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**D7.15: Paper on the co-evolution of financial instruments and institutions and low carbon transitions, focusing on drivers for and barriers to innovation and co-evolution**



## **The Co-Evolution of Financial Instruments and Institutions and Low Carbon Transitions**

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### **Abstract**

This paper is based on the premise that the impacts of markets and finance are inherently ambiguous and highly contingent and that any form of finance cannot be separated from the contexts and conditions that co-evolve with its deployment and governance. We start by exploring this premise with reference to the impacts of markets and neo-liberalism on the environment, and we contrast the impacts of neo-liberal market-led initiatives with those that are associated with civic-led, grassroots movements.

To explore the merits of these arguments in more specific and applied terms, we consider the potential contribution of different modes of finance and governance to low carbon transitions at the local level. Adopting a case study that considered the different ways of financing and governing large-scale investments in energy efficiency and domestic sector retrofit in the Leeds City Region in the UK, we evaluate the potential contribution of a specific form of investment – namely revolving funds for retrofit - under what we term the private, public and civic modes. Our previous research has found that revolving funds – in a generic form - have the potential to significantly reduce the costs and enhance the efficacy of low carbon transitions.

The results of the analysis suggest that the impacts of revolving funds could vary dramatically depending on how they are financed and governed. The analysis clearly shows that the private, public and civic modes all have a contribution to make. However, when compared to the private mode, the results show that the public and civic modes could generate substantially higher levels of investment and decarbonisation and a series of more positive spill-over effects that shape the potential for further or wider change. The analysis suggests that the civic mode has particular potential to generate such impacts.

We conclude by suggesting that the potential of alternative modes of financing and governing the provision of public services is clear but that this is an area where there are significant knowledge gaps that will need to be filled if this potential is to be better understood and if the co-evolution of appropriate financial instruments and governing institutions is to be realised.

## 1. Introduction: Markets, Finance and the Environment

Awareness of the unsustainable impacts of modern society on the environment has grown dramatically over the past few decades. While issues relating to air and water pollution have received attention throughout much of the industrial revolution, 'wicked' problems such as climate change that are far more complex and systemic in their causes and effects have made their way to the forefront of societies' attention more recently.

Over the same period, within the political world, there has been a realisation that competitive free-markets do not emerge spontaneously (Harcourt, 2008); rather, they require the support of and co-evolve with an enabling state (Brown, 2009, Wacquant, 2012). There is a persisting belief that such markets – and the apparently rational pursuit of self-interest they entail – will drive the technological innovation and economic growth that is assumed to enhance human prosperity. Within many of the world largest economies, this belief has led to the politics of neo-liberalism: a reconfiguration of the role of the state towards facilitating and upholding this perceived, ideal, economic order. Furthermore, from this new politics, a broader governmentality has emerged – involving actors from all corners of society – that functions to cultivate citizens as ideal participants in this manufactured market society (Read, 2009, Gershon, 2011, Wacquant, 2012). Paradoxically, therefore, neoliberalism strives to unlock the benefits of Adam Smith's invisible hand by redirecting the very visible hand of the state to create the right type of market system and market citizen.

Considering these parallel developments, the outcome for environmental issues, such as climate change, has been predictable. Attempts to reduce carbon emissions now lean heavily upon incentive and information-based approaches and on market-mechanisms such as the EU Emissions Trading Scheme (ETS) and the Clean Development Mechanism (Janković and Bowman, 2013). Apparently rational appeals to eco-efficiency (reducing the environmental impact of each unit of production or consumption) and green growth (pursuing options that are economically and environmentally beneficial) therefore lie at the centre of many low-carbon policy decisions, allowing for the suspension of questions regarding the unsustainable character of an economic system dependent upon growth (Bina, 2013). These approaches to environmental policy epitomise neoliberalism with the disparity between their structural requirements and their objectives; between their need for a complex mix of regulations, accounting, and quota allocations, and their aim to capture the benefits of competitive free-markets by mobilising self-interest, innovation and efficiency towards climate change mitigation. An arguably positive outcome of these developments has been that 'wicked' environmental problems such as climate change have become more politically tractable (Bailey et al., 2011); a change in perspective that has, to some degree addressed levels of antagonism, denial or reticence that emerge when agendas relating to environmental protection or the need for low carbon transitions clash with the economic interests of individuals and businesses (Kahan et al., 2012).

Perhaps also predictably, however, evidence has shown that the innovation unlocked by these market-mechanisms can just as easily be directed towards finding loopholes and deficiencies in the market, as towards developing cleaner technologies. The EU ETS has witnessed substantial levels of fraudulent trading – involving, for example, the reselling of millions of offsetting credits – and it has created perverse incentives, such as those motivating the production of HFCs, whose highly potent global warming potential gives them substantial offsetting value (Bailey et al., 2011, Branger et al.,



2015). And these pragmatic concerns are exacerbated by, and often deeply embedded within, more fundamental objections to markets relating to ethics, distributional justice, and cultural values. The outcome is that the collective psychology of a market-society and the physical demands of a growth-based economy may turn out to be equally incompatible with environmental sustainability (Millward-Hopkins, forthcoming).

These observations point towards the conclusions that long-term environmental sustainability is likely to require very different values to those of self-interest, profit-maximisation, short-termism, and limitless growth that are cultivated by neoliberal politics, and particularly the disconnected financial sector that has grown in its midst. As we will discuss, in contexts of climate mitigation, smaller-scale, civic-led, more connected strategies have the potential to cultivate different and more appropriate values involving cooperation, trust, and resilience, while being orientated towards broader social outcomes. However, such movements have their own issues, such as the intrusion of market-values into even such community-led initiatives and their severely limited capacities with respect to the scale of carbon mitigation challenges, with the lack of supportive policies and access to sufficient finance presenting significant barriers.

In this paper, therefore, we start from the premise that the impacts of markets and finance in environmental contexts are both inherently ambiguous and highly contingent. In particular, we argue that any form of finance cannot be separated from the contexts and conditions that co-evolve with its deployment and governance. We therefore argue that different modes of finance and governance have different features relating, amongst other things, to the source of finance, the objectives, scope and scale of investment, the model and style of deployment, the destination of returns and the conditions for social control. In theory, each has distinct characteristics relating to, for example, their motivations; efficiency/effectiveness of operation; and the social and economic spill-over effects they elicit, both directly, within the contexts of the behaviours of the individual agents involved, and also indirectly, with respect to the wider impact they have upon socio-political practices. In practice, however, such characterisations function only as generalisations and the public sphere in particular may mediate between opposite ends of a given spectrum – for example, that polarised by market-based motivations and an orientation towards local, egalitarian outcomes.

The paper is structured as follows. In section 2, we discuss these characteristics as they relate to low carbon transitions by reviewing literature relating to the psychology and sociology of markets – paying attention to the values they both draw upon and cultivate – before examining the characteristics of civic-led, grassroots movements that, in theory, oppose these market-led initiatives. We then examine how the ideal visions of grassroots initiatives play out in practice and how the movement may be scaled-up without losing the social benefits. In section 3, we draw upon this review to formulate three scenarios to explore how the features of these different modes of low carbon governance may play out in a particular context of low carbon transitions: namely, the application of revolving funds for the deployment of domestic energy efficiency measures. In section 4, we use the model previously developed in Gouldson et al. (2015) to model these different governance arrangements, and consider the outcomes each approach may have, directly and indirectly, making clear the importance of unquantifiable impacts. We then discuss these results in section 5, before making our conclusions and recommendations in section 6.



## 2. Background: Markets, Finance and Low Carbon Transitions

### 2.1 Market Mentality: Motivations Matter

#### *The Psychology of Incentives*

The extensive penetration of markets into all corners of modern life has led to the suggestion that we have shifted from having a market economy to becoming a *market society* (Sandel, 2012). Alongside the ongoing commodification of the environment (Sullivan, 2013), a natural product of this development is that decision making in all contexts, and scales from the level of firms and institutions down to households and individuals, is frequently understood and described in the language of incentives.

