

**CO-DESIGNING FOR SUSTAINABILITY: STRATEGISING COMMUNITY
CARBON EMISSION REDUCTION THROUGH SOCIO-ECOLOGICAL
INNOVATION**

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ABSTRACT

Designing for sustainability requires us to intentionally and creatively explore and implement radical changes in social as well as environmental arenas. This paper reflects on an interdisciplinary, action research project in which we applied principles and tools of co-creation to facilitate knowledge mobilisation between three diverse stakeholder groups: community groups, local authorities and academics from diverse disciplines. Our goal was the development of a Community Engagement Strategy for Carbon Emission Reduction for a Scottish Local Authority. Our methodological approach included ethnographic and participatory methods; seminars; strategy prototyping; and shared governance processes. It was concluded that our project provoked 'social innovation' by catalysing a value shift in the organisations involved, but that the concept of 'socio-ecological innovation' would be more useful in designing for sustainability. This project demonstrates the strategic role designers can play in transcending the constraints of the current consumerist paradigm to co-create a better future.

Introduction

Design as a discipline is moving away from its traditional domain of aesthetics and functionality to focus upon issues of greater global significance, such as health and environment. Buchanan (1992) described a shift in design from a 'trade activity' through a 'field for technical research' to a new 'liberal art of technological culture' (in which technology is seen to be 'an art of experimental thinking'). This context demands a different approach to problem formulation and solving. Design thinking can promote a shift from a symptomatic to a systems approach (Brown, 2009). Design thinking offers intentionality and creativity and a process in which the problem itself is questioned, different alternatives are explored and the best options tried and tested, using an iterative process (see Brown, 2009). It is human centred, research based, providing a broader contextual frame of reference, collaborative and multi-disciplinary and incorporating integrative delivery and prototyping (Young, 2010). Critically, design thinking can develop new frames of reference within which to work, thus creating novel ways of addressing complex problems when conventional problem solving is inadequate (Dorst, 2011).

Our current societal model strives for economic growth, through capitalism, promoting materialism and consumerism and leading to the degradation of our environment (e.g. Meadows et al., 1972, Jackson, 2009). Design currently contributes to this model through the creation of more products to consume, and the design of visual communications and marketing strategies to increase consumption. But the idea the design could also play a fundamental role in the reconfiguration of society is not new. Papanek (1971) inspired a generation of designers to see the potential of this integrative discipline. He described how ‘design can and must become a means for young people to take part in the transformation of society’ (Papanek, 1971). Design can be used to create a more sustainable world through conceptualising and pursuing a societal paradigm shift (see Birkeland 2002, Manzini, 2007).

Sustainable development is a framework that offers pathways towards sustainability. At its core is recognition of the interconnectedness of social justice and environmental integrity, but other principles include the benefits of participatory approaches, linking local and global and maintaining an inter-generational perspective (see Dresner, 2002, Blewitt, 2008). Whilst there are many definitions of this concept, the study of sustainable development ‘pushes the boundaries of our thinking and action towards a paradigmatic shift in the way we look at the world, at nature and at humankind, raising awareness that the physical, social and intellectual worlds are interconnected and interdependent’ (Ferraro et al., 2010).

Many sustainability challenges, such as climate change, manifest as ‘wicked problems’, or even ‘super wicked problems’ due to their complexity and multi-dimensionality (Rittel and Webber, 1973, Buchanan, 1992, Bernstein et al., 2007). Even simply describing the problem is not possible in a definitive way unless we adopt a particular (stakeholder) perspective. The wicked problems approach to design contrasts with linear approaches in that it acknowledges that design problems are indeterminate (Buchanan, 1992). Rittel and Webber (1973) considered that such problems do not have single correct public policy solutions. It seems the best we can do is to formulate these problems in a dynamic fashion through interdisciplinary approaches and multiple stakeholder engagement.

A transition towards sustainability will demand radical changes in society and in our relationship with the environment (Ferraro et al., 2010). Lasting social change can be understood and driven through the concept and practice of social innovation. Social innovation has emerged not only in the creative/arts literature but also in debates around political governance, management science, business success and social/environmental progress (Moulaert et al 2005). These authors conclude that it is a multidimensional concept including enhanced satisfaction of human needs, changes in social relationships with regard to governance (increased participation) and enhanced socio-political capability and access to resources (empowerment). Despite multiple and casual definitions and understandings of the concept, it retains value (Pol and Ville, 2009). Phills et al. (2008: 36) define social innovation as being ‘A novel solution to a social problem that is more effective, efficient, sustainable or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals.’

