Institution:	University of Northumbria at Newcastle
Unit of Assessment:	16 - Architecture, Built Environment and Planning

a. Overview: The Unit includes 19 staff submitted from the disciplines of Architecture, Building Services, Construction, Property and Surveying. Our research is concentrated in four areas: *Building Information Management* (BIM), *Sustainable Energy Systems, Urban Regeneration and Architectural Design* and *Virtual Reality and Visualisation*. Since RAE 2008 we have increased the number of Category A staff returned by 48%, and our PGR population by 200%. The Unit's research is strongly engaged with external partners, and through such initiatives as *Virtual NewcastleGateshead* (VNG) partnership and the associated *VNG City Model*, and the formation of *BIM Academy* and its 'spin out' company *BIM Academy Enterprises Ltd,* has high impact on industry and professional practice.

b. Research strategy

RAE 2008 and subsequent changes: Our strategy for the period 2008-2013 has been to encourage high-quality research across the range of our disciplines, but specifically to develop and invest in four main research areas consolidating existing and emerging activity. In RAE 2008 four research themes were presented. The *Sustainable Development* area has since been incorporated into the current *Sustainable Energy Systems Group;* the theme of *Regeneration and Conservation* has combined with our architectural design research to form the *Urban Regeneration and Architectural Design Group;* and researchers in the *Construction Management* theme have engaged with new staff interests in digital engineering to form the *Building Information Management Group. Virtual Reality*, identified in 2008 as emerging, has benefited from internal and external investment and matured into the *Virtual Reality and Visualisation Group* with its flagship *VNG* project. The work of these groups is presented below, alongside other research within the Unit.

Evaluation of research strategy since RAE 2008: The University's *Strategic Investment Fund* (SIF) has resulted in investment of around £18 million across the University. It has been used to target new appointments, management and administrative support for research and infrastructure. Within the Unit this has funded the appointment of seven senior researchers (including five Professors). Since 2008 our objectives have been to:

1. focus on distinctive areas that target national and international priorities;
2. build research capacity through both recruitment and developing existing potential;
3. provide support through funding, equipment and infrastructure;
4. promote interdisciplinary collaboration that supports and involves industry and practice;
5. foster a research-led culture in the entire academic environment.

The ***Sustainable Energy Systems Group*** is led by Professors Agnew and Underwood. Other staff include Walker and Ng (since 2009, ECR) and there are seven associated PhD students. Research interest is focused in low carbon and renewable energy for heating, air conditioning, power and lighting in buildings. This includes ground-source heat pump (GSHP) design (Underwood), energy policy and micro-generation (Walker), thermal systems and subway climatology (Agnew) and heat transfer in buildings and thermal analysis (Ng). The group has received the substantial share of £1.14 million institutional capital spend on equipment across the Unit, which has supported the acquisition of three facilities: a combined renewables *Low-carbon Systems Lab* for experimentation; a mobile (*GeoLab*) GSHP laboratory and heat pump test facility; and a hybrid solar/biomass organic *Rankine-cycle clean power plant* (under construction). Funding has also been secured from industry, EU and RCUK grants (see *Section d*).

The ***Urban Regeneration and Architectural Design Group*** comprises Professors Giddings, Pickard and Jones (promoted, 2012), Greenhalgh (promoted to Reader, 2012), Hope (joined 2009, ECR), and Pugalis (joined 2011). The group has 14 associated PhD students and conducts research into architecture, urbanism, regeneration and the integration of the social, economic, physical, cultural and environmental fabric of places. It specialises in design quality and methodology, policy development and evaluation. It engages with place-based communities, social

enterprises and the voluntary sector, business bodies and public sector organisations. It has led successful Knowledge Transfer Partnerships related to urban and architectural design (Giddings) and significantly influenced EU approaches to heritage preservation in the Balkan states (Pickard).

