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Towards an agenda for post-carbon cities. Lessons from Lilac, the UK's first ecological, affordable cohousing community

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Abstract

This paper explores an agenda towards post-carbon cities, extending and deepening established debates around low-carbon, sustainable cities in the process. The label post-carbon builds upon issues beyond those of greenhouse gas (GHG) emissions, energy conservation and climate change, adding a broader set of concerns including economic justice, behaviour change, wellbeing, land ownership, the role of capital and the state, and community self management. The paper draws upon a case-study of an embryonic post-carbon initiative due for completion in 2013 called Lilac. Based in Leeds, Lilac stands for *Low Impact Living Affordable Community* and is the first attempt to build an affordable, ecological cohousing project in the UK. Its three aspects each respond to significant challenges: low impact living and the challenge of post-carbon carbon value change; affordability and the challenge of mutualism and equality, and community and the challenge of self-governance. I conclude the article by exploring six lessons from Lilac that tentatively outline a roadmap towards post-carbon cities: the need for holistic approaches that deal with complex challenges, prioritizing self-determination rather than just participation, engaging with productive political tensions, adopting a process rather than outcomes based approach, developing strategy for replicability, and finally embracing a non-parochial approach to localities.

Introduction

Over the last few years there has been a wealth of academic and practitioner debates on building more socially and ecologically sustainable cities through a number of overlapping concepts such as low impact (Pickerill and Maxey, 2009), carbon reduction (Mulugetta et al., 2010) eco-urbanism (Hodson and Marvin, 2010), low-carbon (Feliciano and Prosperi, 2011; Gossop, 2010, Bulkeley et al., 2010, Peters et al., 2010), zero-carbon (Dunster et al., 2009), and post-carbon (Heinberg, 2004; Heinberg and Lerch, 2010; Evans, 2008). These ideas foreground the leading role that metropolitan areas are taking to deal with multiple, inter-connected challenges such climate change, ecosystem degradation, and the peaking of fossil fuels (see Lovell et al., 2010; Bulkeley et al., 2010; North, 2010; Bridge, 2010; Bicknell et al., 2009).

What I want to do in this paper is extend this work in new directions by exploring an agenda towards post-carbon cities. I use the word 'towards' purposefully as the post-carbon is not achievable any time soon, nor is it a static end-point but an ongoing and provocative process of questioning, learning and challenging. I want to focus on what this process based approach means in practice as a challenge to many of the conventional policy lessons surrounding sustainability and low carbon transitions. In this paper I do not intend to repeat the detail of the challenges cities face as they have been well articulated (Giradet, 2007; Pearce, 2006; Kuntsler, 2006). Instead, I want to introduce the concept of the post-carbon to interrogate, critique and deepen ideas of what sustainable, low-carbon cities mean in practice. The post-carbon builds upon issues beyond greenhouse gas (GHG) emissions, energy conservation and climate change, adding a broader set of concerns including economic justice, behaviour change, wellbeing, mutualism, land ownership, the role of capital and the state, and self management. I do this through exploring the real world practices, challenges and lessons of an embryonic post-carbon cohousing initiative called Lilac, a project I have directly been involved in as a cofounder and future resident. Lilac, based in Leeds, stands for *Low Impact Living Affordable Community* and, due

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for completion in 2013, is the first cohousing project that in the UK that is both ecological, affordable and fully mutual. It is worth noting that my interpretation of the project in this paper is shaped by my positionality, especially given I have a direct interest in its success and expansion. So, while this research paper reports on the factual basis of the Lilac project, it also represents a form of engaged and participatory research which advocates for, and shows solidarity with, these kinds of projects (see Chatterton, Fuller, Routledge, 2008; Autonomous Geographies Collective, 2010). There are certainly projects around the UK and beyond that share Lilac's three aspects (low impact, affordability, community), especially in terms of the growing number of cohousing, community land trust and ecovillage projects. In fact, Lilac's founders undertook extensive visits at many of these to form its own model such as Hockerton Housing, BedZed, Springhill Cohousing, Lancaster CoHousing and Findhorn. However, Lilac is the first project that brings these concerns and challenges together in a holistic and integrative way and importantly foregrounds environmental concerns with mutualism, economic equality and deliberative decision making. I contend that these together start to sketch out a roadmap for what post-carbon urban living might mean in practice, well beyond more established ideas of low carbon cities.

The first part of the paper outlines this emerging agenda for post-carbon cities and then details the three aspects of the Lilac project and their associated challenges. These include: low Impact living and the challenge of post-carbon carbon value change; affordability and the challenge of mutualism and equality, and community and the challenge of self-governance. I conclude the article by exploring six lessons from Lilac that tentatively outline a roadmap towards post-carbon cities.

An emerging agenda for post-carbon cities

So what does a post-carbon agenda actually entail? The term 'post-carbon' is partially a misnomer given that vast amounts of carbon will continue to be cycled by the earth's biosphere,

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atmosphere and hydrosphere. More usefully, it is short hand for urgent action given global carbon budgets are being pushed beyond safe limits due to the introduction of high levels of anthropogenic greenhouse gases since the industrial revolution (IPCC, 2007). Clearly, then, it is not an agenda for a world without carbon (which is one of the building blocks of life), but a world where carbon is used more responsibly and equitably by our economies and societies. Indeed, a route to a less carbon dependent world will require carbon intensive industries to manufacture new homes and micro-renewables, as well as equitable carbon allowances for poorer countries.

Since the shape of the world beyond fossil fuel dependency and dangerous levels of GHGs is hotly contested, it is understandable that there is no agreed definition of the post-carbon. The Post Carbon Institute (PCI), a public think tank based in the USA defines it as responding 'to the interrelated economic, energy, environmental, and equity crises that define the 21st century. We envision a world of resilient communities and re-localized economies that thrive within ecological bounds' (Post-carbon Institute, 2010). Their work on the post-carbon is broad and encompasses climate, consumption and waste, communities, culture and behaviour, ecology, economics, education, energy, food and agriculture, government, health, population, social justice, transportation, and water. The work of Richard Heinberg, one of the fellows of the PCI, stands as the most detailed and profound statement on the nature of a transition to a post-carbon world through his 'powerdown' scenario (2004).

Given the implications of growing global urban populations for tackling climate change, the post-carbon idea has been applied to the city. Lerch (2007) outlined five principles to work towards a post-carbon city including dealing with transportation and land use, tackling private energy consumption, using multiple solutions at different scales, planning for fundamental changes and build a sense of community (see also Condon, 2010). Various urban initiatives have

emerged to put these ideas into practice such as 'Los Angeles Post-carbon' and the Transition Towns movement (Hopkins, 2008).

However, the use of the 'post' prefix highlights a highly uncertain and largely unknown situation with a number of possible transition pathways conceivable (see Walker and Salt, 2006; Pike and Dawley, 2010; Homer-Dixon, 2006; Spratt and Simms, 2009; Shove and Walker, 2007) involving intense debates and differences in terms of the role of personal values, institutions and the state, social relations and regulation. For example, incremental 'low carbon' solutions can deliver reductions in carbon use up to a point through new green technologies and novel forms of institutions, governance and ecologically-focused regulation (Mol et al., 2009; While et al, 2004), while more drastic scenarios raise the prospect of curtailment and restrictions of freedoms, new regimes of governance based on carbon control (While et al., 2010), long term inaction leading to eventual collapse for the majority, and 'lifeboat' scenarios for a wealthy minority. The post-carbon could equally be a manifesto for a return to, for example, slavery and feudal economic relations. Finally, more transformative routes are envisaged based on a relocalisation of economic life and more resilient and egalitarian social scenarios (Holmgren, 2002; Hopkins, 2008) while there are others which are overtly anti-paradigmatic aiming for economic degrowth, moratoria on fossil fuel extractions, a greater role for grassroots social movements and a new deal for poorer nations based on a recognition of historic carbon debt (Bond, 2010).

