Institution: University of Reading

Unit of Assessment: 16 Architecture, Built Environment and Planning

a. Context

Research in this unit is undertaken within two Schools: **Construction Management and Engineering (CME)** and **Real Estate and Planning (REP).** In **CME**, research is organised into five priority areas of industrial and policy relevance, supported by dedicated research groups: *Business Innovation in Construction (BIC); Innovative and Sustainable Technologies (IST); Digital Practices (DP); Transition Pathways to a Low-Carbon Economy (TPLCE);* and *Healthcare Infrastructure (HI).* CME also hosts the EPSRC Industrial Doctorate Centre *Technologies for Sustainable Built Environments (TSBE).* In **REP**, research is organised within four groups: *Real Estate Investment and Finance (REIF)*; *Real Estate Valuation, Leasing and Market Practice (REVLMP); Environment, Sustainability and Participation (ESP);* and *Housing (HO).*

Our users include: construction contractors, sub-contractors and specialists, materials and product manufacturers, design and management consultants, investors, developers, property managers, landlords, occupiers of land and buildings, and the professional institutions which govern their activities. Our impact includes identifying and implementing new techniques, practices and knowledge, and providing evidence and advice impacting on Government and other policy bodies.

b. Approach to impact

Both Schools have a long tradition of co-production, which brings together researchers and users of research to generate 'actionable knowledge' that meets the dual requirements of enhancing industrial and professional practice and developing the scholarly and scientific underpinnings of relevant disciplines. Three embedded practices support impact:

(i) Collaboration with user communities

We engage user communities to instigate and shape innovation in policy and practice, research agendas and opportunities for the development of actionable knowledge. **CME** examples of relationships with industry and relevant policy domains in the REF period are as follows: (i) Engagement with policy and standards development: e.g. Hughes, W., member of BSI drafting Committee for BS 8534 Construction Procurement (2008-10), PAS98 Formation of Consortia (2009-10); Cook, member of BSI Committee B559/1/2 Access for Disabled People to Buildings (1998 to date), BS9266 General Needs Housing (2012 to date); Torriti, DEFRA Economic Advisory Panel (2012 to date). (ii) Engagement with professional bodies and delivery of professional guidance: e.g. Yao, member of drafting committee CIBSE Environment Design Guide A (2011 to date); Green, chair of the CIOB Innovation and Research Panel (2011 to date); Flanagan, member of the RICS UK World Regional Board (2009 to date); Connaughton, chair of the CIRIA Executive Board (2013 to date) and Council (2010-12); Whyte, member of the ICE Information Systems Panel (2008 to date); Dixon, member of the RICS Sustainability Task Force (2011 to date). (iii) Representation on boards and expert groups: e.g. Green, Commission for a Sustainable London 2012 (2007-13); Flanagan, board member of Skanska, AB (1999-2008), Halcrow (2001-07).

REP's strong relationships with industry and relevant policy domains are focussed on: (i) Engagement with policy and standards development: e.g. Ball, Expert Committee CLG, (2007-10); Parker, co-ordination of the CLG-funded 'Supporting communities in neighbourhood planning' research programme while on 80% secondment at RTPI (2012-14); Pain, European Spatial Observation Network (2010-12). (ii) Engagement with professional bodies and delivery of professional guidance: e.g. Crosby, RICS Valuation Standards Board (2008 to date) and International Standards working group (2011-13); Devaney, Investment Property Forum (IPF) Research Committee (2012 to date); Wyatt, RICS Guidance Note working group (2010 to date); Pain, RICS Vision for Cities taskforce (2010 to date). (iii) Representation on boards and expert groups: e.g. Marcato, advising the Bank of Italy on valuation practice (2010 to date); Devaney and Crosby, respectively consultant and consultative committee member of Investment Property Databank (2001 to date); Tsolacos, Director of Co-star/Property and Portfolio Research(2006-13); D'Arcy, Chair of Research Committee of European Public Real Estate Association (2010-13); Pain, Director of Globalization and World Cities Network (2001 to date); Street, Secretary to the Royal Geographical Society-Institute of British Geographers Planning and Environment Research Group

