Institution: The Open University

Unit of Assessment: D34 Art and Design: history, practice and theory

Title of case study: Sustainable design

1. Summary of the impact

Design has research programmes on designing for sustainability in transport, housing, energy systems and waste management. The resulting research has changed government policies, and benefited the practices of public and private sector organisations in engaging domestic and business user groups with sustainability issues. These organisations include several agencies concerned with energy, built environment, transport and waste, businesses, councils, trade associations, schools and universities.

2. Underpinning research

Design of low-carbon household energy systems
Underpinning research on the design of household energy systems to improve adoption and use began in 2000 with **Robin Roy**'s (OU from 1970 and currently Professor Emeritus) work with the OU Design Innovation Group (DIG) on 'Household ecological footprints'. This led to projects with Sally **Caird** (OU part time contract researcher in 2005 and Research Fellow from 2010) between 2005–10 including 'People-centred Ecodesign' with the National Energy Foundation, the Energy Saving Trust, Milton Keynes Energy Agency and the BBC.

A continuing partnership with the Energy Saving Trust, with funding from Carbon Connections, led to further studies including 'Household adoption and use of micro-generation heat' (2007) which identified domestic heat pumps as a potentially key environmental technology. This research (Reference 3.1) examined factors influencing consumer adoption/use of low-carbon products and systems (insulation, lighting, solar thermal and photovoltaic systems). It identified financial savings and/or environmental concerns as drivers, while cost, incompatibility with buildings and visual impact were barriers to wider adoption and use.

A major conclusion is that a combination of design modifications and policy changes can improve adoption and efficient use. One of the routes to impact has been through follow-on projects with industry partners (Reference 3.2). These include The Energy Saving Trust's funding of the 'Heat pump field trial user evaluation' (2008-9) which examined user experiences of low-carbon household energy systems and proposed design improvements to installation and controls. Further research on designing user-friendly controls is underway in the OU's Computing Department.

Design of sustainable waste systems
Christine **Thomas** (OU Research Fellow since 1993 and currently Senior Research Fellow) founded the Integrated Waste Systems (IWS) Group in 1998. It has six members and runs joint laboratories with Environmental Science. Underpinning research (Reference 3.3) in sustainable waste systems began in 1999 with 'Evaluating the role of public perception of recycling collection schemes' through a Hampshire survey to improve recycling systems. Follow-on studies with Hampshire County Council (2001-6) explored methods to improve data use including 'Developing integrated waste management strategies' and 'Waste composition data analysis and key resource streams'. Hampshire Council engaged **Thomas** as Strategic Advisor from 2004–07 which resulted in long term policy changes and benefits to improved waste management and recycling.

A second cycle of underpinning research (Reference 3.4) was conducted by other members of the Integrated Waste Systems Group (Jim **Frederickson** OU Research Fellow since1993 and currently Senior Research Fellow, and Rachael **Slater** OU Lecturer since 2007). This focussed on designing community composting schemes and routes to UK policy change. A DEFRA-funded project (2006–10) evaluated the contribution of community composting to UK Government waste-related targets.

Design of sustainable transport systems
Stephen **Potter** (OU Research Fellow since 1993 and currently Professor of Transport Strategy)

initiated research on the role of institutions and financial models in shaping the adoption and use of innovative transport technologies and systems. A 2002 project for the Department for Transport/Greater Manchester Passenger Transport Executive (PTE) on 'Innovations in demand responsive services' focussed on demand side drivers in transport design and innovation. Results (Reference 3.5) indicated that user practice and adoption is closely integrated with policy formation. These ideas formed the basis for a partnership in 2009 with Milton Keynes' Low Carbon Living Programme which consolidated this research and opened routes to impact. This programme included a £5m 'Plugged in Places' grant from the Office for Low Emission Vehicles and a £120,000 SEEDA grant, funding two PhD studentships. The OU team in Design, which includes **Potter** and Matthew **Cook** (OU Lecturer from 2009 and currently Senior Lecturer), continues to develop impacts in user-led transport design through contributions to several implementation projects. These include the £14m 'Project Falcon Smart Grids' (2012–15) on user engagement and the £16m MK: SMART project (starting 2014) which includes integrating IT systems in the design of new forms of public transport.

Eco-taxation measures are designed to stimulate cleaner transport technologies and more sustainable travel behaviours. Underpinning research (Reference 3.6) by **Potter** has built on his earlier work with Marcus **Enoch** (OU Research Fellow 1999-2003), including their ESRC funded project 'Taxation futures for sustainable mobility' project (2003–04). This research presented strategic re-design options for the transport taxation regime through policy change and strategic interventions, including EU programmes.

3. References to the research

3.1. Caird, S. and Roy, R. (2008) 'User-centred improvements to energy efficiency products and renewable energy systems', Special issue on user-centred innovation, *International Journal of Innovation Management*, Vol. 12, No. 3 (September), pp.327–55.