In this way, market ideologies have led to the dominance of financially-incentivised mitigation programmes to encourage pro-social and -environmental behaviour changes (Bailey and Wilson, 2009), which aim to appeal to the competitive, self-interested and rational utility-seeking actors (i.e. *homo-economicus*) envisioned to lie at the heart of market-based theories (Webb, 2012). This is evident both in the corporate sphere – via international market mechanisms such as the EU Emissions Trading Scheme and the Clean Development Mechanism – and at the individual level – via subsidies such as Feed in Tariffs. Even the advocacy of many environmental NGOs and related educational programmes now frequently bolster such strategies by appealing to self-interest, human rationality, and the economic opportunities of climate mitigation (Calel, 2013, FOE, 2014, WWF, 2014). However, this mobilization of incentive- and market-based strategies towards socially or environmentally desirable ends is, from certain perspectives, ethically dubious and, pragmatically, may prove to be largely self-defeating (Webb, 2012). These objections are, in fact, closely interlinked, both leading to the conclusion that, in the long-term, motivations matter.

Many argue that incentives and market-values ‘crowd out’ intrinsic motivations, potentially changing the norms and values inherent to the social situations and/or commodities involved (Sandel, 1997, Sandel, 2013). Markets in kidneys, surrogate mothers, and indeed carbon emissions, epitomise these concerns raising serious ethical questions (Sandel, 2012). Furthermore, while research has shown that incentive-based schemes may be useful in some situations, effects relating to the crowding out of intrinsic motivations can have perverse and unexpected effects, with experiments finding that people frequently react to financial incentives in ways that cannot be captured by a simplistic framework based upon economic rationality (Gneezy et al., 2011). For example, it has been shown that, in certain contexts, the introduction of a fine to penalise an undesirable behaviour may have the unintended effect of increasing the occurrence of the behaviour because fining such behaviours commodifies them, thus removing moral obligations that previously constrained such behaviours (Gneezy and Rustichini, 2000). Other experiments have also emphasised the corrupting power of financial incentives, discovering that offering incentives for altruistic behaviours may change peoples’ self-perception, thus decreasing the likelihood of them behaving altruistically in the future without further monetary incentives (Burger and Caldwell, 2003).

More recently, researchers have focused on the impacts of financial incentives relating specifically to pro-environmental behaviours. Evans et al. (2013) found that when financial motivations for pro-environmental behaviours are emphasised, positive spill-overs into other pro-environmental behaviours can be suppressed. Moreover, such positive spill-overs were only found to increase significantly when self-transcending (environmental) reasons alone were made salient. Evaluation of

households energy use post-installation of micro-generation systems has resulted in similar conclusions, suggesting that financial subsidies can foster an attitude of 'fit-and-forget' (Keirstead, 2007, Bergman and Eyre, 2011), in contrast to the indirect benefits of reduced demand that are hoped for in such situations. Other researchers have found that emphasising financial rather than pro-environmental motivations to encourage carbon-saving behaviour may even reduce compliance with the behaviour itself (Bolderdijk et al., 2013).

### *Technologies of Behaviour Change*

Although the prevalence of neo-liberal market-based approaches and the design of behaviour change initiatives give the impression of a persisting belief in the idea of *homo-economicus*, this idea has been challenged in the past decades by the growing field of behavioural science and economics. It has been widely argued that our decisions are often driven by instinct, emotion and social conformity as opposed to reason, and even when our rational thinking process are engaged they may serve only to rationalise our previous irrational behaviours (Kahneman, 2011). This understanding of our irrational tendencies has inspired behavioural scientists to develop a range of interventions such as 'nudge' to manage such behaviours (Thaler and Sunstein, 2008). In contrast, by incorrectly assuming that supplying people with relevant information will lead to rational interpretation and appropriate behaviour change, some environmental educational initiatives may be considered to be lagging somewhat behind in this respect (Moloney et al., 2010).

Information-based approaches such as nudge have proved to be an attractive political strategy within 'libertarian paternalism', having been adopted first in the USA then in the UK in around 2004 (Leggett, 2014, Jones et al., 2011). The title of libertarian paternalism refers to the suggestion it offers a third way in between laissez-faire limited government and an overbearing, overregulating state. The primary approach of nudge-based interventions is to modify the 'choice architecture' within which individuals decisions are made, by increasing the likelihood of certain choices being made without explicitly prohibiting others (Thaler and Sunstein, 2008). Typical objectives may include overcoming short-termism and our tendency to discount the future, exploiting our tendency to go with default options and harnessing the power of social norms (BIS, 2011). It is worth noting here that many of these irrational and heuristic characteristics of human decision-making will impact upon low-carbon initiatives independent of their scale of operation and the motivations behind them.

This contemporary libertarian paternalism has been criticised from both ends of the political spectrum (Leggett, 2014). Statists have criticised it for being pro-market and anti-state, and for its ability to give the impression of socially active government while it explicitly avoids addressing inequality (Wells, 2010). In contrast, it has been criticised from the opposite end of the spectrum for being top-down, technocratic and restrictive of freedoms (The Economist, 2006). Crucially, nudge retains and refutes characteristics of *homo-economicus* selectively (Jones et al., 2011): while it recognises the error in the assumption of the economic rationality of human behaviour, it retains the assumption of self-interest as a predominant behavioural driver.



### *Breaking Social and Political Inertia*

Other important objections to market-led carbon mitigation strategies relate to the limitations they place upon capacities to break unsustainable social practices, challenge vested interests, and reconfigure long-lived infrastructures.

In the case of climate change, the over-individualisation of responsibilities inherent to market-thinking can result in a disregard of the importance of normalised social practices (Shove, 2010, Moloney et al., 2010); insufficient collective pressure to break current infrastructural lock-ins (Seyfang and Smith, 2007, Bergman and Eyre, 2011); individuals feeling a sense of helplessness when facing a problem on such a vast scale (Heiskanen et al., 2010); and a loss of a concept of, and thus the potential to appeal to, the common good (Moloney et al., 2010, Heiskanen et al., 2010). The construction of the environment as a separate 'other' has also become a common cultural perception and has been suggested to be a fundamental cause of the ecological crises facing modern society (Macy and Brown, 1998). This perception can lead to an attitude that pro-environmental behaviour changes must fit into current lifestyles, demonstrating a lack of awareness of these lifestyles dependence upon a healthy environment (Webb, 2012).

There are also serious concerns relating to the fundamental structure of growth-dependent economies and the physical consequences for the environment, typically referred to as the dilemma of growth (Schumacher, 1973, Dietz and O'Neill, 2013). The reconfiguration of climate change as an economic opportunity rather than a cost (Janković and Bowman, 2013) exacerbates this issue as, despite having been born out of the arguably positive shift of the business world embracing environmentalism, it leaves corporate and political interests blind to the dilemma of growth and limits their interest to the 'win-win' mitigation strategies associated with eco-efficiency and green growth. In any case, evidence suggests that the market, rather than environment, is prioritised in a post-financial crises world (Finney et al., 2012, Geels, 2013). In such contexts, more economically challenging mitigation that is essential for long-term carbon reduction targets is over-looked, and the retrenchment of the state under neoliberalism may mean that the governance capacities needed to drive their adoption no longer exist (Catney et al., 2013; Millward-Hopkins, forthcoming). The consequence is path-dependent politics in which major changes to the structure of socio-economic systems are considered to be outside of the 'boundaries of the possible' (Bailey and Wilson, 2009, Bailey et al., 2011, Webb, 2012).

