Institution: University of Sheffield
Unit of Assessment: C-13 Architecture, Built Environment and Planning
1. Unit context and structure, research and impact strategy

1.1 Context

The Unit is, as evidenced in previous RAE and REF exercises, a longstanding centre of excellence across built environment disciplines. Since 2014 we have further enhanced the scale, scope, and impact of our research through an ambitious growth strategy enabled by targeted investments in both researchers and high-quality research support. We have **doubled our research income and grown our staff base by a quarter,** including doubling the size of our early career researcher (ECR) cohort and leading innovations in researcher development programmes.

This enables a vibrant and diverse research environment with 79 submitted staff and 25 research assistants, conducting research characterised by its innovation, interdisciplinary rigour, international reach; and generating advances in understanding that make substantive contributions to improving policy, professional practices, and places.

Our growth has been guided by our mission to pursue globally significant, transformative research into the built environment that significantly advances both academic and professional knowledge. We are driven by a shared commitment to social justice, diversity, and environmental sustainability, and we work closely with co-producers and users of our research throughout the world to achieve these goals.

Our research is widely recognised for its methodological and conceptual originality, and its use of new forms of data and analysis within a framework that promotes ethics and participation, including the pursuit of open research.

The Unit is comprised of the **School of Architecture, Department of Landscape Architecture**, **Department of Urban Studies and Planning (USP)**, and the cross-departmental, interdisciplinary **Sheffield Urban Institute (SUI)**, all located within the Faculty of Social Sciences.

Recognising our research strength, the Faculty has prioritised the Unit for significant research investment. The SUI, founded in 2013, along with the Sheffield Institute for International Development (SIID), established in 2011, were created to build critical interdisciplinary mass, required to tackle the complex and multi-faceted challenges of the built environment. Each has expanded exponentially during the assessment period, with the SUI now securing over £1m in grant income annually. We recruited a new cohort of **professorial research fellows** to drive globally leading interdisciplinary research, further facilitated by **thematic clusters** within departments working collaboratively across four broad **platforms**: '**Design', 'Infrastructures', 'Place and Equity', and 'Practices'** (see Figure 1).

Our common identity is operationalised through shared **research, knowledge exchange (KE) and postgraduate researcher (PGR) support teams** and our projects and studentships combine colleagues from across and beyond our Unit as co-investigators and co-supervisors. Our collaboration is overseen by a **standing coordinating committee** of senior staff. Additionally, we benefit from our strong influence over Faculty research strategies, with the current Faculty Vice-

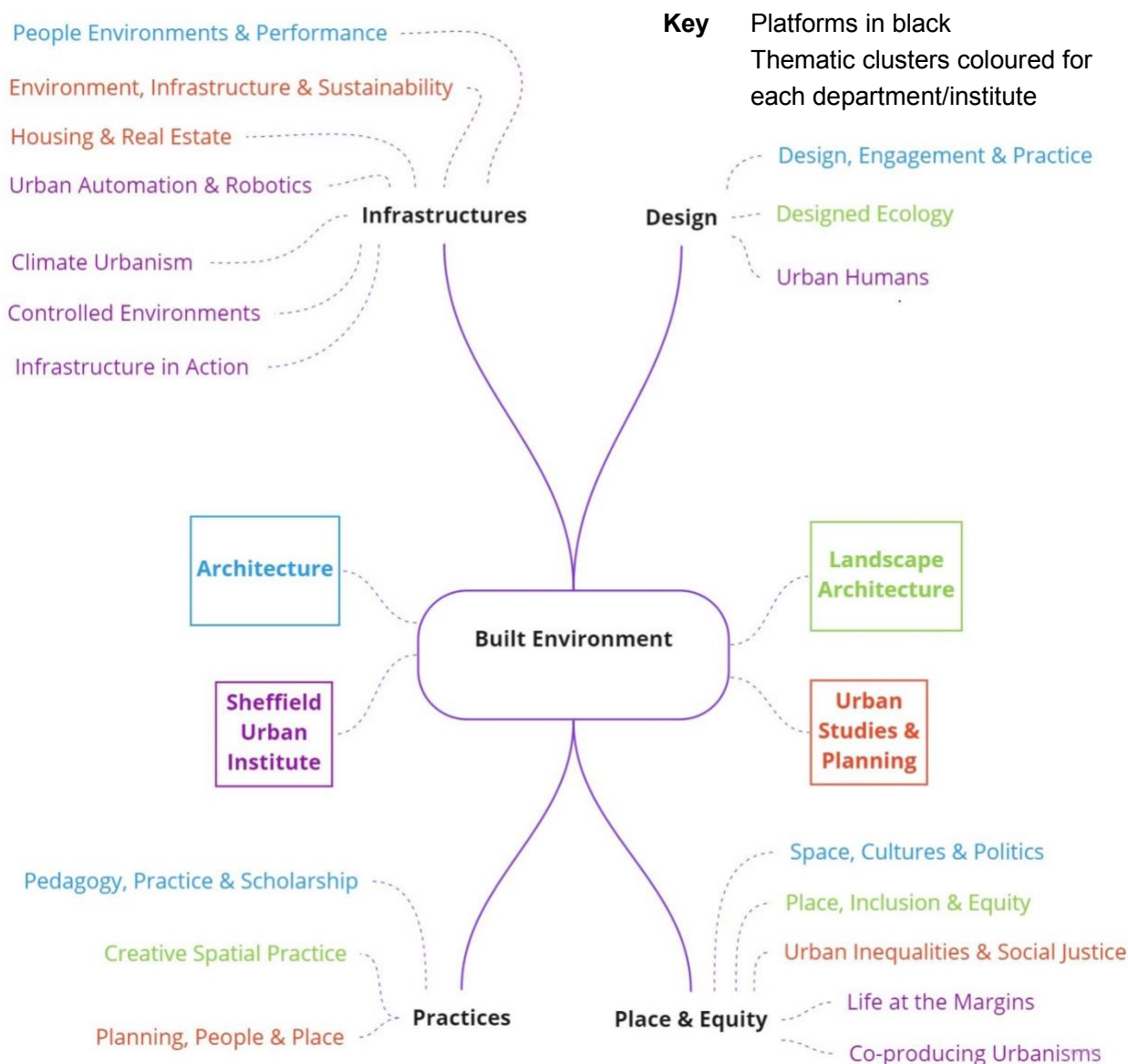President, Director of Research and Innovation, and former Faculty PGR Director all based in our Unit.

Figure 1: Our Interdisciplinary platforms and thematic clusters

1.2 Delivery of REF 2014 ambitions

In REF2014 we articulated our vision: to provide a vibrant, world-class research environment for outstanding staff and PGRs, enabling them to address the global challenge of creating built environments that sustainably facilitate economic, human, ecological, and technological development, whilst fostering inclusive and diverse communities, and promoting social justice. We identified **three specific growth opportunities** and each of these is now established as an area of excellence. Our strength in **co-production and big data** includes sector-leading work on co-production (Perry) and new innovations and techniques in visualising data (Rae, Pryce). Our excellence in **housing policy and design** is underpinned by our co-directorship of the ESRC UK Collaborative Centre for Housing Evidence (CaCHE), and a suite of further ESRC, EPSRC and EU-funded projects. The enhancement of our excellence in **international development** has been achieved by Unit staff having leading roles in the Sheffield Institute for International Development,

securing large-scale research funding, including over £1.1m from the Global Challenges Research Fund (GCRF). We articulated **six ambitions** for this assessment period, which have all been delivered. We have:

- **Increased the quality and number of our academic staff and PGRs.** Our research-active staff base has increased from **76** in 2014 to **104** in July 2020**,** with growth at all career stages. This has enabled us to both build further critical mass in existing areas of excellence and to establish capacity in targeted new fields of strength. The average value of our research income per submitted staff member rose by **64%** from **£17,189** in 2013/14 **to £28,202** by 2019/20. We have increased the number of PGRs from **33** starters in 2014/15 to **38** in 2018/19, many securing competitive studentships, particularly from the ESRC.

- **Provided intellectual leadership, guidance, and support to enable all staff to realise their research potential.** Our field-leading development infrastructure for ECRs combines universal intensive mentoring with peer-led support mechanisms and annual cohort disciplinary training programmes. Transformative outcomes include the grant value of projects initiated and led by our ECRs rising from **£13k** in 2014 to **£332k** in 2019.

- **Secured a greater volume and a higher quality of research funding.** Total research income is now **£13.7m** (up 110% from £6.5m in REF2014), with an annual increase from £1.4m in 2013/14 to £2.2m in 2019/20. Our UKRI funding has increased to £9.3m (from £2.7m in REF2014) and more than doubled annually from £719k to £1.6m. We have also diversified our funders, with a total of 65 supporting our research, including the European Research Council (ERC), charities, municipalities and governments around the world.

- **Built links with key partners and stakeholders to facilitate co-production of knowledge and enhance its impact on industry, policy, and practice**. We work closely with a wide range of external organisations, including the Bank of England, the UK Ministry of Housing, Communities and Local Government, the Royal Institute of British Architects, the Royal Town Planning Institute, and the Wildlife Trusts.

- **Developed the interdisciplinary and international dimensions of our research.** Our investment in the SUI and SIID and our cohort of professorial fellows has driven the expansion of our interdisciplinary research. The SUI has secured **£5.5m in research income** since 2014 and currently has three staff members simultaneously holding ERC fellowships. We have extended our global scope and collaboration to the extent that the **majority of our funded research projects now include international components.**

- **Continued to provide sector-leading doctoral training.** We have contributed extensively to the ESRC **White Rose Doctoral Training Partnership (DTP)**, including supporting the development of a dedicated Cities Environment and Liveability Pathway. Pryce is a Director of the ESRC Data Analytics and Society Centre for Doctoral Training. We deliver two Marie Sklodowska-Curie Innovative Training Networks and PGR training for the Royal Horticultural Society.