3.2. Caird, S., Roy, R. and Potter, S. (2012) 'Domestic heat pumps in the UK: user behaviour, satisfaction and performance', *Energy Efficiency*, Vol. 5, Issue 3, pp. 283–301.

3.3. Thomas, C. (2001) 'Public understanding and its effect on recycling performance in Hampshire and Milton Keynes', *Resources, Conservation and Recycling*, vol. 32, pp. 259–74.

3.4. Slater, R., Frederickson, J. and Yoxon, M. (2010) *Unlocking the Potential of Community Composting: full project report*, London: Department for Environment Food and Rural Affairs, online at http://oro.open.ac.uk/30542/.

3.5. Lane, Ben and Potter, Stephen (2006). 'The adoption of cleaner vehicles in the UK: exploring the consumer attitude–action gap' *Journal of Cleaner Production*, Vol 15(11-12) pp. 1085–92.

3.6. Potter, Stephen; Parkhurst, Graham and Lane, Ben (2005). 'European perspectives on a new fiscal framework for transport'. In: Reggiani, Aura and Schintler, Laurie A. eds. *Methods and models in transport and telecommunications: Cross-Atlantic perspectives*. Advances in spatial science. New York, Springer, pp. 319–33.

4. Details of the impact

Influencing evidence-based government policy

The 'People-centred eco-design' project led to an invitation to provide evidence to the 2007 Parliamentary Committee Enquiry on Climate Change and subsequently to develop the methodology for a government-sponsored micro-generation study. The results of the project 'Household adoption and use of micro-generation heat' (2007) (reported in Reference 3.1) were used in evidence in the UK government's June 2008 *Micro-generation Strategy Progress Report* and in the comprehensive review by Element Energy Ltd (Source 5.1). This research was publicised by the BBC, the *Independent* newspaper, professional journals and at an invited presentation to Department of Energy and Climate Change (DECC). The results fed into DECC's 2012 micro-generation heat strategy consultation, 'Strategic framework for low carbon heat in the UK' (Source 5.2) that informed the Government's March 2013 *The Future of Heating* policy document.

The 'Community composting' report (Reference 3.4) showed DEFRA's 2009 proposal to change

waste site regulation would adversely affect many small-scale community composting sites. On this evidence DEFRA changed its policy; removing a proposed charge and increasing the exemption threshold.

Influencing sustainable transport policy

Potter was a founder member of the Transport Taxation Group, chaired by Stephen Joseph from the NGO Campaign for Better Transport, which facilitates interaction between HM Treasury and the research/NGO community. **Potter**'s research led to his participation at Treasury/HMRC briefings and appointment as Transport Commissioner for the *Green Fiscal Commission* (2007–09). Chaired by Robert Napier, members included Lord Adair Turner, Lord Chris Smith (Chairman, Environment Agency) and MPs from the three main parties (including, Greg Barker, now Minister of State for Energy and Climate Change). Potter's research formed the core of the Commission's transport briefing paper with Paul Ekins from UCL Energy Institute (Source 5.3).

In the run-up to the 2010 election, **Potter** was invited to provide guidance on transport and fiscal policy to the JMG Foundations Quality of Life Policy Group, a Conservative Party think-tank instigated by MPs Zac Goldsmith and John Gummer. OU research on transport taxation design is directly cited in their *Blueprint for a Green Economy* (Source 5.4). Potter also authored a chapter in the 2013 Liberal Democrats' policy development *Green Book* (Source 5.5).

In 2008 **Potter** was invited to a Treasury meeting supporting the King Review on vehicle and fuel technologies, leading to a range of new measures in the 2008 budget. In 2011 he was an invited national expert to the European Commissioner for Taxation and Customs Union, Audit and Anti-Fraud (CEC DG TAXUD) on the Expert Platform 'Green Budget Europe Company Car Taxation Workshop' in Brussels. His research policy assessment paper is in a 2013 joint publication by DG TAXUD and Green Budget Europe. Potter and the OU team have also worked with the Business in the Community Ways2Work programme, including authoring a Travel Plan Tax Guide in *The Essential Guide to Travel Planning*, Department for Transport 2008, and National Business Travel Network (NBTN) advisory note 1- *Tax and Travel Plan Measures*, July 2008 (Source 5.6).

Enhancing knowledge and practices of public and private organisations

Results from the ''Household adoption and use of micro-generation heat' (2007) project were disseminated to installers, manufacturers, customers and users through the Energy Savings Trust (Source 5.7). The findings led to the Energy Saving Trust's national 'Heat Pump Field Trial' (2008–10), with the OU team as research partners. The OU research support is documented in several EST publications aimed at the public, equipment installers and manufacturers, and resulted in the rapid introduction of more user-friendly controls and to DECC updating its *Microgeneration Installation Standard: MIS 3003* (Source 5.8).