From multiple perspectives therefore the ability of neo-liberal, market based approaches that rely on incentives and information provision to change private behaviours so that they are more compatible with social and environmental objectives has been questioned. It is really not clear that such approaches are capable of cultivating the deep, long-term changes in production and consumption that are likely to be required if dangerous levels of climate change are to be avoided.

### **Alternative Modes of Delivery**

#### *Grassroots Movements and Civic Engagement*

Due to these criticisms of neo-liberal market-based approaches to carbon mitigation, much hope has been placed in community-scale grassroots movements to challenge this orthodoxy, which are often considered to be the antithesis of these market-led schemes. A crude summary would consider



market approaches to be motivated by values of short-termism, competition and rational self-interest, while grassroots movements are based upon and seek to cultivate cooperation, trust and collective interest. For comparison, mitigating carbon emissions – in the absence of contrived, artificial carbon markets – demands the values of the latter, while in theory those of the former simply lead to *The Tragedy of the Commons*. Those most supportive of grassroots movements believe therefore that they will be key players in building a sustainability transition of a fundamentally different character to the prevailing market-centred regime.

This simplified vision of market-mentality appears to be based on reasonable assumptions. Self-interest is, of course, considered to be an inherent character of markets and assumed to be a fundamental aspect of their utility. And aside from, for example, cooperation within firms, collusion of business cartels, and consumer trust manifesting as brand loyalty, trust and cooperation are often alien values. For example, evidence suggests a severe lack of community trust of large wind farm developers (Aitken, 2010, Cass et al., 2010) and this may even contribute to climate scepticism by associating profit motivations with ecology.

In contrast, grassroots movements are expected to bring many indirect benefits (Walker, 2011). These include their potential to create opportunities for local democratisation and long-term engagement with broader sustainability movements and outcomes (Walker et al., 2010); often explicit aims of building of trust and social capital in local communities (Catney et al., 2013); orientation towards more equitable societies via fair distributions of projects' outcomes (Catney et al., 2013); potential to create new sites of, particularly social, innovation (Seyfang and Smith, 2007, Arentsen and Bellekom, 2014). In theory, these social practices, behaviours, and forms of organisation can then diffuse into the wider society (Walker, 2011, Arentsen and Bellekom, 2014, Gabriella Dóci, 2014).

These benefits indicate the potential for community-based approaches to stimulate various positive, and long-term, spill-over effects by increasing environmental awareness, utilising local place identities, and changing social practices and norms (CSE, 2007, Walker, 2011). Various authors have highlighted the need to focus on changing these practices – and not just individual behaviours – which in turn require changes in infrastructures, institutional arrangements, systems of governance and social meanings (Shove, 2010, Moloney et al., 2010, Shove and Walker, 2010, Webb, 2012, Barr and Devine-Wright, 2012). Transition movements in particular have distinctly long-term aspirations, aiming to offer spaces in which the skills of living resiliently in a world of increasing scarcity of fuel and other commodities can be developed (Barr and Devine-Wright, 2012). Furthermore, the egalitarian nature of such movements may also offer resilience to future instabilities in the economy.

However, whether these positive outcomes are achieved by a particular project will depend upon its specific aspirations and mode of operation. It has been suggested that community projects will typically have a *process* and *outcome* dimension (Walker and Devine-Wright, 2008). While some projects are concerned mainly with encouraging local participation (process dimension) and some with achieving equal distributions of benefits (outcome dimension), it is suggest that projects should incorporate both these characteristics in order to maximise the potential benefits and spillovers: “...an ‘ideal’ community project, is ... a project that is both by and for local people” (Walker and Devine-Wright, 2008).





### *Positive and Negative Localism*

In reality, however, this *process-outcome* criterion is not always met. Consequently, the visions of community-based sustainability initiatives described above are, with respect to some cases, simplistic, optimistic and idealistic (Walker et al., 2007, Walker et al., 2010, Middlemiss and Parrish, 2010, Seyfang et al., 2014).

One indication of the great diversity of such movements – and the various ends to which they may be mobilised towards – is the enthusiastic use of terms such as *community* and *local* by movements extending from Occupy on the left through to the Tea Party on the right (Catney et al., 2013, Morris, 2013). Another is the various ways in which *community* may be defined (Walker, 2011): as a scale (in-between individual household and local government levels), place (e.g. a village or town), network (for example a climate activist network), process (e.g. a distinctive way of acting), or an identity (like-mindedness). Further insight into the complex motivations underlying calls to *community* can be gained from considering two contrasting versions of such movements, namely those fitting into *positive* and *negative* localism frameworks.

In what proponents of alternative agendas call *positive* localism (Catney et al., 2013), community-based approaches can be considered a 'response' to the direction of modern politics and markets, in which communities believe themselves to be better placed to serve their own needs and to build social capital and trust within local networks. The state is expected to play a key role in facilitating the development of such movements, paying particular attention to the uneven capabilities – social and financial – of underprivileged groups. With appropriate support, therefore, socially-just community schemes can emerge.

In contrast, in what such commentators refer to as *negative* localism, community-based approaches represent a laissez-faire form of development. Market-based instruments and competitive funding schemes are employed to promote, for example, community renewable energy and fuel poverty reduction initiatives (Catney et al., 2013). This form of localism has been suggested to help the state to retain a socially active appearance despite continuing retrenchment, although some have argued that it may represent a selective off-loading of government responsibilities onto low-cost service providers (Peck and Tickell, 2002, Walker, 2011, Morris, 2013). Furthermore, issues of inequality are left unchecked, potentially leaving communities lacking financial, social and/or personal capital falling further behind wealthier classes and communities (Catney et al., 2013). In this view, negative localism is considered to be another strategy of 'roll-out' neoliberalism. Indeed, it has similarities with nudge in this respect, as both maintain an image of a socially active government alongside state retrenchment, while neither addresses inequality. The legitimacy of this strategy is effectively gained via the *local trap*, in which an initiative is assumed to be good on the bases of it being local merely in a geographical sense (Catney et al., 2013, Devine-Wright and Wiersma, 2013).

### **The Case of Community Energy**

#### *Expectations vs. Reality*

The case of community energy presents a useful window into how these different visions of community-initiatives play out in reality. Community energy is a particular type of grassroots initiative that is undergoing rapid expansion in the UK (Seyfang et al., 2013) and elsewhere (Gabiella



Dóci, 2014) and it include projects aimed at energy production (solar, wind, hydro, biomass, district heating, etc.) and demand reduction (behaviour change and energy efficiency measures) (Devine-Wright and Wiersma, 2013). It is not a new concept (Walker, 2011, Morris, 2013), having been advanced in the 1970s (Schumacher, 1973), and from the beginning it was suggested to be capable of producing many indirect benefits similar to those described above.

Fortunately, the expectations of ideal grassroots movements have been observed within community energy movements. Many groups investigated by researchers appear to be successfully cultivating empowered, participatory, trusting communities, in which both the process and outcome dimensions of the projects are locally embedded (Walker and Devine-Wright, 2008, Walker et al., 2010, Middlemiss and Parrish, 2010, Aiken, 2012, Devine-Wright and Wiersma, 2013). Projects have been observed to have a positive impact on people's general understanding of renewable energy, increasing their support for projects and likelihood of installing their own systems (Walker and Devine-Wright, 2008); to reduce NIMBYism, instead facilitating consensual deployment of sustainable energy technologies (Warren and McFadyen, 2010, Walker, 2011); and help in addressing feelings of helplessness that commonly occur in the face of climate change by cultivating collective action (Heiskanen et al., 2010).