(2012 to date); Parker, Chair of the Berkshire Community Council (2006–11); Murray, South America knowledge exchange organiser for the Academy of Urbanism (2009 - to date). REP is also supported by the Reading Real Estate Foundation (RREF), whose board is made up of both REP academics and industry leaders. RREF, a registered charity, sponsors research activity and dissemination within REP and provides funding, administrative support and research seminars.

(ii) Targeted research on core policy / industry areas

In **both Schools** each of the dedicated research groups identifies current and emerging areas of industry and policy concern in close collaboration with its policy/industrial partners. The prioritization of core areas underpins research strategies and funding priorities set out within both Schools' three-year plans. These plans drive the University's investment in new appointments and infrastructure such as the five AIP appointments set out in REF 5, four of which strengthen capability in the area of climate change and the built environment.

An example of **CME** targeted research in a core area is work on digital technologies and associated practices, with a particular focus on BIM (building information modelling). The *DP* group has formulated new best practice guidelines on data handover processes on the London Olympics 2012 and Crossrail projects. The work is impacting directly on BIM practices within Crossrail (Whyte is now a member of the Crossrail BIM Industry Panel, 2012 to date). The *HI* group impacts include improvements to BIM on two major PFI hospital projects: Barts and London. The group is collaborating with two of the UK's leading construction/design businesses in the health sector (Skanska, HOK Architects). The work has directly resulted in new practices and additional investment in BIM capability. Both Skanska and HOK now routinely incorporate an immersive virtual reality (VR) capability in their client/design proposals which was developed in partnership with UoR utilising its 3D immersive VR facility.

Research in **REP** is similarly targeted on core areas that respond to policy and industry imperatives. An example is the School's continuous body of work since 1972 into property valuation and investment across both the *REIF* and *REVLMP* research groups. Research priorities have been developed with industrial partners and supported through industry funding from IPF, RICS and EPRA. Significant impact on portfolio investment management and valuation practice is directly linked to this work; for example, via professional guidance notes and information papers within mandatory standards, co-produced industry reports and invited industry conference papers on depreciation, commercial lease policy and pricing, liquidity, fund allocation, and REITs.

(iii) Knowledge exchange and capacity building

A holistic approach to impact is deeply melded into established 'pathways to impact' practices. **Both Schools** have developed knowledge exchange (KE) and capacity building mechanisms to enhance the overall impact of our activity on policy and practice. Dissemination of research encompasses traditional vehicles (e.g. industry reports) as well as use of social media, such as dedicated School Facebook and Twitter. Examples of KE and capacity building include:

Collaborative research projects. **Both Schools** support the on-going development of long-term relationships with policy and industrial partners through projects funded from a variety of sources. The goals and activity of the projects are developed by all the partners. The 'actionable knowledge' generated provides the industrial partners with cutting edge knowledge and practice to solve problems, whilst further developing research capability in core areas. In **CME**, for example, the EPSRC-funded Innovative Construction Research Centre's research priorities, programme of work and pathways to impact were set up, monitored and evaluated by a Steering Committee made up of senior industrialists and academics. Similarly, in **REP**, the body of research funded by the IPF is a prime example of collaboration. Membership of the IPF Research Steering Committee ensures engagement with the research agenda. REP undertakes funded research into topics from that agenda with industry-based steering groups, leading to IPF produced research reports.

