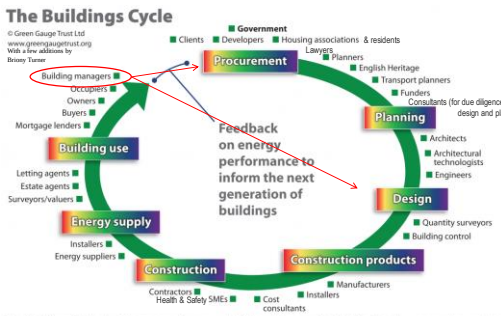
National Adaptation Programme

- Climate Change Act 2008 – framework for action
- 5 year cycle of risk assessment (Climate Change Risk Assessment - CCRA)
- NAP document 2013
- Cross Whitehall programme plus devolved programmes
- HMT: no funding or regulation
- Adaptation Sub Committee



Environment Agency

The extent of the sector



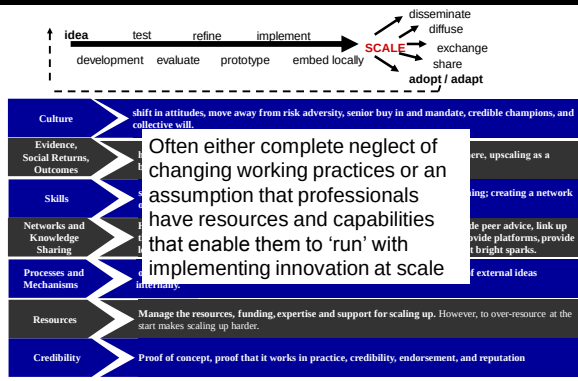
The Buildings Cycle involves many players – all of whom have a role in delivering low energy low carbon

A brief introduction to my research

The aim of my thesis is to identify the institutional factors that enable and constrain the deployment of, and scaling up of, climate change adaptation of existing homes within England's social housing sector

I've been working with Sustainable Homes and have analysed past SHIFT data to look for trends in relation to the climate change adaptive capacity of social housing providers.

Instigating an industry transion *In theory…*



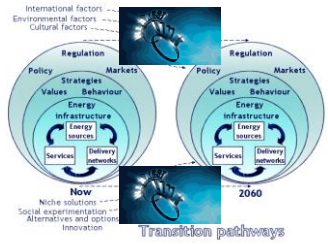
Often either complete neglect of changing working practices or an assumption that professionals have resources and capabilities that enable them to 'run' with implementing innovation at scale

Source: *Scaling up innovation in the public sector* Final report of the Capability Building Programme Project Group, April 2011

BAU –I'd rather be reactive…

Transition pathways

The importance of ***adapting*** as well as ***mitigating*** for climate change, and ***the content*** of the transition pathways, the process of change, have been largely neglected, both by industry and academia

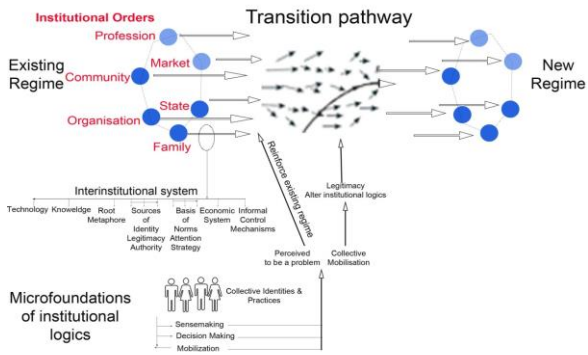


Transition pathways model to a low carbon future (source: Transition Pathways Consortium, 2011)

Image source: http://en.wikipedia.org/wiki/File:The_weakest_link_UK_titlecard.png

BUT it's not all doom and gloom

Transition Pathway

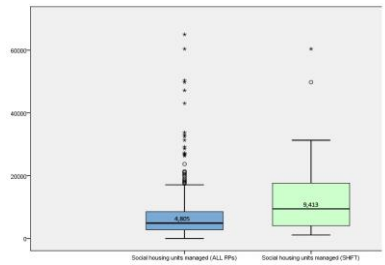


What are social housing providers doing about climate change?

SHIFT index

The 2008/09, 2010/11 and 2012/13 SHIFT datasets were provided for analysis by the organisation Sustainable Homes.

