Institution: De Montfort University (DMU)

Unit of Assessment: 16 Architecture, Built Environment and Planning

a. Context

Research in the unit is carried out in two main groups: the Institute of Energy and Sustainable Development (IESD) and the Leicester School of Architecture (LSA).

IESD: The Institute of Energy and Sustainable Development (IESD), within the Faculty of Technology, has a strong research portfolio within energy, climate change, the built environment and smart grids. The major strength of IESD lies in its multi-disciplinary staff (scientists, engineers and social scientists) and their collaborative research to understand how buildings and technologies work in the real world. This diversity is reflected in the wide range of non-academic organisations benefiting from its research.

Improved models and climate change weather data for simulation feed into the building design process both directly, through IESD's consultancy for novel/complex building designs, and indirectly, through developments in widely used simulation software (IES, EnergyPlus, DesignBuilder). This also relates to contributions to professional design guidance, for example CIBSE (Guide A2 and A5) and ASHRAE publications. Technical and social research contributes to evidence-based policy for local government (local authorities in the East Midlands) and central government (NHS, DECC, DEFRA), including building regulations, and climate change adaptation and mitigation for buildings, resulting from both measurements in real buildings and simulation (e.g. of future climate impacts). Links with the manufacturing industry have been developed by staff with an industry background, bringing building monitoring and modelling techniques into manufacturing processes. This has resulted, for example, in energy saving at Airbus and Toyota, and a new combined model being developed commercially. Local housing associations and community groups, and local SMEs are benefiting from socio-technical research and expertise in relation to building retrofit, energy efficiency and renewable energy deployment projects, where a multidisciplinary approach is essential. Smart grid research in the CASCADE and AMEN projects is also expected to feed into impact in future years.

An important area of IESD research activity relates to low energy buildings and developing world sustainability issues (water, solar power) which has international impact and where social/organisational issues are at least as important as technology and finance, notably through PhD students based overseas. Public engagement projects linked to research and expertise are another significant area of activity, for example sustainability at open air festivals.

LSA: Staff in the Leicester School of Architecture (LSA), part of the Faculty of Art, Design and Humanities, are actively engaged in community and practice based research that is of interest to a wide audience of beneficiaries in the non-academic community. These include: architectural practitioners; urban designers and social scientists involved in interpreting, making and remaking the city; local communities; local authorities; professional bodies; professional design guidance; national and international audiences (e.g. UN-Habitat); and committees and relevant government boards. Our research work ranges from understanding the processes through which the making of the built environment constitutes and consolidates our cultural understanding, to new insights into the creation of the digital representations of heritage buildings. More specifically, the School undertakes research which has impact through:
Influencing planning policy – as a result of critiques of current planning approaches to the city in a constructive and holistic way by laying bare the strangeness of its syntheses and of its transformative potential;
Influencing professional standards and guidelines as a result of contribution to knowledge;
Engagement with local and international communities and professional bodies – for example as a result of architectural work which has been exhibited nationally and internationally, winning significant awards for Architecture.

b. Approach to impact

IESD: Impact is built into IESD's mission statement: to make a worthwhile and significant

contribution to sustainable development through research, consultancy and education provision of the highest standards, and most of the research is highly applied.

Staff and students are encouraged to engage with industry, government departments and other stakeholders. Meetings are organised with stakeholders as part of our process to develop new research ideas and to seek input to projects. Staff are funded to visit stakeholders and attend events such as exhibitions and consultation meetings with government departments and industry. Consultancy activity also provides a route to impact.

For example, since 2008 the IESD has been involved in several research projects working with industry, funded by the Technology Strategy Board. As these projects are typically 50% industry funded, they embody a clear 'pathway to impact'. Project areas include building retrofit with social housing providers, energy in manufacturing and software development for building design working with large and small companies. There have also been five Knowledge Transfer Partnership (KTP) projects since 2008 on schools, hospitals, rural communities, energy in housing and energy for festivals, all informed by research outputs and which have led to significant impact. Further engagement with social housing organisations followed from these projects, e.g. advising on an exemplar retrofit house for Seven Locks Housing and advising householders on the Green Deal in DMU's Square Mile (M2) project. EU and other projects have involved improving information on building energy use, which if successful can have direct impact on building performance.

The majority of our funded research projects have project steering groups which are designed to bring in industry expertise, but also provide links at senior level to government and industry – for example, the Carbon Reduction in Buildings (CaRB) project's steering group included representatives from DEFRA, BERR, EDF and the Carbon Trust. In addition to project steering groups, the IESD has a separate industrial advisory panel which includes senior representation from Southfacing (design), CIBSE, AECOM and Leicester City Council. In a similar way, dissemination outside academia is often a first step to achieving impact. As one example, the audience for the final EPSRC CASCADE project presentations in Mar 2013 included representatives from E.ON, Western Power Distribution, Ecotricity and Ofgem. Staff also provide advice to government and other agencies. Advice given includes information on the impact of housing retrofit on overheating (used by Health Protection Agency, DEFRA, NHS and DECC); building design guides (CIBSE) and day lighting standards (European Committee for Standardisation CEN / TC 169 WG11).