Design and sustainability have partnered successfully in different ways. The pursuit of energy or waste minimising products comprising non-toxic materials altered design briefs without challenging the societal paradigm. Study of plants and animals offered novel insights for design through biomimicry (e.g. Benuys, 2002). Sustainable architecture not only addressed material aspects of building but also recognised the potential of such edifices to change our values and behaviours (e.g. Orr, 2006). A more wide-ranging vision of product design incorporated notions of life cycle analysis and cradle to cradle design (McDonough and Braungart, 2002), hence alerting us to the finite nature of resources and offering a new manufacturing paradigm. Ecological design used system thinking and biological processes to demonstrate new modes of linking different human activities to minimise waste and energy use (e.g. Todd and Josephson, 1996). More recently, design for sustainable behaviour has offered interdisciplinary solutions to reduce environmental impacts of use (e.g. Lockton et al., 2013, Bhamra et al., 2011).

Whilst all of these approaches are important in redefining the role of design in the modern world, it is the potential for design to contribute to the imagining and development of alternative sustainable futures that is explored in this paper. Such intent is less ‘sustainable design’ and more ‘design for sustainability’; an active

approach to design new societal paradigms and routes towards them. In this respect, the concept of social innovation is enjoying a recent revival in the field of design (Mulgan, 2007b). Manzini (2007) calls for design research for sustainable social innovation, and Vezzoli (2006) promotes radical social innovation in order to reshape our lives in the transition to sustainability. Bjogvinsson et al. (2012) suggest that this new role of design in social innovation permits a re-visioning of the design of social and political assemblies rather than of material objects.

The sustainability principle of participation is employed in design through the practices of co-design, co-creation and participatory design. In co-creation, the boundaries between, for example, service providers and their customers are dissolved and customers become part of an ‘enhanced social and cultural fabric’ (Prahalad and Ramaswamy, 2000). Co-creation refers to any act of collective creativity, but co-design implies a more fundamental, collaborative process in which stakeholders are involved in the initial conceptualization as well as prototyping and design adaptation (Sanders and Stappers, 2008). In participatory design, any part of the design process may include stakeholder input. Whilst it is acknowledged that participatory ways of working are *desirable* when following design thinking principles (Sanders and Stappers, 2008) it is clear that participation is *essential* when designing social assemblies (Bjogvinsson et al., 2012). In this paper we investigate how co-design for sustainability might tackle significant societal and environmental issues, explore the contribution of social innovation and introduce a new concept: socio-ecological innovation.

Objectives

This paper reflects on an interdisciplinary, action research project in which we applied principles and tools of co-design to facilitate knowledge exchange between three diverse stakeholder groups: community groups, local authorities and academics from both social science and creative disciplines. Our goal was to co-design a strategy for a Scottish Local Authority to enhance community carbon emission reduction and to enhance regional ability to respond to sustainability challenges. Whilst the intention is to ultimately reduce carbon emissions, this was not a specific objective within this study. Specifically, we ask in this paper: How did we achieve our goal of co-designing a strategy? In what ways did the process catalyse a change in organisational

structures and achieve social innovation? Is social innovation an appropriate route to sustainability? What new/old opportunities exist for the flourishing of design for sustainability? In response to the latter question, we pose the concept and practice of socio-ecological innovation.

Project context

Climate change is an example of a wicked problem, with predictions of further global warming, sea level rise, extreme weather events and subsequent disaster, food security, migration and energy challenges (IPCC, 2007) Urgent mitigation strategies, and increasingly adaptation goals, have been established at international and national levels, although they face some resistance. Scotland has responded with the most ambitious global targets; the Climate Change Act (Scotland) (2009) has imposed targets of 80% decline in carbon emissions by 2050. Local government, managed by 32 local authorities across Scotland, is beginning to rise to this challenge.

This project was funded within a programme intended to build links between Higher Education Institutions (HEIs) and local authorities (LAs) in Scotland¹. We co-designed a Community Engagement for Carbon Emission Reduction (CECER) Strategy for Fife Council (a leading local authority in sustainability). We also prototyped the strategy in a local community and began to disseminate our findings across other local authorities. Within our project we used as a case study Fife region (a rural district with mixed urban development, north of Edinburgh, measuring 1,322 sq km with approximately 330 000 inhabitants). The study was prototyped in a marginalised area in Fife: Levenmouth.

We ‘academics’ were a sustainability scholar with a background in biology and community engagement; a designer with both practical and academic design experience and deep personal commitment to community initiatives (the authors to this paper); two anthropologists, one a strong activist and one embedded more firmly within academia; and an ecological economist. Within the LA we worked most closely with a Sustainability Team Leader, a Community Development Officer and an environmental group officer. A member of a local government national network organisation also sat on the Steering Group. Community engagement began with

personal contacts and followed a ‘snowball’ technique, enhanced by open marketing across appropriate networks for specific events.