Figure 1 Boxplot to show the Registered Provider population and SHIFT members' distribution of social housing stock



SHIFT index

Table 1 Comparison of stock and financial attributes of SHIFT members with those of all Registered Providers

Attribute	Registered Providers* (England)	SHIFT 2012/13 population	Proportion SHIFT represents
PROVIDERS		All data in this section based on data within SHIFT index	
No. RSLs	1500	39	2.6%
No. RSLs<1000 homes	1100	0	0
No. RSLS>10,000 homes	79	24	30.3%
STOCK	All data below based on RSLs with >1000 stock	All data below based on 35 RSLs for which data was available*	
No. social housing homes managed	2,551,126 (mean=7,373)	522,463 (mean=15,367)	20.5%
No. non-social housing units managed	67,760	24,478	24.5%
FINANCE	All figures below based on RSLs with >1000 stock	All data below based on 35 RSLs for which data was available*	
Net book value of housing properties	£71,150m (mean=£196,387m)	£13,827m (mean=£406,685m)	19%
Total assets less current liabilities	£73,193m (mean=£211,557m)	£14,680m (mean=£431,757m)	20%
Management cost per unit	£908	£962	NA
Routine and planned maintenance cost per social housing unit	£979	£1047	NA
Turnover	£13,751m	£2,748m	20%
Operating surplus	£3,220m (mean=£9,363m)	£590m (mean =£17,362m)	18%

*Data source: (Homes and Communities Agency, 2013)

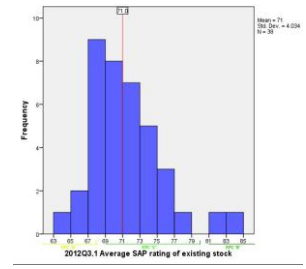
SHIFTIndex

2012/13 dataset

- 37members had a sustainability strategy formerly adopted by their board however…
  - only 12 strategies were indicated to cover climate change adaptation
  - Only four included reference to water efficiency
- 34 members had an associated Sustainability Action Plan in place
  - 27 members had integrated it into Executive
  - 31members had integrated it into functional employees' objectives/appraisal targets.
  - whilst 41% of the sustainability action plans were identified as containing targets relating to climate change adaptation, closer inspection revealed the majority related to mitigative, not adaptive action
  - In addition, four members that did not have a sustainability action plan in place still had sustainability objectives built into their employee's objectives.

Shift Index

For the 2012/13 dataset the mean was a score of 71 Standard Assessment Procedure (SAP)



SHIFT Index

The next section comes with a health warning:

Just because stock is risk assessed, it does not mean that the risk has been acknowledged and built into the business plan at a corporate level, nor that action has been taken to adapt the stock to climate change.

Due to the nature of the scoring, dwellings considered not at risk are counted as adapted. However, if the information that defines them as 'not at risk' changes, then they still might need adapting as no physical alteration has taken place. For instance stock built post 2008 is:

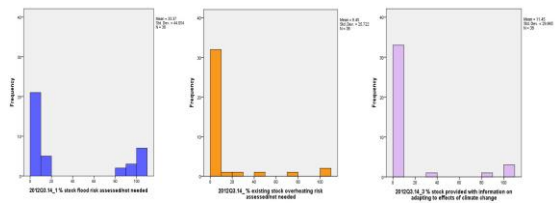
- *considered to be compliant with minimum building regulations and therefore to be flood risk assessed and adapted if in a flood risk area*
- *considered to have undergone an overheating assessment due to the SAP requirements within building regulations.*

However, just because flood risk assessment has occurred it doesn't mean that the new buildings have not been built in a flood risk area.

Shift Index

22 SHIFT members indicated that a proportion of their stock was adapted to/was not at risk of overheating

(15 had new build stock which was considered not to be at risk…)



Cross tabulation revealed that inclusion of climate change adaptation within sustainability strategies of members appeared to have no definable relationship with the level of adaptation of the stock/information provided to residents.

SHIFT Index

And in-house….

- Just over 60% of members indicated that they had conducted an overheating risk assessment of their offices
- a large number also having taken/planned for redressing action where necessary (47%).
- Water efficiency - whilst the SHIFT guidance indicates that members should be aiming for 3m^3 per employee or less by 2030
  - only two members had achieved this
  - A third of members using 29m^3 or more per employee.

Adaptive Capacity –where's your organisation?

Business–as –usual – non-responsive

- No action, potentially discouragement from top level management.
- No effort made to identify, nor acquire the necessary expertise
- Reluctance to modify operations
- No formal learning encouraged, possibly actively discouraged.

