Institution: University of Brighton	
Unit of Assessment: D34 Art and Design: History, Practice and Theory	
Title of case study: Designing Sustainable Urban Living	ICS [7]

1. Summary of the impact

Research focusing on sustainable urban living explores design innovation at the intersection of technology and policy. Its impact has been through the co-design and co-development of integrated systems for securing a sustainable future in collaboration with user groups and communities. The research has reduced energy consumption and increased well-being through innovations in 'whole system' retrofitting combined with user participation in the UK and France. It has also led to the development of 'living laboratories' and exemplar projects for both the construction industry and building users, demonstrating ways of 'locking-in' and reusing waste material in building construction. Influential in the development of planning policies for urban agriculture in London and Berlin, the research has also been instrumental in empowering and mobilizing communities in cities worldwide.

2. Underpinning research

Research into sustainable urban living includes work over the past fifteen years by three interconnecting research programmes:

MCEVOY and SOUTHALL in passive ventilation systems; VILJOEN and BOHN in urban agriculture, and; BAKER-BROWN in the re-use of waste materials for building construction. Collectively, the research has generated new design thinking and innovations that advance the integration of human, technological and legislative solutions for making urban environments and lifestyles more sustainable.

MCEVOY and SOUTHALL's research has embraced the complex technical challenge of adapting existing social housing stock across Europe whilst enhancing the health and well-being of residents. Their research has developed 'supply air' windows combined with 'passive stacks' that result in a holistic ventilation system, incorporating heat reclamation without the use of electricity. The research has shown that environmentally friendly methods for 'whole-house ventilation' can be based on energy saving construction involving air-tightness while maintaining indoor air quality [references 3.3 and 3.4]. Funded by the DTI, EU and EPSRC, their research has advanced and generated new knowledge through a series of high-profile practice-based projects. MCEVOY founded the spin-off company 'Dwell Vent' in 2005, which tested and refined the design innovations in ventilation with partners in Denmark, Ireland and Poland through a €278k EU Intelligent Energy Europe Programme grant: Advanced Ventilation Approaches to Social Housing (AVASH), 2007–2008. In 2009, The Dwell Vent system was awarded the Built Environment Prize from the Institution of Engineering and Technology (IET). The high profile of the system led to the formation of links with new partners and, in 2011, the development of a €3.1m EU Interreg IVA project: Innovation for Renewal (IFORE) [3.4]. Led by MCEVOY, this project, which has had additional private investment from two housing associations, put forward a new approach to eco-retrofitting through the adaptation of MCEVOY's integrated ventilation system to 200 social housing units in the UK and France.

BAKER-BROWN's complementary research explores how to improve the existing housing stock and uses living laboratories and exemplar projects to demonstrate how new builds can be constructed at lower cost and more sustainably. BAKER-BROWN has used construction prototypes to develop partnerships, undertake research and create new audiences. The building featured in Channel 4's *'The House That Kevin Built'* was a low-budget straw-bale building and the first A+ environmentally-rated new building; this approach to prototyping was advanced at the University of Brighton with 'The Brighton Waste House'. This project demonstrates that it is possible to design and construct a contemporary, low-energy, domestic building using over 85% waste material and to 'lock-in' to the construction toxic, oil-based waste (predominantly plastic), thus creating value from waste and surplus materials [3.5]. The use of exemplar projects has allowed 'cradle to cradle' design principles to be developed, stimulated productive and

constructive dialogue with construction industry professionals and engaged their apprentices in new methods and models of construction.

VILJOEN and BOHN's research extends our work on housing to look at sustainable urban design in public spaces. Conducted worldwide (in Europe, Cuba, and the USA) over a period of ten years, the highly regarded research has looked at how agriculture can be integrated into the urban fabric to increase the health and economic well-being of people who live in cities. Using a grounded theory approach, they have shown that to increase biodiversity and decrease carbon emissions, policy-makers and communities need to be strategically committed to interconnecting green spaces [3.2]. The way to do this, VILJOEN and BOHN found, is by combining productive with continuous urban landscapes, as detailed in the influential book *Continuous Productive Urban Landscapes: Designing Urban Agriculture for Sustainable Cities* [3.1]

Key researchers:

Duncan Baker-Brown:	Senior Lecturer (Oct 1995–to date).
Katrin Bohn:	Senior Lecturer (Sept 2001–to date).
Mike McEvoy:	Professor of Architecture (Feb 2007–to date).
Ryan Southall:	Research Fellow (Sept 2005–July 2006), Senior Research Fellow (Aug 2006–Aug 2012), Senior Lecturer (Sept 2012–to date).
Andre Viljoen:	Senior Lecturer (Aug 2001–Aug 2009), Principal Lecturer (Sept 2009–to date).