Project methodology

In this project we employed the philosophy of intentional design thinking, for the specific output of the strategy (Brown, 2009, Brown, 2008). We explored alternative frames for the problem (Dorst, 2011) (e.g. of climate change, role of local authorities) through a scoping study and open discussions in the steering group. The scoping study also allowed us to place the problem within a wider context and to employ systems thinking (Charnley et al., 2011). We creatively identified a series of possible actions, selected a best option and implemented it through the prototype area, then reflected back on the process and pursued further iterations. In so doing we used an iterative, open problem solving process that avoided linear and reductionist approaches (Birkeland, 2002, Brown, 2009). We also sought to achieve co-design (Sanders and Stappers, 2008). However, the interdisciplinary and participatory nature of the project precluded a methodology comprising only design thinking and using only design tools. We also drew on other research traditions as described below.

The project was more than research, but also action research (Brydon-Miller et al., 2003) and social experimentation (e.g. Bjogvinsson et al., 2012). An ethnographic approach was taken, grounded in an awareness of the variation existing between different people’s values, social circumstances and actions. It allowed us to recognise and respect the variety of communities and community responses that existed (Carrithers, 2005). We thus attempted to avoid a form of participation in the project that would merely legitimise top down processes (e.g. Cooke and Kothari, 2001), instead trying to support participants’ autonomy (e.g. Rahnema, 2005). An ethnographic approach can clarify cultural contexts and social norms; it can assist designers in making sense out of complex cultural patterns; and it can allow designers to create outputs that will be more culturally acceptable (Weber, 2009). However, we recognised the tension between the nature of ethnographic research (which achieves immersion and understanding but not intervention) and design (which is intentional in nature) (Grudin and Grinter, 1995).

Methodologies, processes and tools used to co-create social innovation

The methods used to co-create social innovation included a scoping study, seminars, capacity building, placements and an impact generating activity: the development of the strategy (Figure 1).

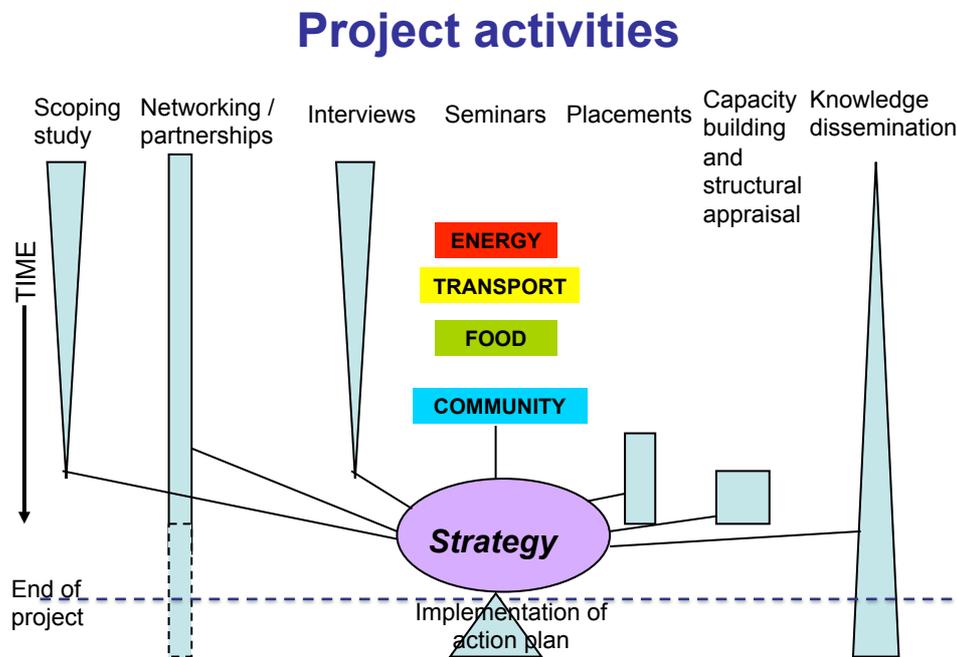


Figure 1 Project activities with time shown from top to bottom illustrating the relative development of different activities over the course of the project. Many activities fed into the development of the strategy.

The scoping study was a large interdisciplinary academic document that informed our conceptual thinking around the project. It served to generate academic discussion and create debate over different epistemological positions and theoretical understandings. However, it was considered to be of limited use by our LA partners, who preferred more practical outcomes.

