

<b>Institution: Glasgow Caledonian University</b>
<b>Unit of Assessment: 16 (Architecture, Built Environment and Planning)</b>
<p><b>a. Context</b></p> <p>UoA16 comprises three pooled research thematic areas: Construction Management and Economics (CME), Sustainable Urban Environments (SUE) and, Environmental Technology and Management (ETM). The unit is submitting the research work of <b>21.6 FTE</b> staff, an uplift of <b>76%</b> on RAE2008, (12.3 FTE) and an increase to <b>86 outputs</b>. UoA16's work has impact beyond the academic world and we endeavour to take to the market the intellectual property arising from the breadth of our work. We ensure that, wherever possible, we identify and communicate widely work that addresses societal and industrial challenges such as sustainable built environments and energy, logistics within the supply chain, operative health &amp; safety, waste and defects, security, and the ageing society.</p> <p><b>Partnerships</b> are critical to our activity and our research for a range of these partners drives changes to policies and practices e.g. DECC on Green Deal, BSi and CEN on BS 5250 and associated European standards relating to condensation, Knauf on how cavities are filled, risk data sets to Historic Scotland and, codes of practice with HSE (L144), Scottish Water on digestion, Zero Waste Scotland on waste streams, Scottish Environment Protection Agency on bio-waste.</p> <p>A specific example of our impact can be seen from the research with The HSE Construction Division and Construction Skills (CITB), on worker engagement: investigating how migrant workers could be more fully engaged. An output disseminated widely was the Critical Safety Communication (Module F5); Construction Skills GE700 (Construction Site Safety Manual); used by some <b>100,000+</b> industry practitioners including: construction managers, supervisors and professionals, now part of standard industry training cited by The HSE in their guidance documents.</p> <p><b>b. Approach to impact</b></p> <p>Post RAE2008 we reviewed how we engaged with both the academic and wider communities as to how messages about our work were conveyed. We set out to demonstrate our research in action through a wide range of outlets e.g. Knowledge Transfer Partnerships, pay-to-view journals (i.e. subscription based), open access journals, media events, seminars, social media, conferences and bespoke outlets such as CIC Start Online, CPD and KT events, and the RICH centre.</p> <p>Long-term and successful <b>relationships</b> have been established with commercial organisations such as Knauf (developing novel insulation materials and installation approaches), Bovis Lend Lease, Mace, Brookfield, Amec, SPAB, Skanska, BAM, Laing O'Rourke, CEN, CIB, Serco, Cebarco, Galfar (validating fire engineering), English Heritage (modelling building refurbishment), DECC (policy derivation), the NHS, BSi, CITB (developing health and safety guidance notes), Historic Scotland, RICS, City Building Engineering Services, Hulley+Kirkwood, Zero Waste Scotland (framing and driving policies), Health Facilities Scotland, ng Homes, Glasgow Housing Association, IES Ltd (developing novel software), Sysnet Ltd (developing novel snagging systems), Miller Ltd., Estates at the University of St. Andrews, City Building, and Foster &amp; Partners, to name but a few. And a range of academic institutions</p> <p>As a key component of the Scottish Research Partnership in Engineering (SRPE), the Glasgow Research Partnership in Engineering has supported pan-Scotland interdisciplinary research and knowledge exchange initiatives through the Energy Technology Partnership (ETP), and the Scottish Sensor Systems Centre (S3C). These allow us to tap into other sectors and build wider networks. S3C has funded joint industry-academic exploratory projects and is about to transform into the Scottish Innovation Centre. GRPE links our research with complementary activities at Strathclyde and West of Scotland universities enables thriving strategic research groups in environmental rehabilitation with the likes of SERCo and Archial. These efforts are supported at institution and school level by a PVC Business Development (BD), an Associate Dean BD, and BD managers.</p> <p>In terms of broader knowledge transfer, some of which has not been submitted within the REF, there has been a strong performance against a range of indicators e.g. our research income at <b>£2.58 Million+</b> and CPD income of £3.13 Million+ has led to <b>86</b> papers/reports/policy documents/guidance docs/others, and demonstrates robust engagement in these stringent times. Our team is prominent in national and international policy debates, reflected in media presence and major</p>