The ***Building Information Management (BIM) Group*** formed by Professors Greenwood and Lockley (joined 2009) and including Perera (joined 2009), currently includes six other academic staff, two technical support staff, 17 related PhD students and occupies approx. 30 m^2 of dedicated operating space, equipped with £250,000 of associated software and hardware. In 2010, the Group launched ***BIM Academy*** in a joint venture with Ryder Architecture. BIM Academy has had successes in international competitions, winning awards at the world's premier collaborative BIM events (*Build London Live, 2012: Best Multidisciplinary BIM and use of Interoperability* and overall winner at *Build Qatar Live* and *Build Sydney Live,* both in 2013) and receiving a *Constructing Excellence Special Innovation Award* (2013). Funding has been secured from the Technology Strategy Board (three grants totalling £1.85 million) and includes a £120,000 contract with National Building Specification for production of the National BIM Library. Current research is in *data interchange and interoperability* (Lockley), *integrated project delivery* (Greenwood), and *e-business* (Perera). In 2013, a spin-out company, BIM Academy (Enterprises) Ltd, was formed to convert the group's research capabilities into increasing consultancy income.

The ***Virtual Reality and Visualisation Group*** is led by Professors Dalton (joined 2010) and Greenwood and has two technical support staff, a research associate and six current PhD students. The Group occupies the 65m^2 Virtual Reality Suite, containing equipment and software that represents a capital investment during the 2008-13 period of around £500,000. The team's virtual modelling capabilities and its *Virtual NewcastleGateshead* (VNG) model support many aspects of built environment research including: simulating a virtual e-mobility route linking North Sea Region countries (Dalton) - part of the €6.6 million North Sea Region E-Mobility project; an AHRC-funded virtual reconstruction of Medieval Newcastle (Greenwood); support for Agnew's subway climatology research; and agent-based modelling and human reaction to environments (Dalton). The latter area has attracted an institutional investment of £100,000 in test equipment and 53m^2 of experimental laboratory space.

Research investment has not been limited to these four groups. Recent recruits Corradi, Osofero and Vo (all joined 2013) will join Richardson (promoted to Reader, 2013) and Maheri in ***construction technology research*** targeted for future development (see below).

Results of research strategy since RAE 2008: The expansion financed by institutional investment, particularly since 2011, has seen the number of Professors in the Unit increase from 4 to 10, and a 48% increase in Category A staff returned to REF 2014. We have increased external support for research and the PGR population by over 300% (from 12.6 to 40 FTE). Links with industry and academic institutions worldwide have enhanced the international visibility of our research. We have hosted and organised four international conferences – the *Informed Cities Forum* (2010), *Dealing with Disasters* (2010, 2013) and *Building Information Management* (2012), with a fifth (*eCAADe (Computer Aided Architectural Design))* forthcoming in 2014. Among our 12 Visiting Professors is the current holder of the Mott MacDonald Chair in Building Energy (Hudson) and we were the beneficiaries of a Royal Academy of Engineering Distinguished Visiting Fellowship Award (Professor Anumba of Penn State University, USA, May 2012).

***Research objectives and priorities for next five years*:** Our main priorities are to increase research income to a level commensurate with the progress made in research activity over the current period, and to ensure the recent increase in PGR population results in an excellent completion rate. Forward strategy is to develop our four current areas whilst recognising new areas of potential. In general, the main driver for success will be our increasing staff capacity, backed by excellent facilities, administrative and technical support.

Objectives for existing research groups: The first objective of our forward strategy is to sustain and develop the outputs, income and PGR base of our four main research groups. The work of the ***BIM Group*** will be increasingly important with the increased uptake of BIM by the construction industry in the UK and around the world. Our main targets are: to increase applications for funding of research; to grow the research-active membership of the group; and thereby to increase published outputs by 50% over the period. The work of our ***Sustainable Energy Systems*** group