The post-carbon agenda, then, operates at different levels of complexity. Given its associations with hydrocarbon fuels and carbon emissions, in its simplest form the post-carbon agenda is generally associated with addressing the peaking of oil supplies, ensuring energy descent and tackling climate change (Monbiot, 2007; Lynas, 2007; Giradet, 2007; Heinberg, 2004, 2005; Kuntsler, 2005; Roberts, 2005; Murphy, 2008; Atkinson, 2007; Mulligan, 2010). Further still, the post-carbon agenda addresses the need for governance structures that are neither over reliant on just the market or state, but which increase empowerment, local self management, accountability

and neighbourhood level participation, while at the same time ensuring that issues of justice and equality are addressed (see Agyeman, 2005; Barber, 1990; Boyle, 2009). A democratic deficit is still acutely felt at the neighbourhood level where communities often feel powerless to steer the direction of their localities (Preston, 2008).

Finally, the post-carbon agenda brings into the debate failures in the international financial system since 2007 and more recent austerity cuts which have generated significant debate on how to regulate and manage economic activity that can maintain welfare services and ensure prosperity while staying within the limits of the global biosphere. The significant question raised is the extent to which the 'business and usual' model of perpetual economic growth predicated on individualist and consumerist values and high resource throughputs can be maintained without seriously undermining the social and ecological systems that urban areas rely upon. The wider challenge is how health, wellbeing and prosperity can be achieved without high levels of economic growth? (Simms et al., 2010; Jackson, 2009; Wilkinson and Pickett, 2009, New Economics Foundation, 2010).

The particular position in this paper is that all of the above are integral and co-dependent elements in moving towards post-carbon cities, and in recognising this the agenda moves away from individual elements and silo thinking towards an holistic understanding of a post-carbon transition that addresses GHGs, aims towards energy descent whilst also maximising prosperity and wellbeing and ensuring equality, participation and social justice. Such an approach is informed by a number of critical, but often under-articulated, issues. First, real limits exist in terms of current attempts to decarbonise the economy and behaviour beyond a certain point (Jackson, 2009). The concept of Factor 10 suggests that an average minimum tenfold dematerialization of Western styles of life in absolute terms has to be achieved to avert dangerous climate change and allow developing countries adequate resources to grow (Schmidt-Bleek, 2008). Similarly, Anderson et al. (2008) have suggested that to stay within the safe two

degrees of global warming, carbon emission reductions of the order of 6-9% per year are necessary. What this adds up to is a decarbonisation roadmap for the economy which would essentially radically transform social and economic relations beyond all recognition. Second, conventional pro-growth economics and rises in incomes in western countries are no longer delivering happiness and wellbeing outcomes, in fact the reverse is true (Simms et al, 2010). Third, data revealing that the prospect of dangerous anthropogenic climate change is far more likely than previously thought is gaining recognition (Spratt and Sutton, 2008). Finally, a lack of capacity of communities to develop solutions to increase resilience fast enough is increasingly apparent, and infact the current era of financial austerity has eroded national governments' ability to respond to future challenges and may well have an impact on the adaptive capacity of communities (Moulaert et al., 2010).

Drawing on the work of the Post-Carbon Institute, what emerges from this post-carbon agenda is a distinctive approach requiring that: the intellectual focus needs to be on how our societies manage and respond to the current situation rather than exploring the need for action; that issues cannot be addressed from disciplinary silos, and effective action needs holistic work teams; that any responses unfold in, and work with, a context of growing uncertainty and risk and that the production of knowledge and policy lessons must be undertaken collaboratively with end users and go hand in hand with the generation of practical skills and resources. A post-carbon roadmap, then, is holistic, collaborative, inspirational, participatory, multi-methodological and multi-disciplinary. Rather than seeking a fixed end point, the post-carbon is a provocation and process (Heinberg and Lerch, 2010). It is a practical learning tool that asks us to think about, starting from where we are now, what steps we all could take in working towards a post-carbon world. It is an approach and design methodology that starts with people's daily lives, and thus may not immediately start with ecological issues. It is a call to acknowledge the challenges raised by our utterly carbon-dependent and carbon-producing age and how to overcome them if human life is going to continue safely on planet earth (Heinberg and Lerch, 2010).

Therefore, while the post-carbon agenda is a natural extension of debates on low carbon cities around how to tackle climate change, GHGs and energy constraints, it also moves us beyond them. If it is to address the seriousness of issues and concerns, it is no less a new socio-economic-ecological deal based on overcoming the limits of the carbon age through economic decarbonisation, degrowth and eventually a steady state economy (O'Neill, 2011), a moratorium on fossil fuel use, a relocalisation of daily life, and reclaiming space for greater popular control and common ownership from both the market and state. Defined thus, it is distinctive and more useful precisely because it is both radical and open in terms of seeking grassroots innovation and the co-design of solutions that are potentially feasible and scalable. Rather than dwelling on documenting the shortcomings of the carbon age, the question becomes: how can a post-carbon agenda address the challenges that the carbon economy has failed to resolve? (see Prins et al., 2010). The paper now turns to the Lilac project as an example of an emerging post-carbon urban initiative in practice.

Lilac. An overview of the project

Lilac is a housing co-operative project that I cofounded in Leeds, UK, in 2009. The idea significantly predates this and originally grew out of two parallel discussions. The first involved a group of friends who were interested in setting up a cohousing project and the second concerned the possibility of forming an eco-village in the city after a lecture was organised on ecovillages by Ezio Manzini, Italian Professor of Industrial Design. Subsequent contacts were made with the Global Eco-Village (GEN) network throughout 2008 to explore how the idea could be translated into practice. At this stage, there was a huge range of opinions and preferences as to what the idea might mean in practice. It required a smaller group to offer strategic direction and initial momentum who focused on three core ideas to drive the project forward: low impact living, affordability and community. This led to the creation of the acronym 'Lilac' which summed up the social, economic and ecological ambitions of the project.

In May 2009 Lilac was registered as an Industrial and Provident Society under English law by five founder members. It won a further small initial grant from a social enterprise charity Unltd to set up the society's infrastructure such as website, rules and leaflets. It developed a number of business plans which it used to engage in dialogue with the local authority over three years. After a long land search Lilac finally entered into negotiations with Leeds City Council to purchase a 0.7 hectare site from them. After protracted discussions, the local authority sold the site to Lilac at market levels, deferring half of the land receipt and receiving a grant from the UK Government's Homes and Communities Agency to decontaminate it. This external grant support was crucial and raises questions of replicability which are discussed later.

In the first year the basic parameters of the project were developed before recruiting members. Lilac was committed to building with natural materials and especially straw and timber which would allow it to deliver an ecological, affordable and community-based approach to construction. It teamed up with Modcell, a firm that had developed a modular solution to building with straw and timber. It received a £420,000 grant from the Homes and Communities Agency under its Low Carbon Investment Fund to experiment with straw construction. The Society also chose a mutual home ownership model and a cohousing approach to enhance deliberative decision making and social interaction amongst its members.