There are also some less promising developments within community energy movements, some of which relate to projects that are local merely in a geographic sense and others that are symptomatic of the market-society such projects are embedded within. For example, community energy projects that have not involved significant local participation and are primarily profit-driven have created divides and reduced trust in communities, leading Walker et al. (2010) to conclude that:

*...the rosy rhetorical image of close-knit rural communities must be subject to the realities of the fractures and disputes that can open up when people feel, legitimately or otherwise, that they have been misled, that projects have been misrepresented in some way and that some people in the locality are either benefiting or being harmed in some way more than others...*

These concerns can be amplified by the fact that government policy often considers community to mean merely a group of buildings (Walker et al., 2007). Moreover, private sector-led decentralised energy projects have been shown to be, in general, much less locally embedded than community or public sector-led cases (Devine-Wright and Wiersma, 2013). While the participatory nature of the Transition Towns movements appears to be successfully avoiding these issues, their developments raise different concerns. Although the movement embodies strong, democratising values of participatory, consensus based decision making and community empowerment, it is, at the same time, depoliticising, as it has little interest in challenging or engaging with political parties directly (Aiken, 2012, Barr and Devine-Wright, 2012).

Conclusive empirical evidence of positive, pro-environmental spill-overs is difficult to find, largely because these effects are highly difficult to measure (CSE, 2007). Speculations as to which direction such spillovers may take could be made based upon community energy groups' motivations, but these appear to be difficult to extrapolate from. On the one hand, findings of recent investigations suggest that environmental awareness and motivations are prominent drivers of urban, decentralised energy projects (Chmutina et al., 2014) and within UK community energy groups more generally (Seyfang et al., 2013). In addition, there is evidence of community groups having catalytic with respect to their operation, for example the tendency for them to reinvest returns locally



(Seyfang et al., 2013). On the other hand, the same survey found financial motivations (occurring in 88% of groups surveyed) are even more common than environmental ones (96%)(Seyfang et al., 2013). Perhaps not unexpectedly, therefore, empirical evidence for reduced energy use post installation of micro-generation systems shows only weak correlations (Keirstead, 2007). Similarly, the wider effects of a local, biomass heating project found that while it demonstrated an ability to “dispel myths and stimulate uptake of new technology”, unfortunately, “its potential to change energy practices, increasing overall sustainability of residents’ lifestyles, may be relatively weak” (Rogers et al., 2012). The authors go on to suggest that the salience of local economic sustainability as a motivation may explain this lack of broader lifestyle changes.

In practice, such financial considerations are, of course, unavoidable, but the danger is that positive spill-overs may be hindered when such considerations develop into significant motivations. And in a market society, it is all too easy to fall into this trap.

### *Building Capacity*

A challenge that these theories and observations of community low-carbon initiatives reveal is that of building their capacity while minimising the intrusion of market-values and avoiding their use as a means for neoliberalism to address economic-externalities without modifying its own problematic political foundations. Currently, it is estimated that community renewable energy capacity in the UK totals approximately 60 MW (Harnmeijer et al., 2013), or well under 1% of total capacity. This contrasts with Germany where 40% of renewable energy capacity is community owned and Denmark where the majority of wind turbines – which supply over a third of the country’s electricity – are community owned (DECC, 2014). Clearly, therefore, although it is not fictitious to imagine such alternative modes of energy delivery contributing significantly to UK energy supply, community energy in the UK is lagging extremely far behind these best-practice countries. Fortunately, surveys of UK grassroots energy groups have found the movement to be growing rapidly (Seyfang et al., 2013), but many barriers remain.

Evidence also shows community energy groups can have catalytic effects, both socially and financially, indicating a potential for further, self-supported growth: a high proportion of UK community energy groups (1/3<sup>rd</sup> of those surveyed) reinvest surplus capital to address further social, environmental and economic issues in their localities (Seyfang et al., 2013). The rapidly growing international Transition Towns and Ecovillages movements are also reportedly diffusing many social innovations and significantly influencing wider society, via, for example, town planners (Aiken, 2012, Arentsen and Bellekom, 2014). An insight into these spillover effects can be gained by considering the case of *Hockerton Housing Project*, a low-carbon community project outside Nottingham, UK that is moving towards energy and food self-sufficiency. The five households involved in the original project have inspired and facilitated over fifty local residents to facilitate a local wind energy cooperative of their own, purchasing a 225kW turbine that offsets the full electricity use of the households involved ([www.hockertonhousingproject.org.uk](http://www.hockertonhousingproject.org.uk)). Of great significance is the fact that these same local residents were initially strongly opposed to the wind turbines planned for *Hockerton House* itself, delaying the planning application by six years. Therefore, the village cooperative signifies a complete turnaround in their attitudes towards wind energy.



Such movements, however, tend to emerge where financial capabilities and/or environmental awareness are pre-existing, reflecting the concerns of Catney et al. (2013) relating to the uneven development inherent to negative localism. *Transition Towns* in particular is often associated with the rural middle-class (Aiken, 2012), a description that may also fit *Hockerton Housing Project*. And the achievements of other successful movements have been suggested to be due to its pre-existing high cultural, organisational and personal capacities (Middlemiss and Parrish, 2010).

Moreover, the UK grassroots energy movement has been suggested to be far from robust, requiring better networking and lobbying powers if it is to exert a strategic influence or have its ideas diffuse more widely (Seyfang et al., 2014). In this respect, community energy in the UK has much to learn from the Netherlands, where the movement appears to be more robust and well developed (Gabriella Dóci, 2014). Here, the groups involved are highly diverse socially, well connected to each other and to national and regional actors (NGO's, local authorities), and supported strongly by Government policies and via preferential bank loans. For these reasons they are now changing the entire Dutch energy system. However, other researchers are less positive about the role of decentralised energy in sustainability transitions even in the Netherlands, arguing that such projects are unlikely to become dominant players in the energy system due to the power of current centralised energy institutions and the enormous electricity demands of modern society (Arentsen and Bellekom, 2014). Clearly, there are contrasting perceptions of the success of community energy in low-carbon transitions, but it is possible that these are simply an outcome of differing expectations as to the movement's potential role.

### *Financial and Policy Support*

There are a number of factors that may explain the greater progress of these movements in the Netherlands, Germany, and Denmark, with respect to the UK. Not least of these is the relatively limited history of cooperative ownership in the UK in general (Bolinger, 2001). However, the more egalitarian societies present, particularly in Denmark, in comparison to the UK may also play an important role. Therefore, inequalities in the UK may impose limits upon the capacity for self-organising community energy movements. This represents a challenge for appropriate support – Governmental, financial and otherwise – to be developed to cultivate communities of widely varying financial capabilities.

Feed in tariffs (FITs) – suggested to have played a significant role in supporting the development of renewable energy in Germany and the Netherlands (Meyer, 2003) – have, of course, now been implemented in the UK. However, while these tariffs are becoming a more dominant form of financial support than grant funding, it has been suggested that it is too early to assume that such opportunities are equally open to interested communities (Seyfang et al., 2013). Therefore, the question remains as to how these tariffs can be harnessed to support communities with low financial capabilities, rather than the wider economic effects of such subsidies becoming a burden on these communities, as many have concluded (Catney et al., 2013). Some suggest that if third party installers were to take FIT benefits to pay for installation of distributed energy systems and offer households cheaper bills in return this could be somewhat financially beneficial, but that a much better option would be the provision of low interest loans or the support of local energy organisations – charities, community groups, local authorities, for example (Saunders et al., 2012). The first option is also problematic in the sense that it lacks any participatory dimension, thus it



would likely fail to cultivate ecologically responsible citizens and realise the indirect benefits of decentralised energy. In any case, while FITs may be valuable for securing long-term financial stability of community energy projects, grants are at present still highly important: it is estimated that two thirds of UK community energy groups have financial support from grants while only a third have an income stream from energy generation (Seyfang et al., 2013). Thus, methods of providing such upfront costs are clearly still of substantial benefit.