1.3 Future strategy

Our aim is to ensure that our unit continues to be a globally recognised centre leading research that significantly advances knowledge about designing, creating and enhancing sustainable, just and thriving built environments. To achieve this, we will:

- **Build on our institutes and platforms as primary mechanisms for producing world-leading interdisciplinary research**, utilising the Faculty's identification of built environment research as an investment priority to build further critical mass in areas including: planning and public health; critical real estate; big data and the visualisation and simulation of change in the city; understanding human-centred socio-technical systems; and transforming public connection with, and control over, built and natural landscapes.

- **Increase the scale of our international collaborations**, already evidenced by growing numbers of joint funded projects and co-authored outputs, and specifically further strengthen our partnerships in China, Columbia and East Africa.

- Lead collaborations with the Chartered Institute of Housing, Landscape Institute, Royal Institute of British Architects, Royal Institution of Chartered Surveyors and the Royal Town Planning Institute in order **to establish the built environment professions at the forefront of embedding open, ethical and replicable research** utilising the new opportunities of big data, AI and innovative methodologies.

- **Invest in our team of knowledge exchange professionals to maximise the impact of our research**. We will lead new initiatives to establish exemplar programmes of community engagement that support holistic interventions enhancing the built environment and embed the Knowledge Exchange Concordat in our work.

- **Establish new Centres for Doctoral Training (CDTs) that facilitate interdisciplinary studentships,** supervised by teams across and beyond our three departments. They will forge collaborations between our disciplines and with non-academic users and equip a new generation of researchers with the novel conceptual and methodological tools required to address the fundamental global challenges facing the built environment.

- **Continue to build one of the strongest groupings of built environment early career researchers in the world**, further developing sector-leading, cross-disciplinary training programmes that will equip them to work across disciplinary boundaries; to engage collaboratively across the globe and with diverse users of their research. We will engender the skills and aptitudes needed to lead ambitious, complex, and responsive research programmes required to solve society's greatest problems.

- **Develop sector-leading training and support programmes that embed a new understanding of Equality, Diversity and Inclusion (EDI)**. This culture will be understood by all as essential to an excellent research environment and inherent to the research process and its outcomes. It will be evidenced through the recruitment and career progression of our staff and PGRs; the foregrounding of EDI in the design and delivery of research processes; and further diversification of the partners in, and beneficiaries of, our research.

- **Lead responses to the challenges facing our built environments,** including COVID-19, and intersecting threats to human health, prosperity, and environment. Using our interdisciplinary expertise and collaborations we will generate knowledge to inform the response of organisations and communities, and by leading the development of innovative methods, concepts and ethical frameworks, we will sustain world-leading research in the context of future global pandemics.

The vitality of our unit is driven by our focus on **interdisciplinarity** and **impact**.

1.4 Interdisciplinarity

We are deeply committed to interdisciplinary research, because we recognise that understanding and enhancing built environments involves tackling complex challenges that require conceptual and methodological contributions from a wide range of fields, often in new and innovative combinations. Our staff have disciplinary backgrounds and expertise in architecture, economics, environmental psychology, environmental science, housing studies, international development, landscape architecture, planning, real estate, politics, social policy, sociology, urban design and urban studies. We have provided new opportunities for interdisciplinary working, including:

- Creating **significant new vehicles for interdisciplinary research and exchange.** The SUI's function is to build interdisciplinary teams collaborating on large-scale international research tackling the most complex problems of urban environments. The SIID similarly seeks to address fundamental challenges in development through interdisciplinary engagement, including 15 scholars from our Unit as fellows and a bespoke Cities theme (led by Meth). The UK Centre for Housing Evidence (CaCHE), co-directed by Watkins, is a £5m, five-year investment with an explicit interdisciplinary remit to address the contemporary housing crisis.

- Appointing a **new cohort of interdisciplinary research leaders** through our innovative **professorial fellowships scheme** (Castan Broto, Lancione, Perry, Rae) and through ECR fellowships combining disciplines including sociology and urban studies (Burgum) and engineering and housing studies (Sousa).

- Undertaking **interdisciplinary research projects** on key built environment global challenges, including urban water management, housing for an ageing society, connecting wellbeing and nature, culture and climate change, and energy and place.

- Developing **collaborative initiatives** to combine different disciplinary perspectives on key urban issues, including the Sheffield Water Centre which brings together scholars from engineering, geography, landscape architecture, urban studies and planning; and major collaborations with the Department of History to explore urban change and the Department of Physics and Astronomy to understand urban climates.

- Promoting **PGR studentship projects with interdisciplinary supervision teams** through the White Rose DTP. These students have been funded via network awards and the Grantham Centre for Sustainable Futures.

These mechanisms have enabled us to secure an increasing **number of research grants for major interdisciplinary projects,** including Improving Wellbeing through Urban Nature (NERC £1.05m) and Community Energy and Sustainable Energy Transitions (GCRF, £1.3m). We have also **secured funding across the UK research councils** (AHRC, EPSRC, ESRC, NERC) and won major interdisciplinary research fellowships from the ERC (Castan-Broto, Lancione, Silver) and Leverhulme (Tyszczuk). The increasingly **interdisciplinary endeavour of our scholarship** is demonstrated in the proportion of such outputs included in this REF2021 submission. We are also **building the next generation of interdisciplinary researchers** through a growing portfolio of PGR studentships combining concepts and methods from different disciplines, guided by multi-disciplinary supervision teams.

1.5 Impact

In 2014, we stated our ambition to 'further develop our links with key partners and stakeholders to facilitate the co-production of knowledge and to enhance its impact on industry, policy and practice'. We have achieved this as a result of an impact and KE strategy that ensures our research informs real world change. We seek to partner with those who are responsible for addressing key global challenges in the built environment, so that they can draw on our research and expertise, ensuring positive outcomes for those living and working in cities and their wider regions. Our strategy is founded on five pillars:

1) **Prioritising world leading research**: transformative and ambitious research achieves impact of the strongest reach and significance. Cumulative programmes of funded research are vital to enabling this.

2) **Developing an impact culture:** the strongest impacts can only be achieved when impact is planned from the early stages of the research cycle. We resource and support the prioritisation of impact activities, enabling field-leading impacts to develop, with the framework of the University's Academic Career Pathway that identifies impact as one of its key pillars.

3) **Fostering strategic partnerships:** policy and professional routes to impact are fostered through long-term partnerships with key research user groups, including government and professional bodies such as the Chartered Institute of Housing, Landscape Institute, Royal Institute of British Architects, Royal Institution of Chartered Surveyors and the Royal Town Planning Institute.

4) **Meaningful co-production:** a world-class impact strategy must recognise the value of engagement with communities across the globe. We have developed leading models of co-production with international research users, resulting in meaningful impacts benefiting communities and localities around the world.

5) **Investing in impact:** we have built a team of expert KE and partnership support professionals and they have driven the provision of training, mentoring and resources for our researchers, and ensured the targeted allocation of funding to enable the maximisation of impact from our research. This includes a full-time **Impact Associate** providing dedicated support to our Unit.

All our submitted case studies exemplify these pillars and are based on extensive funded research programmes, co-designed and delivered in partnership with non-academic research beneficiaries. The diverse forms of our impact include:

- **Influencing national policy and legislation** in the fields of lighting (Fotios), open data (Rae) and housing (Watkins).

- **Utilising** technological developments to shape industry and government standards and regulations in lighting (Fotios) and sound (Kang) in the built environment.

- **Informing major urban infrastructure innovations and developments** (Hitchmough, Rae).

- **New economic development, and commercialisation**, including spinout companies specialising in urban landscape management and urban greening (Dunnett, Hitchmough), as well as wider partnerships with leading industry bodies (Chang, Stevenson).

- **Fostering open research, public information and engagement** (Rae).

- **Internationalisation of impact**, including in Australia, China, France and the United States (Dunnett, Hitchmough, Petrescu, Rae).

We have **prioritised co-production**, developing new models of effective engagement (Perry). We have used research council funding to work in partnership with organisations including Derby Museums, Manchester Health and Care Partnerships, the Royal Town Planning Institute and Sheffield City Council, and marginalised groups and communities in the UK (Inch), Europe (Lancione, Petrescu), and extensively in the Global South, including projects in South Africa (Meth, Perry) and East Africa (Horn, Silver).

We have extensive **engagement with policymakers**, who have used our research, for example to set standards for practice (Fotios, Petrescu). Our Crook Professional Fellowships programme funds co-produced projects between researchers and policymakers in a range of built environment organisations, while the CaCHE Policy Fellows Programme enables researchers and practitioners to jointly seek solutions to housing challenges. We have utilised secondments of staff and PGRs to deepen engagement with key partner organisations (Tait at Sheffield City Council, Westling at DEFRA). Castan Broto is a lead author for the International Panel on Climate Change and through a suite of DFID/FCDO funded projects, we have significantly informed policy making in Uganda and Nigeria.

1.6 Open research and research integrity

We are committed to ensuring that our research findings are available as widely and freely as possible. We have led the development of new **open access journals**, including the *Radical Housing Journal* (co-led by Lancione), *Field*, and *Buildings and Cities* (Stevenson) and *Regional Studies, Regional Science* (Rae, Hincks). Our Unit has undertaken significant work to make new urban data accessible to the public, ensuring that it is published openly, and we have invested **substantial funding to enable Unit staff to publish in OA formats,** prioritising support to ECRs.