With its architect White Design appointed, it developed a 20 home scheme based around a central common house and began recruiting members to join the Society. By mid 2012 all the properties were filled and the membership had the following characteristics: 32 adults with 9 children, although these were largely toddlers with teenagers absent due to the reluctance of established families to move their children once in high school; a wide age range including members over 70 years old and several over 50 years, reflecting the popularity of cohousing with older age groups; a significant group in their 30s who largely represent younger social pioneers and who were establishing families; more women than men overall; due to the net incomes

needed to live in the project all members worked and there is an identifiable trend towards work in public sector, care and health professions; a dominance of cohabiting households, three of which were same sex couples; and an identifiable subset of older single women. Lilac received planning permission in May 2011, started on site in March 2012 and is due for completion in January 2013. Due to space constraints the various stages and huge work load spreading over four years by the founding members to get the project established cannot be expressed in any detail in this paper.[i]

So why an urban location and why Leeds? In the absence of coherent national and international agreements, opportunities are emerging for decisive action at the subnational scale by city regional authorities (see Bulkeley and Schroeder, 2008; Farreny et al., 2011). Given that cities alone account for 78% of anthropogenic carbon dioxide emissions (Stern, 2006) their response will in large part dictate the overall success in dealing with climate change over the coming decades. A city, then, seemed the natural location. However, the Lilac initiative did not emerge from mainstream policy efforts in Leeds to install what Jonas et al. (2011) have called a new environmental politics of urban development (NEPUD). Rather Lilac represents a more grassroots, informal and community-led approach to low carbon urban governance (Seyfang, 2009). Rather than formal policy support, Leeds offered a critical mass and a fortunate series of encounters, opportunities and informal networks to bring together active individuals and groups to kick start the idea. These included the local Green Party who brokered a meeting with the Leader of the Council, grassroots organisations such as the Permaculture Network, the Co-operative Development Agency, and Sustainable Futures Leeds who provided early support, as well as founder members who had built up experience in housing co-operatives and community organising in the city. Nevertheless, various statutory policy measures were useful devises which helped Lilac shape and align their argument to policy priorities when bidding for resources from the local state including Leeds City Council's ambitious carbon reduction plan, as well as national guidance on sustainable communities and community asset transfer. In the case of Leeds, Lilac

was actually leading low carbon urban policy rather being led by it. It also represents a fundamental departure from the kinds of priorities contained in NEPUD such as competitiveness, entrepreneurialism, marketing and low carbon economic growth. The next sections detail the three elements of Lilac which outline a tentative agenda for post-carbon cities based on the project to date.

(a) Low Impact Living. The challenge of 'post-carbon' value change

It is now well established that creating a society that is less dependent on fossil fuel resources and which decarbonises its energy and productive systems will inevitably entail both value and behaviour change as well as technological innovation (Hopkins, 2008). While (2011) has introduced the idea of 'carbon value change' which is useful to understand new forms of carbon calculations that are opening up possibilities for altering values at different sites and scales of decision-making involving household choices and public and private sector organisations as responses are made to tackle environmental change. This era of low carbon capitalism (Jonas and While, 2010) presents a complex set of policy options, technological choices, value systems and interpretations of citizenship and modes of decision making, many of which overlap and compete in terms of how best to make a post-carbon transition (Mol et al., 2009).

The Lilac project effectively represents an attempt to explore what low-impact, post-carbon values means in practice. Translating low impact urban living from an idea to a reality has become such a challenge and has proved so elusive precisely because it involves debates not just about technological change but also in terms of value, cultural and institutional change as well as redefining relationships between individuals, communities, states and markets. Reductions in GHGs and energy use will only be achieved through developing a radically different and more collective and ecological notion of citizenship (Littler, 2009, Dobson, 2003), especially in terms of a shift away from prioritising individual consumer identities towards group interconnection and shared responsibility as sources of prosperity and wellbeing. Living lightly on the planet

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raises a complex set of ethical choices that have implications for how social and political systems are designed, managed and delivered far beyond the choice of technologies and institutional forms. These choices raise issues of equity, distribution, reciprocity (Katz, 2004), relations between humans and non humans (Plumwood, 2001) and (anti-)consumerism or de-growth (Victor, 2008).

In terms of housing, the debate focuses on the urgent need to reduce carbon emission rates from dwellings. There are technical, behavioural and cultural aspects to this. In 2010 domestic consumption was 32% of total UK final energy consumption, with space heating accounting for 58% of this usage alone (DECC, 2010). Given this situation, in 2006 the UK government set ambitious targets for ensuring all new homes are 'carbon neutral' by 2016, although in 2011 these requirements have been downgraded to just being 'zero-carbon', eliminating the requirement to offset carbon emissions from all energy use in the home (DCLG, 2010; Goodchild and Walshaw, 2011). Nevertheless, the Code for Sustainable Homes in the UK has meant a step change in the use of building techniques and materials that both have lower embodied carbon and promote lower levels of energy use over the building lifetime. This has also promoted the use of natural building materials such as hemp, straw and timber (Woolley, 2006).

Lilac's approach to low impact living embraces the need for substantial value change from the outset and is committed to a deliberative democratic approach to choosing and coproducing social and technical systems to achieve this. A number of key choices were made by members at various stages across four areas: building fabric, micro-renewables, community design and behaviour issues encoded through community agreements. The first choice that was made was to invest in very low impact and high performance natural building materials. Straw and timber were preferred as they provided opportunities for elements of community self build but also because they can be sourced locally and create value added local supply chains. Jones (2009) has estimated that 423,000 houses could be built using the 2.37m tonnes of waste straw that is

ploughed back in to agricultural land annually in the UK. Lilac chose a prefabricated strawbale and engineered timber system called Modcell for the construction of the houses. This system using Modern Methods of Construction (MMC) offers advantages over traditional strawbale building in terms of structural strength, building insurance, ease and speed of construction and getting over the difficult perceptual barrier straw is dangerous or outdated. Modcell is based around individual panels which are built in a temporary 'flying factory' near the construction site where residents take part in their construction. High precision cross laminated timber is assembled into frames and filled with straw and then finished with a lime render.

Modcell is currently more expensive than other traditional construction techniques such as brick and block, however it was chosen as strawbale construction not only delivers low embodied carbon in the construction materials, but also in terms of lifetime energy usage. Natural, plant based and locally sourced building materials can play a huge role in reducing carbon emissions given that they sequester carbon through their use. In contrast, conventional materials such as steel and cement have a huge impact on the planet, with the cement industry producing more than 5% of total global CO2 emissions alone (Worrel et al., 2001). Using straw in construction is carbon negative as carbon is stored and then locked up in plant based construction materials. One 16kg strawbale alone stores 32kg of CO_2 (Jones, 2009, 22). A typical 100m2 house made from Modcell sequesters 43 tonnes of CO_2 (Modcell, 2010). This compares to an average UK house that produces 50 tonnes of CO_2 during its construction (Jones, 2009, 22). The project has a requirement to meet the UK Government's Code for Sustainable Homes (CSH) Level 4 certification, achieving a 44% reduction in 2006 Building Regulation CO_2 (25% on the 2010 Regulations).[ii]

A typical house constructed from Modcell has an energy demand of around 30 Kwh/m2/yr. While this compares favourably with an average space heating demand for existing UK housing stock of 140 Kwh/m2/yr, it does fall short of the PassivHaus target of less than 15 Kwh/m2/yr.

Nevertheless, this kind of energy performance still equates to a reduction in energy consumption and bills of up to two-thirds for a Modcell house at Lilac compared to existing housing stock in the UK.

The second set of choices related to how to meet energy and space heating needs. Lilac employed an energy consultant *Progetic* to generate a number of energy options according to a list of criteria which members generated. These were: *Low impact, Future proof, Comfortable, Learning, Reliable, Reduce demand as a starting point, Easy to use and maintain, Appropriate to needs, Affordable, Understandable and demonstrable, Designed to minimize external/additional resources, Locally sourcing and serviceable.* Eight different energy options were generated which met these criteria, and several were eliminated due to lack of affordability, failure to Meet CSH 4 or due to poor fit to energy needs or site. In the end a risk averse, simple and cost effective option was chosen as the excellent performance of the building envelope allowed Lilac to approach this level without significant additional infrastructure and investment. To meet Code 4 and to provide the space and water heating needs of the community, a 28KWp (kilowatt peak) solar PV array and Mechanical Ventilation with Heat Recovery (MVHR) units were added as well as a high efficiency gas boilers with selected solar thermal water heating units.