Strategic Experimentation – breakthrough projects

- Appetite to find out more about the implications of climate change and adaptive measures. Examples of agency within win-win scenarios from risk assessment through to elements of niche activity, where existing organisational priorities overlap with the climate change adaptation agenda.
- Pilot project/experimentation and support for individual/networks of champions but no strategic commitment as yet, to necessary organisational change.

Strategic responsiveness –strategic resilience

- Recognition of opportunities for strategic action to increase resilience. Likely to be support for internal and cross-organisational programmes of action in areas relevant to its own responsibilities and interests. Plans for resilience under realistic climate scenarios. Will have conducted risk assessment and incorporated these within business planning in a manner to reduce risk exposure.
- likely to engage tenants on key issues with possible development of networks and tenants' capacity on the issue. Might be willing to explore alternative approaches where these might improve outcomes, even when payoff may not yet be clear

Champion organisation

- Internal and cross-organisational programmes of action. Climate scenarios incorporated into business planning and activity. Climate risks assessed with associated adaptation measures incorporated within business planning. Contractors and suppliers may be required to make similar changes.
- Understands wider stakeholder needs
- Likely to engage in public debates, consultations and in forums focused on enabling change within industry. Might be building coalitions to take on constraints to change
- Might be actively involved in knowledge mobilisation across the sector

Emerging trends from the case studies

- Understanding of climate change adaptation
  - acknowledgement of intrinsic link with lifestyle & behaviour
  - Often interpret corporate response to climate change adaptation as mitigation activity
  - but not necessarily climate projections relevant to their patch/stock and to potential disruption of construction
- Sources of information
  - Mostly their organisations/trade press
  - Seemingly not very aware of the information provided by the public sector
  - Not much reference to professional bodies/CPD
- Emerging Gaps in Knowledge/Activity
  - micro-climatic impacts
  - stock condition/asset data
  - Consideration of summer as well as winter temperatures in modelling
  - Incorporation of climatic projections in whole-life costing approach
  - scenario modelling
  - Legislative framework and business case

Arising sector challenges

- The devil is in the detail
- Momentum/lag time
- Knowledge mobilisation
- Information required on working processes
- ICT: systems/software
- Strategic drivers/middle management
- Supply chain and construction risk
- Conflicts with mitigation

What makes stock vulnerable?

Risk exposure

-How many of you think about the risks posed by the weather?

-What are the main risks your stock is exposed to?

The new definition of decency?

LCCP & LBBD Colne & Mersea tower blocks 2009-2011

- 17 storeys, 200 flats, late 1960's-1970's build
- Due to carry out Decent Homes works – upgraded specification to adapt the tower blocks and individual residences to projected climate change
  - Flooding (ground floor flats redesigned for rapid reinstatement –sacrificial kitchens, meters and services raised above predicted flood level, flood resilient render, drainage surveyed and repaired, non-return pipes fitted on soil pipes)
  - Overheating (overcladding with condensation risk assessment, tripple glazed windows with integrated blind, MVHR & trickle vents)
  - Water scarcity (aerated taps, low flow fittings, water meter)

FULL EVALUATION REPORT HERE

Drought –case study: London

The August 2003 heatwave

- temperature increase was only 3.4°C above averag atures
- over 60(

Projected cl

- the aver nperature is proje
- a 10% p exceeding +6.5°(ent to 27°C.
- Urban Heat Island effect can increase the external temperature by up to 10°C (occurred during the 2003 heatwave).

Urban Heat Island Effect

Water shortages

One of the solutions = opening windows for night purging however there are issues of exposure to poor air quality and r

Air quality is

- higher te to washout the pollu rease in the formation of ground l
- Reduced ill reduce dissipation natter, both harmful to health.