To ensure maximum discoverability of our research, we aim to put all outputs in White Rose Research Online, our shared repository with Leeds and York (green route). The 1,058 outputs deposited over this assessment period were downloaded 138,000 times. This is our preferred route, ensuring equity in publishing opportunities regardless of available funding; we also publish outputs in fully OA journals, or hybrid where required for funder compliance.

Our culture of research integrity is promoted through an explicit focus on open discussion of research methods, rigour, and practice. This is designed to encourage and support researchers to use new and exploratory methodologies with confidence. Initiatives have included:

- Workshops organised by the SUI and SIID have **enabled important debate** on the ethics of international research.

- Support for PGRs has been extended through initiatives such as the UKRI-Newton funded **Sheffield-Witwatersrand PhD Training Partnership**. This allowed **ECRs to explore the ethical challenges inherent in researching complex urban issues** in the UK and internationally.

- **Leading innovation and enhanced practice on just and ethical approaches in co-produced research through** major projects including Jam and Justice and Stories for Change (Perry).

- Our Urban Education Live initiative has **explored critical junctures between universities and communities**, while the Westfield project within USP enabled reflection on research in deprived neighbourhoods, winning an RTPI award.

Research integrity is a key element of our induction, probation, training, and professional development programmes, complemented by mentorship and supervision, enabling a thorough understanding of project design, authorship and publication, data management, and dealing with conflicts of interest. It is within this framework that our ethical review processes are situated, ensuring every research project requiring ethics approval is assessed by at least three colleagues.

---

2. People

2.1 Staffing strategy

The **recruitment and development of excellent research and support staff** is key to the vitality and sustainability of our unit and the delivery of our research strategy. Since 2014, we have both increased our cohort of researchers and further developed innovative programmes of support, resulting in a greater number of large, multi-disciplinary grants and prestigious early career fellowships. Our **staffing strategy** has six key objectives. We aim to:

- Recruit high-quality researchers at all career stages.

- Invest in the future of our disciplines, creating an interdisciplinary environment for ECRs to flourish and become leaders.

- Target recruitment in order to extend and deepen existing areas of excellence and to expand into new fields of research, allowing further internationalisation, increased interdisciplinarity, and methodological innovation.

- Provide guidance, support, resources and expert training and skills development to all our researchers.

- Foster an environment that promotes EDI.

- Create clear pathways and frameworks for career development.

Growing our staff base

The number of research-active staff in the Unit has grown in this assessment period from **76** to **104** (79 submitted staff and 25 research assistants). We have increased the quality and reach of our research, by **doubling the number of research-specialist staff from 17 to 40.** Since 2013 we have aimed to establish a vibrant ECR community. The **proportion of postdoctoral researchers has grown from 18% to 27% of our research staff base,** while the total number of research-active staff **between the ages of 25 and 39 has grown by 72%** between 2013 (22) and 2019 (38).

Post	Proportion of total research complement
Postdoctoral researcher/junior research fellow	31%
Lecturer/research fellow	24%
Senior lecturer/reader/senior research fellow	24%
Professor	21%

Table 1: Proportion of total research complement

We have increased the number of **early career fellowships** within the Unit from **0** in 2013 to **13** in 2020, with all our fellows supported by an innovative cohort-based programme of training and development.

We have also grown the **international scope and relevance** of our research. The proportion of overseas staff has risen from 8% to 13%, and the **diversity** of our staff has also increased. The implementation of training for senior staff overseeing recruitment processes, and close work with advisors on the wording of job descriptions and advertisements, have resulted in a growth in the number of our **minority ethnic research-active staff** from 3 in 2013 (4%) to 20 (19%) of our total research-active staff, while 5% have declared a **disability**, compared to 0% in 2013. Our research-specialist staff are evenly balanced in **gender** terms (52% female).
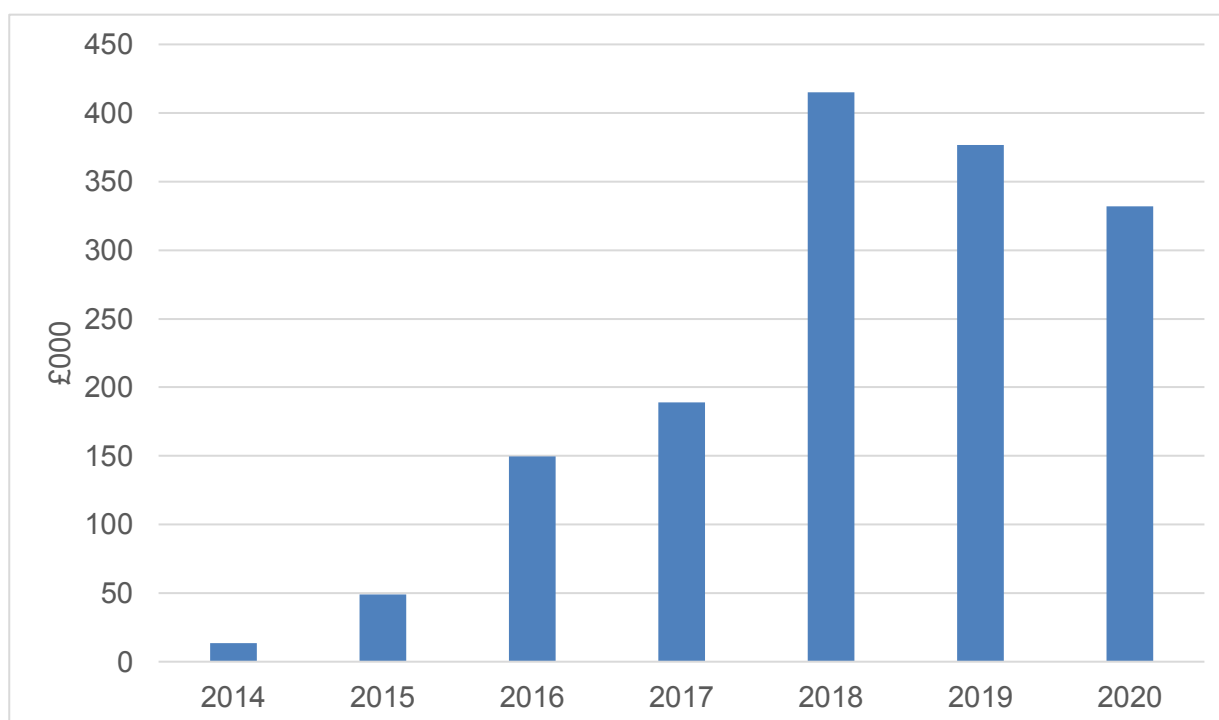

Figure 2: Value of research funding won for independent research by ECRs (2020 figures to July 2020)

2.2 Supporting our researchers

Enabling our staff to realise their potential requires the provision of development pathways and the support to become established researchers and, subsequently, leaders. Departmental, Unit and Faculty strategies, running in tandem with University-wide policy and programmes, have clarified criteria for promotion, and expectations of staff at different grades.

REF2021

As described in REF5a, in 2018 the University of Sheffield introduced its **Academic Careers Pathways (ACP),** delineating expectations for staff at different grades and clarifying criteria for promotion. **University-wide training**, in the shape of the small-group Sheffield Leader programme, has enabled staff to develop their leadership skills since 2014.

A dedicated Faculty Research Leadership initiative supports mid-career staff through a programme of shadowing, workshops, and networking opportunities. Since 2016, the Faculty's **professorial/ senior research fellowships** enable the fellows to combine their research with a dedicated leadership development programme. The four fellows in our Unit (Castan Broto, Lancione, Perry and Rae) have between them **secured £5.4m in research funding**, including two ERC Starting Grants.

The SUI enables staff to dedicate all their time to research and impact, while in our three departments, teaching and research (T&R) staff are allocated a minimum of 40% ring-fenced time for research and impact, organised through a transparent Work Planning Framework. Staff are supported in **research planning and review; mentoring; funding and training; and collective peer-led development.**

- All research-active staff are supported in **long-term strategic planning**, based around 3-year plans for funding, outputs and impact and the tailored individual support required to achieve these, with six-monthly meetings with Directors of Research to review progress. This is complemented by the annual **Staff Review and Development Scheme (SRDS)**, which utilises the ACP framework to agree annual objectives and the resources, training and advice needed to deliver them. All new lecturers are assisted to produce three-year plans within their probation period, with the Faculty Director of Research and Innovation providing individualised feedback on each plan and linking them to appropriate support mechanisms.

- Research-active staff, at all grades, are assigned a **mentor** to provide advice and guidance on their research, writing and impact activities. Colleagues on probation are similarly assigned a **probation advisor** to undertake this role. In addition, colleagues may access the **University mentoring programme** and we regularly provide further **specialist mentoring**, enabling experienced researchers to provide support for colleagues targeting specific funding schemes, or being PI on a major grant for the first time. The Unit implements the University's Code of Practice on Mentoring and all colleagues are encouraged to engage proactively with the University's development programme for mentors.

- All these planning and mentoring mechanisms are coordinated with our research hub, and department Directors of Research in order to ensure effective **provision of training.** This includes staff accessing **expert methods training** delivered by the Sheffield Methods Institute, located within the Faculty and formerly directed by two Unit members (Pryce, Rae); and new training in response to identified staff development needs; for example, on scaling up research projects, data protection and EDI.

- This coordination enables the effective allocation of research and impact funding resources. **Personal funding for conferences, event attendance, and externally- provided training** is available for all staff in the Unit. In Architecture and Landscape Architecture, research clusters provide funds for staff to present and publish their work, whilst ECRs are given £1k to support conference attendance. In USP, all T&R staff are provided with £800 annually to support conference attendance. Further funding is available through departmental research stimulation funds. This has enabled staff to attend international

conferences, with outcomes including the publication of special issues of journals arising from conference sessions. Colleagues involved in preparing large-scale grant applications can access the Faculty research stimulation fund to facilitate collaboration and consortia-building.