Third, a collective design methodology was undertaken for individual houses and the whole community to design out certain carbon intensive elements. The overall site was designed with a shared common house and car-free home zone in the middle. Car restraint and segregation were principle components. Overall there are only 10 car parking spaces (0.5 for each dwelling which is below the average of 1.7 for the city) and 40 cycle spaces. The Society has adopted a travel plan which outlines how car allocations will function and will dictate that 50% of cars will be pooled either by the Society or by groups of members.

Figure 1. Layout of the Lilac development. Source: White Design Associates.

Finally, a number of community agreements were devised to provide guidelines for member's individual behaviours, their interactions with others, and the use and management of shared spaces. Clearly there is a complex deliberative process underpinning the creation of such agreements, and this is discussed in section three.

Considering the participatory nature of the project, implementing post-carbon value change is an ongoing process which is far from problem free. These include the difficulties of actually achieving 0.5 cars per dwelling as many residents are still locked into workplace car dependency, worries about the performance and comfort of micro-technologies such as MVHR units and concerns whether centralizing laundry facilities in the common house will actually serve the needs of residents. Further, a number of compromises had to be made on cost grounds such as having a gas supply, reducing rather than eliminating the use of cement, and only achieving Code 4 rather than meeting more exacting PassivHaus or zero-carbon building standards.

(b) Affordable. Mutualism and the challenge of equality

Given that housing is such a central determinant of wellbeing and prosperity, the second challenge that Lilac foregrounds is the need to challenge an unsustainable housing model and develop an alternative based on economic equality between residents, permanent affordability, demarketisation, non speculation and mutual co-ownership. Changes in housing markets over the last twenty years have become a particular barrier to greater social equality. Access to easy credit has led to the commodification of housing and a hugely over-inflated housing market over the last two decades (Smith et al., 2009; Whitehead and Williams, 2011). Before the recent financial crisis, what this led to was a housing affordability crisis. The average house price to earnings ratio doubled from just 2.7 to 1 in 1995 to 5.4 to 1 in 2005 (Wilcox, 2006) with the post economic crash figure still at 4.43 (Nationwide, 2011).

One of the concerns Lilac had was that the shift in emphasis towards low- or zero-carbon ecohousing may exacerbate the affordability crisis, attract high house price premiums and create new opportunities for speculative activity and new asset bubbles. There is nothing inherently affordable about patterns of low carbon urbanism. How to make housing that is both low carbon and affordable, then, is a major challenge. In fact, what Lilac found was that building to exacting lower carbon standards attracts a cost premium compared to average build costs, but that this increase in value cannot be recouped through higher mortgage valuations, which in turn creates loan-to-value ratios which are not sufficient to finance the full build cost without additional gap funding (see also Osmani and O'Reilly, 2009). In practice, evidence points to highly uneven development outcomes in terms of access and cost (Hodson and Marvin 2009). Of concern is the trend towards gated, exclusive, privately owned and speculative eco-urban developments which have created archipelagos of adaptation for a wealthier minority that fail to address growing affluence and urban sprawl (Hodson and Marvin, 2010).

Such an affordability crisis requires a wholescale rethink about the financial and legal infrastructure for the provision of housing. Housing needs to be reconceptualised as a consumer durable that depreciates rather than a speculative asset that constantly appreciates according to market conditions. There is a long tradition of self managed mutual and co-operative housing solutions that have attempted to rethink housing including tenant management organisations, shared and part equity schemes, community gateway projects, community land trusts and short-life and fully mutual housing co-operatives (New Economics Foundation, 2003, Field, 2011).

The Lilac project attempts to pioneer one such solution through a new affordability model called a Mutual Home Ownership Society (MHOS) which is an equity based leaseholder approach to co-operatively owned housing. This model, first proposed by the New Economics Foundation and CDS Co-operatives, lays out the case for intermediate housing that guarantees affordability in perpetuity for its members (New Economics Foundation, 2003). In this model, affordability is

defined through the proportion of income spent on housing set at no more than 35% of net household income. It creates an intermediate housing market where rents are above those of social housing but below market price (Wilcox, 2006). While Wilcox (2006) found that 40% of households fall within the 'broad intermediate housing market' in the UK, the size of the housing market to meet this demand is inadequate. There is huge potential for the mutual housing market to fill this gap especially given that it currently only represents 0.5% of housing in the UK (Commission on Co-operative and Mutual Housing, 2009).

Lilac will be the first MHOS in the UK and chose this model to experiment with economic equality in practice. This model is complex and a simplified schematic is presented in figure 2. The MHOS owns the homes and land rather than individual members. Lilac is owned and managed by its members who will be the residents who live in the homes it provides. Each member has a lease which gives the right to occupy a specified house or flat owned by the MHOS. Membership of the MHOS will give members democratic control of their housing. The cost of building the homes owned by the MHOS, is financed by a long term mortgage loan from ethical bank Triodos. Under the terms of their lease, each member will make monthly payments to the MHOS which will pay the Society's loans, and cover a deduction for service costs.

The cost of buying the land and building the homes owned by the MHOS and financed by the mortgage is divided into equity shares. This equity is allocated to households and they are acquired (or paid for) through each member in that household being levied a monthly member charge equivalent to 35% of their net income. Members pay a deposit equal to 10% of the equity shares they can afford to finance through their monthly payments. In this way every member, regardless of their income, pays the same proportion, placing the principle of equality at the heart of the model. The number of shares owned by each member depends on their income and the build cost of their home. The more they earn the more equity shares they can afford to finance. If the income of a member falls, rather than lose their home, they can sell equity shares

if there is a willing buyer, draw on the Society's reserve fund, or convert to a standard rental tenancy. To ensure sustainability of the project the value of the equity shares owned by a household cannot differ more than (plus or minus) 10% of the build cost. If the monthly member charge payments (35% of net income) is 10% above the amount required to finance equity shares of the value of the build cost Lilac has devised a High Earners Policy which places the excess into a reserve fund, capped at £3000.

Once equity shares have been paid for by a household, it will then pay a nominal 10% of its net income. If a member moves out and sells their shares before they have lived in the MHOS for three years they will only be able to sell them at their original value (or a lower one if their value has fallen). For members who leave after three years, they will receive 75% of the change in value of the equity shares, which is indexed to changes in average national incomes rather than local housing prices. Members can move between properties in the scheme as they become available and as their housing needs change as long as all the equity shares can be financed by incoming members.

Figure 2. Lilac's Mutual Home Ownership Society. Source: the author.

Clearly, Lilac is affordable within parameters as a minimum net income for all members in a household is needed to service the debt allocated to each household. These household minimums currently range from £15,000 for a one bed flat to £49,000 for a four bed house. In the future, it is anticipated that as financial reserves are built up a greater range of incomes can be admitted to an MHOS, with less debt needed to be allocated to those on very low incomes. Additionally, members cannot be benefit claimants as they are prohibited from accruing equity under housing law. If a member lose their job, their equity is frozen and they are placed on a contractual tenancy.

Nevertheless, there are a number of reasons that this model remains affordable: monthly member charges are geared to 35% of net household income; members secure a 'foothold' on the housing ladder at lower household incomes and with lower entry deposits; members can buy more shares as their income rises; transaction costs on buying into and leaving are reduced because homes are not bought and sold; and the linkage in the change in the value of equity shares to average earnings rather than local house prices helps reduce risk and dampen increases in value and make it affordable from one generation of occupants to the next (see Rodgers, 2009). In sum, the MHOS is a radial departure from conventional routes to home ownership. It promotes resident self management, decommodifies housing tenure and creates more stable neighbourhoods.

The MHOS model both promotes access to less wealthy groups and discourages wealthier groups who are seeking speculative returns from housing. This is a significant difference to owner occupied forms of eco and cohousing. Clearly there are still limits that need working through, and some which Hodkinson (2010) rightly highlights, including the lack of sources for accessing development finance, the need for households to meet minimum income thresholds, the exposure to risk that comes from the small size of this sector, and dependency on grant funding as well as from additional capital from members.