3. References to the research

[3.1] VILJOEN, A. and BOHN, K. eds. (2005) *CPULs continuous productive urban landscapes: designing urban agriculture for sustainable cities*. Oxford: The Architectural Press. [Quality validation: this book was nominated as the Royal Institute of British Architects (RIBA) book of the week and has been cited as suggested reading by the Royal Commission on Environmental Pollution. In 2007 it was shortlisted for the RIBA President's Award for outstanding university research. This book was also submitted to RAE 2008 – Output quality profile for RAE 2008: 81% 2* and above.]

[3.2] VILJOEN, A. and WISKERKE, S.C. eds. (2012) *Sustainable food planning: evolving theory and practice*. Wageningen: Wageningen Academic Publishers. [Quality validation: the papers in this edited collection were peer reviewed by an international panel for the conference and then peer reviewed once more during editorial selection. The book has also been submitted to REF 2014, see VILJOEN, output 3.]

[3.3] MCEVOY, M.E. and DYE, A.R (2008) *Environmental construction handbook*. London: RIBA Publications. [Quality validation: this output resulted from the EPSRC-funded project ECONSTRUCT, an interactive CD-ROM illustrating the sustainability debate in relation to buildings (GR/R79852/01). The EPSRC's evaluation of the final report was 'Tending to outstanding'. The book has also been submitted to REF 2014, see output 1.]

[3.4] MCEVOY, M.E. and SOUTHALL, R.G. (2010) A programme of testing to evaluate a passive approach to whole-house ventilation. *Construction Innovation*, 10 (4), pp.395–407. [Quality validation: this peer-reviewed journal paper was the culmination of previous work stemming from 2005. The resulting EU Interreg IVA project, Innovation for Renewal (IFORE), was given funding of €3.1 million. The article has also been submitted to REF 2014, see SOUTHALL output 2.]

[3.5] BAKER-BROWN, D. (2013) The Waste House. [Quality validation: submitted to REF 2014, output 1. This project began life as Channel 4's *The House That Kevin Built* (2008), which featured the building of the first A+ environmentally rated building.]

4. Details of the impact

The underpinning research has resulted in international impact in the ecological, economic, social and political aspects of advancing sustainability in urban environments within the UK, Europe, North and South America, and South Africa. It has:

Reduced energy consumption: MCEVOY and SOUTHALL's work has enhanced domestic eco-retrofitting and reduced carbon footprints. Under MCEVOY's leadership, the EU IFORE Interreg

IVA project has resulted, as of July 2013, in the retrofit of 100 social housing units in deprived areas of Isle of Sheppey (by the end of the project an additional 100 units in Nord-Pas de Calais, France will have also been retrofitted). Two large-scale social housing organisations, Amicus Horizon and Pas-de-Calais habitat, have invested in excess of €4 million, a substantial amount for private organisations, on new ventilation technologies and resident-oriented education and advice solutions (source 5.1). Although data for this winter (2013) remains to be collected to confirm the annual energy savings, it is expected that the project will reduce carbon emissions by 4,693kg CO_2/yr per unit, generate energy savings for residents at £512/yr, and eliminate condensation, damp and mildew. Residents have already noticed a drop in their energy bills (5.2). Amicus Horizon confirmed that the retrofit in Rushenden 'is the exemplar for our forthcoming rollout of retrofit throughout our other communities' (5.3). The project has also benefitted residents in deprived urban communities through the establishment of community liaison roles that advise residents on ways to save energy. The Green Doctor has, according to the housing association, strengthened relations with tenants, with one participant saying that the project had 'made me aware of the technical improvements that had been made in my house so that I could use them properly and efficiently' (5.3).

Developed cutting-edge ideas about re-using waste material: The work of BAKER-BROWN has changed attitudes to thinking about waste both regionally and nationally. *The House that Kevin Built* was featured on Channel 4 to an average audience of 1.78 million per episode (5.4) and showed how straw can be used to construct a sustainable and efficient building. The Brighton Waste House, constructed with 'waste' material on the university's estate as an early-stage prototype, has been a unique demonstrator vehicle for engaging learners through hands-on activities linked to cutting-edge sustainable construction techniques. The project has allowed educational activities to be developed for over 30 local schools and further education learners that champion sustainable building design. On-site construction activities have played a central role in the training of 60 apprentices for the Mears Construction Company and Brighton City College, with the innovative nature of the learning through direct interaction contributing to Mears being awarded Regional Employer of the Year 2012 by the National Apprentice Service (5.5).

'The Brighton Waste House' has been adopted as a 'living laboratory' by Brighton and Hove City Council, which has changed planning practices and policy in the city to encourage eco-retrofitting, promote sustainable design, and reduce waste during construction phases (5.6). Eco-retrofitting research projects by BAKER-BROWN are described by the Head of Planning as exemplars that show developers 'it can be done', and have contributed to the Council's award-winning Sustainable Design and Waste Minimisation Planning Strategy (5.7).