To this end, one promising method is the setting up of revolving funds to supply community renewable energy projects upfront costs. In Scotland, one such fund has been set up on a relatively large-scale: the Highlands and Islands Enterprise for community renewable energy projects ([www.hie.co.uk/community-support](http://www.hie.co.uk/community-support)). Another method of financing is emerging from the Government's 'Big Society Capital' (BSC) investment fund ([www.bigsocietycapital.com](http://www.bigsocietycapital.com)). The fund invests in 'social investment finance intermediaries' (SIFI), who then go on to provide finance for social sector organisations that are expecting social returns. Many community energy groups – including successful cooperatives in Bristol and Brighton – have been funded via BSC funded SIFI's such as 'Leap Frog' ([www.pureleapfrog.org](http://www.pureleapfrog.org)) and the 'FSE Group' ([www.thefsegroup.com](http://www.thefsegroup.com)). Of particular significance is that the FSE Group prioritises projects planned for UK regions falling the top 20% of the latest available Indices of Multiple Deprivation, thus directly addressing a core criticism of negative localism. This appears, therefore, to be promising policy, however, critics point out that the £0.6 bln available from the BSC is shadowed by the £3.3 bln cut in grants to be given by the state to charitable organisations planned by 2015/2016 (Catney et al., 2013). Furthermore, grant schemes, such as the Salix Fund ([www.salixfinance.co.uk](http://www.salixfinance.co.uk)) that offers interest free loans to the public sector for energy efficiency measures, often remain limited to cost-effective low carbon projects – in this case those that will payback financially in a maximum of 5 years. This still leaves the problem of how to deploy cost-ineffective, but essential with respect to long-term carbon targets, mitigation measures.

### 3. The Case: Finance and Governance for Low Carbon Transitions

#### *Revolving Funds for Low Carbon Buildings*

Reflecting upon these perspectives on the nature and influence of different modes of finance and governance, we now seek to examine their potential implications in contexts of a key sustainability issue, namely the transition to low carbon buildings. We do this by taking a generic model for financing of low carbon transitions – namely a revolving fund (RF) – and adapting it to reflect the different features of each mode of finance and governance before examining its contribution to improving the energy efficiency and reducing the carbon footprint of buildings.

Revolving funds are an innovative financing mechanism with the potential to reduce investment requirements and enhance investment impacts by recovering and reinvesting some of the savings generated by early investments (Gouldson et al., 2015). A revolving fund can be established by creating an entity – frequently in the form of a special purpose vehicle (SPV) - to receive funds from investors and to distribute them to recipients in pursuit of its objectives. Revolving funds can be set up, financed, governed and managed in different ways, by different people and with different objectives. But the common feature of a revolving fund is that a proportion of the returns or the savings that are generated from early investments being recovered and fed back to the managing entity or SPV, with some of that recovered revenue being returned to investors and some being recycled and reinvested in the same way as its initial investments. Over time, the on-going activities of the managing company or SPV are likely to be funded less by new investments and more by the returns emerging from the funds it has already deployed. In some instances revolving funds could make the delivery of major investment programmes essentially self-financing, albeit with significant upfront investments that are repaid over an extended period of time (Gouldson et al., 2015).

Although they are not widely applied, revolving funds have been established for different reasons in diverse contexts. Examples include:

- The US Clean Water State Revolving Fund that was established in the 1990s and has provided over 33,000 loans with a total value of over \$100 billion (USEPA, 2015).
- The Thai Energy Efficiency Revolving Fund that since its creation in 2003 has invested c\$470m in 294 energy efficiency projects, mostly in factories (Grüning et al, 2012).
- The UK SALIX revolving fund which since its establishment in 2004 has invested £339 million in over 12,000 energy efficiency and renewable energy projects in the public sector with estimated fuel cost savings of £1.2 billion (SALIX, 2015).
- The US Sustainable Endowments Initiative that was set up in 2005 and has since helped to create 79 revolving funds that invested over \$100 million of investment in energy efficiency and renewable energy projects in higher education institutes (SEI, 2015).

Various other revolving funds have also been created for urban regeneration, infrastructure provision and economic development. Although evaluations of revolving funds were completed for water and infrastructure provision in the 1990s (see Holcombe, 1992; O'Toole, 1996), until recently there had never been a formal academic evaluation of the contribution that such funds can make



either to reducing the cost of achieving particular carbon reduction targets or to enhancing the impacts of scarce low carbon investment funds.

Recent research found that revolving funds – when adopted in a generic form - could significantly reduce the costs and enhance the impacts of low carbon transitions (Gouldson et al., 2015). However, this research did not consider the various ways in which such funds could be adopted by different actors (i.e. private, public or civic), in different ways (e.g. top-down and technocratic or bottom-up and participatory) and for different ends (e.g. for profit or not-for-profit). In this paper we therefore present a fuller analysis that explores the potential contribution of revolving funds to low carbon transitions under different modes of finance and governance.

### *The Case Study Issue*

As a case study, we consider the potential for revolving funds to stimulate investment into the retrofit of buildings in the Leeds City Region (LCR) in the UK. The LCR is an agglomeration of ten local authorities in northern England, which together hold a population of three million and maintain an economy worth £52bn per year (Gouldson et al., 2012). Like much of the rest of the UK, the LCR has a housing stock that includes a large number of older buildings with low levels of energy efficiency. This is a significant issue for two main reasons. The first relates to fuel poverty and public health. Depending on the definition used, between 138,000 and 218,000 of the 1.25m households in the LCR are classed as being in 'fuel poverty'<sup>1</sup> (DECC, 2015). Aside from the human cost, the public health impacts of fuel poverty are significant – it has been estimated that every £1 spent on improving energy efficiency in fuel poor households leads to reductions health care costs of 42 pence (Washan, Stenning and Goodman, 2014). The second relates to climate change and the need to promote low carbon transitions. Carbon reduction targets have been set both at the national and local levels and reducing energy demand by improving the energy efficiency of the housing stock is seen as a key priority at both levels. However, the affordability of public policies to finance retrofit is constantly in question, both at the national and the local levels. Issues of affordability are particularly acute in the context of austerity as public sector budgets are being cut to such an extent that some of what many regard as the core services of government are under threat.

Previous research has suggested that at least £33.7 billion could be invested in retrofit in the UK, and that £1.1 billion could be invested in improving the energy efficiency of houses within the LCR area (Gouldson et al., 2013; 2015). At both the national and the local levels, finding public finance for initiatives of this magnitude that are not a statutory requirement for government is acutely challenging, especially in the context of austerity. Financing mechanisms that could reduce the cost or enhance the effectiveness of retrofit, or that could secure private or civic forms of investment to enable public interest objectives to be met, are therefore of great policy relevance and practical importance. As stated above, the broad potential of revolving funds to contribute to these objectives has been assessed (Gouldson et al, 2015), but the relative merits of different ways of financing and

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<sup>1</sup> The lower estimate comes from the currently adopted definition that considers a household to be in fuel poverty if it has required fuel costs that are above average (the national median level) and if it would be left with an income below the official poverty line were it to spend that amount. The higher estimate comes from the previously adopted definition that was based on the number of households that would have to spend more than 10% of their income on energy to heat it to an adequate level.

governing retrofit programmes have yet to be considered in the academic literature. In the discussion that follows we evaluate the relative merits of public, private and civic modes of financing and governing domestic sector retrofit schemes.

### *Three Modes of Delivery*

To evaluate the relative merits of different options, we characterise public, private and civic modes of retrofit finance and governance by considering the combined influence of a range of key variables. These relate to the forms of ownership, the motivations for investment, the scale of operation, the costs of administration, the interest rates to be applied, the extent of benefit sharing, the levels of participation, the performance of the investments and the destination of returns. The private, public and civic modes of delivery differ when compared against each of these variables, and as we show, the consolidated impacts of these variations lead to dramatically different outcomes. A summary of the variables and their assumed settings under the private, public and civic modes is presented in Table 1 below.