(c) Community. Cohousing and the challenge of co-operative self governance

The final challenge takes the need for low impact and affordable housing and places it in the context of increasing community self governance and resident democratic control of housing (see Ward, 1985). Lilac chose a cohousing approach as a deliberate attempt to embed self managed governance structures in the life of the community and increase purposeful interaction between members (Durrat and McCamant, 2011). Cohousing is an established method of building affordable housing communities, with a range of 12-36 dwellings. There are 300 in Denmark, 65 in North America, and 8 in the UK (with 20 proposed). The concept of co-housing

originated in Denmark centering around the idea of designing housing to promote a more interactive lifestyle using a mixture of individual dwellings around shared spaces, often based upon clear 'intentional' values that help shape group behaviour and ethos. There are a number of benefits to a cohousing approach: a participatory, member-led process that responds to member needs; the site layout and design intentionally fosters community interaction, well being, safety, natural surveillance and support for the elderly; residents have the benefit of private self contained homes with shared co-located facilities; residents manage all aspects of the site; there is a commitment to lower living costs through pooling resources; car reduction combined with car separation and car free home-zones to increase safety, interaction as well as reducing carbon emissions related to car use; a greater sense of democratic participation and ownership; and finally the democratic nature of cohousing creates mechanisms through which low carbon behaviour changes can be enacted (Jackson and Svensson, 2002; Scotthanson and Scotthanson, 2005, Jarvis, 2011; Sargisson, 2009; Bunker et al., 2011).

Lilac adopted a cohousing approach from the outset as a way to increase community self governance and promote individual and collective behaviour change. While it is not an intentional community which overtly foregrounds spiritual or ecological principles (Sargisson, 2007), nevertheless its name and values are directive enough to attract residents with a strong commitment to social and environmental justice in the first instance. Lilac's commitment to self-governance through cohousing is embedded in a number of ways. First, a design approach was used that involved all the members in a problem solving approach to codesigning the neighbourhood and their homes in a way that designed out carbon intensive activities and designed in low carbon behaviour and group interaction. Lilac undertook a series of collaborative design workshops exploring themes such as community layout, the role and function of the common house, the energy strategy and internal layouts.

Second, cohousing requires deliberative and direct forms of democracy which brings residents together to formulate and implement aspects of community life and resolve conflicts and mediate opinions. For Lilac the MHOS forms the democratic heart of the project. Consensus decision making is used in meetings with templates used to generate and discuss proposals, explore pros and cons, generate amendments and ratify decisions (Trapese Collective, 2008). The Society has collaboratively produced a number of community agreements using a standard template which outline expectations and limits on different aspects of community life. Members are free to propose a community agreement and it is put forward as a proposal for discussion, amendment and then ratification. These cover areas such as pets, communal cooking, use of the common house, management of green spaces, equal opportunities, vulnerable adults, the use of white goods, housing allocation and diversity. Some have raised areas of disagreement and have still not been finalised. For example, the food agreement raised ongoing discussions around whether food served in the common house should be vegan or vegetarian and whether meat could be brought into the house.

Figure 3. Template for Lilac's community agreements. Source: Lilac.

This organisational structure is an evolving entity. It has grown organically in response to criticisms and inefficiencies and ideas are constantly tested and refined. For example, the initial centralised 'Development Group' formed by cofounders worked well in the initial years but as the Society grew it could not manage with increased workloads. A visioning day in November 2011 restructured and more equally distributed working practices. From this, a structure emerged based on three kinds of decisions, which was adapted from the Tacoma Cohousing project in the USA. Eight self-directed and participatory task teams undertake routine decisions based on a preset remit in areas such as membership, landscaping, finance, maintenance, publicity, process, community outreach and learning/research. The process team is responsible for maintaining effective decision making across the Society and helps with meeting planning, agendas and

conflict resolution. Bi-monthly general meetings are responsible for strategic decisions and direction where proposals, sent in advance, are discussed, amended and ratified. Finally, members elect the Board of Directors which undertakes an overview function for the legal and financial running of the MHOS within the remit set by members. One of the challenges for the Society is to ensure workloads remain at a sustainable level, which in the development phase has not been the case. The complexities and risks associated with developing the project have created considerable stress for a subset of the membership which have been developing the detail of the project. This raises important concerns about the sustainability of community-led projects at this scale.

Third, the common house is now a well established central feature of cohousing which creates a geographical heart looking inward to the community as well as acting as a permeable interface outwards. Lilac followed the now well established norms for building common houses with shared facilities: it is a two storey building comprising large shared dining and cooking space, office, multipurpose room, workshop, laundry, bike storage, and food co-operative. Many of the facilities will be available to the local community. While the development and running cost has been divided amongst the residents, these are outweighed by the subsequent gains in terms of reduced living costs and increased social opportunities. One of the key innovations is that washing machines are provided in the common house and not the private dwellings offering considerable savings in energy use, and high value-low use resources such as lawnmowers, power tools and repair equipment are pooled. The common house provides a social focus for the community through structured encounters based around community meals and meetings as well as informal encounters through postal collections and notice boards.

An agenda towards post-carbon cities. Lessons from Lilac

What I have outlined in this paper are the results to date from a recently completed project that is attempting to implement a low impact, affordable community-led cohousing project. Clearly it

is a model full of imperfections, complexities and difficulties and many of the assumed benefits will only be fully tested when Lilac operates as a living community. What I want to do by way of conclusion is discuss six lessons that emerge from the Lilac project in its development phase. Individually, these lessons are not necessarily original, as many are hallmarks of longer established cohousing and ecovillage projects. However, their originality comes form their combined effects which together they tentatively outline an emerging agenda towards post-carbon cities, and significantly challenge the Business-as-Usual model of urban development.

First, post-carbon urban initiatives need to be holistic, broad ranging and prepared to deal with the complexity of challenges they face. In this sense, Lilac brings together three key elements each of which responds to significant challenges in their own right: working towards post-carbon value change, mutualism and economic justice, and co-operative self-governance. To deliver its objectives simultaneously requires working across a set of complex institutional and governance frameworks and scales including legal, financial, planning, ecological, community liaison, design and governance issues. The ability to do this is extremely difficult as it challenges conventional wisdom in terms of the functioning of housing markets, land ownership, building fabric choices and community self governance which is reinforced by the silos and specialisms that most professions, especially central government departments and large volume housing builders, operate within. The challenge is to strategically build governance frameworks that promote holistic approaches.

The second aspect relates to the need for greater democratic accountability, control and self-determination. The case for community-level innovation to deliver reductions in carbon emissions through participatory, democratic and grassroots action is now well established (Seyfang and Smith, 2007; Mulugetta et al., 2010; Heiskanen et al., 2010; Peters et al., 2010; Middlemiss and Parrish, 2010). Lilac strives for this by promoting community self-governance through a cohousing approach and its deliberative structures, general meetings and community

agreements which allow life in the project to be debated, modified, and constantly improved. At the heart of the cohousing model is a shift from household to community level decision making which is an essential part of a post-carbon that can challenge the drift into individual consumer behaviour as a response to climate change and energy reduction. The post-carbon challenge is that initiatives are much more than community-led and participatory, but that they also increase local self-determination by taking back control and directly empower, be it in terms of land ownership, energy usage, where food is grown, how homes are financed or how residents interact and make decisions (see also Moore and McKee, 2012).

This entails a fundamental rethinking of the way urban space is used, planned and integrated. Cohousing is a key post-carbon design element in this respect, especially through its radical agenda towards reducing car ownership, reducing size devoted to individual dwelling space and increasing that devoted to spared facilities, the creation of central car-free green shared spaces, integrating productive growing space, maximizing resident interaction, designing convivial spaces, and providing activities that integrate new projects with existing communities. The limitation of current policy and planning frameworks to achieve these kinds of aims cannot be underestimated. Fragmentation of the understanding of the challenges within statutory agencies is still the norm, as is intense risk aversion and a best value approach to the management of public assets. A post-carbon agenda encourages a finer grain approach to planning space which can often yield greater changes than the grand visions of master planning (Hamdi, 2004; Sandercock, 2003).