Influenced strategic planning around urban architecture: VILJOEN and BOHN's research has changed urban policy in Middlesbrough, London and Berlin as well as in South Africa and South America. Redesigning urban space to incorporate food growing has impacted on how major cities promote sustainability through the management of greenspace. In 2008, the Greater London Assembly (GLA) developed the policy paper *Why London needs to grow more food* with one GLA member stating that VILJOEN and BOHN's research had been 'significant in helping to frame the growing interest in policy related to urban food systems and the future shape of London' (5.8). In 2012, the Berlin Senate and the Department for Urban Development and the Environment incorporated the CPUL concept within the Landscape Plan (Strategie Stadtlandschaft – natürlich urban produktiv) for Berlin as one of its three visionary themes for the development of open space in the German capital (5.9) The CPUL concept has also been incorporated into community projects in Rosario (Argentina) and Bobo Dioulasso (Burkina Faso) (5.10). In Rosario, there are now 22ha of multifunctional productive areas of park land that are cultivated by several hundred different producers. As a direct result of VILJOEN and BOHN's participation in the Design Council's DOTT 07 project that took place in Middlesbrough in 2007, 17 new allotment sites have been developed, an annual town meal which regularly feeds over 2,500 local residents with locally grown food has been established, and over 30 schools in the area now use school-grown food in their kitchens (5.11). Having demonstrated the CPUL concept at venues including the Venice Bienniale (2012), the Graham Foundation Exit Arts, New York (2009), and the British Council in Cuba (2006), this concept and examples of its practical implementation were cited by the United Nations University Institute for Advanced Studies in a 2010 report as model examples for delivering urban sustainability (5.12).

5. Sources to corroborate the impact

5.1 Extract from the IFORE project grant that details the match funding provided by Amicus Horizon and Pas de Calais Habitat.

5.2 Amicus Horizon website containing: project details, energy saving statistics and a project film that highlights the benefits felt by residents as a direct result of the IFORE project. Available at: http://www.amicushorizon.org.uk/IFORE [Accessed: 12 November 2013].

5.3 Testimonial available from the Regional Asset Director at Amicus Horizon. The testimonial draws attention to learning through co-production and the benefit of the project to the communities involved.

5.4 Viewing figures for the five episodes of *Grand Designs Live* featuring *The House That Kevin Built.* Data provided by the Broadcasters' Audience Research Board.

5.5 Testimonial available from Mears Construction that draws attention to the importance of BAKER-BROWN's work in forging and delivering their apprenticeship scheme.

5.6 Brighton and Hove One Planet City Sustainability Case Study Spring 2013. Available at: http://www.brighton-hove.gov.uk/content/environment/sustainability-city/one-planet-city [Accessed: 12 November 2013]. Supplementary evidence includes the One Planet City Sustainability Action Plan and the invitation for BAKER-BROWN to have his work cited as a model example in the Horizon2020 Science Europe Report (invitation request July 2013, report published September 2013).

5.7 Testimonial available from Head of Planning at Brighton and Hove City Council that highlights BAKER-BROWN's contribution to council projects and the importance of his work as a model for the city. Details of awards received by the council in which BAKER-BROWN played a significant role are also included.

5.8 Testimonial available from Green Party Candidate and Member of the GLA that highlights the contribution of VILJOEN and BOHN to policymaking and papers.

5.9 Strategy document for the City of Berlin: *Strategie Stadtlandschaft Berlin: natürlich, urban, produktiv* (October, 2012). This document shows the ways in which CPULs will be embedded into Berlin's urban landscape. Available at: http://www.stadtentwicklung.berlin.de/planen/stadtforum/downloads/SF_Gruen_Dokumentation_bfrei.pdf [Accessed: 12 November 2013]. Supplementary evidence includes a series of reports that also draw on the work of VILJOEN and BOHN: Brighton and Hove's *One Planet City Sustainability Action Plan* (2012–13); an article on the use of CPULs in Almere (The Netherlands) in RUAF's *Urban Agriculture Magazine* (2011); the GLA's Report *Cultivating the capital: food growing and the planning system in London* (2010); The Building Centre's report *London yields: urban agriculture* (2009), and; an extract from the website *Cultivating Kansas City* on urban agriculture (2013). Reports available on request.

5.10 Testimonial available from the Director of the RUAF Foundation that demonstrates VILJOEN and BOHN's contribution to policy and thinking about urban agriculture and the projects worldwide that have adopted this approach.

5.11 Design Council website featuring the outcomes of DOTT 07. Available at: http://www.designcouncil.org.uk/Case-studies/Urban-Farming/The-outcomes/ [Accessed: 12 November 2013]. Supplementary evidence includes an email detailing further developments, events and actions resulting from the project from Middlesbrough Council's Urban Regeneration Department.

5.12 Policy report by the United Nations University Institute for Advanced Studies. *Cities, biodiversity and governance: perspectives and challenges of the implementation of the convention on biological diversity at the city level* (2010). Available at: http://www.ias.unu.edu/resource_centre/UNU-IAS%20Cities%20and%20Bio%20e-ver.pdf [Accessed: 12 November 2013].