- **Collective, peer- led development is an essential element of our support.** Focused workshops, reading groups and critical friends sessions are a vital feature of our research environment. In addition, monthly 'Brown Bag' seminars facilitate the early presentation of work in progress and emerging ideas in a supportive context.

Study leave is available to all T&R staff within the Unit. It is used strategically for three primary purposes: **facilitating the production of world-leading outputs; enabling the development of major research funding applications; and creating the capacity to maximise the impact of our research**. Study leave is usually for the period of one semester, with objectives linked to our strategic aims, and is based on a detailed plan of outcomes and required support that is approved by the Faculty Director of Research and Innovation. Since 2014, 28 teaching and research staff have taken study leave, **leading to the completion of over 50 publications and 16 major research applications**. For example, Stevenson produced her RIBA-published book on housing fit-for-purpose, while Connelly visited refugee camps in Jordan to scope an interdisciplinary project, which was subsequently funded (£0.7m, GCRF). These study leave periods are complemented by the provision of shorter periods, maximising our capacity to respond dynamically and flexibly to opportunities. For example, they have enabled the submission of applications to UKRI rapid response research funding calls; or facilitated coordinated activities with our partners to seize time-critical opportunities to achieve influence and impact from our research.

2.3 Supporting user engagement and impact

We support staff to maximise their engagement with the users of their research and thereby to maximise the impact for its beneficiaries. **Impact is a priority area in the ACP** framework, placing it at the core of our research ambitions. We have:

- **Employed a full-time Research and Impact Associate** who provides expert and dedicated support to priority projects (including all our submitted case studies) and develops and implements impact and KE training initiatives across the Unit. We also employ a KE and Impact Fellow within the Collaborative Centre for Housing Evidence.

- **Utilised funding,** including Impact Accelerator Account (IAA), HEIF, GCRF and the University's Public Engagement Fund to resource knowledge exchange activities, ensuring that such funding is targeted to those projects with the strongest potential of achieving substantive reach and significance.

- **Delivered training** with a range of programmes and workshops provided by the University. Specialist workshops have been dedicated to developing international impact, which have proven particularly useful for GCRF projects. Unit staff (Castan Broto, Robinson) have participated in intensive policy engagement training delivered in partnership with the Institute for Government.

- **Ensured capacity** through the strategic use of study leave and other targeted periods of reductions in teaching and administration workloads to enable colleagues to maximise impact outcomes.

- **Embedded user engagement and pathways impact into all our projects,** with expert input from our KE team to all grant proposals and co-designing many applications with non-academic partners.

2.4 Supporting ECRs

We have significantly increased our postdoctoral research community through **success in prestigious fellowships competitions and through building opportunities into major funded research projects.** We have secured funding from the British Academy (Cahtterai); Leverhulme (Baker, Burgum, Emery, Sawyer, Verbeek); ESRC Postdoctoral Fellowships (Antaki, Hoddy, Hoole, Kaufman, Yi); GCRF Fellowships (Cawood); Newton International (Mosselson); the Urban Studies Foundation (Higgins) the Commonwealth Scholarship Commission (Daniel); and a UKRI Innovation Fellowship (Sousa). This success is facilitated by our **Visiting Fellowships Scheme** which identifies future world-leading researchers and enables them to undertake short visiting fellowships in our Unit in order to collaboratively develop their applications to these schemes.

Our postdoctoral research associates have been supported by **project funding** from the EPSRC (Chapman, Cheal, Robbins, Skelton, Soto, Westlng, Tomkins); ESRC (Bimpson, Houghton, Hickie, Huang, McNeill, Moore, Mukweyda, Preece, and Slade); NERC (Sefton), EU (Choe, Kenyon); Marie-Skłodowska Curie (Aletta, Margaritis) and the Royal Horticultural Society (Chalmin-Pui) .

Our postdocs have produced monographs for Routledge (Burgum, Mosselson), chapters in edited collections for Cambridge University Press, Palgrave, and Springer, and have published in the most respected journals in our disciplines including *Energy and Buildings*, *Environment and Planning*, *Geoforum*, *Global Environmental Change*; *Housing Studies*; *International Journal of Urban and Regional Research*; *Journal of Building Performance Simulation*; *Journal of Digital Landscape Architecture*; *Landscape Research*; *Landscape and Urban Planning*; *People and Nature*; *Town Planning Review*; *Planning, Theory and Practice*; *Urban Geography; and Urban Studies*. Purvis's paper in Sustainability Science was the winner of the 2019 Most Outstanding Article Award.

Mosselson secured the Chancellor's Fellowship at Edinburgh, Hoddy gained a fellowship at Lund and several others are continuing in research associate posts at Birmingham (Hoole), Durban (Houghton), Exeter (McCalman), Hong Kong (Choe), Manchester (Lockhart), Reading (Wargent), Sheffield (Mario-Diaz; McNeil), Sheffield Hallam (Bimpson), University of Central Lancashire (Kenyon) and Utrecht (Baibarac, McCrorie) as well as teaching associate positions at Glasgow (Kaufman). Our ERCs have become lecturers at Birmingham City (Burgum), Liverpool (Moore), and Witswatersrand, South Africa (Mukwedeya), as well as a senior lecturer at Northumbria (Skelton), associate professors at Birla Institute of Technology, India (Nadigama) and the Indian Institute of Management, Chennai (Thampi). Westling is now in the science research team in DEFRA.

The University is a signatory of the **Concordat to Support the Career Development of Researchers**. The Unit seeks to embed the Concordat's principles of environment, employment, and career support in its approach. Consequently, a **Director of ECR Development** (Lancione), works with the ECR community (around 20 scholars annually from across our three departments and the SUI) to deliver an innovative programme of interdisciplinary career and development support to develop impact, strategies for publication, collaboration and understanding academic promotion. All our ECRs have designated mentors. The **Inclusive Societies Early Career Support Network**, convened by Atkinson, also delivers an annual interdisciplinary cohort

development programme. In addition, the ECRs convene their own **Critical Friends Group**, which meets regularly to provide peer review for papers and research bids.

ECRs shape department activities through their representation on the Research Committees and EDI Committees of our departments and they have organised key **research dissemination activities**, including public research seminars (Herman, Higgins, Sawyer) and internal 'brown bag' seminars (Preece, Wang).

Our ECRs have already made significant contributions to their disciplines, including holding **key roles in learned societies.** Three current and recent ECRs are members of the Housing Studies Association Executive Committee (Burgum, Bimpson, Lucas), one (Uttley) is Associate Editor for two journals (*PlosONE* and *Indoor and Built Environments*), and three have **published edited collections and special issues** (Higgins and Burgum with Manchester University Press and Keskin in *Town Planning Review*). They have also secured prestigious research awards, including **three ERC Starter Grants** (Castan-Broto; Lancione, Silver), an ESRC New Investigators Award (Horn), a UKRI Innovation Fellowship (Sousa), and an ESRC Future Leaders Fellowship (Goodfellow).

2.5 Supporting PGR students

A vibrant community of excellent PGRs is essential to our research ambition and Unit staff have made significant leadership contributions to major PGR initiatives. Watkins was inaugural director of the White Rose DTP and Flint is a member of its Academic Quality Committee, Pryce is a director of the Data Analytics and Society Centre for Doctoral Training and Williams was PGR Director for the Faculty, while Cameron advised the Royal Horticultural Society on the design and launch of its PGR programme.

Our graduate school remains one of the largest built environment PGR centres in the UK and is currently home to an internationally diverse cohort of **145 PGRs from over 30 countries**. We have sought funding for studentships that ensures the excellence of our PGRs, enables us to increase the diversity of our cohort and facilitates new partnerships. We have secured highly competitive studentships from the White Rose DTP, the White Rose Centre for Arts and Humanities, the Data Analytics and Society CDT and the Grantham Centre for Sustainable Futures. We have also used major research grant awards to fund linked studentships, including Welfare Conditionality (ESRC) and Radical Housing Transformations (ERC) and have secured prestigious China Scholarship Council studentships. We have built our portfolio of international funding partners, including the CAPES Foundation in Brazil, Chongqing University and Harbin Institute of Technology, Commonwealth studentships and the Saudi Ministry of Housing.

Year	Students graduating with a PhD	Students graduating with a professional doctorate
2013	22.5	0
2014	29.0	0
2015	34.3	1.0
2016	25.0	0
2017	27.5	0
2018	27.0	0

Table 2: PGRs graduating by doctoral type (fractions show shared supervision with another unit).

Since 2014, we have enhanced our PGR training in several ways. We have developed new CDTs and DTPs, most notably the **White Rose DTP,** a collaboration of seven universities led by the University of Sheffield which has established a cross-institutional community of PGRs, with training on a shared '**Cities, Environment and Liveability' pathway**, which includes events, interdisciplinary and discipline-specific discussion, and international seminars with visiting speakers*.* The current and previous deputy directors of the pathway are both based in our Unit (Powell, Pill).

Students in the Unit are supported through other CDTs, including nine students who receive a further three months of funding to undertake additional training through the **Grantham Centre for Sustainable Futures**, The Unit also hosts two **Marie Skłodowska-Curie Innovative Training Networks** in the School of Architecture, with 30 students benefiting from a network of 16 universities. Additionally, our PGRs access bespoke methods training delivered for the Faculty by the expert team of the Sheffield Methods Institute. We have further strengthened our **departmental-level PGR training**, with bespoke modules including collaborative writing workshops, and guidance on career development. We build **strong cohort identities and interactions**, including ensuring engagement between PGRs at different stages of their studies, and across our departments.