The seminars captured people, from LAs, community, other relevant organisations and to a lesser extent academia (30-50 people per seminar). Each seminar addressed an issue (Energy, Food, Transport, Community), provided an opportunity for networking and knowledge exchange and actively contributed to production of the final project goal – the CECER strategy. Presentations were offered by different stakeholders, with opportunities for collaborative discussion, using Open Space Technology (Owen, 2008) and other tools, and for informal networking seeded by creative ice breaker activities.

Two capacity building workshops were held, with the aims of enhancing understanding of contested concepts and strategic goals and establishing an arena of shared values, rather than to impart specific skills. ‘Placements’ were used to enhance understanding across any of the project partners, and they served to strengthen relationships and enhance mutual understanding, building towards shared values and priorities to inform the design outcome. The seminar and capacity building events offered spatial and temporal zones within which the different stakeholders could interact (Figure 2).

Project stakeholder structure

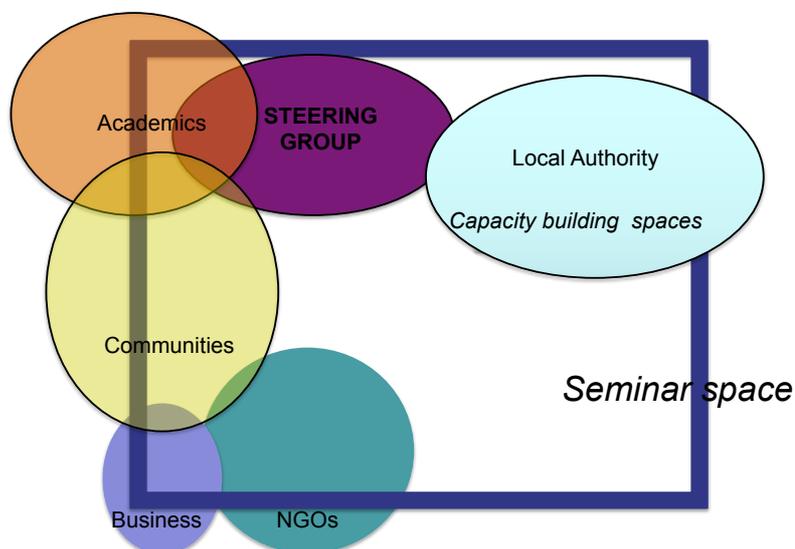


Figure 2 The main stakeholders involved in the project, illustrating how they influenced governance through the steering group. The large square illustrates the seminar space and the small squares capacity building spaces.

We thus created three strands of process that wove together to create the whole. Firstly, there was a goal oriented process in which we had specific goals (actions) to achieve. Secondly, there was a process of social and conceptual learning and, thirdly, a management (governance) process.

The goal oriented process comprised the explicit and visible strand of activity, in which we had specific goals (actions), including the CECER strategy, to achieve. The process of social and conceptual learning was more subtle and occurred through the exchange of knowledge and discussions within the ethnographic approach, the

networking at seminars, debate in the capacity building workshops and the meetings generated to discuss the issues of community engagement and climate change and in the discussion of academic theories. Social learning is both the acquisition of knowledge that can occur within a social group and the process of learning by individuals from others (Ganis, 2009). Participation enhances social learning and the development of relationships, which in turn can lead to more effective participation (White et al., 2005). Indeed, Vezzoli (2006) believes we have to see a transition towards sustainability as being a 'wide reaching social learning process'.

The management process also assisted in the exchange of ideas and in ensuring that the goal oriented process followed a direction that was approved by local authority staff, external adviser, academics and with constant reference to community voices. Governance occurred with regular meetings of the Steering Group; frequent meetings between academics (either all or some combination); infrequent meetings with senior management in Fife Council; with the principal investigator ensuring effective interweaving of the project strands. The project governance structure, with the stakeholder representative steering group, endorsed the co-design process, bringing about a collaborative mindset at all levels of the project.