## Impact template (REF3a)

advisory roles e.g. Teedon with Local Authorities; Baker (through the Research on Indoor Climate and Health centre – RICH) and with NGO's; Cameron with the HSE; Hytiris with <http://www.bbc.co.uk/news/uk-scotland-glasgow-west-21431763> Kumar with BSAC of the Scottish Government and a BIM sub-task group; Sommerville with RICS, NHBC and ng Homes; Craig with BRANZ. Also, the launch and operation of the Construction Improvement Club (CIC) Start Online and Mainstreaming Innovation has helped put us at the forefront of industry's mind through seminars and podcasts. UoA16 staff have been encouraged and supported in engaging in a range of international conferences e.g. CIB, ARCOM, COBRA, ASCE, in order that our work reaches both national and international practitioners. Examples of the long-term relationships developed from such events are (apart from UK ones): Arizona State University; with Kashiwagi; Hong Kong with Cheng, Fellows, and Rowlinson; Maloney at Kentucky, Law at Stanford, Anumba at Penn State, Verghese at IIT Chennai, Smith at EPFL Lausanne, Tookey at Auckland, Lingard at RMIT, Smallwood at Nelson Mandela Metropolitan, Fang Dong Ping at Tsinghua University, China. Our Construction Improvement Club (CICStart Online), attracting over 2,200 members with our **FREE interactive online webinars** being watched across the United Kingdom and in 53 other countries ranging from Algeria and Australia, all the way through to Vietnam and Zimbabwe. Companies engaged included: 658 Scottish SMEs; 1,963 others across the UK, and 47 businesses from other countries; 30 webinars were hosted; 2 online conferences were held with 15 videos and 4 live conferences (DVD packs) produced. 1,850+ viewers watched live online seminars and over 950 have downloaded recordings of the seminars; + over 7,000 viewers have watched our online conference videos available on YouTube. As a corollary to the success of CIC Start, we are now the lead for the joint project (**9 universities**), entitled Mainstreaming Innovation, with the primary focus being research on integration of sustainable infrastructure into the existing built environment. <http://www.mainstreaminginnovation.org/>

### c. Strategy and plans

The strategy adopted post RAE 2008, with clear goals, has been to increase the critical mass of researchers and the quality and quantity of outputs. In addition to increasing the number of staff being submitted by 76%, with a concomitant **rise in outputs to 86** (in response to RAE 2008 Panel comments we have also increased the spread of output types: now with **24%** non-journal), we have increased our annual PhD completions from 3.85 per annum to **5.4** per annum, and securing funding of £2.58 Million through engaging with a range of stakeholders and £3.13 Million of CPD/Consultancy. Post REF2014 we intend to develop and refine our proactive strategy for impact focusing on: **1)** extending long standing core mission/values of the university towards the common good; **2)** developing skills required by researchers to conduct impactful research; **3)** bringing together teams of academics; key partners, beneficiaries and end-users; business development and knowledge transfer; and marketing and communications experts to effectively bridge the academic-users-of-research 'gap'; **4)** developing sustainable plans to incrementally enhance the depth of our impact; and, **5)** developing and resourcing methods to articulate, evidence and benchmark the reach and significance of impacts locally, nationally and internationally.

**1) Overall strategy:** UoA16 will prioritise the strongest areas of research excellence to develop a portfolio of research impact 'nuggets' – those most impactful areas of built environment research for the 'common good'. Support and resources will be strategically targeted to core impacts. Incentivising and supporting staff engagement with government consultations, public debates, and professional bodies by establishing mechanisms taking advantage of opportunities for translational research and implementation activities e.g. Cameron and Hare, and Craig and Sommerville's work with the HSE and OFT, Emmanuel's work with IES Ltd.

**2) Developing research impact skills:** UoA16 will continue to prioritise research impact skills training for all of our researchers. Working with the Graduate School to extend training for early career researchers promoting 'engagement, influence and impact' from the Vitae, Researcher Development Framework. The **Caledonian Research Excellence Development Opportunities (CREDO)** forum will continue to develop research impact training for contract researchers, principal investigators and research leaders. UoA16's *Peer Review College* will develop new processes to help principal investigators develop comprehensive plans to support the pathway to impact strategy made at the application stage of external grants and commercialisation activities.