Interdisciplinarity, international collaboration and impact are at the heart of our training and support for PGRs. We led **two ESRC multi-institutional network studentships awards** (Atkinson, Lombard) and we have secured **ESRC-funded collaborative awards**, enabling our PGRs to gain further bespoke non-academic training from partners including the Chartered Institute of Housing, Sheffield City Council and Wessex Housing. Our PGRs have also benefited from **placement schemes** with the Royal Horticultural Society, Transport Research Laboratory and the UK Parliament. Several of our PGRs have, through the **Crook Public Service Fellowships** programme, worked with senior practitioners and policymakers on joint research projects leading to new policy briefings. Ball produced a new parents training guide that is now used by Sheffield City Council, Hughes developed a series of online resources for community-led housing and Beckett was seconded to the *Housing Studies* journal to assist in developing a new database. The **East-West Studies PGR Group** provides an interdisciplinary forum through seminars and lectures to share and advance new ideas in architecture and landscape architecture between East Asia and Europe.

Williams led the UKRI-funded **Developing Research Capacity for Inclusive Urban Governance** partnership between Sheffield and Witwatersrand, South Africa, enabling a cohort of 20 PGRs to undertake exchange visits and intensive bespoke joint training programmes. We have also **led international PGR summer schools** (for example Inch with the University of Florence) and participated in Social Sciences-STEM PGR project collaborations through the Grantham Centre.

PGR recruitment and supervision are key pillars of the ACP framework and in the Unit, **staff at all career stages are supported to undertake supervision and to secure studentships**. The University has introduced mandatory training for supervisors and a programme of continuing collective reflection on PGR provision. Peer support networks, online modules and discussion workshops ensure the sharing of best practice and our School of Architecture introduced an innovative code of supervision practice, including principles for co-authorship and research collaboration.

Our PGR community is **fully integrated into the life and research environment of our unit,** with extensive involvement in our seminars and discussion groups and formal representation on dedicated PGR committees as well as research committees. USP established the role of **PGR Director of Doctoral Development,** enabling a senior colleague to co-produce a series of

discussion groups and initiatives with our PGRs that have addressed issues including decolonising research and strategies for publication. All our PGRs are given opportunities to regularly present and discuss their work at department-wide all-staff informal sessions.

We encourage our PGRs to make strong wider contributions to our disciplines, including organising three annual conferences on architecture manifestos, lighting, and landscape architecture research.

PGR student welfare is a priority for the Unit. In addition to at least two supervisors and an independent personal tutor, PGRs have access to a variety of support mechanisms, including a University-funded **wellbeing advisor**. Doctoral students are members of **departmental EDI committees, and these have coordinated** interventions to promote the welfare of PGRs during the COVID-19 pandemic; providing externally delivered wellbeing training, providing laptops and hosting additional online communal events.

Our PGRs have benefited from the University's **publication bursary initiative**, providing three months additional post-viva funding to facilitate the production of journal articles and monograph proposals. Our Unit proactively **encourages co-authorship between PGRs and supervisors**; based on the co-produced principles of collaboration developed by our School of Architecture. Since 2014, **31 publications** have been authored by current or former PGRs based on their doctoral work with articles in journals including *Urban Studies* (Wan), *Environmental Policy and Practice* (Calman) *Journal of Cleaner Production* (Wian) and chapters in edited collections for publishers including Palgrave Macmillan. PGRs are supported to present at the leading national and international conferences and Morales won Best Congress Paper at the Association of European Planning Schools conference in 2017.

Our PGRs have progressed to prominent positions in the academy, policy, and practice. Morales is now a professor in Mexico, and our doctoral graduates have secured assistant professorships in Bahrain, China, Germany, Malaysia, South Korea, Nigeria, Turkey and the United States and senior lectureships in Denmark, Jordan and at Sheffield Hallam and the University of the West of England in the UK. Many of our PGRs have been appointed to postdoctoral research and fellowship positions including in the UK at Bristol, Manchester, and Sussex and internationally at universities including Guanajuanto, Lund, Singapore Management, SWPS Warsaw and Tongii.

Reflecting our emphasis on maximising the societal benefits of our research, one of our former PGRs (Young) is now the KE Manager for the ESRC UK Centres for Collaborative Housing Evidence. Beckett was our Unit's Impact Associate before recently becoming the Impact Manager for Arts, Humanities and Social Sciences at UCL, while Faulkner is Conflict and Security Research Advisor at the FCDO.

Many of our PGRs have become influential in built environment policy and practice, including becoming a partner in the award-winning Peynore and Prasad Architects; Director of Xanxi Planning and Research Consultancy, China: Head of Horticulture at the Oman Botanic Garden; Horticultural Director at St Andrews Botanic Garden and holding senior positions at Barclays Bank and the Iraqi Prime Minister's Office.

2.6 Equality, diversity, and inclusion

The Unit has a **shared commitment to create more equal, diverse, and inclusive built and natural environments** and this can only be achieved if we enact these goals ourselves, necessitating ongoing review and reflection and working with a wide cross-section of our research community to identify opportunities to revise and enhance our practice.

Our core objective is to **develop sector-leading training and support programmes that embed a new culture of understanding of EDI**. We view this as essential to an excellent research environment and inherent to the research process and its outcomes. Our commitment will be evidenced by the recruitment and career progression of our staff and PGRs; the foregrounding of EDI in the design and delivery of research processes; and further diversification of the partners in, and beneficiaries of, our research.

We have actively sought to **recruit a more diverse group of researchers in the Unit.** Since 2013, the number of minority ethnic research-active staff has grown from 3 in 2013 (4% of all research-active staff) to 20 (19%). 5% of our total research-active staff have declared a disability, compared to 0% in 2013. We have increased the proportion of our female research-active staff (now 38%). Increasing this further is a key strategic priority and we have sought a long-term sustainable approach through ensuring that the majority of ECRs joining the Unit are female. We access expert input into all of all our job specifications and advertisements to maximise the inclusion and diversity of applicants; mandating that all staff involved in chairing recruitment (and promotion) processes have completed unconscious bias training and requiring diverse representation on recruitment panels.

Our work sits within the **University's framework for promoting EDI**. This has informed recruitment practices, representation on key decision-making groups, support mechanisms, and wider action on EDI issues. Our Unit proactively supports the University's Race Equality Strategy and Action Plan, its initiatives in relation to gender equality, and its policies on disability inclusion and LGBTQ+ equality. However, we also aim to go beyond these, recognising the individual and collective roles that we can play in diversifying the professions within which our research is aligned.

Each department within the Unit has an **EDI Director,** a senior member of staff who either sits on the departmental Executive Committee or reports directly to the Head of Department and are also members of the Faculty EDI Committee, encouraging engagement with wider EDI agendas across the University. The directors chair our departmental EDI Committees, which set strategies and priorities for EDI work, including with respect to research, and monitor progress against key objectives. The membership of these committees is deliberately broad, ensuring the participation of ECRs and PGRs and similarly, we have facilitated greater diversity in our research committees. All three of our departments have dedicated teams currently preparing a **submission for an Athena SWAN Bronze award**, facilitated by significant formal workload allowances.

We **audit promotion processes** for diversity and use our staff development and review processes to encourage researchers within protected groups to consider promotion and to ensure that outcomes take account of periods of leave for caring and parenting responsibilities. We also audit study leave, and since 2014 over 50% of those benefiting have been female members of staff.

Staff who have caring responsibilities are offered specialist support, including the University's flagship Women Academic Returners Programme. This enables women to mitigate the impact of parental leave on research progression, leading to outcomes such as new research bids being developed. **All staff have the opportunity to work flexibly,** and the contributions of part-time staff (12% of research active staff) are recognised and valued explicitly in promotion and staff review processes. **Staff have access to professional health and wellbeing support,** with additional resources provided over the COVID-19 pandemic, including wellbeing sessions led by professional advisers.

We seek to engage, critically and openly, with **issues of power and exclusion in the built environment.** We foster self-reflection and collective discussion on issues of race, sexuality, gender, and disability. The School of Architecture has explicit initiatives promoting feminist

approaches to research and practice, including the **Feminist School of Architecture** (a platform to cultivate intersectional feminism in UK architecture schools amongst students, graduates, and staff). It also hosts **The Feminist Library**, a website celebrating feminist research and practice in architecture. Stevenson and Samra were chosen to be RIBA Role Models in 2019. Landscape Architecture have diversified their research reading lists, while Simone has convened an Urban Institute series of **public discussions reflecting on race and its implications for cities**.

Our Unit has fully implemented the University Code of Practice governing our REF2021 submission. All members of our coordinating committee completed REF-specific EDI training; and maximising diversity and protected characteristics were key criteria in our output selection. We have provided clear definitions of 'independent researchers' and provided regular opportunities for colleagues to understand and, if necessary, challenge our categorisations. We have continually provided peer feedback to colleagues at all grades, including our postdocs, on all their published outputs and colleagues are informed of the REF score attributed by our review panel to each of their outputs. We have used calibration and moderation exercises to ensure that all forms of output, discipline and methodology were assessed fairly. The University has regularly undertaken equality impact assessments of our output scoring and attribution, and on our independent researcher decision-making, and found no evidence of bias. We also ensured awareness of the institutional process for disclosing equality-related circumstances, with explicit guidance that this was a confidential decision entirely for an individual to make.

---

3. Income, infrastructure and facilities

Since 2014 we have built on our strong platform of research funding to achieve a significant step change in the scale and international reach of our work. We have more than doubled our research income during the assessment period and now a majority of our projects have an international component. We have facilitated these outcomes by providing further support to all staff to undertake ambitious projects and through new enabling infrastructure, most notably our interdisciplinary research centres, including the Sheffield Urban Institute.