Project outcomes

It can be difficult to distinguish the outcomes and impacts of a project striving for social innovation. We draw here first on the model proposed by the strategic consultancy uscreates to distinguish between immediate outputs, which catalyse outcomes, which lead to impacts in a ripple effect.¹ We also draw from Nutley et al. (2007) who define distinguish forms of impact as being instrumental (e.g. policy or practice), capacity building (e.g. personal and skills development) or conceptual (e.g. reframing debates, offering new understanding). Hence, firstly, our action research discussions and activities (outputs) led to real and immediate changes in community and local authority action (outcomes and instrumental impacts). For example, a mentoring system began to emerge between established community initiatives in more affluent areas and emerging initiatives in deprived areas. Secondly, the project activities (outputs) altered the strategic direction of the local authority (outcomes) in a

¹ <http://uscreates.com/2013/08/08/social-outcomes-vs-social-impact/>

manner that we anticipate will reduce carbon emissions (a longer term instrumental impact – although we did not measure this in the scope of the project). In both environmental and community development divisions there is now an explicit recognition of the benefits of environmental considerations and need for community engagement respectively. More specifically, the CECER Strategy (output) identified six conceptual strategic areas, with strategic goals and action points under each area allocated to departments across the LA:

- (1) Developing alternative delivery mechanisms to enable community action
- (2) Building community resilience
- (3) Creating infrastructure and processes
- (4) Supporting marginalised communities
- (5) Exploring how the financial climate offers an opportunity for different ways of thinking and an internal realignment of resources and
- (6) Learning from the local authority itself as a community of interest.

This strategy was seen to be a ‘great foundation to build on’ (LA staff member).

Thirdly, the project, through the scoping study (output) and seminars (outputs) impacted on our academic understanding of ‘community’, community engagement and resilience, design thinking and the function of local government and multi-level responses to climate change (outcomes). These conceptual impacts are being developed elsewhere.

Finally, there was evidence of impacts on the cultures of the organisations and groups involved, generated by the process outcomes of co-design. Within the LA, the project provoked more cross sectoral debate about community engagement, altered ways of communicating with local communities and re-established links between practice and academic theory. Through provision of a platform for stakeholders to engage, in the seminars with the Open Space sessions, local government staff were able to communicate with community members in an environment conducive to open discussion and debate. They had to recognise that for community members ordinarily, ‘finding the right person when you want to talk about [allotments etc] is really hard.’ The academic discussion of contested concepts provided purpose and meaning to the daily drudge of tasks and targets for some staff in the LA (commenting ‘that team

meeting was fun!'). In this sense there was a shift to a shared values, systems thinking approach (Seddon, 2008) rather than a reductionist target driven approach. A community member asked 'How can communities and the council work together [on sustainable food]?' whilst a LA staff member acknowledged that 'sustainable transport is cheaper than building more roads'. The person centred changes would be defined as capacity building impacts.

Communities gained insight into how local authorities can assist community initiatives, seeing local government as 'a missing link'. In the recent past, action on climate change had been seen to be primarily from emerging communities (grassroots) or from national government (top down). This intermediate local layer of governance can serve to stimulate and facilitate bottom up action as well as to implement national level initiatives. There was surprise voiced by some community members at the potential for local authorities to be powerful partners in action against climate change; for example in procurement, planning, infrastructure. Contacts were made and new relationships established. However, the importance of individuals was recognised. One community member stated that, 'It is absolutely crucial that we have great locality managers' and another about the council: 'There are individuals in there who are really helpful.'

As academics, we were impressed by the management efficiencies of local government processes; our initial attempts at rather theoretical strategies required action plans and SMART (Strategic, Measurable, Achievable, Realistic and Time bounded) targets (e.g. Haughey, 2010). We had to learn to change our language and not assume knowledge of literature or acronyms. We had to work to different timescales. Whilst we often wanted to promote long term learning and work towards long term goals, local authorities needed to engage in the short term, often in response to policy initiatives and procedural deadlines. As academics, we were also challenged by the interdisciplinarity of the project. Epistemological tensions (different ways of interpreting the world) prompted discussion and even disagreement, and we had to learn a common academic language. Completion of the scoping study enabled us to explore these differences productively, and widen the theoretical framework within which we worked. We also needed to acquire empathy to develop insights that would change people's lives (Brown 2009). Empathy is essential in the pursuit of sustainable

product design (Niinimaki and Koskinen, 2011) and we argue even more so when addressing social systems. We suggest that the process of ethnographic engagement and of co-design enabled us to develop sufficient empathy to genuinely encourage participation and listen to participants.

Overall, our research indicated that, in order to address sustainability challenges, LAs will need to shift from being service providers to becoming community enablers; in particular with regards to rebuilding community resilience characteristics, such as local energy independence, food and transport security, and social resilience. Further collaboration with Universities can provide a strong evidence base for decision making, offer new processes such as co-design and facilitate the re-connection of theory and practice. Creating community resilience and pursuing these forms of knowledge mobilisation will, however, require a significant change in culture from local authorities, as well as social transformation within communities.