Third, post-carbon initiatives need to deal with, rather than overlook, the political tensions and conflicts that they generate as a result of working towards various, and often competing, urban futures (Hulme, 2010). As While (2010: 42) notes, politics matters in the 'low carbon transition'. The task at hand is to challenge the turn to the 'post political' (Swyngedouw, 2009), an era where issues such as climate change are often neutralized and sanitized through a scientific and

technologically driven consensus that focus on abstracted concepts such as percent reductions in CO_2. Embracing these political differences is actually productive and allows us to sharpen our thinking on the kinds of socio-technical and governance arrangements that promote a post-carbon transition and how these can be achieved.

This politics of post-carbon cities is complex to grasp, being simultaneously 'in', 'against' and 'beyond' the current paradigm (Holloway, 2010). An initiative such as Lilac has to deal with these complexities (Feliciano, 2010). For example, it has to act within the constraints of existing planning, financial and regulatory frameworks, and cultural and behaviour norms. At the same time, it aims to be a radical alternative, seeking to build resilience through intervening in the structural origins of problems rather than responding passively to external shocks and changes (see Evans et al., 2009), as well as developing new ways of urban living that challenge growth-based neoliberal policies (see North, 2010; Pickerill, 2011). Finally, it represents an inspirational laboratory, acting as educator, overcoming inaction and confusion, providing compelling examples and innovative experiments in future adaptations that can tackle climate change and energy scarcity (Evans, 2011). Post-carbon initiatives need to find ways to break down their broad, holistic vision into practical components that are simple, localisable and replicable within the mainstream.

Fourth, post-carbon initiatives encourage us to think about urban transitions in terms of process as opposed to merely outcomes. Rather than predetermining and then aiming for optimal outcomes or targets, a process based approach foregrounds the post-carbon as a participatory provocation. What this process based approach means for gauging wider impact is important. Hodson and Marvin (2010) raise the important question of 'how would we know if we have been successful?' The answer is as much about how we get there, as our destination.

Constant vigilance and intermediate milestones are needed to assess where post-carbon initiatives are heading. The post-carbon could become a roadmap for rebooting and deepening

capital accumulation, further embedding market relations, commodifying land and resources and further uneven geographical outcomes. Cohousing is an illustrative case as it contains tendencies towards the more egalitarian Scandinavian model based on co-ownership and maximizing access, as well as the more US influenced privatized cohousing model based upon individual condominiums for sale at open market prices. Eco-developments and cohousing schemes are already emerging with high entry barriers in prosperous high consumption semi-rural towns or more progressive cities n the UK such as Stroud, Lancaster, Brighton and Bristol. A commitment to affordability, accessibility and economic equality need to be at the heart of this post-carbon roadmap. Lilac is one example that aims for this through a mutualist model of intermediate housing which is a direct challenge to the 'business as usual' market supply of housing. The MHOS model is a useful rebalancing devise that can offer housing to those facing barriers accessing housing and attempts to address the imbalance in terms of how work is remunerated differently in the labour market (Albert, 2004). The challenge remains to create a generalised model that can be implemented in intermediate housing markets and lower income urban communities. Hodkinson's work (2010) encourages us to push alternative approaches to future housing policy further by considering common ownership as a route to limit the expansion of capitalism.

Fifth, strategic action planning for replicability is essential. While Lilac can be understood as a micro-level, niche, protected space which represents a window of opportunity to change dominant socio-technical regimes (Geels, 2005) there are concerns about the extent to which they can diffuse their ideas beyond niches and into wider society (Seyfang , 2010). Clearly, there are limitations to the replicability and affordability of Lilac given it relied on a significant central government grant which no longer exists, and significant investment capital (from public or private sources) would be needed to broaden the model. The significant challenge, as Seyfang and Smith (2007) rightly stress, is breaking out of these niche ghettos through constructing intermediate institutions that can scale up their impact and gain broader leverage over, for

example, multinational corporate interests and those of the business-friendly state (see also Bailey et al., 2009; North, 2011). The question, then, is how and in what form, to do this. It is common place to discuss how low carbon cities are emerging through multilevel governance frameworks (Bulkeley, 2005; Bulkeley et al., 2011; Hodson and Marvin, 2011) which are co-constituted through formal levels of institutional and governance arrangements, more informal social norms and actions, as well as decisions and action at different spatial scales (Paavola et al., 2009; Peters et al., 2010). The task remains to determine precisely which governance arrangements promote and which inhibit the kinds of post-carbon urban transitions discussed here, and to build strategy and capacity that strengthens the former while weakening the latter.

Indicative elements of this strategic planning include support and resources for deliberative democratic structures, community capacity building, institutional and planning realignment to aid risk taking and experimentation, a reorientation of lending/start up capital for the mutual and intermediate sector, reforming land markets focusing on prohibiting land banking and speculation by the large-scale private sector, and a land fund to allocate land for mutual, community-led housing.

Finally, the post-carbon agenda entails arguing for localities that are neither parochial nor inwards looking, but recognise and build upon extra-local links and the global networks of solidarity, justice and co-operation that have long characterized anti-paradigmatic experiments (Featherstone, 2008). Katz's (2001) concept of 'counter-topography' is useful which practically and analytically connects community innovations across disparate places. The post-carbon will at some level also entail a radical rethinking of what is commonly understood and experienced as the urban. What settlement forms and neighbourhood patterns emerge in future scenarios that are both more localized and egalitarian, as well as limit dangerous levels of GHGs and the use of fossil fuels, is a considerable research question that needs urgent further research as part of this post-carbon agenda (Vanderbilt, 2010).

Acknowledgements

References

Autonomous Geographies Collective (2010) Beyond scholar activism: making strategic interventions inside and outside the neoliberal university. ACME. 8(1).

Agyeman, J. (2005) *Sustainable communities and the challenge of environmental justice*. New York University Press.

Albert, M (2004) *Life after capitalism*. Verso: London.

Anderson, K., A Bows, S. Mander (2008) From long-term targets to cumulative emission pathways: Reframing UK climate policy. *Energy Policy* 36:10, 3714-3722.

Atkinson, A (2007) 'Sustainable development' and energy futures. *City: analysis of urban trends, culture, theory, policy, action,* Vol 11, 2, pp. 201-213.

Bailey, I., Rob Hopkins, Geoff Wilson (2009) Some things old, some things new: The spatial representations and politics of change of the peak oil relocalisation movement. *Geoforum*. 41 (4). 595-605.

Barber, B (1984) *Strong democracy. Participatory politics for a new age*. San Francisco. California Press.

Bicknell, J., D. Dodman, et al., Eds. (2009). *Adapting Cities to Climate Change: understanding and addressing the Development Challanges*. London: Earthscan.

Bond, P (2010) *Climate justice, climate debt, and anti-capitalism: An interview with Patrick Bond*. Durban Group for Climate Justice. http://www.durbanclimatejustice.org/articles/climate-justice-climate-debt-and-anti-capitalism-an-interview-with-patrick-bond.html.

Boyle, D (2009) *Localism. Unraveling the supplicant state*. New Economics Foundation. London

Bridge, G. (2010). "Geographies of peak oil: the other carbon problem." *Geoforum* 41(4): 523-530.

Bulkeley, H., and Schroeder H. (2008) *Governing Climate Change Post-2012: The Role of Global Cities - London,* Tyndall Centre Briefing Note 34.

Bulkeley, H., Castan-Broto, V., Hodson, M. and Marvin, S. (2011) *Cities and Low Carbon Transitions*. London: Routledge.