3.1 Research income

Securing grant funding is a key pillar of our research strategy, enabling us to undertake innovative, interdisciplinary research at a scale that has social impact and makes a distinctive intellectual contribution. Our funding strategy aims to:

- Achieve a diverse portfolio of projects supported by a range of funders, with an emphasis on rigorously peer-reviewed funding schemes, including UKRI, GCRF and ERC.

- Obtain a funding balance between individual scholarship such as fellowship and team-based projects.

- Facilitate large-scale interdisciplinary and multi-method projects capable of addressing fundamental social problems at scale and use these major research investments to generate capacity for transformative societal impact.

- Provide an expert professional research support infrastructure for grant capture, providing extensive knowledge of funding schemes, enabling partnership collaborations and coordinating rigorous peer-reviews of all proposals.

- Ensure that all staff have short- and medium-term objectives for grant capture, appropriate to their discipline and career stage.

Targeted investment to significantly enhance our capacity has included the establishment of the **Urban Institute**, appointing five **interdisciplinary professorial research fellows** and embedding a **dedicated research hub** supporting all three departments to maximise collaboration and coordination. We have clear **frameworks and expectations** for staff in relation to research funding complemented by **comprehensive support** for staff to pursue innovative and ambitious research projects. We proactively utilise departmental **pump-priming funds**, enabling researchers to scope out projects, collect preliminary data, and establish links with collaborators. Grant proposals go through a rigorous process of peer review and UKRI proposals further benefit from assessment by the Faculty Review Panel. These mechanisms have resulted in:

- **Total research income rising 110%** from £6.5m over REF2014 to £13.7m in this assessment period; **UKRI income tripling** from £2.7m to £9.3m.

- Income **increasing** per annum from £1.4m in 2013/14 to £2.2m in 2019/20; UKRI income doubling from £719k to £1.6m.

- The **value of new grant awards** more than doubling from £690k in 2013/14 to £3.6m in 2019/20 with the average value rising from £26k to £85k.

- The number of specialist research staff (research associates and fellows) growing by more than 100%, from 17 to 40.

The growth in our research income and particularly our success in securing UKRI funding, is illustrated in Figure 3 below.

We expect and support our staff to increase the scale and scope of their research programmes as they progress through their careers, with larger awards being a primary mechanism for achieving this and we have been successful in this goal, as demonstrated in Table 2.

Academic grade/title	Average total research grant award value per head
Research Associate/Junior Research Fellow	£61k
Lecturer/Research Fellow	£63k
Senior Lecturer/Reader/Senior Research Fellow	£219k
Professor	£385k

Table 2: Average total new grant award value per head by grade (2014-2020)
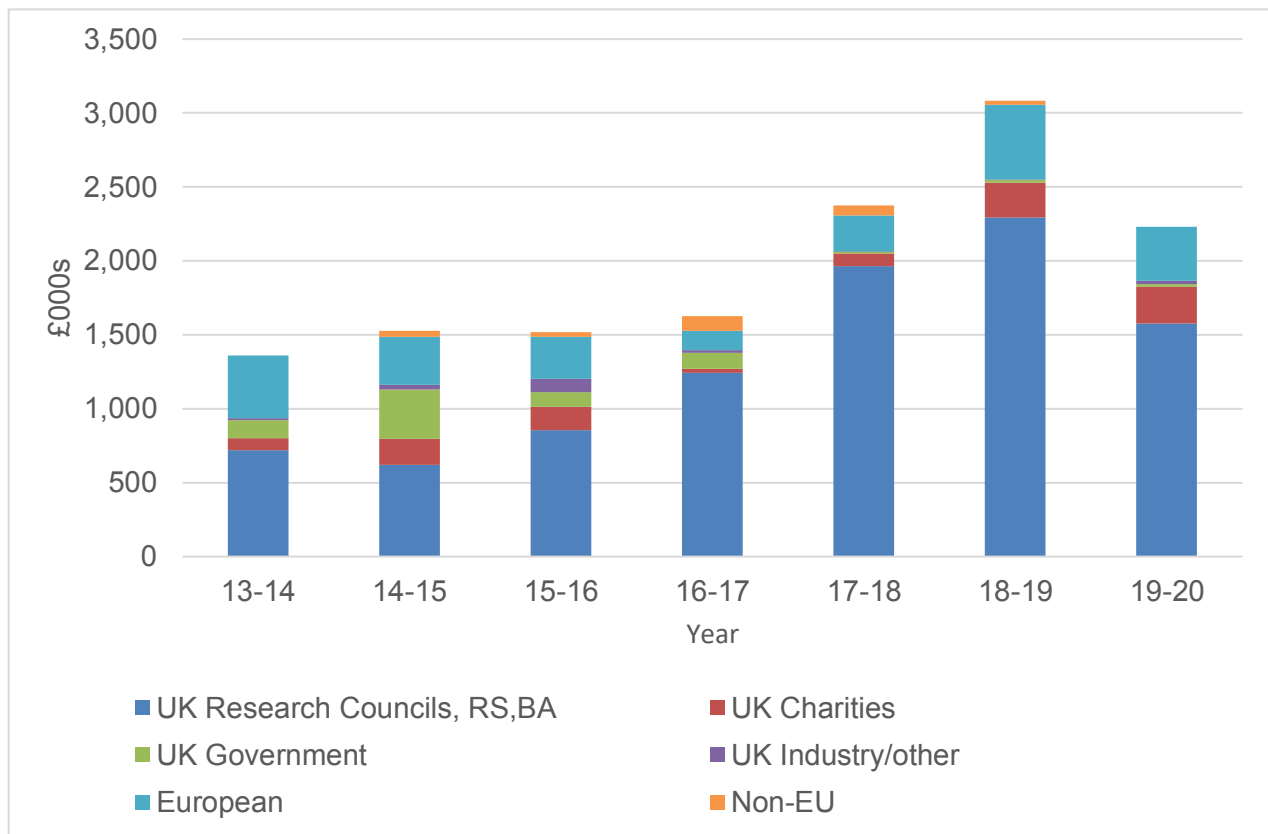
Figure 3: Annual research income

3.2 Funding to engage research users

We have funded engagement with research users through six key mechanisms:

- Invested in **expert support teams,** providing extensive specialist advice and resources for communications, partnerships and events, as well as a Unit-specific Research and Impact Associate.

- Won **Higher Education Innovation Fund, Impact Accelerator Account, Industrial Strategy Investment Fund and GCRF Partnership Fund resources** to ensure that the key findings from major research projects achieve influence on the understandings, policies, practices and outcomes of key partner institutions across the public, private and third sectors in and beyond the UK.

- Secured external **secondments** enabling staff to co-design and secure impact from research (including with the Department for Environment, Food and Rural Affairs, the Department for Work and Pensions, the Noise Abatement Society and Sheffield City Council); and utilising **visiting scholarships** for industry partners to work directly in our departments, including Tina Saaby, Chief City Architect, Copenhagen and Greg Peynore, Peynore and Prasad, London.

- Set up **key international partnerships**, connecting our work to global debates and generating substantive impact. For example, the R-Urban project (EU Life, Petrescu) led by researchers in the School of Architecture, uses co-produced research to enhance urban resilience, bringing ecological, economic, and social benefits to deprived neighbourhoods across Paris and London, with the outcomes attracting multiple prestigious awards,

including from the Innovation in Politics Institute (2017). Additionally, the £6.3m Horizon2020 Conexus project exploring nature-based infrastructure, led from Landscape Architecture, now involves 29 international partners across Europe and South America.

- Secured the UK Collaborative Centre for Housing Evidence (CaCHE) - a £5m UKRI-funded investment co-directed by Watkins, with participation from a further five Sheffield-based researchers). It offers a 5-year multidisciplinary platform, working with 14 institutions, including the RTPI and CIH. The Centre employs a dedicated full-time impact officer who has delivered a suite of high-profile policy briefings and events and built a research user network enabling housing stakeholders to co-produce the Centre's research programme. Policy fellowships have facilitated practitioners and policymakers to work directly with Unit researchers on projects aimed at addressing specific policy and practice challenges. The Unit also submits robust evidence to national Government reviews, including the Letwin Review and research on valuing planning obligations (Crook).

- Developed a portfolio of large-scale projects focusing on co-production of policy. The 'Realising Just Cities' project, funded by Mistra Urban Futures and led by Perry, has generated a platform for interaction and co-production between the cities of Sheffield and Manchester. This has led to events including the 2018 Manchester Green Summit (with 1200 participants) and work with local governments in the UK, South Africa, and Kenya on strategies to support the delivery of the UN Sustainable Development Goals. The project heavily influenced the decision of the Local Government Association to support these Goals.

3.3 Facilities

All three departments have had extensive refurbishment since 2014 and the SUI is situated in bespoke space within the Faculty's interdisciplinary research centres hub, facilitating further collaboration with other research centres. Our research is supported by substantial investment in computing and IT equipment, including high-specification capacity to enable sector-leading work on big data, GIS mapping and modelling. Each department and the SUI has a dedicated IT support officer. We ensure that all our PGRs are centrally based within our departments with their own refurbished workspaces. We have also secured investment in bespoke research infrastructure that has significantly enhanced our capacity since 2014. This includes the **Lighting Lab** with a scale model road apparatus, funded by the EPSRC and Highways England, a **new research glasshouse** for Landscape Architecture and an innovative **virtual reality studio** in USP. Our Unit utilises Faculty and University investments, for example our selection as a site of an **ESRC-funded Safepod** enabling access for researchers to new databases previously unavailable due to data security concerns. We also co-designed and benefit from access to the data generated by the £1.8m **EPSRC Urban Flows Observatory** sited at the University and using cutting edge sensory equipment to map energy, climate, and resource usage across the city of Sheffield and are represented on its Advisory Board (Flint). The SUI will be located from 2022 in the interdisciplinary research hub space in the brand **new £94m Social Sciences Building.**

> **4. Collaboration and contribution to the research base, economy and society**

A central element of our mission is to draw on our diverse research strengths to work with a range of partners to positively inform and produce societal impact. We have significantly increased our international partnerships and developed new and innovative means of co-producing research, which has led to significant impacts both in the UK and internationally.

