Developing Urban Retrofit Scenarios: An Outline Framework for Scenario Foresight and Appraisal

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Retrofit 2050 Working Paper

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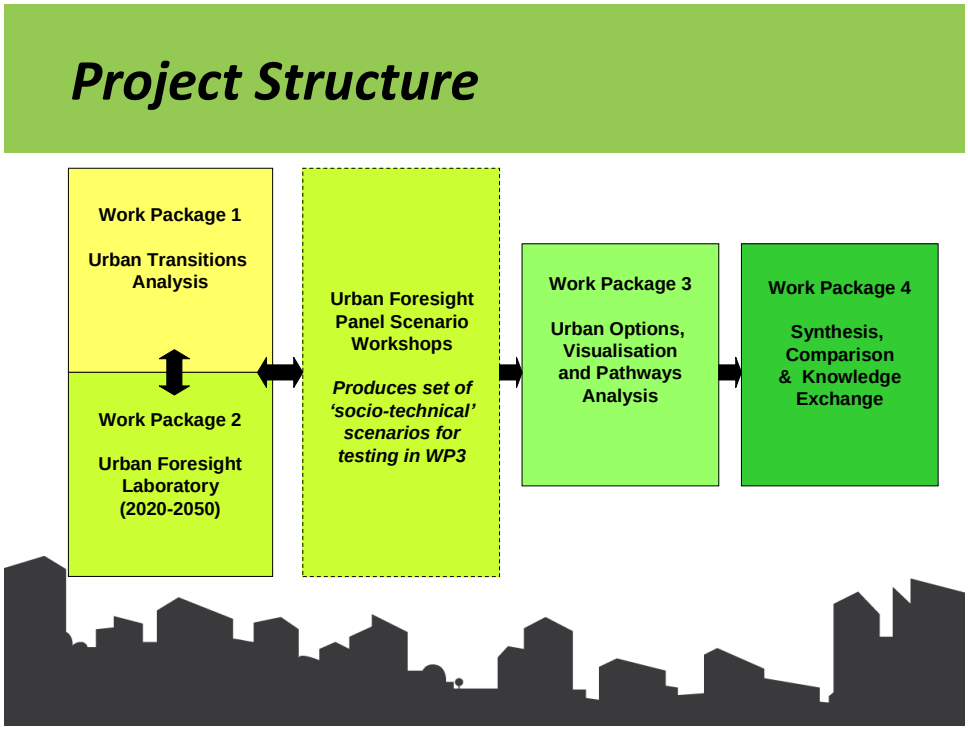
1. Introduction

The following paper briefly outlines the bespoke scenario foresight and appraisal process being developed by the project team for the Retrofit 2050 project. The initial stages of this process are currently being implemented. The overall framework will be subject to significant further elaboration as the process is rolled out over the next two years.

A key objectives for the RETROFIT 2050 project as a whole is **"*to articulate and appraise 'city-regional' specific visions and prospective pathways for urban-scale retrofitting of the built environment*".**

Moreover, implicit in the project's design was an assumption that the process of scenario construction and appraisal through which this objective would be achieved would provides the 'glue' - integrating the various elements and providing a coherent structure - to the project's work programme.

Figure 1: Retrofit project structure



Prospective research, foresight and scenario building are always challenging as the future is inherently uncertain. Moreover, whilst a wide variety of tools and methods exist, scenario building remains more of an art than a science. Developing and appraising a set of scenarios for the Retrofit 2050 project will be particularly challenging as we are seeking to explore the evolution of multiple complex socio-technical systems across multiple scales and domains. Whilst we can therefore seek to build upon the existing state-of-the-art within the field, it is none the less necessary to design a bespoke research framework for the Retrofit 2050 project.

The framework set out below builds upon previous experience of developing novel tools and methodological approaches in the field of sustainability foresight and technology appraisal.

2. Under standing urban retrofit as a socio-technical process

For the purposes of the Retrofit 2050 project, we have developed a **normative definition** of **sustainable urban retrofitting** as comprising the:

"directed alteration of the fabric, form or systems which comprise the built environment in order to improve energy, water and waste efficiencies."

In the context of the project, we are particular concerned with incremental and disruptive improvements to the built environment - through (inter alia) a combination of systemic technological and social (institutional governance and behavioral) changes - operating across the building, neighbourhood and city-regional scales. This definition of retrofitting would also include new build but only the 1-2% of renewed stock that operates within cities – but not the construction of new cities or towns.

