Mass Retrofitting of an Energy Efficient-Low Carbon Zone

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Introduction

Upon a recent study of improving energy performance through adaptation and renovation at a community scale, mass retrofitting also provides the opportunity to achieve significant carbon savings.

The first step in improving the energy performance of buildings is to study and simulate their behaviour.

Similarly, research suggests that retrofitting goes well beyond energy consumption, because retrofitting's greater potential goes well beyond incremental adaptation, reuse and renovation.

This tends to suggest the literature currently available on retrofitting is selective, offering only a partial knowledge of the subject and is insufficiently comprehensive to offer an integrated solution.

A Case-Based Approach

The case study which has been decided to demonstrate the strategic value of mass retrofits in the housing sector is that known as the Hackbridge project.

Deakin *et al.,* (2012a, 2012b) have developed the methodology for such a base-lining exercise and applied it to Hackbridge where it was found that the task relates to environmental profile which this adaption strategy is based on.

My research will build off this to develop a socially-inclusive account of the mass retrofit capable of overcoming the divisions Deakin *et al.,* (2012a, 2012b) identifies such ventures tend to maintain – though under the name of the energy saving and carbon reduction such measures drive towards as part of the search for environmental sustainability.

Previous research has only managed to develop a socially-inclusive account by way of and through by the use of proxy measure. My research shall substitute real measures for these proxies and codify both the form and content of the analysis in the process.

Demonstrating How Urban Morphology Matters

✓Urban morphology is the study of the form of human settlements and the process of their formation and transformation.

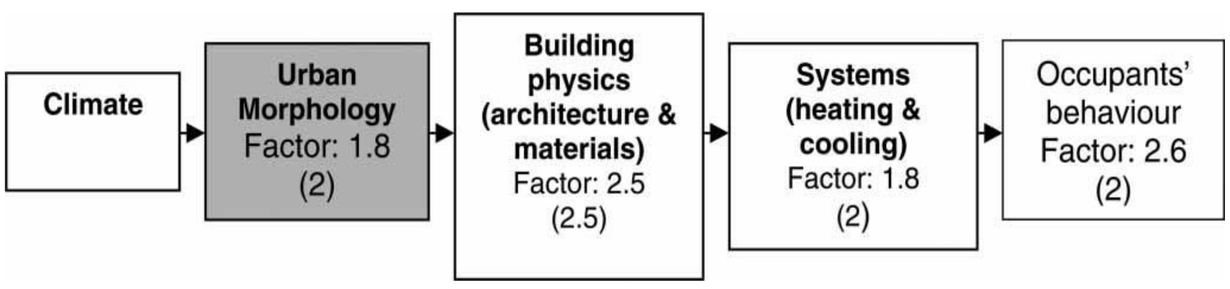
✓In meeting this aim and demonstrating how urban morphology does make a difference, my research shall draw upon the encounters of a transformation taking place in the London Borough of Sutton known as the Hackbridge venture.

✓My research shall attempt to re-ground the subject via case-study analysis of a late attempt to save energy and reduce the associated levels of carbon emissions, both by way of and through what has been termed: an active and integrated institutional arrangement.

✓That is, by way of a mass retrofit proposal which is active and integrated through an urban regeneration strategy; whose vision is capable of sustaining the on-going transformation of Hackbridge into an energy efficient, low carbon zone.

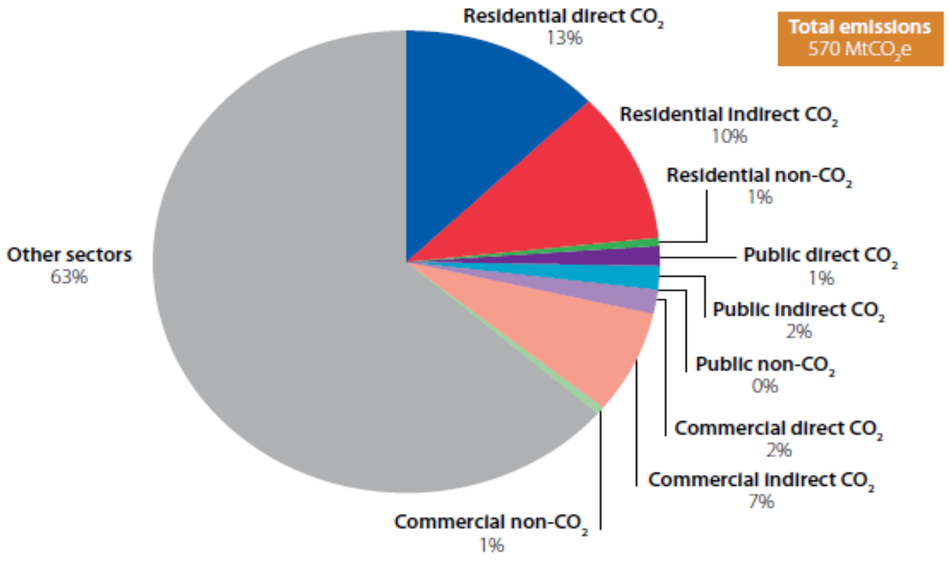
Energy Efficiency

In a simple term, energy efficiency could be described as "using less energy to provide the same service".