We did thus identify instrumental impacts (specific actions and of course the new policy document), capacity building impacts (learning across all participants, not just in capacity building workshops) and conceptual impacts (insights on academic fields, not least the reflections on design presented here). The definition of impact offered by Nutley et al (2007) does not, however, capture the important aspects of trust and relationship building that are acknowledged within co-design (Sanders and Stappers 2008). There were also some tensions visible in this process. Not only did academia and local government have different modes of working, but as many social movements seek to achieve greater democratic control over the state (Moulaert et al., 2005), there was an anarchic energy from some community members that some LA staff were astonished and even threatened by. A community member commented that ‘They’re very frightened that community groups will take over’. We struggled to maintain momentum from output (strategy) to outcomes in all LA departments targeted. ‘The sheer complexity of the organisation [LA]’ made systems thinking challenging (LA staff member).

Towards socio-ecological innovation

To what extent then did this project achieve social innovation? Social innovation can be both a process and a product or outcome; some processes and products are adopted and disseminated but some are not (Phills et al., 2008). In this project we believe that we achieved a *process* of social innovation. The collaborative partnership between Universities, local government and communities provided new opportunities for cross pollination of ideas and different ways of working, fulfilling both the participation and empowerment elements of the definition by Moulaert et al (2005). Secondly, the research approach created the conditions and impetus for social innovation. The establishment of networks and ongoing relationships helped create a shift from ‘projecting’ to ‘infrastructuring’ (Bjogvinsson et al., 2012), which is required for societal impact.

Was an *outcome* of social innovation achieved in this project? Certainly a strategy was developed which has the potential to engineer a change in the ways that local government and communities work together in building community resilience and reducing carbon emissions. However, this strategy is still being embedded in a broader policy framework. We have not seen an abrupt change in working approaches, but rather gradual shifts in values and practices of the three stakeholder groups involved. Brown (2009: 16) suggests that ‘the continuum of innovation is best thought of as a system of overlapping spaces rather than a sequence of orderly steps’. We created overlapping spatial and temporal locations (outputs) to enable our outcomes, but recognise the messy nature of the links between outputs, outcomes and ultimately impacts.

The three key aspects of most important social innovations are said to be that they are usually combinations of existing factors, rather than entirely new systems; implementation requires cross sectoral or interdisciplinary approaches; and they create new and valued sets of social relationships between groups of people which open up opportunities for further innovations (Mulgan, 2007b). This project addressed the first aspect by combining the ideas and facilitation from Universities with the rooted and inevitable (driven by legislation) move of local government to reduce carbon emissions and with the creativity of some communities.

Mulgan (2007b) proposes that in order to see these initial steps towards innovation continued, we will need to see supportive leaders, focused financial models, more open markets for social solutions, incubators and R&D, user friendly tools for innovation, institutions to orchestrate systemic change, cross national possibilities for exchange, new institutions to adapt technologies for their social potential and new ways of cultivating innovators. At this time of fiscal austerity and rapid change in the public sector in UK, it might seem unlikely that such conditions will emerge. However, Mulgan proposes that in times of fiscal crisis or when the need for alternative systems becomes clear, the usual barriers to social innovation can be overcome. He suggests that people will overcome initial inefficiencies to try out new systems and, in times of rapidly changing circumstances, mental models and cultural norms start to change and longterm personal relationships come under strain as some people take on board new ideas and others resist them. If there is an opportunity to build new relationships, one of the barriers to social innovation (the glue of existing personal networks) can be overcome.

Social innovation is said to be encouraged when the ‘bees’ (small, mobile organisations) pollinate ‘trees’ (large, stable, strongly rooted organisations such as governments, large companies or big NGOs) (Mulgan, 2007a, b). In this project we demonstrated how community groups (bees) have innovated rapidly in response to climate change and can actually pollinate ideas in the larger local authority (the tree). This change was a new perspective because the local authority saw itself as a leader of community development. One community development member said how surprising it was to see some community initiatives that had developed such sophisticated energy saving schemes without any local authority input. A recognition of the mutual benefits of exchanging lessons and ideas amongst Universities (potential incubators and disseminators of ideas –Vezzoli, 2006) local authorities (rooted organisations, slow to change but with many resources and experience) and communities (nimble, some able to change rapidly and some in need of support and leadership - trees and bees – Mulgan, 2007a, b) provides a strong rationale for employing co-design for social innovation in this project.