However, we also start from the perspective that the processes of urbanisation which underpin the development of cities are complex, and that urban environments can best be understood as complex socio-technical systems (Elzen et al 2004). By this we do not mean simply that cities are complicated (although clearly they are), but rather that they exhibit the sort of dynamic non-linear, emergent behaviour we associate with complex systems.

In order to explore the future of sustainable urban retrofitting, it is then first necessary to seek to characterise and understand the (often emergent) processes of change which have historically re-shaped the *fabric, form and systems* of our built environments.

Much of these are pervasive, taken for granted - almost 'invisible' - processes of repair and maintenance. As Graham & Thrift (2007) point out all buildings, infrastructures and technological systems experience a continual process of decay, necessitating repair and maintenance. And what starts out as repair or maintenance often becomes improvement and innovation.

At the same time, as we look back over the longer term historical evolution of our cities we also see instances of radical and disruptive innovation and systems change (the introduction of mains sewage, gas, electricity and ICT networks, etc): although the actual diffusion and adoption of these radical and disruptive innovations has often been much more incremental and piecemeal than one might imagine.

Within the city these processes of repair, maintenance and innovation may be seen as clustering around a number of distinct (although often overlapping) regimes. By 'regimes', in this context, we mean relatively stable configurations of buildings and infrastructures, networks of actors and institutions, technologies, policies and regulations, social norms, practices and shared expectations.

Understanding prospective processes of sustainable urban retrofit in terms of the dynamics of the regimes within which these processes are embedded will be central to the scenarios approach outlined below.

3. Foresight and scenario approaches

As noted above a wide variety of scenario tools have been developed in recent decades. The table below briefly summarises some of the main approaches found in the sustainability foresight literature.

Figure 2: A typology of foresight and scenario approaches

Descriptive	**Forecasts** use formal quantitative extrapolation and modelling to predict 'likely' futures from current trends.
	Exploratory Scenarios explore possible futures. They emphasise drivers, and do not specify a predetermined desirable end state towards which storylines must progress.
	Technical Scenarios explore possible future technological systems. They emphasise the technical feasibility and implications of different options, rather than exploring how different futures might unfold.
Normative	**Visions** are elaborations – usually narrative accounts - of a desirable/sustainable future. They describe a (more or less) plausible end state rather than the pathways through which that future might be achieved.
	Backcasting studies start by defining a desirable and plausible future end point (or vision). They then investigate possible **pathways** to reach that point.
	Socio-technical transition scenarios emphasis a multi level co-evolutionary understanding of the social and technological dimensions of the large scale systems changes.
	Roadmaps provide a schematic description (time line) of a sequence of specific measures or targets designed to bring about a particular future.

(Adapted from McDowall & Eames 2004)

4. Methodological approach

We will adopt a participatory **backcasting** approach in order to develop a realistic, internally coherent and transparent set of **socio-technical transition scenarios** for systemic urban retrofitting.

The process of **backcasting** can be defined as "*generating a desirable future, and then looking backwards from that future to the present in order to strategize and to plan how it could be achieved*" (Quist & Vergragt, 2006). In other words a vision of a desirable future is first defined and then a pathway to that future articulated.

In fact backcasting is a fairly broad term. Backcasting studies vary in their detailed design and implementation. In this context key issues to consider include:

- Who develops and appraises the future vision(s);
- Whether single or multiple visions and pathways are considered
- Theoretical grounding with respect to (implicit/explicit models of) innovation and dynamics of systems change
- Empirical grounding with respect to the spatial and temporal specificity of the scenarios; and,
- The degree of reflexivity and appraisal built into the process.

Rather than imposing a single normative vision, our approach will seek to acknowledge the contested and inherently political nature of sustainability through exploring a broad range of visions of what a sustainable city-region might look like and the processes of systemic urban retrofitting that each might entail. In addition we will also seek to illuminate critical 'branching points' which may lead to the failure of particular transitions pathways, and hence unsustainable futures.

The term 'scenario' will then be taken to refer to the combination of an end 'vision' and a specific 'pathway' describing the journey from the present day to that future world. We refer to socio-technical transition scenarios as together the visions and pathways we develop will informed by a co-evolutionary understanding of the social and technological dimensions of the large scale systems changes (or transition) necessary to achieve systemic urban retrofitting.

Having developed a set of contextual socio-technical scenarios we will then explore the implementation and appraisal of these scenarios in our two specific case study regions.

The work will be exploratory in that it will explore multiple possible futures each grounded in particular sets of expectations about how current 'niche' activities and 'regime' practices might develop. Moreover, in seeking to illuminate the socio-technical dynamics of the innovation processes involved it will be important to illustrate the potential contribution of both purposive and emergent change.