4.1 Our strategy

Developing substantive and meaningful collaborations with academic, policymaking, and community partners is critical in creating built environments that are sustainable, inclusive, and diverse. Our strategy is underpinned by:

- The recognition that **built environment problems are frequently global**, and that we need to work with international partners to understand the dimensions of these at scale, whilst developing nationally and locally sensitive solutions.

- An understanding that sustainable solutions to built environment problems require **interdisciplinary approaches**, in collaboration with academic and policy/practice communities across a range of fields.

- An orientation to **meaningful collaboration and co-production** of research with communities and the public, recognising the need to integrate social justice into our work.

We have sought to enact three strategic priorities:

- Investment in **major research centres,** scaling up our capacity to engage with a range of stakeholders

- Prioritisation of **international partnership work** to produce long-standing engagements outside the UK, including focused projects with partners in Australia, China, South America, and sub-Saharan Africa.

- **Development of staff capacity** to engage productively with a wide range of communities and partners, expertly supported by impact associates and Faculty engagement and partnerships managers.

4.2 International collaborations

Most of our projects over the last seven years have an international partner and focus and we have **conducted funded collaborative research** with academic partners in 19 European countries and a further 20 countries across the Americas, Africa, Asia, and Australasia.

In establishing our unit as a **key hub in a global network of built environment research** and scholarship, we have hosted residential visits from more than 40 academic visitors from 20 different countries, and our staff have undertaken more than 70 academic visits to overseas universities in 25 countries.

We undertake extensive engagement with places in the Global South, and in understanding the connections and disjunctions between these contexts and those of the Global North. 15 researchers in the Unit are fellows of **SIID** and have used its extensive platforms, networks and formal partnership agreements in collaborative research and impact projects around the world as

well as benefitting from SIID's partnership training programmes. Several of these staff have received funding from bespoke University **GCRF** resources, ringfenced for international partnership building and impact projects.

We have benefited from the work of the **Faculty International Partnerships Team,** who build, develop and support partnerships with leading institutions and organisations across the world. The **Faculty Global Engagement Plan 2016-2021** established a portfolio of priority partnerships, including for our Unit, with funding provided to pursue these links, such as a major collaboration with South American scholars and new links with Javeriana University, Colombia. This has generated an ESRC-AHRC Network Award on security and territory in Colombia (Lombard); A Horizon 2020 award on Urban Nature in Latin America (Wild) and urban water management in Bogota (Rojas-Bernal); and an ESRC New Investigators grant (Horn) working with communities in the region.

Funding from the **Worldwide Universities Network** and **GCRF** has allowed us to develop projects with the Federal University of Minas Gerais, Brazil (Nawratek, Silvestre, Horn), and a PGR Network Award from the ESRC White Rose DTP supports our collaborative work with researchers at the Universities of Leeds and York on Latin American issues, alongside a major Horizon 2020 RISE Contested Territories network (€2.2m, Horn, Lombard, Silvestre, Habermehl).

Similarly, we have expanded links with researchers and universities in **Sub-Saharan Africa**. We secured **ESRC-Newton funding for a PGR Training Partnership** to provide bespoke training to over 20 PGRs from Sheffield and Johannesburg. We lead the ESRC-funded 'Living the Peripheries' project, working with academics from South Africa and Ethiopia, which led to the GCRF 'Youth Futures' project; we are researching drone usage in Africa (Marvin, British Academy); investigating transcultural understandings of climate change in South Africa (Peng), and we organised the Realising Just Cities Conference in Cape Town (Perry, Mistra Urban Futures). Further links have been made with the University of Addis Ababa, Makerere University, Uganda, and the University of Lagos, leading to the £2m GCRF-ARUA project on Managing Urban Conflict.

We have also developed substantive collaborations in **Asia,** including working with Tsinghua University, China on projects in relation to older people's housing (Hadjri, Huang). We lead interdisciplinary projects with partners in China on biodiverse urban planting (Hitchmough, Lange), and have formal links with Chongqing University, including a PGR exchange.

4.3 Institutional and interdisciplinary collaborations

Our commitment to develop interdisciplinary research to understand and support sustainable urban change is evidenced by the establishment of the **Sheffield Urban Institute (SUI)** in 2013. It has grown to a team of over 20 core and affiliated staff working in eight cross-disciplinary thematic clusters including automation, infrastructures, climate urbanism, marginality, and justice and has secured £5.5m in research funding since its formation.

The Unit has led several **major interdisciplinary projects**, including Improving Wellbeing through Urban Nature (NERC, £1.3m) which draws together landscape architects, ecologists, real estate researchers, and health researchers to investigate how the natural environment can support health and wellbeing. We also host a major project on housing for older people (ESRC, ANR, NSFC €1m), working with public health specialists and architects in China, France, and the UK.

In addition to the SUI and SIID, staff in the Unit are involved in other multidisciplinary University research institutes and centres. The **Sheffield Water Group** (led by Sharp), has stimulated

interdisciplinary projects at the interface of engineering, design, and social science, including two funded by the UK Climate Resilience Programme (£880k) on co-production of infrastructure and working with communities to test rainwater harvesting in Hull. Cawood's GCRF Fellowship involves collaboration with Water Aid (Bangladesh) to investigate **urban water usage**, and four staff (Buck, Robinson, Marvin and While) are members of the **Sheffield Energy Research Institute**. Two Unit members (Pryce and Rae) have been directors of the **Sheffield Methods Institute** which has secured significant UKRI and other funding to drive cutting edge methodological innovation and pioneer advanced methods training to researchers, PGRs and research users across social science disciplines.

4.4 Impact and contributions to economy and society

Our impact strategy utilises transformative research programmes, strategic relationships, and individual opportunities for our staff to generate transformative impacts on the economy and society. We are maintaining and further developing local, national, and international relationships with the policymakers, professional bodies, industry actors, and third sector organisations, who are key drivers of change within the built environment. As an interdisciplinary unit, our strategic partners are purposively diverse, including:

- **National governments, policymakers and agencies,** including the Department for International Development, the Department for Food, Environment and Rural Affairs, the Department for Transport, the Department for Work and Pensions and the Ministry of Housing, Communities and Local Government, the Northern Ireland Executive, the Scottish Government and the Welsh Government and government agencies including the Environment Agency, Historic England, Natural England and the Northern Ireland Housing Executive.

- **Local and regional governments** including the City of Beijing, City of Melbourne Council, Gothenburg City Council and Sheffield City Council.

- **Professionals and Professional bodies** including the Charted Institute of Housing, Landscape Institute, Royal Institute of British Architects, Royal Institution of Chartered Surveyors and the Royal Town Planning Institute.

- **Companies and NGOs** including the National Trust, Royal Horticultural Society, Rightmove, South Yorkshire Housing Association and the Wildlife Trust

- **Local communities** and those who represent them including An Even Better Arbourthorne, the Carbon Coop, Greater Manchester Centre for Voluntary Organisations and Westfield Big Local.

We foster these partnerships through organisational- and individual-level engagement and collaboration to:

- **Raise our Unit's reputation for research excellence to encourage stakeholder engagement.** Transformative and ambitious research achieves the strongest reach and most significant impact. We therefore provide extensive professional support for staff to develop cumulative programmes of funded research.

- **Encourage individual researchers to develop continuing project-level relationships with varied stakeholders.** We offer study leave and periodic reductions in teaching and administration workloads to allow staff time for engagement and emphasise the importance of knowledge transfer and co-production.

This has enabled us to simultaneously lead and set research agendas while continually shaping our research to stakeholders' needs. The two strands are mutually reinforcing: strong collective relationships with key stakeholders allow opportunities for individual- and project-level engagement, while individual- and project-level collaborations strengthen inter-organisational relationships for impact.

4.5 Working with our research partners

We seek real-world influence by embedding a culture of impact in our work with our key groups of stakeholders.

National governments, policymakers, and agencies

- Watkins' work in relation to the economic value of planning has informed the UK Government in its design of mechanisms to capture land value, including the Community Infrastructure Levy

- In 2019, Sharp was one of nine academic 'thought leaders' invited to present to senior policy officers in the Environment Agency and DEFRA in their 'Joint Water Evidence Programme'. Her evidence informed the writing of the Environment Bill.

- Cameron was invited by DEFRA to present on the ecosystem services of gardens to the UK All-Party Parliamentary Horticulture and Gardening Group and advised on the UK Horticulture Innovation Programme.

- Stevenson was an expert advisor to the Technology Strategy Board's Building Performance Evaluation Programme

- Crook and Henneberry presented evidence to an inquiry into Land Value Capture run by the House of Commons Select Committee for Housing, Communities and Local Government.

- Inch presented evidence on behalf of Planning Democracy to the Scottish Parliament's Local Government and Regeneration Committee in 2017, which was then cited during debates on new planning legislation in the parliament.

- Crookes and Tait acted as academic advisors to the Labour Party Planning Commission.