Social innovation should not be exclusively associated with public sector organisations. Manzini (2007) promotes a strong role for creative communities and

collaborative networks. Both he and Vezzoli (2006) argue for distributed economies models that can challenge the globalisation that is an aspect of the current dominant paradigm of economic growth. They suggest that creative communities and cooperative networks can play a key role in enhancing resource access democratisation whilst reducing environmental impacts. We thus propose that social innovation towards sustainability embraces communities where appropriate. This discourse of relocalisation is a core aspect of the Transition movement, which uses design (especially permaculture) principles to propose steps by which communities can make a 'transition' (see Hopkins, 2008). Both Vezzoli and Hopkins, in different ways, see communities not as isolated, distinct groups of humans, but as diffuse interconnected clusters of people who can gain strength from networking. Manzini (2007) calls this a 'multi-local society'. In this project we demonstrated the ability of some communities to innovate in reducing carbon emissions, but with additional benefits of social capital, social learning and enhanced sustainability awareness. In this way we have provided support for Manzini's (2007) contention that 'creative communities' can develop new ways of thinking and contribute significantly to the transition to sustainability. Collaboration with communities can help unleash this creativity and trigger cascades of social change.

Whilst good ideas may arise in Universities, they often lack the dissemination capabilities required for effective knowledge exchange and social change. Academics in science have made greater changes in setting up technology incubators and start-ups, but we still lag behind in mechanisms to drive social change (Mulgan, 2007a, b). Hence, co-design offers a model for universities to play a more active role in practical social innovation.

The public sector is often maligned for a lack of innovation, but in fact has a rich history of innovation. For successful public sector innovation, we require effective leadership and receptive culture, a particular drive or need, creativity and novel recombinations, prototypes and pilots, the ability to scale and effective diffusion of innovation and finally sophisticated risk management (Mulgan, 2007a, b) Credit is due to the local government staff involved in this project for exhibiting all of these characteristics.

Eco-design tends to focus on rather technical increments in eco-efficiency, often developed by engineers, rather than the more radical life cycle product changes which might be achieved with the input of designers (Sherwin, 2004). Other designers considering sustainability support socio-ethical change without due consideration of environmental issues (Vezzoli, 2006). Bjogvinsson et al (2012) support not only the notion of participatory design, but also the empowerment of stakeholders to develop and embed design processes for the future; a concept that chimes with the empowerment elements of social innovation (Moulaert et al 2005) but which again omits environmental concerns. Whilst Buchanan (1992) suggests that design purpose can recognise cultural and environmental contexts, design does not automatically adopt sustainability principles, where environmental limits set the boundaries within which socio-economic activities can take place. The concept of social innovation suggests active and longterm change *of* systems, rather than design *for* or *within* systems.

This analysis provides strong support for the promotion of social innovation in pursuit of the transition to sustainability. Understanding the preconditions, stimulators and potential barriers will facilitate a more rapid change in society. However, when pursuing sustainability, social change cannot be disconnected from the underpinning environmental constraints. The debate on social innovation to date includes the satisfaction of human needs through participation and empowerment (Moulaert et al 2005). Whilst such goals are commensurate with sustainable development, they omit the need for environmental concerns. Indeed, in an analysis of the definition of social innovation, Pol and Ville (2009) demonstrate that social innovation is for the ‘public good’, but question the extent to which this means ‘for people and planet’. The fundamental basis of sustainable development is that social justice is interconnected with ecological integrity (White, 2013). Hence, we introduce a new concept of ‘socio-ecological innovation’. This wider concept dictates that social change be stimulated and implemented within an environmental context. Socio-ecological innovation thus expands beyond service design, social design and social innovation (Figure 3).

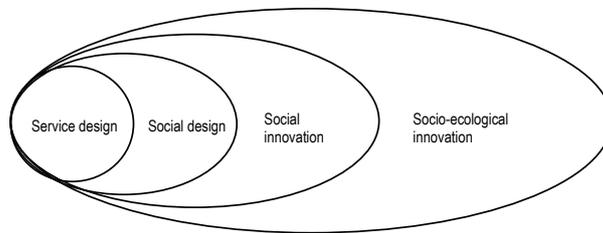


Figure 3 A conceptual illustration of the positioning of ‘socio-ecological innovation’.

In this project we observed socio-ecological innovation as evidenced by changes in the way that environmental and community development officers worked with each other, built on new trust and relationships; a re-prioritisation of community development workers towards consideration of environmental variables; a wider debate on resilience with a recognition of the botanical origins of this term and its context within sustainability debates; a focus of communities on not just carbon emissions but also building social capital. In fact, social change in this project (community action, local government function, the role of academia) was catalysed by the need to address environmental issues.

In a sense, what we propose here is a shift beyond Bruno Latour’s collectives of humans and non-humans, beyond the socio-material assemblies described by Bjogvinsson et al (2012) towards a new vision for design for sustainability that incorporates a) visioning for alternative futures, including innovative changes in society, b) awareness of ecological constraints, c) respect for different worldviews and d) the principle and practice of collaborative approaches, such as co-design and co-production.