Bulkeley, H. (2005). "Reconfiguring environmental governance: towards a politics of scales and networks." *Political Geography* 24: 875-902.

Bunker, S., Coates, C., Field, M., and How J (eds.) (2011) *Cohousing in Britain Today*. Diggers and Dreamers Publications: London.

Chatterton, P., Fuller, D and Routledge, P (2008) Relating Action to Activism: Theoretical and Methodological Reflections, in Pain, R and Kesby, M (eds.) *Connecting people, participation and place*. London: Routledge. p245-287.

Chatterton, P (2010) 'The urban impossible: A eulogy for the unfinished city', *City*, 14: 3, 234 — 244.

Commission on Co-operative and Mutual Housing (2009) *Bringing democracy home*. CCMH. London.

Condon, P (2010) *Seven Rules for Sustainable Communities: Design Strategies for the Post-carbon World*. New York: Island Press.

Department for Communities and Local Government (2010) *Summary of changes to the Code for Sustainable Homes technical guidance – 2010*. DCLG Publications: London.

Department for Energy and Climate Change (2010) *Energy Consumption in the UK*. http://www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx

Dobson, A (2003) *Citizenship and the Environment*. Oxford University Press: Oxford.

Dunster, B, Simmons, C and Gilbert, B (2008) Th*e ZedBook*. Taylor and Francis: London.

Durrett, C. and K McCamant (2011) *Creating Cohousing: Building Sustainable Communities*. New Society Publishers.

Evans J, Jones P and Krueger R (2009) Organic regeneration and sustainability or can the credit crunch save our cities? *Local Environment* 14 683–98.

Evans, G. R. (2008) Transformation from Carbon Valley to a Post-Carbon Society in a climate change hot spot: the coalfields of the Hunter Valley, New South Wales, Australia. *Ecology and Society* 13(1): 39-51.

Evans, J. (2011) Adaptation, ecology and the politics of the experimental city. *Transactions of the Institute of British Geographers* 36, 223-37.

Farreny R, Oliver-Solà J, Montlleó M, Escribà E, Gabarrell X, Rieradevall J, (2011) "Transition towards sustainable cities: opportunities, constraints, and strategies in planning. A neighbourhood ecodesign case study in Barcelona" *Environment and Planning A* 43(5) 1118 – 1134.

Featherstone, D.J. (2008). *Resistance, Space and Political Identities: The Making of Counter-Global Networks*. Wiley-Blackwell, Oxford.

Feliciano, M., David C. Prosperi, (2011) Planning for low carbon cities: Reflection on the case of Broward County, Florida, USA, *Cities*, 28:6. 505-516.

Field, M (2011) *Housing co-operatives and other mutual housing bodies*. Institute for Urban Affairs. University of Nottingham.

Geels, F. W. (2005). *Technological Transitions and System Innovations: A Coevolutionary and Socio-Technical Analysis*. Cheltenham, Edward Elgar.

Girardet, H (ed) (2007) *Surviving the century: facing climate chaos and other global challenges*. London: Earthscan.

Goodchild, B. Aimee Walshaw (2011) Towards Zero Carbon Homes in England? From Inception to Partial Implementation. *Housing Studies.* 26:6, 2011.

Gossop, C (2011) Low carbon cities: An introduction to the special issue, *Cities*, 28: 6. 495-497.

Hamdi, Nabeel (2004) Small Change. *The art of practice and the limits of planning cities* London: Earthscan.

Heinberg, R. (2004) Powerdown. *Options and Actions for a Post-Carbon World.* New Society Publishing: San Francisco.

Heinberg R (2005) *The party's over: oil, war and the fate of industrial societies.* New Society Publisher: San Francisco.

Heinberg, R and Lerch, D (2010) *The post carbon reader.* New Society Publisher: San Francisco.

Heiskanen, E., Johnson, M., Robinson, S., Vadovics, E. and Saatamoinen, M. (2010) Low-carbon communities as a context for individual behaviour change, *Energy Policy* 38, pp. 7586-7595.

Hodson, M. and Marvin, S. (2009), 'Urban Ecological Security': A New Urban Paradigm?. *International Journal of Urban and Regional Research,* 33: 193–215.

Hodson, M. and Marvin, S. (2011) 'Can Cities Shape Socio-technical Transitions and How Would We Know If They Were?' In Bulkeley, H., Castan-Broto, V., Hodson, M. and Marvin, S. *Cities and Low Carbon Transitions.* London: Routledge.

Hodson, M., and Marvin, S., (2010) 'Urbanism in the Anthropocene', *City*, Vol.14: No.3. pp.299-313.

Hodkinson, S (2010) Housing in Common: in Search of a Strategy for Housing Alterity in England in the 21st Century. In *Interrogating Alterity.* Editors: Fuller D, Jonas AEG, Lee R.

Holloway, J. (2010) *Crack Capitalism.* Pluto Press: London.

Homer-Dixon, T. (2006) *The upside of down: catastrophe, creativity, and the renewal of civilisation.* London: Souvenir Press.

Hulme, M. (2009). *Why we disagree about Climate Change.* Cambridge University Press, Cambridge.

Intergovernmental Panel on Climate Change (2007) *Fourth Assessment Report of the IPCC. Climate Change 2007. Synthesis Report.* Geneva, Switzerland.

Jackson, H and Svensson, K (2002) *Ecovillage living. Restoring the earth and her people.* Totnes: Green Books.

Jackson, T. (2009) *Prosperity without growth: economics for a finite planet.* London: Earthscan.

Jarvis H. (2011) Saving space, sharing time: integrated infrastructures of daily life in cohousing. *Environment and Planning A*, 43(3), 560-577.

Jonas, A.E.G., Gibbs, D. and While, A. (2011), 'The New Urban Politics as a politics of carbon control' *Urban Studies* 48, 2537-2544.

Katz C (2004) *Growing up global. Economic restructuring and children's everyday lives.* University of Minnesota Press, Minneapolis MN.

Katz, C. (2001) On the grounds of globalization: a topography for feminist political engagement, *Signs*, 26,1213–1234.

Kunstler, J (2006) *The long emergency: surviving the converging catastrophes of the twenty-first century.* London: Atlantic.

Lerch, D. (2007) *Post carbon cities: planning for energy and climate uncertainty.* Santa Rosa, CF: Post Carbon Institute.

Littler, Jo (2009) Radical *consumption*: Shopping for change in contemporary culture. Open University Press.

Lovell, H., Bulkeley, H. and Owens, S., (2009) 'Converging agendas? Energy and climate change policies in the UK', *Environment and Planning C: Government and Policy* 27(1), pp. 90–109.

Manzi, T (eds.) (2010) *Social sustainability in urban areas: communities, connectivity and the urban fabric.* Earthscan, London.

Middlemiss, L; Parrish, BD (2010) Building capacity for low-carbon communities: The role of grassroots initiatives, *Energy Policy*, 38, pp.7559-7566.

Mol, A. P. J., D. A. Sonnenfeld, et al., Eds. (2009). *The Ecological Modernisation Reader: Environmental Reform in Theory and Practice.* Routledge. London.

Mulligan, S. (2010) Energy, environment, and security: critical links in a post-peak world, *Global Environmental Politics*, 10(4), pp. 79-100.

Monbiot, G, (2007) *Heat. How to stop the planet burning.* Allen Lane: London.

Moore, T. and McKee, K. (2012) "Empowering Local Communities? An International Review of Community Land Trusts" (Policy Review), *Housing Studies* 27(2):280-290.

Moulaert, F. ,Martinelli, F. Swyngedouw, E and Gonzalez, S. (2010) *Can neighbourhoods save the city?*, Oxon: Routledge.

Mulugetta Y, Tim Jackson, Dan van der Horst (2010) Carbon reduction at community scale. *Energy Policy* 38: 12. 7541-7545.