will extend to research into sustainable solutions to climate change and energy deficits. The main targets for this group are to increase funding applications with the expectation of increased research income, and to increase PGR population to 10 students by 2018. For the ***Urban Regeneration and Architectural Design Group*** the incorporation of all aspects of sustainability into building design will remain a priority area. Issues of economic growth and sustainable regeneration will inform research development. Over the period we will: target a rise in funding applications to increase research income; submit two international design competition entries; and increase the PGR population to 10 students by 2018. For our ***Virtual Reality and Visualisation Group*** the main target will be to increase collaborations with other institutions and organisations in large-scale national and international funding applications. The group will also be a springboard for three of our identified potential areas for development (see below) as well as supporting projects where simulation or analysis can be reinforced by visualisation within an accurate urban model.

Objectives for areas of future potential*:** Four further research areas – some at the interface between the work of existing research groups - merit attention for their potential: i) Our expertise in BIM technology and virtual city modelling will trigger exciting opportunities as ***digitally-enabled smart cities become an increasingly important issue worldwide, and we plan at least one large-scale (£1 million plus) joint application within the next two years; ii) Our ***subway climatology*** research has already, in a recent project based on the Newcastle Metro system, combined air-movement modelling with visualisation capabilities to simulate and visualise pedestrian movement and air flow in emergency scenarios. This holds great potential for fire and rescue services worldwide as well as for designers, facilities and security managers; iii) The concept of '***usability of spatial environments'*** combines agent-based modelling (Dalton) with the Unit's VR capabilities to address relationships between spatial layouts and people's understanding of them. A recent £100,000 equipment and 53m^2 laboratory space investment will enable eye tracking, mobility and electro-physiological measurement in tandem with state-of-the-art visualisation techniques. Targets for both ii) and iii) include investment in a team of four PGR/postdocs and submission of at least one funding application per annum. iv) New staff (Corradi, Osofero and Vo) active in ***construction technology*** research will add to existing capabilities, such as Maheri's work in the design of engineering structures and Richardson's development of innovative admixtures for concrete for which, during his current sabbatical, patents are under development and discussions in process with European body RILEM (*Reunion Internationale des Laboratoires et Experts des Materiaux de Construction*).

c. People

Staffing strategy and staff development:

The major aims of our ***staffing policy*** have been to cultivate research culture and reward research excellence. This aligns to institutional strategy - to be a research-rich, business-focused, professional university producing world-leading and internationally-excellent research - which is reflected in the institutional support mechanisms for staff. All academic staff recruited since 2010 are research active, and research is given priority in work-planning, where it is expected to account for around 40% of academics' time. Priority has also been given to developing physical resource and financial structures that underpin this staff investment (see Section d). The appointment of Visiting Professors (Hudson, Klein, Millican, Nisbet, Woolliscroft) with strong connections to industry and practice has contributed to the vitality of the environment and potential for impact. Our internal funding is designed to stimulate research growth. *Research Contingency* and *Staff Development* funds are accessible by all staff and an additional rapid start-up fund is available to give immediate support to newly appointed staff. All staff have an annual appraisal and complete a self-reflective 'Personal Research and Innovation Plan' to set research objectives and record achievements. These are reviewed *in aggregate* (at departmental and group levels) and *individually* (at appraisals) to inform allocation of workloads, capital and PGR-support. The *University Awards and Titles* process has an annual round of promotions based on independent assessment and track record in which research is prominent. Beneficiaries have been Jones (Professor, 2012), Greenhalgh and Richardson (to Reader, 2012 and 2013). Staff are funded to attend national/international conferences and workshops to maintain their research profile and extend their networks. Their membership of external organisations, and participation in national and international policy-making bodies and research networks, ensures awareness of, and

contribution to, national and international research priorities.

Our main ***recruitment objective*** has been to strengthen the staff base with high-quality appointments from the best candidates internationally. Recent examples include Corradi (Italy), Osofero (Hong Kong) and Vo (Vietnam). A key enabler of this, particularly in terms of our priority research areas, has been the University's £18 million Strategic Investment Fund (see Section b, above). However, distinction or potential in research is a priority criterion for all new academic appointments and to emphasise this the Associate Dean (Research and Innovation) now oversees the process for all faculty academic recruitment. New staff are given access to flexible (typically £2,000) research funds immediately on appointment. Early Career Researcher (ECR) staff are assigned an experienced mentor and are prioritised in the annual research capital scheme.