Subsidence

Overheating

Drought – overheating risk

Date	Announcement/report	Lead Org(s)
February 2011	TSB publish "Design for future climate report Opportunities for Adaptation in the Built Environment"	Bill Gething
January 2012	Overheating and space cooling are anticipated for consideration in 2015 SAP review	DECC
January 2012	Overheating in buildings identified as key risk for the UK	CCRA
June 2012	Heat Thresholds report launched	London Climate Change Partnership/EA
June 2012	Overheating in homes lit review + gap analysis published	DCLG
July 2012	Understanding Overheating, where to start -Overheating design guide	NHBC Foundation
October 2012	Building Standards Review launched	DCLG
November 2012	Overheating in new homes evidence review	NHBC Foundation + BRE&HPA
FEB 2013	Overheating guidance for retrofitting to be finalised	ARCC
Ecobuild 2013	Design for Climate Change (book) devised from lessons learnt and evaluations of the TSB Design for Futre Climate Adapting Buildings programme	Bill Gething (and Katie Puckett)
March 2013	due to report back on investigation into observed overheating in existing homes	Good Homes Alliance + NHF commissioned by DECC in Dec 2012
March 2013	Overheating awareness raising in house building industry	Zero Carbon Hub due to report back to Defra.
April 2013	Heatwave Plan refresh	HPA
June 2013	Good Homes Alliance Overheating Event –many case studies presented –mostly issues with new build but this event did tackle climate change implications as well	PPTs available here: http://www.goodhomes.org.uk/events/138
July 2013	Adapting to Climate Change: National Adaptation Programme	Defra

SUSTAINABLE HOMES

Water and SHIFT

Richard Lupo, MIEMA, CEnv

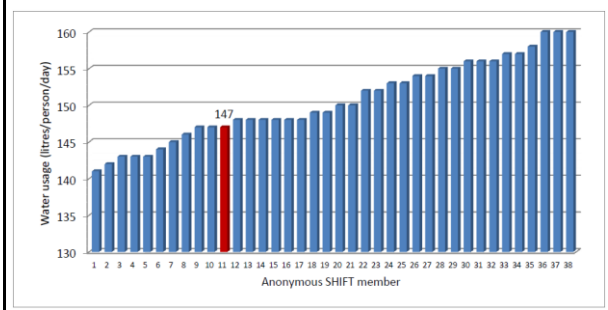
SUSTAINABLE HOMES

- +100 landlords assessed for sustainability using SHIFT
- +320 Code assessors trained and qualified
- Homes +20,000 - risk assessed for fuel poverty
  +70,000 - energy efficient improvement strategies
  +1,000,000 represented in Govt consultations
- Guide to the Green Deal for the HCA
- Training Green Deal Advisor
  Energy Efficiency for Asset Managers
  Housing Quality Indicators

SHIFT INDEX

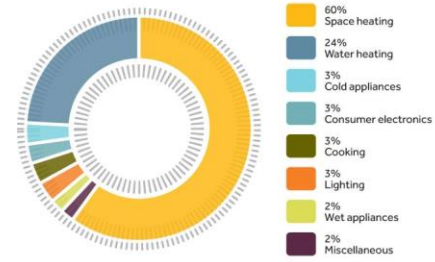
SUSTAINABLE HOMES

SHIFT data water



- UK average 160 litres per person per day (lpd)
- Environment Agency calculate we need to be 130 lpd
- WHO state 40 lpd
- Atlantic sailors ration 4.5 lpd
- Fuel poverty.....

SUSTAINABLE HOMES



Source: Retrofit Guide 2: Surveying & accessing buildings, Institute for Sustainability, 2012

SUSTAINABLE HOMES

Combismart

Interactive session

Code and building regulations tool for new build

Based on "normalised usage patterns"

Methodology has been adapted for SHIFT calculator

SUSTAINABLE HOMES

Closing remarks

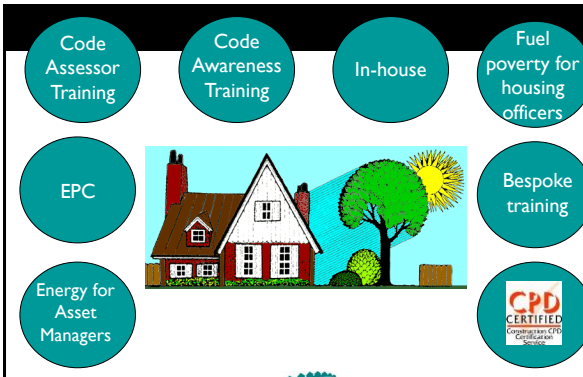
Water is important

Do NOW – get free things for your water supplier

Do SOON – change void / refurbishment / Decent Homes specifications

Can also engage with residents

SUSTAINABLE HOMES



SUSTAINABLE HOMES

Speaking

Sustainability index for HAs, LAs and ALMOs

Design advice

Assessments against the Code for Sustainable Homes

Sustainability strategy development

SUSTAINABLE HOMES

Today

Introduction

Benefits of water saving

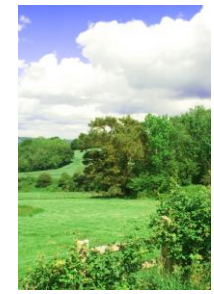
Interactive session

Closing comments

info@sustainablehomes.co.uk

020 89730429

Thank you for your time



SUSTAINABLE HOMES

How do you build stock portfolio resilience to multiple vulnerabilities?