Research on 'Understanding recycling behaviour' resulted in **Thomas**' appointment as Strategic Advisor to Hampshire County Council in 2004-7, which had major impacts on policy change in the period 2008-13. Robert Lisney, previously Assistant Director of Hampshire County Council, comments on the research: 'We used the expertise of the OU team with Christine as the leader on many occasions to undertake research both for future policy and decision making. … I have been very pleased to take the information and use it for my own decisions and also to influence the next generation of policy… On so many fronts, one has been able to use the outcomes in a real sense' (further corroboration in Source 5.9). The Community Composting Network (coordinator Cath Kibble, Source 5.10) has been instrumental in delivering the changes and benefits resulting from the work of **Fredrickson** and **Slater** (Reference 3.4).

A key impact of the research on 'Innovative transport technologies and systems' is the close partnership with Milton Keynes Council. This partnership has played a major part in shaping the Milton Keynes Low Carbon Living Programme and the development of a number of low-carbon trial and pilot projects in the Milton Keynes area. Following an invited submission to the 2008 Milton Keynes Bus Strategy consultation, Stephen **Potter** gave a presentation that led the Council to explore demand responsive operations and a trial project is now due to be implemented in 2014. This work subsequently led to developing the MK: Smart project, led by the OU with an £8m HEFCE Catalyst grant and a further £8m of partner co-funding, which will provide a big data ecosystem to support a range of smart city technology deployments including innovative transport designs. Geoff Snelson, Milton Keynes Council's Director of Strategy, sums up our role by saying:

'Milton Keynes aims to be a pioneering city for low carbon living. We are lucky to have the Open University with its world class capabilities as an enthusiastic local partner in delivering our programme.' (Further corroboration can be obtained from Source 5.11).

Education and public engagement

The 'household ecological footprints' research by **Caird** and **Roy** has led to online interactive educational eco-tools, one of which accompanied the popular BBC/OU *Coast* TV series, and was completed by 9000 people. A second eco-lifestyle quiz for schools on the soils education website (http://www.soil-net.com/) was funded by DEFRA. Wider engagement from our Sustainable Design research programme is achieved through OpenLearn and iTunes U podcasts.

5. Sources to corroborate the impact

5.1 Element Energy *The Growth Potential for Microgeneration in England, Wales and Scotland,* (2008) Cambridge, Element Energy Ltd http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file46003.pdf, p.133

5.2 Dept of Energy & Climate Change (DECC) (2012) *Strategic Framework for Low Carbon Heat in the UK: Summary of Responses,* London: Dept. Energy & Climate Change, p.36 http://www.decc.gov.uk/en/content/cms/meeting_energy/heat_strategy/heat_strategy.aspx

5.3 Ekins, P and Potter, S (2010) *Reducing Carbon Emissions through Transport Taxation*. Green Fiscal Commission, London briefing paper 6, March 2010. Director at the Energy Institute UCL is a named source for corroboration.

5.4 Gummer J, Goldsmith Z (2007) *Blueprint for a Green Economy*, page 345 cites Reference 3.6. Online at http://www.conservatives.com/pdf/blueprintforagreeneconomy.pdf

5.5 *The Green Book: New directions for liberals in government* (2013) published by Biteback Publishing Ltd. Online at http://www.green-book.org.uk/index.php/buy-the-green-book.

5.6 *The Essential Guide to Travel Planning*, Department for Transport 2008 http://ways2work.bitc.org.uk/pool/resources/essential-guide-to-travel-planning-final-mar-08.pdf and Potter S (2008) National Business Travel Network (NBTN), advisory note 1- Tax and Travel Plan Measures, July 2008 http://www.tfw.org.uk/documents/NBTN_ADVISORY_TAX_NOTE_1.pdf

5.7 Energy Saving Trust publications: *The heat is on: heat pump field trials phase 2*, London: The Energy Saving Trust, p.25, online at http://www.energysavingtrust.org.uk/Organisations/Working-with-Energy-Saving-Trust/The-Foundation/Our-pioneering-research/The-heat-is-on-heat-pump-field-trials. Also Energy Saving Trust (2010) *Getting warmer. a field trial of heat pumps*, The Energy Saving Trust, London (http://oro.open.ac.uk/31647/) p.3 The Senior Technical Manager at the Energy Savings Trust is a named source for corroboration.

5.8 Microgeneration Installation Standard: MIS 3003 Requirements *for contractors undertaking the supply, design, installation, set to work commissioning and handover of micro and small wind turbine systems*. Issue: 3.1a Feb 2012 http://www.greenbooklive.com/filelibrary/Microgeneration/MIS_3003_-_Micro_Wind.pdf

5.9 Assistant Director of Hampshire County Council (retired), LRL Consultancy Ltd.

5.10 Coordinator, Community Composting Network.

5.11 Director of Strategy, Milton Keynes Council.