The ***effectiveness*** of these measures has enabled us to increase the number of Category A staff submitted for assessment by 48% since 2008, with an associated growth in PGR population and research grant awards. We have been able to develop and build four leading research groups and access to institutional funding has secured key appointments in each. Furthermore, as noted in **Section b**, a number of research themes of future potential are developing within the Unit. The ***demographic profile*** of this submission is well-balanced: 32% of returned staff are under 40, and three of the staff returned are ECRs.

In terms of ***internal communication and dissemination*** there is an accessible research support blog containing research news, policy analysis, training events and funding opportunities to provide support and guidance around the University's research support processes and the research funding environment. Staff from the Unit engage with the University's annual two-day *Research Conference* and with regular cross-University topic-related *Research Fora* that aim to promote cross-disciplinary collaboration. Beneficial results have included the stimulation of joint funding applications (e.g. with Psychology, General Engineering, Geography and Information Systems) for PGR studentships, HEIF (through the University), and RCUK and EU funding.

There is a commitment to ***developing research careers.*** Since 2008 the University has developed and implemented an action plan in line with the Vitae Concordat to Support the Career Development of Researchers. There is a support scheme for new academic staff that includes a year-long *Researcher Development Programme* with workshops mapped to *Vitae's Researcher Development Framework* and training and support particularly targeted towards ECRs. This includes a University-wide *ECR Forum*, designed to allow ECRs to form links, discuss research challenges and opportunities and share experiences. All new staff undertake a *Research and Innovation module* that represents one-third of the credits of a Postgraduate Certificate in Higher Education Practice. The University was awarded the *European Commission HR Excellence in Research Award* in 2013. Research ***sabbaticals and secondments*** are an important commitment to a strong, healthy and sustainable research environment. To support this, a scheme exists for sabbaticals under three categories: (i) *experienced researcher* (for grant applications and authoring of outputs); (ii) *research development* (for authoring); and (iii) *enterprise* (generating impact from research). In implementing this scheme, we normally expect around 5% of staff to be on research sabbatical leave at any one time. Greenhalgh (2011), Richardson (2012) and Pugalis (2013) are recent beneficiaries of sabbaticals, and Ng has had support for industrial secondment to Thermacore Europe Ltd (2013). The University is committed to promoting and supporting ***equality of opportunity*** and diversity within research. For example, research staff are included within the Equal Pay Audit and are included in the University's work-life balance policies. All staff are required to attend Equality and Diversity training as part of core training requirements. Attendance at an appropriate training session is also required for those taking part in selection panels and carrying out appraisals, and for staff with a line management role.

Considerable emphasis is placed on the need to maintain high standards in ***research governance and good practice***, as per the tenets of the UK Research Integrity Office's Code of Practice for Research. The University's Research Ethics Committee, reporting to the University's Research and Innovation Committee, is responsible for overseeing research governance across the institution and developing cross-University policy. It has instituted an *Online Research Ethics Approval System* which was launched in 2011-12, and is responsible for the *Research Ethics and Governance Handbook* and for the periodic Research Ethics Audit carried out in all Faculties.