Training of the next generation of researchers and industry practitioners. **Both Schools** have established PhD programmes that promote and support high-calibre graduates. The TSBE provides a direct route for the development of highly skilled people into business. There are currently some 34 engineers in the Centre who work within sponsoring organisations for 75% of their time. The **CME** Knowledge Transfer Partnership (KTP) projects (for example, British Institute of Facilities Management/Elmualim; Skanska Technology Ltd/Harty) and EPSRC CASE

studentships (for example, Atkins China, BRE, Halcrow) provide other valuable KE and capacity building routes. Currently, industry-funded PGRs in **REP** are actively developing existing expertise in core areas (e.g. indirect real estate pricing) and supporting and building capacity in identified under-researched areas of industry and professional practice (e.g. corporate real estate).

c. Strategy and plans

For **both Schools**, the strategy for the next five years is to enhance our impact on current and emerging policy and practice priorities through our established processes that support targeted research. The strategy will be achieved through the following activity. First, research proposals will continue to have robust 'pathways to impact' plans. These plans will be supported by established procedures for monitoring and assessing impact covering the adoption and take up of research findings, by both direct beneficiaries and the wider community. This will complement and strengthen more traditional (output-based) measures. Second, both Schools will continue to expand their international engagement with both industry and academe. In addition to working with international policy bodies and multinational construction and property firms (see previous section), both Schools will increase collaboration with research groups to progress core areas of expertise. Current examples within **CME** are long-term links with Chongqing Uni., China (energy); VTT Technical Research Centre of Finland and Stanford Uni., USA (digital technologies and practices); Luleå University of Technology, Sweden (procurement); Copenhagen Business School, Denmark (healthcare). Examples within **REP** include participation in RICS-backed projects in South America with the Universities of Sao Paulo, Belgrano, Javeriana (housing policy, property valuation (with Ulster), and the development process); continuing work in Europe, Pacific-Asia and China within the GaWC network (World Cities and urban development); work in the US, South Korea and Europe with the Universities of Florida, Cincinnati, Portland, Zurich, South Korea (fund flows, liquidity, smoothing); and work with the Indian Institute of Management (governance within local communities). **Both schools** are involved in the development of the University of Reading, Malaysia, a forum to engage with agenda-setting bodies in South-East Asia. Internal collaborations are already widening the academic research agenda and identifying core industry priorities. Unit staff work with colleagues across campus through the Walker Institute for Climate System Research, which has the aim of engaging directly with the users of research in the broad area of climate change and its consequences. **REP** examples include the progression of collaborative pricing and governance research agendas with the ICMA centre and the Henley Business School's Governance, Accountability and Responsible Investment Research Centre (GARI).

A key priority for the next five years for **both Schools** will be to continue to build impact in the field of sustainability. Critical mass for this endeavour has been created by the establishment in 2012 of a cross-University research initiative on *Sustainability in the Built Environment*. This will be developed further to realise new 'pathways to impact' underpinned by interdisciplinary research across school and faculty boundaries, including CME and REP.

d. Relationship to case studies

Case studies illustrate the breadth and depth of our research: CS1 Commercial leases policy and practice; CS2 Making the built environment and public transport more user-friendly for visually-impaired people; CS3 Research informs new British Standard for construction procurement, benefitting industry and clients; and CS4 Understanding and integrating communities through neighbourhood planning processes. Our key pathways to impact have been central to the development and delivery of these case studies. The cases exemplify our involvement of users/practitioners in setting the agendas and the operation of the research. CS1 and 3 show strong engagement with more discrete sections of the user community. CS2, 3 and 4 engage with a wider set of community stakeholders, working in collaboration with representatives of the visually impaired community, small business tenants and the various stakeholders in local planning. All case studies are clearly targeted on topical and significant industrial and policy challenges, especially CS3 on improving value for money in construction (including public) procurement; CS1 leading Government policy on commercial lease reform and driving industry change; and CS4 influencing the development of neighbourhood planning policy and practice. Cases emphasise the importance of knowledge exchange and capacity building. For example, CS2 and 3 have led directly to the production of new British Standards now in widespread usage; CS1 has informed Government sponsored codes of practice and developed industry guidance notes.