**Table 1: Key Variables for the Private, Public and Civic Modes**

	<b>Private</b>	<b>Public</b>	<b>Civic</b>
<b>Source of investment</b>	Institutional	Government	Community
<b>Dominant motive for investment</b>	Private benefit	Societal benefit	Community benefit
<b>Ease of access to finance</b>	High	Medium	Low
<b>Interest rate on funds provided to the SPV (real)</b>	5%	0%	3%
<b>Proportion of loans repaid to investors p.a.</b>	5%	5%	5%
<b>Scope of investments</b>	Cost-effective measures only	All measures	All measures
<b>Max. % of total opportunity that can be exploited p.a.</b>	20%	10%	5%
<b>Max. % of capacity to invest in any one measure that can be exploited p.a.</b>	20%	20%	5%
<b>Interest rate on funds lent by the SPV to householders</b>	7%	0.5%	3.5%
<b>Cost of SPV admin.</b>	3%	3%	3%
<b>Cost of installing</b>	10%	9%	8%
<b>Rebound effects</b>	15%	12.5%	10%
<b>Share of savings retained by households whilst loans repaid</b>	30%	25%	20%
<b>Share of savings retained by households for 5 years after loans repaid</b>	100%	75%	50%





<b>Level of householder defaults on repayments</b>	5%	4%	3%
<b>Energy company charge for cost recovery</b>	0.1%	0.1%	0.1%

*- The private mode of investment*

A defining feature of the private mode of investment is that the *raison-d'être* of the revolving fund when adopted in this form is to invest only in low carbon options that generate profits for the investors once all other costs have been taken into account. The fund – which is set up and controlled by private investors - therefore only invests in low carbon options that will be cost-effective when assessed using a market-competitive private discount rate of 7%, and it ignores all other options regardless of their potential social or economic benefit. This means that from the outset the scale of the fund is smaller and the scope and objectives of the fund narrower than for the public or civic modes that are discussed below.

Once the scale of the profitable opportunity for low carbon investment has been assessed, we assume that private investors can access sufficient funds to supply 20% of the required funds per year and to exploit 20% of the available opportunity for investment in any one measure per year. This implies a significant and intense programme of investment and retrofit activity. Funds are provided to the SPV on the basis that investors will receive a 5% real return per year on their investment and that 5% of all outstanding loans will be repaid in any one year. As the fund is profit-seeking, and does not seek to generate positive externalities, it does not qualify for any public sector support or subsidy.

Once the SPV has received funds from investors, we then assume that it will lend those funds out to participating households at a real interest rate of 7% per year. Assuming it can persuade households to sign up to the scheme at those interest rates, the fund therefore makes money – and covers some of its costs or generates some of its profits – from charging more to lend money than it is charged to borrow money. In addition to the money that it makes in this way, we assume that the administration costs for the SPV represent 3% of its annual lending. We also assume that the private contractors who fit the measures that are funded by the SPV charge the profit-making scheme 10% of the costs of each measure.

Levels of householder participation in the scheme depend on incentive rates, and we assume these have to be higher than for the public or civic modes both because of the higher interest rates that will be charged and the lower levels of trust that are likely to be associated with a private for-profit scheme. Householders are therefore offered 30% of the savings generated by the measures until the costs of the measures have been recouped, and 100% of the savings once initial investment costs have been recovered.

As householder participation is secured only on the basis of the economic savings that they could realise, we assume that rebound effects are slightly higher than they would have been if appeals had been made to wider social or environmental commitments, so that 15% of the potential savings from energy efficiency are lost through higher levels of energy consumption. As levels of trust in or ethical commitment to the private fund are likely to be lower than for the other modes, we assume

that levels of default on the loans to household are likely to be slightly higher, so that 5% of all households default and fail to repay their loans to the SPV.

Savings are recovered and fed back to the SPV by the energy companies, which we assume is paid 0.1% of the saving as an administrative fee. Once the SPV has paid 5% interest to investors, and repaid 5% of all outstanding loans, any surplus funds are then reinvested until all of the potential for cost-effective low carbon investment has been exploited.

#### *- The public mode of investment*

Unlike the private mode, the public mode of investment invests in all low carbon measures, regardless of their cost-effectiveness, on the basis that they could generate significant social, economic and environmental benefit. A publicly established and controlled fund therefore has a larger scale, a broader scope and wider objectives than those of the private fund outlined above.

Once the scale of the wider investment opportunity has been assessed, we assume that in any one year the public sector can supply 10% of the total funds needed to exploit the total opportunity, and that a maximum of 20% of the available opportunity for investment in any one opportunity will be exploited in each year. This implies a very significant commitment of funds from the public sector – albeit one that enables a less accelerated or concentrated period of investment than that assumed above for the private sector fund. Interest free funds are provided as an effective subsidy to the scheme on the basis that the wider social, economic and environmental benefits generated will be worth more than the interest foregone. Like the private scheme discussed above funds are provided on the basis that 5% of the funding provided will be repaid in any one year.

As the publically owned and controlled SPV receives its funds on an interest-free basis, we assume that it will lend those funds out to participating households with an interest of 0.5% that will enable the SPV to cover defaults on loans. Like the private fund, we assume that the administration costs for the SPV represent 3% of its annual lending. However, we assume that the contractors who fit the measures that are funded by the public SPV will be slightly cheaper than those associated with the private scheme and that they charge 9% of the costs of each measure.

Incentives for participation are less important than in the private scheme because of householder access to nearly interest free loans, and because appeals to householders can be made on the basis of their citizen as well as their consumer selves. We therefore assume that householders are offered 25% of the savings generated by the measures until the costs of the measures have been recouped, 75% of the savings for a period of 5 years once initial investment costs have been recovered and 100% of the savings thereafter. Because participation is not only secured on the basis of the economic savings that they could realise, we assume that rebound effects are slightly lower than in the private scheme, so that 12.5% of the potential savings from energy efficiency are lost through higher levels of energy consumption. As levels of trust in or ethical commitment to the public fund are likely to be slightly higher than they would be for the private fund, we assume default levels are lower, so that 4% of all households default and fail to repay their loans to the SPV.

As with the private fund, we assume that all savings are recovered and fed back to the SPV by energy companies that retain 0.1% of the saving as an administrative fee. Once the SPV has repaid 5% of the



initial funds to the public sector, any surplus funds are then reinvested until all of the potential for cost-effective low carbon investment has been exploited.

#### *- The civic mode of investment*

Like the public mode, the civic mode of investment seeks to finance all low carbon measures, not in the pursuit of profits but because they generate significant social, economic and environmental benefits for the local community. Although the scope and objectives of a community established and controlled fund are therefore broad, we assume that the civic sector finds it harder to access the scale of funding needed to exploit the available opportunities than the private or public sectors. We therefore assume that in any one year the civic sector can supply 5% of the total funds needed to exploit the total opportunity, and that a maximum of 5% of the available opportunity for investment in any one opportunity will be exploited in each year. This means that the civic mode will take considerably longer to exploit the available opportunities than either the private or public modes.

Although the civic mode of investment is not driven by the need to generate competitive market rates of return, we assume that it will find it harder to access the levels of subsidy that are more available to the public sector. We assume that individual investors will offer funds to a civically established SPV as long as the returns are equivalent to those that could be secured in mainstream savings accounts and that the SPV will lend those funds to householders for a small premium designed to cover the costs of defaults. We therefore assume that local investors will supply funds to the SPV at a rate of 3% and that the SPV will then lend these funds to householders at a rate of 3.5%. Like the private and public schemes discussed above, we assume that 5% of the funding provided will be repaid in any one year and that the administration costs for the SPV will equate to 3% of its annual lending. While we assume that the contractors who fit the measures that are funded by the private and public schemes would charge 10% and 9% of the costs of each measure respectively, for the civic sector we assume that the costs will be slightly lower at 8%.