Research students: PGR expansion in the 2008-13 period has been marked, with an increase in the Unit's PGR student population to over 30 FTE, while at the same time retaining programme quality (in the Higher Education Academy's *Postgraduate Research Experience Survey*, Northumbria has been highly rated for *Quality of PGR Experience*, with an upward trend over recent surveys). The University's Graduate School, established in 2008, provides dedicated central PGR support, particularly in recruitment, progression and examination. A range of doctoral studentship and scholarship schemes is offered, including funding specifically designed to attract collaboration with industry and practice. Research students have at least two academic supervisors, appropriate technical and laboratory support and 72m^2 office space with individual desk and IT facilities. More open space is provided in a 230m^2 open plan Postgraduate Research Hub with an additional 86m^2 of IT lab and, since 2011, a 170m^2 Research Zone in the University Library. In addition to their acquisition of specialist skills, students are provided with structured general training programmes designed to provide the elements needed to complete their programmes effectively and to prepare them for subsequent careers. Students present their work publicly at least four times during their study: at regular weekly seminars and at departmental, faculty and university-level research forums. They are formally assessed every 12 months as a precondition to progression, which also includes formal confirmation of their completion of skills training in a *Personal Development Portfolio*.

d. Income, infrastructure and facilities

The University's overall research strategy, organisation and management are headed by its Pro-Vice Chancellor (Research and Innovation) who chairs the Research and Innovation Committee, Research Ethics Committee and Research Advisory Group (comprising Faculty Associate Deans for Research). Institutional structures are mirrored in Faculties and Departments, which have their own research committees. Administrative support is provided by a central Research and Business Services (RBS) department that, among other things, manages university funding allocations (e.g. HEIF) and the institutional Research Development Fund, and the Graduate School. Development of research funding applications and other research activities are supported RBS, which has expanded in line with the University's increased emphasis on research.

RBS offers pre- and post-grant support in the areas of funding sources, proposal development, bid authorisation, monitoring and reporting. During the period, the Unit overall has benefited from £1.14 million institutional capital spend on new laboratory equipment, £683,000 additional capital from the Research Capital Investment Fund (RCIF) and £581,000 IT equipment/software expenditure. This has enabled the enhancement of our research infrastructure, as shown by the following: i) Researchers in the Unit have access to 765m^2 of design studio space, over 400m^2 of laboratory space, 450m^2 of workshop and technician accommodation and 2,305m^2 of IT laboratory; ii) Recent acquisitions have been made in support of the four areas of specific research focus (detailed below) but have also included a construction materials testing chamber, a timber defects analyser, a wireless occupancy sensor system, wireless energy monitoring system, in-situ u-value sensors and upgrade to existing thermal imaging equipment.

The upsurge in research capacity induced by the University's SIF investment has yet to be fully reflected in total research income (£1.2 million for the period with a further £500,000 income from consultancy and professional services) but has already materialised in a significant increase in the volume and value of applications for research funding, particularly since 2011. The targets and nature of funding reflect the ambitions of individual researchers and the strategic targeting of key areas, as follows:

The ***Building Information Management Group*** (Greenwood and Lockley) has targeted industry-linked research and enjoyed success in funding applications to the Technology Strategy Board (three grants in the period to date, totalling £1.85 million with partners including AEC3, Autodesk, BSRIA, Faithful and Gould, Kingspan, RIBA Enterprises, Vinci, 4Projects) and external enterprise earnings (e.g. a £120,000 contract for the NBS National BIM Library). The group currently occupies 63m^2 of dedicated operating space with an approximate value of £250,000 in associated software and hardware. We plan to locate its spin-out company, BIM Academy (Enterprises) Ltd, in new fully-serviced Grade-A office accommodation (with 15 workstations and around 100m^2) within the Northern Design Centre, a hub in which the University locates research based creative and digital