LSA: Staff in the LSA have a proven record of delivering impact from community and practice based research and addressing policy development, for example:

The Architectural Design Group's work is concerned with the craft of digital fabrication and the implication of drawing and making in architectural design and representation. The group's work has been exhibited internationally (Royal Academy of Art, The Venice Biennale, the Museum of Art and Design in New York and the Mathaf: Arab Museum of Modern Art, Qatar) winning significant awards for Architecture. The work has been reported at suitable international meetings in both academic and non-academic sectors encouraging staff to develop links with professional bodies. This has led to an improved education of architects and increased professional standards.

Staff in the Developing World Built Environment Group have been engaged in impact activities via their contribution to UN-Habitat 2012/2013 Global Report on Environmental Sustainability and Prosperity of Cities, and the revision of CIBSE Guide C. **Taki** has worked successfully on several funded research projects related to building physics and this has afforded him experience in disseminating research findings through seminars, conferences and learned journals. This has led to an invitation from CIBSE to revise and contribute to CIBSE Guide C. CIBSE is the standard setter and authority on building services engineering. It publishes Guidance and Codes which are internationally recognised as authoritative and sets the criteria for best practice in the profession. Guide C is being widely used, nationally and internationally by major bodies and organisations which govern construction and engineering occupations. These professional guidelines provide a route to impact where relevant beneficiaries are public policy, practitioners/professionals and

services.

Periton's research (Architectural History, Theory and Criticism Group) is concerned with increasing our understanding of how architecture helps to constitute and disseminate the practices of everyday life. Her work is an attempt to reveal the processes through which the making of the built environment consolidates our cultural assumptions and to question the desirability of those assumptions by studying their impact and their provenance. She is one of the officers of the Architectural Association Board of Trustees, contributing to the way in which a school of architecture might place itself in a global market (it has over 8,000 members worldwide). She is a member of AHRA, providing a comprehensive network for researchers in architectural humanities in the UK and overseas. The research work related to 'Urban Life' has led to informal collaborations and discussions with architects and developers, and has been used as a set text for students at the Universities of Nottingham, Michigan (USA) and Oxford Brookes University. The book has been used as the basis for seminars at the Architecture Association and New York/Paris Program of Columbia University's Graduate School of Architecture, Planning and Preservation.

Staff in both the IESD and the LSA work with and are supported by dedicated business development staff in their respective Faculties and centrally. For example support staff scan the research horizon, facilitate meetings and proposal development with prospective partners, arrange events such as the 'Technology Showcase' aimed at regional industries, and give strong support in setting up and running KTPs.

c. Strategy and plans

The **IESD** and the **LSA** have common strategies to embed and monitor impact over the next five years. Both groups will refine and further develop the approaches outlined in section b and will seek to learn from each other where examples of best practice can be identified. One aim is to undertake more high quality research of a multidisciplinary and applied nature, across a wide spectrum of themes, as outlined above and in the environment template.

Other objectives include:

- To consolidate existing (and develop new) research collaborations with strong academic and industrial partners; to continue working with professional bodies; and to develop collaborative links between disciplines.
- To raise the level of impact of our existing research on the wider society.
- To ensure that more of our research is turned into new services and products by collaborating with charities, public sector business, professional bodies and community groups.
- To enhance the visibility of our research and expertise with a strong web and social media presence.
- To support, develop and grow the impact and prestige from innovation outputs such as spin-out companies, patents, licences, etc., and to otherwise promote the commercialisation of our research findings as appropriate.
- To support developing relationships with key stakeholders including large companies, professional practices, policy makers etc.
- To encourage staff to identify and exploit their IP through, for example, patents, licences, etc.

d. Relationship to case studies

The two Case Studies demonstrate the Unit's approach to impact:

The Wattbox benefited from wider exposure to potential users through the EPSRC/EON Carbon, Control, and Comfort (CCC) project, its extensive use in the TSB funded Retrofit for the Future project homes and other industrial links formed through projects within the IESD. The retrofit work shows the linkage between a fairly theoretical piece of work and IESD's engagement with industry and social housing providers at a very practical level.

The Advanced Building Simulation Tools study showed our inputs into a range of state-of-the-art design software projects, made possible by our strategic partnerships with various industrial and government organisations, particularly DesignBuilder in the UK, and NREL and other public sector bodies in the USA, who brought with them wider stakeholder links.