Different groups of external participants and stakeholders will be involved in different phases of the scenario process (see below). In general terms, however, the role of the external participants is to broaden the range of knowledge and expertise available to the research team, and to provide an element of critical review and societal appraisal. Responsibility for the content and ownership of the scenarios will rest firmly with the research team.

5. Risk and Uncertainty

Risk and irreducible uncertainty are inherent properties of the future. However, the purpose of our work is not to predict the future, but rather to allow more robust and informed decisions to be made in the present by illuminating a range of possible futures and the societal processes through which they may come about.

Within our backcasting framework we will explore critical uncertainties through considering both emergent and normative drivers of change, working with multiple visions and pathways, and through engaging a broad range of experts, stakeholders and societal interests in the scenario building and appraisal process.

6. Outline Framework

The overall process will comprise five steps: **i) Problem framing and structuring; ii) Visioning; iii) Pathway Analysis; iv) Regional Implementation and Visualisation; v) Evaluation and Appraisal**

These five steps may be grouped into three phases on the basis of the nature of the external participation in each step. See Table 1 below.

Table 1: Overview of Retrofit 2050 Scenario construction and evaluation process

	Step	Focus	Participants
Phase 1 October 2011 – September 2012	Problem framing and structuring	Practices, drivers and expectations	National experts
	Visioning	Radical & disruptive innovation across scales and domains (Indicator development)	
	Pathway analysis	Transition dynamics (Indicator development)	
Phase 2 October 2012 – June 2013	Regional implementation	Grounding and visualisation (Modelling)	Key regional stakeholders
Phase 3: June 2013 – September 2013	Evaluation and appraisal	Sustainability and resilience under multiple perspectives (Multi Criteria Analysis)	Wider sample of regional stakeholders and societal interests

Phase 1: Foresight and scenario construction

The first phase of the process will focus on the development of a set of **contextual socio-technical scenarios for the systemic urban retrofitting** of core UK city regions.

Phase 1 will be structured around a series of three **national expert workshops**, which will run in parallel with the Expert Reviews commissioned under WP 2 and broader research activities undertaken under WP1, 2 & 3. The role of the expert workshops will be to help develop, inform and critically review the work of the project team.

Participants in the expert workshops will be drawn from a trans-disciplinary **Urban Foresight Panel** of approximately twenty five to thirty leading thinkers from academia, industry, government and civil society organisations, with a core of members drawn from the RETROFIT 2050 Project Advisory Group. Additional participants will be selected on the basis of their individual knowledge and expertise rather than as representatives of specific organisations or sectors. Our intention will be to capture a broad range of disciplinary and institutional/organisational perspectives, whilst also seeking to ensure a high degree of creativity, critical thinking and challenge from within this group.

Participants will be invited and encouraged to participate in all three expert workshops. Those unable to attend the first workshop may be interviewed individually.

Workshop I: Urban retrofitting: practices, drivers and expectations
The focus of this workshop will be on **problem framing and structuring.** We will introduce the participants to the project and explore the meaning of urban retrofitting, drivers of change and how current 'niche' activities and 'regime' practices might seed future transitions.

Specifically we will explore the meaning of urban retrofitting through the following two key questions:

- How can we best characterise past and current practices of urban retrofitting at different scales?
- What are the key (emergent & purposive) drivers of urban retrofitting at different scales?

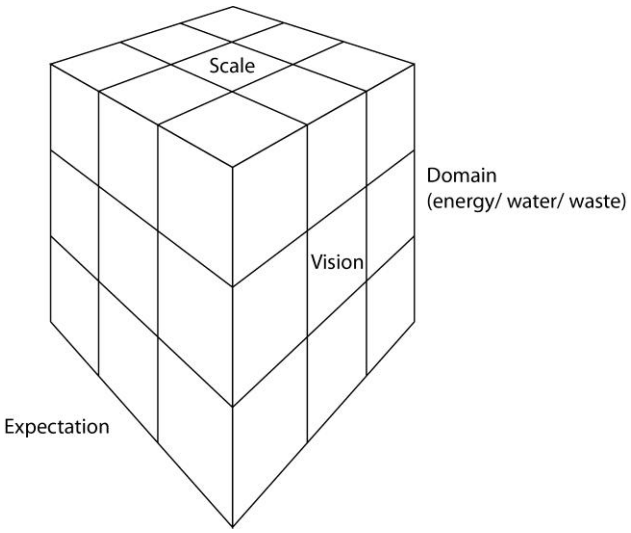
In addition we will also undertake some initial 'brainstorming' activity to begin to explore the questions:

- What conceptual models or shared expectations for the future (scaling up) of urban retrofitting can we identify?