Designing for sustainability: an emerging role for co-design

What lessons can we learn about the use of co-creation and co-design principles in order to design for sustainability?

There has been reticence regarding the wider introduction of co-design in the general field of design, partly because of a common belief that only 'lead consumers' can be sufficiently creative (Sanders and Stappers, 2008). In this project, every community, public sector, NGO and academic person contributed creatively. It thus serves as a demonstration for co-design and for the wider engagement of people from all backgrounds to participate in designing our new future. The collaborative approach of co-design also facilitated the social learning and relationship building that are key aspects of social innovation (see Mulgan 2007a). However, it is important to realise that whilst everyone can demonstrate creativity, not everyone is a designer and design specialisms will continue to be required to understand the complexities of problems (Sanders and Stappers, 2008).

The framework of design thinking allowed our project to adapt to the needs of our partners. We provided a platform for collaborative social learning. In this way we were able to develop flexible ways to accommodate different agendas and forms of knowledge: social, practitioner, experiential and conceptual. Unpredictable spinoffs can occasionally be more valuable than achieving aims that are defined and constrained by research bids. Design thinking allowed us to reconfigure our research questions and to create innovation spaces that encouraged inspiration, ideation and implementation in an iterative, non-linear journey (Brown 2009). This project blurred the boundaries of traditional research in terms of discipline, problem identification, action and reflection, theory and practice.

Tim Brown's interpretations of design thinking ring true when he defines design thinking as 'a methodology that imbues the full spectrum of innovation activities with a human-centred design ethos' (Brown, 2009). However, in this article Brown speaks from a business perspective, and promotes design thinking for the business world and for leaders to obtain 'a principal source of differentiation and competitive advantage'. If limited to this perspective, design thinking will continue to contribute to the problems caused by a society dominated by capitalist thinking, materialistic goals, environmental degradation and global challenges such as climate change and poverty.

Perhaps, indeed, 'all design is political' (Orr 2004: 44). Happily, design thinking is now contributing to better public sector working. Sanders and Stappers (2008) describe a shift in the landscape of design practice from the designing of products to designing for a purpose, as Bjogvinsson et al (2012) describe a shift from designing things (objects) to Things (socio-material assemblies). The use of design thinking to catalyse social (socio-ecological?) innovation has the potential to change organisational cultures and may ultimately contribute to a shift to values based on wellbeing, justice and environmental integrity rather than profit. In this way we scale the concept and application of design thinking from attractive product packaging, to product design, to system design, to innovation of systems, to the creation of new paradigms for society that are more compatible with sustainability principles. Ultimately, we should see design thinking contribute to the notion and implementation of sustainable development itself. Designing for sustainability thus alters the function of design itself, and not just the process and form of output that design can produce.

The shift from user-centred to co-design implies a change in the role of designers (Sanders and Stappers, 2008). Higher education institutions have a major role to play in designing sustainable futures, not only as disseminators of ideas, but also as incubators of locally based and networked enterprises (Vezzoli, 2006). In catalysing social innovation for sustainability, designers need to take a role that is more facilitator than leader; in which they design conditions and processes to stimulate the 'wide reaching social learning' (Vezzoli, 2006) that is required for the radical transition in society. We argue thus that HEIs, and in particular the designers within HEIs, need to be facilitators, partners, provocateurs, mentors, social organisers to stimulate the socio-ecological innovation required in designing for sustainability.

Conclusions

The 10 world changing social innovations listed by Mulgan (2007b) (and Phills et al (2008) provide a similar list) describe fundamental aspects of sustainability. They are the rise of environmentalism, the growth of human rights, the spread of humanitarian relief, feminism, participatory models (budgeting and software), fair trade, community based microcredit models and increased access to learning (Open

University and other distance learning). Social innovation is currently being explored actively in many fields, but has not been taken up strongly in debates on sustainable development, whereas designers have seen the benefit of learning and action in relation to social innovation. We propose that designers and sustainability academics and practitioners work in partnership using co-design for social innovation, better still - for socio-ecological innovation. We demonstrated here some evidence of how co-design and social innovation were synergistic in promoting interactions between people that enabled both the development of a strategy to engage communities in reducing carbon emissions and the acceptance and implementation of the strategy. It remains to be seen how successful the strategy is in terms of actually reducing carbon emissions, but we hope that the participants were empowered by the process and can take forward conceptual and capacity gains as well as instrumental impacts. This project thus serves as a demonstration of the strategic role designers can play in transcending the constraints of the current consumerist paradigm to co-design a better future.

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