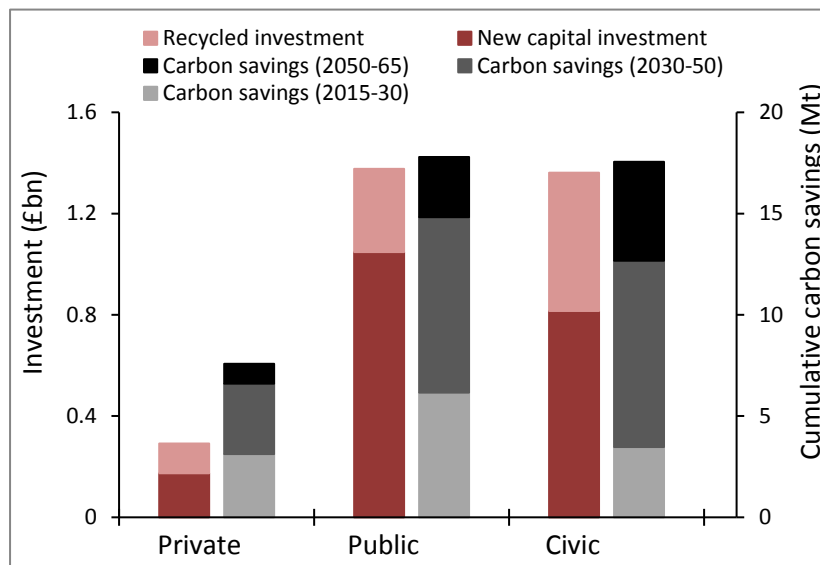
As the civic scheme will be locally based, with word of mouth playing a more significant role in marketing, levels of trust in a community owned not-for-profit scheme being higher and the citizen rather than consumer selves of householders playing a more prominent role in motivating participation, we assume that the incentives required to motivate participation will be lower. We therefore assume that householders are offered 20% of the savings generated by the measures until the costs of the measures have been recouped, 50% of the savings for a period of 5 years once initial investment costs have been recovered and 100% of the savings thereafter. We also assume that rebound effects are slightly lower than in the private and public schemes, so that 10% of the potential savings from energy efficiency are lost through higher levels of energy consumption. Based on the factors outlined above, we also assume that default levels will be lower and that 3% of all households will fail to repay their loans to the SPV.

As with both the private and public funds, we assume that all savings are recovered and fed back to the SPV by energy companies that retain 0.1% of the saving as an administrative fee. Once the SPV has repaid 5% of the initial funds to the public sector, any surplus funds are then reinvested until all of the potential for cost-effective low carbon investment has been exploited.

#### 4. Results, Analysis and Discussion: The Impacts of Different Modes on Low Carbon Transitions

The results of the analysis reveal some significant differences in outcome between the private, public and civic modes of finance and governance for retrofit in the LCR area. Figure 1 below presents a summary of the main findings, relating both to the levels of new and recycled investment generated and the carbon savings realised.

**Figure 1: Comparisons of investment levels and carbon savings from the private, public and civic modes**

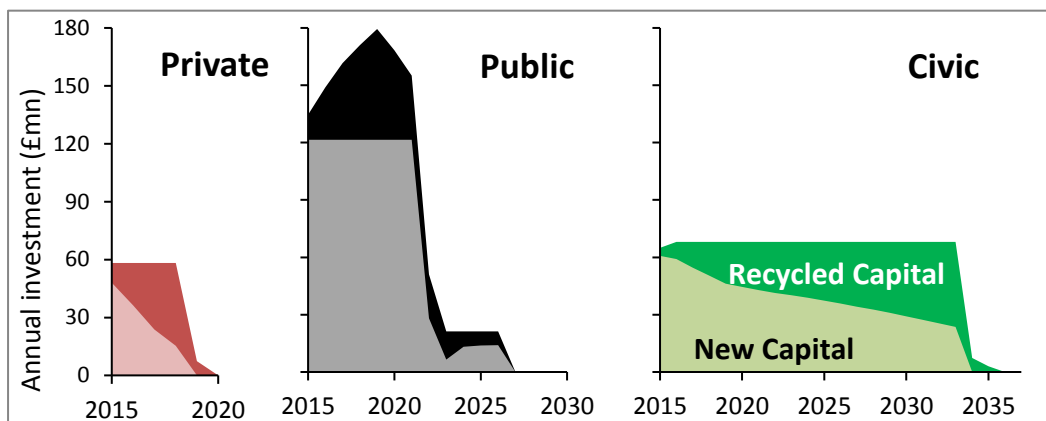


As can be seen, under the private mode, £174 million of new capital is invested in cost-effective forms of low carbon investment in the domestic sector within the LCR area, and this generates a further £117 million of recycled investment. These investments would generate 2.1 MT of cumulative carbon savings by 2030, a further 3.5 MT by 2050 and a total of 7.6 MT by 2065. Under the public mode, £1.05 billion of new capital is invested in all low carbon measures available for the domestic sector, and this generates a further £329 million of recycled investment. These investments generate 6.2 MT of carbon savings by 2030, a further 8.7 MT by 2050 and a total of 17.8 MT by 2065. Under the civic mode, £816 million of new capital is invested in all of the low carbon measures available for the domestic sector, and this generates a further £546 million in recycled investment. These investments generate 3.5 MT of carbon savings by 2030, a further 9.2 MT by 2050 and a total of 17.5 MT by 2065. The public and civic schemes therefore each generate approximately 4.7 times as much investment and 2.3 times as much carbon savings as the private scheme.

However, as can be seen from Figure 2, the scheduling of the investments generated by the different modes differ considerably. The private mode is much more time intensive, with all investments made within 5 years, while the public mode invests intensively for 8 years and then less intensively for a further 5 years. The civic mode by contrast steadily generates investments over an 18 year period. In the private mode, investments of new capital are front-loaded, with investments of

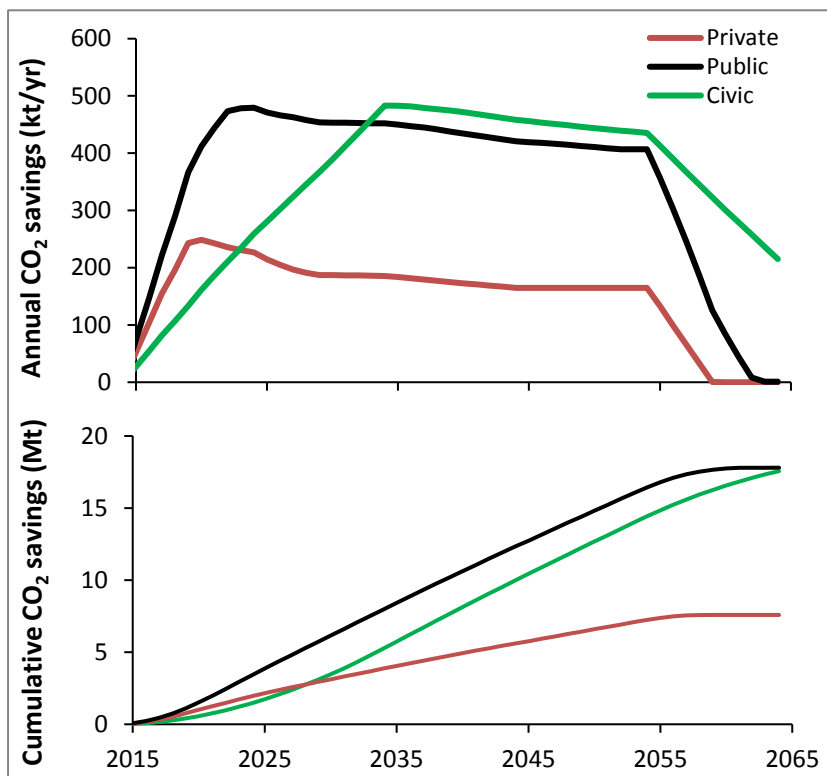
recycled capital growing throughout the period of investment until all of the cost-effective opportunities have been exploited and investment stops. Ultimately, recycled investment makes up 40% of the total investment generated. In the public mode, higher levels of investments of new capital are maintained for 7 years, with levels of recycled investment growing and then declining rapidly in this period, with recycled investment ultimately constituting 24% of total investment. In the civic mode, levels of new capital investment decline steadily and levels of recycled investment increase steadily over an 18 year period. Ultimately, recycled investment constitutes 40% of the total investment realised under the civic mode.