businesses. Funding in the ***Sustainable Energy Systems Group*** has come from institutional sources, industry (e.g. Gentoo Green), EU grants (EU 228882, ID: 35-2-6-11) and RCUK (EP/GO61467/1, EP/F038135/1), the last being the result of £4.7 million in grant applications to UK research councils by group members Agnew, Ng, Underwood and Walker. In addition to its engineering research laboratories (see above) the Group has acquired three facilities: (1) a unique £300,000 'live' *Low-carbon Systems Lab* for experimentation (as well as contributing to campus power and heat) with a 400M vertical borehole supplying five ground-source heat pump (GSHP) test rigs; evacuated tube and flat-plate solar collectors; a 300L phase-change thermal energy store and a micro CHP module. (2) *GeoLab North,* comprising 2x120M standing column wells with closed loop test heat exchanger and mobile thermal response test rig (c. £225,000) is a GSHP test lab that is hired commercially. (3) a hybrid solar/biomass organic *Rankine-cycle clean power plant* (c. £275,000 funding approved) is under construction. The ***Urban Regeneration and Architectural Design Group*** has led a number of successful Knowledge Transfer Partnerships, including research into assessing design quality for municipal clients North Tyneside (REF: 6998; 2008 – 2011, KTP Outstanding Award) and Gateshead (REF: 7705; 2009 – 2012) and an evaluation tool adopted by North Tyneside Council for specifying and assessing the environmental sustainability of building designs (REF: 6997; 2008-2011; Hope). Pickard's work in heritage preservation in the Balkan states has been funded by the European Union, and Jones' investigation into the impact of design software on creativity has earned £50,000 of in-kind support from Autodesk. Group members have also undertaken research work with UK trusts and charities (primarily Dalton and Pugalis) and local/regional government (Greenhalgh and Pugalis). There has been substantial infrastructural investment in the group, including 765m^2 of new design studio space. The ***Virtual Reality and Visualisation Group*** has submitted bids to RCUK and the Joseph Rowntree Foundation (Dalton, £530,000) and secured direct funding for developing and maintaining the *VNG City Model* from the municipalities of Newcastle and Gateshead (£100,000 in total with matched institutional funds), and there has been considerable indirect investment through staff time devoted to steering and special interest group activities. Within its 65m^2 Virtual Reality Suite, there has been additional spend of around £12,000 per annum for IT equipment and modelling software. This is supported by the purchase of two 3-D laser scanners and rapid-prototyping equipment with two associated 3-D laser model printers (together around £50,000). In 2010 the Group acquired a further (*Usability of Spatial Environments*) space that has attracted £100,000 of institutional investment in test equipment and 53m^2 of dedicated experimental laboratory space for testing physiological responses to spatial stimuli.

e. Collaboration and contribution to the discipline or research base

The Unit's extensive national and international external academic involvement is reflected in the collaborative research undertaken by its staff. Of the total outputs presented in this submission 60% have been with external co-authors and 30% have been the product of international cooperation with countries including Australia, Belgium, China (including SAR Hong Kong), Egypt, Germany, India, Iran, Italy, Japan, Kenya, Libya, the Netherlands, Nigeria, Sweden, USA and Vietnam. Our research projects over the 2008-13 period have involved many external industrial and professional organisations and we are regularly involved in international joint funding bids. Examples include involvement in EU Tempus projects (involving Dutch, French, German, Portuguese and Swedish partner universities and beneficiaries in the Middle East) and EU Projects 'PRIMUS' (Ref: 226814; €1.2 million, 2009-12; with universities and organisations from Finland, Germany and Italy) and 'E-Mobility NSR' (€6.6 million, 2011-14; with Belgian, Danish, Dutch, French, German, Norwegian and Swedish collaborators). Much of our research is interdisciplinary as evidenced by the nature of the four key groups and the future potential research areas (Section b, above). Collaboration with external business organisations is supported by Faculty-based Business Development Managers who promote TSB, Knowledge Transfer and contract research.