Murphy, P. (2008) *Plan c: community survival strategies for peak oil and climate change.* Pat Murphy. New Society.

Nationwide (2011) *Nationwide House Price Index.* http://www.nationwide.co.uk/hpi/historical/Oct_2011.pdf.

New Economics Foundation (2010) *Good Foundations: towards a low carbon, high well-being built environment.* London: New Economics Foundation.

New Economics Foundation, (2003) *Common Ground – for mutual home ownership.* NEF: London.

North, P (2011) The politics of climate activism in the UK: a social movement analysis. *Environment and Planning A*. 43. 1581 – 1598.

North, P. (2010). "Unsustainable urbanism? Cities, climate change and resource depletion: a Liverpool case study." *Geography Compass* 2(6): 1-15.

O'Neill , D (2011) Measuring progress in the degrowth transition to a steady state economy. *Ecological Economics*. In Press.

Osmani, M. and O'Reilly, A., 2009. Feasibility of zero carbon homes in England by 2016: a house builder's perspective. *Building and Environment*, 44 (9), pp. 1917-1924.

Paavola, J; Gouldson, A; Kluvankova-Oravska, T (2009) The Interplay of Actors, Scales, Frameworks and Regimes in the Governance of Biodiversity, *Environmental Policy and Governance*, 19, pp.148-158.

Panitch, L., Gregory Albo, Vivek Chibber, Colin Leys (Eds) (2010) *The crisis this time*. Merline Press. London.

Pearce, F (2006) *The last generation: how nature will take her revenge for climate change*. London: Eden Project.

Peters, M., Fudge, S., and Jackson, T. (Eds) (2010) *Low Carbon Communities: imaginative approaches to combating climate change locally*. Edward Elgar, Cheltenham.

Pickerill, J. (2010) Building liveable cities; urban Low Impact Developments as low carbon solutions? In Bulkeley, H., Vanesa Castán Broto, Mike Hodson and Simon Marvin, *Cities and Low Carbon Transitions,* Routledge: London.

Pickerill, J and Maxey, L. (2009) 'Geographies of sustainability: Low Impact Developments and spaces of innovation', *Geography Compass* 3, 4, 1515-1539.

Pike, A and Dawley, S (2010) Resilience, adaptation and adaptability. *Cambridge Journal of Regions, Economy and Society*. 1-12.

Plumwood, V (2001) *Environmental Culture: The Ecological Crisis of Reason*. Routledge: London.

Post-Carbon Institute (2010) '*About us'*. http://www.postcarbon.org/about/.

Preston, R (2008) *Who Runs Britain?: and Who's to Blame for the Economic Mess We're in*. Hodder: London.

Prins, G (2010) The Hartwell paper. A new direction for climate policy after the crash. LSE Mackinder Programme for the Study of Long Wave Events. London School of Economics: London.

Roberts, P. (2005) *The end of oil: on the edge of a perilous new world.* New York: Mariner Books

Rodgers, D (2009) *New Foundations – unlocking the potential for affordable homes*. The Co-operative party: London.

Sandercock, L (2003) *Cosmopolis II: Mongrel Cities in the 21st Century,* London: Continuum.

Sargisson, L, 2007. Imperfect Utopias: Green Intentional Communities. *Ecopolitics,* 1(1), 1-24.

Sargisson, L, (2009). Sustainability and the Intentional Community: Green Intentional Communities. In: Leaonard, L, B, John, eds. *The Transition to Sustainable Living and Practice.* Emerald Management Research Publishing, pp. 171-192.

Scotthanson, C and Scotthanson, K (2005) *The cohousing handbook. Building a place for community.* Gabriola Island: New Society Publishers.

Seyfang,G., (2009) Community action for sustainable housing: Building a low carbon future. *Energy Policy,* Energy Policy 38 pp.7624-7633.

Seyfang, G. and Smith, A. (2007) 'Grassroots Innovations for Sustainable Development: towards a new research and policy agenda'. *Environmental Politics* 16(4) pp.584-603.

Sharp, E. B., D. M. Daley, et al. (2011). "Understanding Local Adoption and Implementation of Climate Change Mitigation Policy." *Urban Affairs Review* 47(3): 433-457.

Shove E, Walker G, 2007, "CAUTION! Transitions ahead: politics, practice, and sustainable transition management" *Environment and Planning A* 39(4) 763 – 770.

Simms, A., Victoria Johnson and Peter Chowla (2010) *Growth isn't Possible. Why rich countries need a new economic direction.* Earthscan: London.

Smith, S,. B.A. Searle and N Cook (2009). Rethinking the Risks of Home Ownership. *Journal of Social Policy,* 38 , pp 83-102.

Somerville, P and Haines, N (2008) 'Prospects for Local Co-Governance', *Local Government Studies*, 34: 1, 61 — 79.

Spratt, D and Sutton, P (2008) *Climate Code Red: the case for emergency action.* Scribe Publications: New York.

Spratt, S and Simms, A (2009) *The Great Transition.* New Economics Foundation. London.

Swyngedouw, (2009) The Antinomies of the Postpolitical City: In Search of a Democratic Politics of Environmental Production. *International Journal of Urban and Regional Research.* Volume 33.3 p601–20.

Trapese Collective (2008) *Do It Yourself. A Handbook for changing our world.* Pluto Press. London.

Victor, P (2008) *Managing Without Growth: Slower by Design, Not Disaster.* Edaward Elgar: London.

Walker, B and Salt, D (2006) *Resilience Thinking.* Island Press: New York.

Ward, C (1985) *When we build again. Let's have housing that works.* London: Pluto Press.

While A (2011) The carbon calculus and transitions in urban politics and urban political theory, in Bulkeley H., Castan-Broto V, Hodson M and Marvin S (eds.) *Cities and Low Carbon Transitions.* Routledge: London.

While A., Jonas AEG, and Gibbs D (2010) From sustainable development to carbon control: eco-state restructuring and the politics of urban and regional development. *Transactions of the Institute of British Geographers* 35(1) 76 – 93.

While, A., A. Jonas, et al. (2004). "The Environment and the entrepreneurial City: Searching for the Urban 'Sustainability Fix' in Manchester and Leeds " *International Journal of Urban and Regional Research* 28(3): 549-569.

Whitehead, C and Peter Williams (2011) Causes and Consequences? Exploring the Shape and direction of the Housing System in the UK Post the Financial Crisis *Housing Studies*. Vol. 26, Iss. 7-8, 2011.

Wilcox, S (2006) *The geography of affordable and unaffordable housing.* Joseph Rowntree Foundation. York.

Wilkinson, R and Pickett, K (2009) *The spirit level. Why more equal societies almost always do better.* London. Allen Lane.

Vanderbilt, T. (2010) The new urbanism: in future, what will our cities look like? *World Policy Journal,* 27(4), pp. 3-7.

Woolley, T (2006) *Natural Building: A Guide to Materials and Techniques.* Crowood Press. London.

Woodin, T., David Crook and Vincent Carpentier (2010) *Community and mutual ownership: A historical review.* Institute of Education, University of London, Joseph Rowntree Foundation.

Worrell, E. Lynn Price, C. Hendricks, L. Ozawa Meida (2001) Carbon Dioxide Emissions from the Global Cement Industry. *Annual Review of Energy and Environment*, Vol 26. Pages: 303-329.

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[i] A forthcoming book with Earthscan in 2014 will deal with the detail of the project.

[ii] A typical plastered strawbale wall which is over 450mm thick achieves a U Value (the measurement of the rate of heat loss through a material measured as W/m2.K, the lower the number the better) of 0.13, more than twice the insulation that Building regulations in the UK require (Jones, 2009). Modcell panels at Lilac will achieve a U value of no worse than 0.19 and an air tightness of no worse than 2 m3/hr/m2@ 50 Pa.