**Figure 2: Comparisons of the rates of investment from the private, public and civic modes**



The time profile of the carbon savings generated by the different modes also differs significantly, as is shown in Figure 3. The annual savings generated by the private mode peak at 243 KT per year in 2019 and then slowly diminish through to 2054 when the measures invested in reach the end of their functioning life and the annual savings generated rapidly diminish. Those generated by the public mode peak at 478 KT per year in 2023 and then follow a similar trajectory (albeit at a much higher level) to those seen under the private mode. The profile of the savings generated by the civic mode differs in that the annual savings generated steadily increase to a peak of 483 KT per year in 2034, before a similar trajectory to that seen under the public mode is established.

**Figure 3: Comparisons of the rates of carbon saving generated by the private, public and civic modes**



The results therefore show that the private, public and civic modes generate different outcomes. The private mode – which has ready access to finance but that limits its investments to those cost-effective measures that generate direct economic returns – does invest at scale in domestic energy efficiency and low carbon retrofit within the study area. Although the public mode would generate substantially higher levels of investment, the private scheme would generate levels of investment and proportions of recycled investment that are comparable to those generated by a civic scheme, but for a more limited period. The carbon savings generated by the private scheme are also initially comparable to those of the civic scheme, but then the private scheme runs out of profitable opportunities and its levels of investment dry up.

Critically, if a private scheme had exploited all of the cost-effective opportunities, the prospects for a further private or even a public or civic scheme to step in to invest in the less cost-effective measures that were left unexploited by the initial private scheme would be low as the opportunities to cross-subsidise investments in the less cost-effective options with the returns from the more cost-effective options would have been removed. The multiplier effects of the private scheme may also be lower as any returns from investment are extracted from the local economy. The private scheme could therefore be accused of ‘cherry picking’ or even of ‘asset stripping’ the easy and more profitable options and of making longer-term transitions or deeper levels of decarbonisation harder to achieve. The reliance of the private mode on incentives and appeals to *homo economicus* or the consumer-self to promote participation could also degrade ethical or citizen-self commitments to broader social and environmental agendas.

The public mode also has access to substantial levels of finance, with the potential to access such finance enhanced by the fact that the finance is for investments that would pay for themselves over time. This could be seen as something of a departure from what has been the ‘provider state’ and shift towards what could be termed the ‘investor’ or even ‘entrepreneurial’ state (see Mazzucato,



2013). The scope for such investment is also enhanced where the public sector sets its boundaries more broadly because of its interest in the indirect social and environmental benefits that can be generated through low carbon investments. The scale of these broader benefits enables the public scheme to secure lower cost finance and to offer nearly interest free loans to participating households. Per unit of new capital invested, the public sector fund is less able to generate recycled investment than the private or civic schemes, although aggregate levels of recycled investment are still more than double those of the private scheme. Although it is more reliant on new capital investments, the public scheme does generate substantial levels of decarbonisation over a sustained period.

In terms of broader impacts, by investing in all low carbon measures, the public mode has the potential to do much more to reach hard-to-treat homes and to tackle fuel poverty than the private scheme. Its spill-over effects and impacts on the potential for broader social or environmental initiatives will be influenced by the extent to which it promotes participation through appeals to either the consumer and citizen selves of potential participants. Investments in the public mode could also generate positive multiplier effects within the local economy – generating employment and further tax returns for the public sector – and any returns on investment returned to the public sector could be used to fund or subsidise the provision of other public services. However, critics might suggest that the potential scale of a public scheme could create a level of dependency on the state and 'crowd out' the potential for non-state initiatives both from the private or civic sectors.

Perhaps the biggest story to emerge from the findings though relates to the potential of the civic mode of finance and governance. Although the civic sector does not have access to the same levels of finance that are available to the private or public sectors, the analysis suggests that a civic mode could generate the same levels of investment as the public sector, albeit over a more extended period of time, and that it could be more effective at recycling finance so that overall requirements for new capital are reduced. Over time the levels of investment generated, and the carbon savings that are associated with these, would be comparable in size to those generated by the public mode.

The civic mode could also generate various positive spill-over effects for the local community. Participation could be promoted by appealing to the citizen selves of local households, and local ownership of the scheme could also help to generate social capital and a sense of empowerment and agency. Together, these spill-over effects could increase the prospects for wider civically led social, economic or environmental initiatives. On pure economic terms, a proportion of the direct returns on investments in the civic scheme or of the indirect returns that emerge through broader multiplier effects could be reinvested or spent in the local community, thereby enhancing the impacts of the civic mode further.

## 5. Conclusions

This paper was based on the premise that the impacts of markets and finance are inherently ambiguous and highly contingent and that any form of finance cannot be separated from the contexts and conditions within which it has co-evolved. We argued that the impacts of neo-liberal contexts on the environment and on the environmental attitudes and behaviours of the people that live in those contexts have frequently been highly problematic. And we argued that apparently rational appeals to the economic beings that exist in these highly constructed contexts are



frequently self-defeating. We illustrated these arguments with reference to the impacts of market-based and apparently rational information and incentive based approaches to climate policy and the need for low carbon transitions. And we explored the literature that contrasts the impacts of neo-liberal market-led initiatives with those that are associated with civic-led, grassroots movements.

To explore the merits of these arguments in more specific and applied terms, we then moved on to consider the potential contribution of different modes of finance and governance to low carbon transitions at the local level. Adopting a case study that considered the different ways of financing and governing large-scale investments in energy efficiency and domestic sector retrofit in the Leeds City Region in the UK, we evaluated the potential contribution of revolving funds for retrofit under private, public and civic modes. Our previous research has found that revolving funds – in a generic form - have the potential to significantly reduce the costs and enhance the efficacy of low carbon transitions.

The results of the analysis presented in this paper suggest that the impacts of revolving funds could vary dramatically depending on how they are financed and governed. The analysis clearly shows that the private, public and civic modes of finance and governance all have a contribution to make, but that, when compared to the private mode, the public and civic modes could generate substantially higher levels of investment and decarbonisation and a series of more positive spillover effects that shape the potential for further or wider change. The analysis suggests that the civic mode has particular potential to generate such impacts. These impacts could enable and accelerate rather than undermine or restrict the pursuit both of deeper low carbon transitions and of broader social, economic and environmental agendas.

Of course the analysis depends on some simplifying assumptions that may or may not hold to be true in different contexts. But these assumptions do reflect real 'on the ground' conditions, and the results certainly suggest that the prospective impacts of civic modes of financing and governing low carbon transitions are worthy of much more detailed investigation. We recognize though that in practice the boundaries between the different modes of governance are likely to be more blurred than has been suggested in this paper. In the wider literature, considerable emphasis has been placed on the pros and cons of different forms of public-private partnership and of the influencing factors that co-evolve with them. It is striking though that considerably less emphasis has been placed on the potential of public-civic or private-civic partnerships to deliver different public interest agendas. Indeed it could be argued that the potential of such partnerships is frequently entirely overlooked. This could be an important omission – civic modes of financing and governing could be supported, enabled and invested in by the public and private sectors in multiple ways. Whether such dynamic or hybrid forms of financing and governance could be adopted and enabled to co-evolve in ways that reinforce rather than corrode the characteristics of this innovative form of public service provision requires careful consideration.



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