Membership of expert panels, directorship or chair of influential organisations:

Agnew*:* EPSRC Peer Review College; I.Mech.E. Accreditation Advisory Panel. ***Corradi****:* Accademia Raffaello, Italy; RILEM (International Union of Laboratories and Experts in construction materials systems and structures); Deputazione di Storia Patria per l'Umbria, Italy; International Masonry Society; Italian Society for Earthquake Engineering. ***Dalton:*** Portuguese Fundação para a Ciência e a Tecnologia; Swiss National Science Foundation; Israel Science Foundation;

German-Israeli Foundation for Scientific Research and Development. **Giddings:** AHRC Peer Review College; Chartered Institute of Building (CIOB) Innovation and Research Panel and judge for CIOB International Awards. Board member, Ambassador and National Spokesperson on Architecture for Faculty of Architecture and Surveying. ***Greenhalgh:*** RICS Urban Regeneration Policy Panel. ***Greenwood:*** EPSRC Peer Review College; Chair of External Review Panel, ICARDA, Syria, 2011; Head, International Technical Review Group for National Sustainability Rating of Buildings, Egypt, 2008 to 2010; Director of BIM Academy Enterprises Ltd; Board Member, Construct IT; Board Member, Constructing Excellence North East. ***Lockley:*** International Expert Panel for the Singapore Building and Construction Authority's Roadmap for BIM adoption; British Standards Committee B/555 (Construction, design, modelling and data exchange); BuildingSMART International Technical Panel and BuildingSMART UK Management Board; CIOB BIM Task Force; Lead of OpenBIM Initiative. ***Maheri:*** Romanian National Research Council (invited referee, 2012). ***Perera:*** Peer Reviewer, INSPIRE Programme, British Council, Central South Asia (2008). ***Pickard:*** Co-ordinator, Council of Europe Expert Group: Legislative Support Task Force for the Integrated Conservation of Cultural Heritage. ***Richardson:*** Grant proposals referee for the Icelandic Research Fund. ***Underwood:*** Authoring Committee for AM11 Building and Environmental Modelling Guide for the Chartered Institution of Building Services Engineers. ***Walker:*** External Evaluator, European Commission for the Intelligent Energy Europe funding, Marie Curie Programme, and Framework 7.

Editorial positions with academic journals:

Agnew: Editorial Board of four international journals; Guest Editor, *Energy Analysis of Energy Systems* (2012) and *Entropy Advances in Applied Thermodynamics* (2011). ***Corradi:*** Editorial Board, *ISRN Construction Engineering* and *Ingenium*. ***Dalton:*** Editorial Board, *Journal of Architectural and Planning Research, Journal of Space Syntax*; Guest editor, Journals of *Environment and Behaviour* (2003), *Environment and Planning B* (2012) and *Behavioural Sciences* (2013). ***Giddings:*** Associate Editor, *Indoor and Built Environment Journal*. ***Greenwood:*** Editorial Board, CIOB *Construction Information Quarterly*, *Construction Annual Review*, and *Journal of Technology Management in China*. ***Perera:*** Editorial Boards: *Journal of Financial Management of Property and Construction, International Journal of Disaster Resilience in the Built Environment, ASCSA Journal of Construction, Journal of Engineering, Design and Technology*. Joint editor, Special Issue, *Innovation in Construction e-Business* (2011). ***Pugalis:*** Editorial Board, *Leadership and Policy Quarterly*; Guest Editor, *Local Economy* (2013) and Special Issue, *Journal of Urban Regeneration and Renewal* (2013). ***Richardson:*** Editorial Board, *Journal of Green Building* (USA). ***Underwood:*** Editorial Board Chair, *Journal of Building Services Engineering Research and Technology*; International Editorial Board of *Transactions of Hong Kong Institution of Engineers*.

Conference organisation, research working group involvement and invited presentations:

Dalton: Steering Committee, *8th International Space Syntax Symposium*, Santiago de Chile (3-6 Jan 2012); keynotes at five conferences; Workshop chair, ACM SIGCHI Conference on 'Human Factors in Computing Systems' in Austin, Texas (2012). ***Greenhalgh:*** invited speaker at the Association of Chief Estate Surveyors (May 2012), 'Sustaining Creative Economies' (Newcastle, June 2012) conferences and ESRC *Festival of Social Science* (Sheffield, November 2012). ***Giddings:*** Keynote Address and Session Chair at International Conference '*New Urbanity: Cities vs. Global Challenges*', Belgrade (27-29 April 2012). ***Greenwood:*** Chair, *European Informed Cities Forum* (Newcastle, 2010), *Construction Information Technology Alliance* (Dublin, 2012), *UK National BIM Conference* (September, 2012); Keynote speaker RICS (London 2012, Cambridge 2012); Chair, and *Eco Build Conference* (London, 2013); Panel of CIB TG80 (*Legal & Regulatory Aspects of BIM*) and W117 (*Performance Measurement*). ***Hope:*** (ECR) Member of the Scientific Committee *IPMA World Congress* (October 2012). ***Jones:*** Keynotes: *12th International Conference on Engineering* and *Product Design Education* (Trondheim, 2011), *SCHOSA Annual Conference* (2012); invited talk, Politecnico di Milano (2011). ***Lockley:*** Invited speaker at CIOB (Dublin 2012, Leeds 2013), and *New London Architecture* (2010) conferences and the *Singapore Government BIM Symposium* (2011 and 2013). ***Maheri:*** Invited speaker, *5th* & *6th International Conferences on High Performance Structures* and *Materials* (Tallinn, Estonia, 2010 and New Forest, UK, 2012). ***Perera:*** Joint coordinator, CIB TG83 (*e-Business in Construction*). ***Pickard:*** Invited speaker, Inauguration of UNESCO Chair on *Preventative Conservation, Maintenance* and

Monitoring of Monuments and *Sites* (Leuven, 2009); *Institute of Mediterranean Heritage/Institute for Protection of Cultural Heritage of Slovenia/European Legal Forum International Seminar* (Slovenia, 2009); Session Chair, *Institut National d'Histoire de l'Art* (Paris, 2009); Rapporteur and Keynote, European Union's *Euromed Heritage Programme 4* (Syria, 2010). ***Pugalis:*** Conference committee, *British Urban Regeneration Association Steering and Development Forum*; *Regeneration Management Research Network*; Invited speaker, *Regional Studies Association* conferences (2011 & 2012), *Regional Science Association Public Lecture* (Coventry, 2013), *Centre for Regional Economic Development Public Lecture* (Carlisle, 2013); keynote speaker, *International Urban Public Spaces: Economics and Management* conference (Katowice, 2011). ***Richardson:*** Keynote speaker and conference committee, *NUiCONE Conference* (India, 2011). ***Underwood:*** Scientific Committee member, *International Building Performance Simulation Association* (IBPSA) conference series. ***Walker:*** Editorial Committee, *eCAADe conference*; invited speaker at EI-CESI in Paris on *Sustainable development* (2011) and the *Delivering Sustainable Homes* conference (RIBA, 2009).

Senior roles in professional bodies, ***invited academic roles and titles:***

Agnew: Visiting Professor at UITM Malaysia, Wroclaw Technical University, and London Southbank University. PhD examiner in the UK, Eire, India, Nigeria, Serbia, and West Indies; Fellow of the Institute of Mechanical Engineers. ***Giddings:*** Visiting Professor, University of Belgrade (2004-date) and American University in Skopje (2013-date); Lead Examiner for the Architects Registration Board (2005-date); received an 'Outstanding' Award for KTP supervised with North Tyneside Council (2011). ***Greenwood:*** PhD examiner in the UK, Eire, France, India, Malaysia, Australia. Fellow of CIOB. ***Jones:*** Member of SCHOSA; Reviewer for Higher Education Academy. ***Lockley:*** Visiting Professor, Newcastle University (2013-date). ***Maheri:*** Visiting Academic, Meliksah University, Turkey. ***Pugalis:*** Chief Economic Development Officers' Society. Winner, Untested Ideas (USA) Outstanding Research Scholar Award (2013). ***Richardson:*** Fellow of the CIOB. ***Underwood:*** Visiting Professor, Hong Kong Polytechnic University; co-winner (with Community Energy Solutions and Newcastle University) of the DECC Advanced Heat Storage research competition (2012).