Factors affecting the energy usage. ***Source:*** Salat (2009).

Building Emissions



Emissions from buildings in the context of total UK emissions (2015). ***Source:*** NAEI (2013), DECC (2013), Energy Trends, March 2013, DECC (2012) DUKES; CCC calculations.

Active and Integrated Institutional Arrangement

According to UNDP (2015), institutional arrangements are the policies, systems, and processes that organizations use to establish, plan and manage their activities efficiently and to effectively coordinate with others in order to fulfil their mandate.

However, the community's vision for Hackbridge, facilitated by BioRegional and Sutton Council, is to create the UK's first sustainable district – economically successful, socially equitable, and environmentally friendly.

BedZED, the eco-development in Hackbridge.

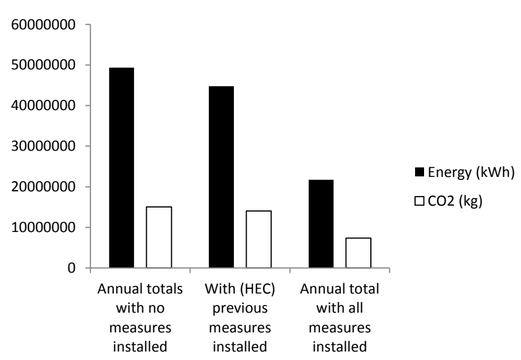
Energy Options Appraisal

Professor Deakin and his team offers an account of Energy Options Appraisal for improving the energy efficiency and carbon emissions of the housing stock in Hackbridge.

In addition, their research sets out the programme of work for domestic buildings produced by Parity Projects in April 2008.

Similarly, it assesses the rates of energy consumption and levels of carbon emissions for the stock of housing within Hackbridge (as designated in the Masterplan). Brief attention is also given to profiling the resident community and referencing Census (2001) returns for the London Borough of Sutton.

The Environmental Profile



Potential Annual Energy and CO_2 Reductions (Deakin *et al.,* 2015).

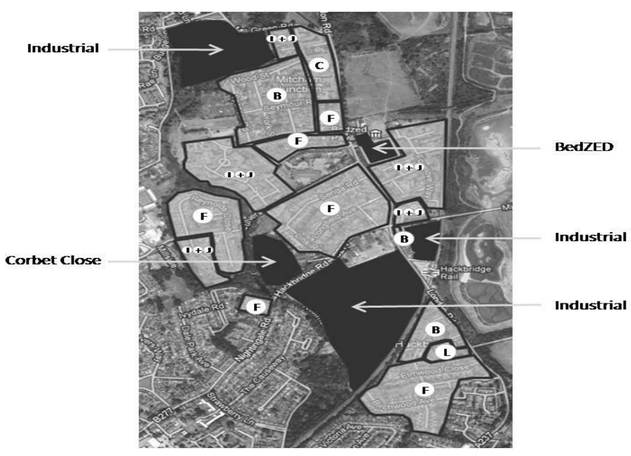
Measure	Total Cost
Loft Insulation - 300mm	£481,387
Loft Insulation - 400mm	£569,936
Draught Proofing	£414,132
Turn Heating from 18 to 17	£0
Boiler for One Hour Less Per Day (Controls Required)	£0
Energy Saving Light Bulbs	£165,599
Efficient Appliances	£599,922
TOTAL	£1,661,040
AVERAGE COST PER HOUSEHOD	£691

Cost of basic measures (Deakin *et al.,* 2015).

Measure	Total Cost
Secondary Glazing	£1,463,056
Solid Wall Insulation (Internal)	£6,328,197
Solid Wall Insulation (External)	£5,709,127
Under Floor Insulation	£1,281,581
Heat Exchange Ventilation	£1,556,069
Cavity Wall Insulation	£265,607
Double Glazing	£4,093,861
Triple Glazing	£5,018,332
Boiler Replacement	£973,792
Solar Water Heating (with ScaffoldingReq'd)	£5,512,950
Solar Water Heating (no Scaffolding Req'd)	£4,608,990
Solar Voltaics	£4,946,103
TOTAL	£25,802,146
AVERAGE COST PER HOUSEHOLD	£10,737

Cost of more complex measures (Deakin *et al.*, 2015).

Hackbridge by House Type



House type	Construction Date	No. of Properties	%
L	Post 2001	57	2
I+ J	1972-2000	872	37
F	1939-1959	913	38
C	1918-1938	121	5
B	Pre 1918	440	18
		2403	100

Hackbridge by House Type (Deakin *et al.,* 2012b).

Conclusion

In the light of this, my research shall propose that whilst acknowledging the significant potential mass-retrofits have to save energy and reduce carbon emissions, future mass-retrofit proposals should be more inclusive, capable of delivering equal benefits to all residents. In doing so, my research shall re-evaluate the baseline assessments needed to legitimate such interventions, with an emphasis on balancing the technical and social criteria needed to promote environmental sustainability, tackle global warming and adapt to climate change.