- Woolley contributed to an All-Party Parliamentary Group statement on Fit and healthy childhood and children's play. Her work was subsequently used by the national government-funded organisations CABE Space and Play England, in publications, presentations, media releases and articles. Woolley's work is now used to inform playground design in the UK and internationally, including in South Africa.

Local and regional governments

We have long-running partnerships with Sheffield City Council, leading to significant research into and influence over the city's greenspace, which includes:

- Surveys on greenspace and local park usage (Brindley).

- Improving Wellbeing through Urban Nature project (Jorgensen and colleagues).

- Place-keeping (Dempsey).

- Grey to Green, a project for urban greening that has influenced other UK cities and that led to sustained engagement between Dunnett and Green Estates Ltd, including the establishment of Pictorial Meadows, a seed sales and consultancy business based in Sheffield, providing local employment opportunities. Over 200 councils, hundreds of commercial organisations and individual households have bought seed products from Pictorial Meadows, providing new wildflower inspired displays across the country, each with local ecological benefits.

- Work on the design of older people's housing, which has been influential in shaping policy and informing guidelines in Cornwall and South Wales as well as Sheffield (Hadjri, Tait).

- Leading research and consultation by academics in USP and Landscape Architecture for Sheffield's successful Future High Streets Fund bid, winning £15.8m to transform the city centre.

Beyond Sheffield, we have collaborated widely with many local and regional authorities, including internationally in countries such as Australia and China.

Professionals and professional Institutes

The **Crook Public Service Fellowships Programme** encourages timely, cutting-edge, co-produced research with industry professionals. Partners to date include the Centre for Progressive Policy, Chartered Institute of Housing, Hackney Council, Making Every Adult Matter Coalition, Metro Dynamics, Newcastle City Council, and the Royal Town Planning Institute. Crook, Flint, Powell, Robinson, Rae, Hincks, and Keskin have been engaged on these projects.

A similar scheme run through **CaCHE** has linked our researchers with leading figures in housing and urban policy, including Public Health England and the Institute for Public Policy Research. This has led to collaborative research informing reports on Valuing Planning for the Royal Town Planning Institute (Watkins).

The profile of our researchers means that they staff **technical committees, boards, and councils**. Crook has served on the Board of the Royal Town Planning Institute, is the Privy Council appointee on the Architects Registration Board and was deputy chair of the Construction Industry Council. In the field of architecture and construction, Chang has served as a member of British Standard B/518 Structural Timber, British Standard B/525/5/Structural Use of Timber, acting as UK Principal Expert to EN 16929:2015 European Standard Committee, and UK Principal Expert to CEN/TC 124/WG3 European Standard Committee and Fotios is member of BS5489 committee for road lighting.

Companies and NGOs

We have strong links with companies and NGOs. For example, Stevenson's empirical research on **housing performance** has led to partnerships with key industry actors including a top 10 UK house builder, Crest Nicholson. Her research suggests ways to improve the quality of life for housing inhabitants, and to mitigate climate change impacts by improving housing performance and design. It has led to **changes to both building performance evaluation (BPE) guidance** and to organisational procedures used by policymakers, consultants, design teams, and house builders/managers. Other collaborations with the housing sector include advising the Sheffield Housing Company (Peng), and partnering with South Yorkshire Housing Association on a Marie Curie ITN programme (Hadjri).

We have close links to the **Royal Horticultural Society (RHS)**: Dunnett is Ambassador for the RHS 'Greening Great Britain' campaign, and Cameron and Clayden co-authored the RHS 'Gardening in a Changing Climate' report and designed and constructed a follow-on demonstration exhibit for the RHS Chatsworth Garden Show.

Sustained engagement between Green and Blue Infrastructure (GBI) researchers and **environmental and water organisations** has been influential on both policy and practice. For example, our work on the design and evaluation of GBI has influenced the South Yorkshire Green Infrastructure Strategy and the Sheffield Waterways Strategy. Work on incorporating GBI in developers' decision-making (Payne) has improved built environment professionals' understanding of the barriers and complexities of user uptake of GBI and facilitated the integration of GBI science into built environment practice. This work feeds into the continuing development of B£ST, a tool for evaluating and valuing SUDS-based GBI investments that is widely used by water companies, local authorities, and private consultancies

Communities and localities

The Unit seeks to understand the ways that communities relate to place, and the social justice implications of poorly designed and managed places. The **Jam and Justice Project** (Perry) developed a 15-person action research collective in Greater Manchester to develop new models of governance and devolution in urban areas. It had direct and widespread influence, including the development of community-owned energy supply. Its success was such that Andy Burnham, Mayor of Greater Manchester, recommended further co-production initiatives in other local authorities.

Student-run **'Live Projects'** in the School of Architecture led to a **JPI Urban Europe Project** (led by Butterworth) with partners in four EU countries. This investigated the potential of using 'urban rooms' to allow communities, NGOs, schools, businesses, and municipalities to shape urban development.

USP researchers set up a project in the **Westfield** area of Sheffield, bringing together researchers, students, and residents to develop plans for the neighbourhood. This enabled the community to draw down the initial £300k of a £1m Big Lottery award. The project led to an international conference in 2015, and visits from the Director of the Netter Centre for Community-University Partnerships at the University of Pennsylvania.

Internationally, we have worked with a range of organisations at a community level. In Cali, Colombia, Lombard's work has enabled a local NGO, Asomevid, to raise key questions about peace building in urban neighbourhoods, including a televised debate. In Lebanon, Rishbeth has worked with community groups to investigate how open space can be used to develop harmonious relationships between sectarian groups. In India, Dempsey, with colleagues from the Centre for Environmental Planning and Technology, has worked with local NGOs in Ahmedabad to secure greater access for residents to riverside spaces following redevelopment. In Africa, work by Silver with the Slum Dwellers' Federation in Uganda and by Horn and King with the Slum Dwellers International in Kenya has enabled enhanced data on housing conditions, and new models for co-produced work with NGOs.

4.6 Engaging the public

We host extensive **public engagement activities** to raise local, national, and international knowledge of our organisational and individual research achievements and agendas. Researchers

have publicised their work through a variety of media, including national and international television channels, national newspapers, and online platforms and blogs.

We use **festivals** to raise the profile of our work. For example, we have exhibited at the annual ESRC Festival of Social Science (Atkinson, Brindley, Burgum, Clayden, Crookes, Dempsey, Meth, Nisha and Robinson), the Oslo Architecture Triennale (Tyszczuk), the Festival of the Mind (Lange, Cameron), the Festival of Wellbeing (Jorgensen), the Off the Shelf Festival (Atkinson, Flint Stevenson), the Festival of Debate (Atkinson), and the Glastonbury Festival (Burgum). Lancione's **film** on evictions in Bucharest has been screened over 30 times and made an official selection three times, including at the Melbourne Documentary Festival. Pilav has used the Un-War Space Lab in eight international exhibitions to demonstrate how landscape alterations aid survival during conflict. Each department and the SUI have a dedicated team working to raise public awareness of research activities, using a combination of web, social media, and events.

Cameron, Claydon, Dunnett, Hitchmough and Jorgensen have raised awareness amongst policy makers and the general public of the benefits of private gardens (ecosystem services, positive human health and wellbeing impacts). This has helped householders to apply new approaches in their own spaces. Dissemination has occurred via numerous publications in horticultural journals and TV appearances on popular gardening programmes.

4.7 Contributions to the vitality and sustainability of our disciplines

We are leading influencers of academic discourse in our areas of expertise. We have organised 20 major international conferences, including:

- Elsevier's inaugural Urban Transitions Global Summit (Robinson).

- The 28th session of the Commission Internationale d'Eclairage (Fotios).

- The European Environment Agency International Conference (Lange).

- The UK-Ireland Planning Research Conference (Tait).

We have also delivered **47 keynote lectures**, including at the World Expo in Milan (Lange), the Petrocultures International Conference (Tyszczuk), the Congres Français de Thermique (Robinson), and the Wales Housing Research Conference (Payne).

We play a leading role in **publications**. Our staff are Editors-in-Chief of four journals: *Housing Studies; Human Figurations; Lighting Research and Technology*, and *Regional Studies, Regional Science*. They are associate editors of a further 10 journals and members of the editorial boards of another 38. We have guest edited five journal special editions and edited three book series since 2013.

Our staff influence **research funding programmes**. They are members or chairs of 15 research council panels. Robinson chaired the Scientific Advisory Board of JPI Urban Europe, leading the preparation of its Strategic Research and Innovation Agenda.

Members of our Unit influence policy and professional practice by **shaping national and international standards** and are members of eight standards committees, including the British Standards Institute (BSI), the European Committee for Standardisation (CEN) and the International Commission on Illumination (CIE). We also act as scientific advisors (6 advisory roles) and as Trustees for 13 organisations).

The excellence of our academic research and research by design has been recognised through **four** '**Best Journal' and five 'Best Conference Paper' awards**, and seven design awards. These include 'Best Paper' prizes in *Urban Studies* (Silver, 2018) and the *International Journal of Urban and Regional Research* (Goodfellow, 2018).

We have received awards from professional institutions, including the Royal Institute of British Architects President's Award for Research (Katz), the Royal Town Planning Institute (RTPI) Award for Research Excellence (Crook, Henneberry, Slade), the RTPI ECR Award (Wang), the RTPI Sir Peter Hall Award (Rae, Crook), the Royal Scottish Geographical Society Bartholomew Globe (Rae), and the International Commission on Illumination (CIE) Waldram Gold Pin Distinguished Services Award (Fotios). Crook was appointed a CBE for services to housing and charitable governance in 2014. Hitchmough was elected a fellow of the Kew Guild and three of our staff (Flint, Robinson and Watkins) were elected to the Academy of Social Sciences.