Workshop II: Visioning retrofit futures
Drawing upon the outcomes of workshop I, together with the broader analysis and input from WP 1 & 2, Workshop II will seek to explore a range of visions for (retrofit) sustainable city regions (for the period 2030-2050).

Here a likely approach would be to seek to describe these future visions in terms of the key innovations (both social & technical) populating a multidimensional matrix (expectations / scale / domain)

Figure 2: Constructing multiple visions across scales & domains



In this workshop we will also need to begin to explore what types of impact domains and indicators are most relevant for quantification and modelling.

Workshop III: Pathway analysis and transition dynamics
Building upon the outputs of workshop II, together with the broader analysis and input from WP 1 & 2, the project team will characterise a set of future visions which should describe the range of plausible retrofit futures (including possible outliers or wild cards).

Workshop III will focus upon seeking to illuminate and provide narrative descriptions of the prospective pathways from the present to each of these retrofit futures. We will draw on insights from innovation studies to help structure the description of the transition contexts and dynamics in each case. Key questions will include how technologies/innovations develop in niches, the dynamics of the incumbent systems/regimes, and role of wider societal changes in each case.

This workshop we will also need to further explore what types of impact domains and indicators would be most relevant for quantification and modelling.

Phase 2: Regional implementation: grounding and visualisation

The second phase of the process will translate the contextual socio-technical scenarios for systemic urban retrofitting developed under phase 1, exploring their prospective implementation in our two case specific study regions (Cardiff/SE Wales and Greater Manchester).

Here the objective will be to ground the scenario narratives in specific regional contexts (natural and built environment, infrastructure, demographic, socio-economic, institutional and governance structures, etc), to identify sub-regional case studies for detailed exploration, and to work with the modelling team to quantify and visualise regional futures under each of the scenarios.

Phase 2 will be structured around a parallel series of **Regional Stakeholder Workshops**, held in Cardiff and Manchester respectively, each consisting of two or three events. In each region we will establish a small panel of about 8 - 10 key **regional stakeholders** from industry, local/regional government and civil society organisations. Participants will be selected on the basis of their local knowledge and sectoral/organisational affiliation.

Phase 3: Regional futures: Evaluation & Appraisal

The third phase and final phase will consist of a deliberative (semi-quantitative) multi-criteria appraisal of the prospective performance of the regional futures developed under phase 2. Here the intention will be to broaden out participation to a wider group of regional stakeholders and social interests, whilst also examining the resilience of the different regional futures to a range of possible shocks and side swipes. Here we may use either a number of smaller workshops/focus groups or individual interviews (details to be developed).

References

Elzen, B. Geels, F. & Green, K. (eds), 2004. System innovation and the transition to sustainability: theory, evidence and policy, Cheltenham, Edward Elgar.

Graham, S. & Thrift, N. (2007) Out of Order: Understanding Repair and Maintenance, *Theory, Culture & Society*, Vol. 24(3) pp1-25

Quist, J. and Vergragt, P. (2006) Past and future of backcasting: the shift to stakeholder participation and a proposal for a methodological framework, *Futures* **38** pp. 1027–1045

Annex 1: Membership of Retrofit 2050 Urban Foresight Panel

NAME	ORGANISATION
Gareth Harcombe	Cardiff City County Council
Chris Jofeh	Arup
Michael O'Doherty	Manchester City Council
Caroline Batchelor	EPRSC
Jonny Williams	BRE
Natalie Grohmann	Welsh Government
Roger Milburn	Arup
Clare Erikkson	RICS
Martin Russell-Croucher	RICS
David Butler	Exeter University
Bakr Bahaj	Southampton University
Phil Jones	Cardiff University
Katherine Randall	DECC
Jeremy Watson	CLG
Barbara Hammond	Low Carbon West Oxford
Pooran Desai	Bioregional
Ben Ross	Forum for the Future
James Walker	Kingfisher PLC
Nicholas Falk	URBED
Marianne Heaslip	URBED
Mark Hallett	Igloo Regeneration Fund
Richard Guy	The Carbon Trust
Rufus Ford	Scottish & Southern Energy
Joanne Wheeler	UKGBC
Scott Cain	TSB
Mark Scaife	Energy Technology Institute
Andrew Mellor	PRP Architects
Helen Northmore	Energy Saving Trust
Miles Keeping	GVA Grimley
Aaron Burton	Environment Agency Wales
Oliver Novakovic	BRE
Chris Woods	Wates