**3) Developing and enhancing relationships with key partners, beneficiaries and end-users:** we will continue to identify the key beneficiaries and users of research to develop long-term, sustainable relationships. This will be achieved by embedding stakeholders in our Institute for Sustainable

Engineering Technologies Research (ISETR) Steering Committee to contribute to strategy and policy development around impact; by extending interface activities through increasing academic appointments and engagements at all levels in built environment communities. We will increase secondments within relevant sectors with a particular focus towards industrial and commercial partners as the Unit's Knowledge Transfer Partnership portfolio increases e.g. Mainstreaming Innovation <http://www.mainstreaminginnovation.org/content/home/1/> Central to our core mission we will engage with the university's *Social Innovation Network* to bring together academics, practitioners, policymakers, citizens and other stakeholders to collaborate on projects or funding bids that drive impact, extending current constituencies to geographies and markets that increase the reach of our research.

**4) Plans for research impact:** Comprehensive *Impact Roadmap Plans* will be developed around the Unit's research impact 'nuggets'. These plans will develop measurable objectives with clear milestones and deliverables: plans will be appropriately resourced and subject to regular review and evaluation. Focus on zero and low carbon buildings and the impacts on humans. Bringing about societal change through contributing to key societal challenges and ensuring that this contribution is well-publicised e.g. Dimitrijevic, Emmanuel and Teedon, with the Scottish Government; Teedon's work with DEFRA on rural communities and ACPO on secure by Design; and Sommerville's work with social housing providers such as NG Homes and ANChO.

**5) Methods to articulate, evidence and benchmark research impact:** the Unit will also use the expertise at the university in marketing and communications and digital outreach to further develop events, branding, and media relations. UoA16 will continue to develop effective qualitative and quantitative toolkits to capture the impacts in terms of reach and significance. Promoting mobility: staff ranging between the university and business, government and a broad range of community organisations e.g. Craig, Kumar, and Sommerville's involvement in The Telford Institute, NHBC, RICS, CIOB, ESTP (Paris). Disseminate our work to as wide an audience as possible through open access journals, media events, seminars, social media, conferences, CIB, and bespoke outlets.

**d. Relationship to case studies**

Investment in our research 'nuggets' includes increased staffing, capital spend, PhD candidates, promotion of in-house staff, and administrative support, all in line with our plans. The **three case studies** included are: Reducing construction accidents: saving lives; Setting the agenda for traditional building refurbishment; and, Driving Sustainable Waste Management Practices in Scotland. Each demonstrates how we have melded a broad range of professionals into a research unit that reaches over a wide spectrum of built environment areas. The case studies arise directly from our research:

..the **first case** (within the CME thematic area) demonstrates connectivity with industry partners in that it has reached, globally, in excess of 100,000 operatives and managers within industry and shaped how safety is embedded, and changed Approved Codes of Practice used throughout the Commonwealth through a combination of journal and report publications, and KT mechanisms described in part. Staff resourcing in this area has increased 200%; PhD candidates have grown (3 completions and 6 underway); research funding has exceeded £100K; and, CPD has mushroomed. <http://www.cicstart.org/>

..the **second case** (within the SUE thematic area) illustrates concern for the broader common good, and society as a whole, in that it has significantly influenced and shaped how we manage and protect the **historic buildings** that surround us and better understand energy policy initiatives e.g. the Green Deal, when delivered on site through policy documents, bespoke reports, and online. Staffing here has grown by two; our environmental chamber has been upgraded and expanded (£80K spend); and, CPD/consultancy funding exceeds £3.13.Million.

..the **third** (within the ETM thematic area) enhances relationships with key partners and facilitates multi-disciplinarity in shaping how wastes are managed, with the team becoming preferred providers of specialist advice to the Scottish Government; also they have become one of the **top four providers** of research on urban planning and poverty advising Local Authorities on the urban overheating problem, along with delivering tools and protocols for sustainability assessment to local building material manufacturers, installers, and client bodies through a combination of reports, policy documents, seminars and workshops. Other government bodies such as **DEFRA** have taken the research and used it as a bedrock for policy initiatives (e.g. Green Deal). Recruitment to this area includes four new staff; the Sustainable Urban Environments (SUE) research hub is active.