Technical Solutions

	Flooding	Drought	Overheating
Protection	• Raise river walls & embankments • Open spaces become potential flood storage	• Water conservation • Foundation design must reduce heave risk, protecting against subsidence (due to clay shrinking and expanding due to water content)	• Planting & temporary structures for shading • Access to open space for overheating relief
Prevention	• Permeable surfaces with soak away –also prevents water shortages in periods of drought by enabling groundwater and aquifer replenishment • Design out fly-tipping + include rubbish eaters to reduce blockage risk • Drainage designed for high frequency higher volume & heavier rainfall.	• Set up maintenance regimes and infrastructure to enable reclaimed water (grey water recycling and rainwater harvesting) for non-potable uses to be used • Ensure plant selection is drought resistant and conservative in water requirements • Think through water features in periods of low flow. Avoid potential for stagnant water. • Materials for surfaces and built infrastructure must function in higher temperatures	• Use plant selection to provide micro-climatic cooling via transpiration -urban greening • Create breeze pathways to enhance natural ventilation • Orientate streets to optimise solar gain • Avoid high glare facades and finishes
Recovery	• On-site natural water cleaning facilities • Buildings: 'wet proofed' +designed to simplify reinstatement post flood event	• Pools can form irrigation water storage • Rivers and wetlands are quicker to recover from pollution, eutrophication and stagnation damage than most terrestrial habitats.	• Water plants deeply prior to forecast heatwaves, • keep garden beds mulched • Ensure interim shading available for susceptible plants and the public

Technical Solutions - flooding

Preventative	Mitigative
Airbrick covers	Garages on ground level
Letterbox cover	Service meters, electric sockets and cabling to >1m above floor level
Door guards	Service meters in plastic housings
Building skirt system / house wrapping	Replace sand cement screeds with a denser proprietary concrete screed
Temporary barriers	Treated timber floors
Survey & fill cracks /defects at window/door frames	Install a damp proof membrane around ends of floor joists where built into walls
Survey & fill cracks /defects at cable/pipe entry	Replace timber floor with solid concrete with waterproof membrane and tiles and falls for draining
Survey & fill cracks in walls	Access hatches in suspended floors
One-way valves - drainage pipes	Clear/repair air bricks/vents to suspended timber ground floors
One-way valves - sewage pipes	Lime plaster/cement render on walls
Drainage bungs - drains/sinks/toilets	Fix plasterboard horizontally rather than vertically
Driveway/property entrance drainage channel	Additional/weep holes at base of walls
Porous materials on driveways	Fibreglass windows
Raised doorstep thresholds	UPVC/plastic skirting boards & door frames
Raised floor level	Paint doors/ frames with oil based / waterproof paint
Sandbag stock	Install lightweight doors with rising butt hinges
Flood doors (external)	Fit kitchen units with extendable plastic/stainless steel feet
Waterproof site boundary walls	Install brick/concrete plinths for appliances
Increased vegetation	Install plastic kitchen/bathroom units
Coat exterior wall with microporous spray coating every 5 years	Furniture bags
Replace patio doors with conventional windows with brickwork underneath	Route cables for power outlets down from upper floors
Raise airbricks/vents to above expected flood level and duct down to floor void	Wall mounted boilers
	Kitchens on first floor level
	Washing machine on first floor level
	Make bottom part of staircase from concrete instead of timber

Technical information supplied by Helen Brydson from her MSc Masters Thesis (University of Greenwich)

Industry take up

Barriers?

Enabling Factors?

Barriers	rank	Enabling Factors	rank

Adaptive capacity of the sector

"Of equal significance is the need to **'unlearn'** much of the existing workforce approach and **unravel** the tightly knitted web of such comments as… 'Well, we've always done it that way'…"

David Philip, Head of BIM Implementation, Cabinet Office + BIM Programme Director at Balfour Beatty

Useful resources

- Adaptation and Resilience in a Changing Climate – Coordination Network *The ARCC CN brings together researchers and stakeholders involved in adaptation to technological, social*
- HPA extreme weather events and natural disasters web pages
- JRF Climate Change and Social Justice web page
- RIBA Design Strategy: Adaptation

Questions?

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Thank you for listening