Institution: University of Sheffield
Unit of Assessment: C-14 Geography and Environmental Studies
1. Unit context and structure, research and impact strategy

Our vision is to conduct world-leading research into the most pressing global challenges of our time, making tangible real-world impact through timely and sustained engagement with external partners. We are shaping intellectual agendas in human and physical geography, and making significant differences to policy and practice. Our research income has increased by 43% since the start of the assessment period (from £1.4m in 2013/14 to £2.0m in 2019/20); our average annual income in this period has increased by >15% relative to that reported in REF2014, and our PhD completions are up by >25% since 2014. We have expanded our research collaborations and are leading two interdisciplinary centres. We have had great success in attracting independent research fellows, hosting 16 such awards since 2014. We recognise that a stimulating and inclusive research environment enables high-quality research and our research strategy seeks to engender this across all career stages.

This Unit refers to researchers from the Department of Geography (in the Faculty of Social Sciences) and others who contribute cognate expertise in comparative urbanism, international development and environmental modelling from the Sheffield Urban Institute (SUI), the Sheffield Institute for International Development (SIID; co-directed by Kleine), the Sheffield Methods Institute (SMI), the School of Mathematics and Statistics, and the University's Flagship Institute for Sustainable Food (ISF; co-directed by Jackson). The Unit comprises 98 researchers, including 35 academic staff, 23 postdoctoral researchers and 40 PhD students, spread broadly across human and physical geography, with the University Vice-President for Innovation (Petley) and Deputy Vice-Chancellor (Valentine) both of whom remain highly active in research.

Our **strategic aims and objectives**, as reported in REF2014, were:

- to **lead intellectual debates** in geography and related fields, both curiosity-driven and in response to major social and environmental challenges;
- to develop new initiatives on **cross-cutting themes** across the nexus of energy, environment and food security;
- to develop **innovative methods** and apply them to **enhance the external impact** of our research.

We have met all of these aims and objectives, as detailed below.

Our research strategy includes making 'space for curiosity', combined with challenge-led research. In particular, Valentine has set **new intellectual agendas** for geographies of encounter, Dubow authored path-breaking theoretical work on the philosophy and aesthetics of space, while Watson pioneered the development and application of practice theory. Clark led empirically-informed ice sheet modelling research via the BRITICE-CHRONO NERC-consortium, and an ERC Advanced grant (PalGlac), alongside Ely's NERC fellowship and Rowan's Himalayan glacier research, which led to a Royal Society Dorothy Hodgkin Fellowship. We have also improved understanding of ice flow in Antarctica (Ng) and melting in Greenland (Sole, Livingstone). Jackson provided intellectual leadership to the RGS-IBG as Chair of Conference in 2016, focusing on Nexus Thinking.

Our research excellence is manifested in **>75% of our physical geographers publishing in Nature journals (17 papers) or in Science Advances (2 papers)** (>15% of our submitted outputs). Furthermore, our well-regarded research environment has helped us secure competitive independent research fellowships (with **16 such awards** held in the assessment period plus **five Leverhulme Early Career Fellowships awarded in the 2020 competition**). Our ability to attract applicants of this calibre provides strong testimony regarding the vibrancy of our research culture.

We have led **cross-cutting research initiatives** on the nexus of energy, food and environment through research on the 'domestic nexus' (led by Watson; with Defra, BEIS, WWF, English Nature and FSA) and through Krzywoszynska's critical analysis of the nexus concept and interdisciplinary leadership on the social science of soils. Jackson published an agenda-setting framework for integrated, interdisciplinary agri-food research; Little advanced policy-integrated research including path-breaking work on the science-farmer interface; while Cleaver led new ways of thinking about international development through *bricolage*, applied, with Whaley, to water management in Africa. Kleine pioneered research on digital methods in international development (ICT4D), while Pickerill advanced cross-cutting research on sustainability and ecological responsibility.

In terms of **innovative methods:** McGonigle delivered award-winning research for NASA, developing next-generation space exploration technology; Whitworth advanced small-area estimation methodologies as co-investigator on a £800k ESRC-National Centre for Research Methods project; Buck pioneered statistical approaches to advance radiocarbon dating science; Ely developed new coding tools for comparing palaeo-data with ice sheet models; Phillips developed new ideas on experiential fieldwork, inspired by Georges Perec; and Bateman published a handbook on luminescence dating.

Enhancing impact: We have a strong commitment to the development of high-quality impact. For example, Whitworth's research has had significant impacts on health-related employment support policies with uptake by the Department for Work and Pensions (DWP) and the Sheffield City Region. Blake's work has influenced national policy actors, addressing fundamental issues of social exclusion and food poverty. McGonigle's volcano sensing technology is in operation worldwide. Buck's work underpins the internationally adopted standard in radiocarbon dating, which is a scientific basis for the 5th IPCC report, which was pivotal to negotiation of the Paris Climate Agreement. Bigg's prize-winning modelling work informs International Ice Patrol iceberg warnings, whilst Little's research has underpinned Defra's bovine tuberculosis programme and post-Brexit agricultural transition plan. PhD student Lambie-Mumford won the 2014 ESRC Outstanding Early Career Impact prize.

Our **research groups and support structures** are designed to promote a stimulating research environment among colleagues at all career stages and to communicate our research externally. They have enabled us to build capacity in key research areas such as glaciology, food security and international development, encouraging younger colleagues to work alongside more experienced staff, sharing ideas, building confidence and increasing the scale and scope of their research. A review of our existing research clusters in 2018 affirmed their purpose of encouraging interactions and providing informal support. These long-standing clusters were reconfigured as research groups in response to new critical mass in certain areas and to enable further interdisciplinary opportunities, with the strategic goal of encouraging exciting research discussions and internal collaboration, providing research confidence via peer support and sharing best practice. These groups have organised reading groups and writing retreats and are underpinned by strategic links with University-wide research institutes, within which our staff play key leadership roles.

While three of the clusters were retained (*ICERS: Ice and Climate Research at Sheffield; Landscape Dynamics; and Culture, Space and Difference*), two new groups were constituted,

reflecting emerging themes: *Social Change and Economic Transformations* and *Environmental Challenges in Global Perspective*. Research groups set an agenda each semester, have scheduled meetings and report to the Research Committee.

Building on existing strengths, our **research strategy** aims:

- to conduct world-leading research into global challenges of social justice and environmental change;
- to lead intellectual agendas within and beyond the discipline, including innovative methods, cross-cutting research, and production of world-leading outputs;
- to be recognised as global change-makers, working in partnership with a wide range of stakeholders to drive meaningful impact;
- to attract, retain and develop the careers of excellent postgraduate researchers (PGRs) and early career researchers (ECRs) as well as colleagues across all grades, whilst pursuing equality, diversity and inclusion (EDI).

To deliver these aims, we are committed to:

- building on existing recognised research strengths in food security, glaciology and international development;
- providing a world-class research environment, using Faculty, University and external funding to recruit, retain and develop excellent staff;
- supporting the development of high-quality grant applications, targeting cross-Council investment for interdisciplinary research and independent research fellowships;
- facilitating production and dissemination of world-leading research outputs;
- enabling world-class impact across human and physical geography through shared commitment to knowledge exchange (KE) and external partnerships, expedited via effective internal support;
- further embedding principles of EDI, open research and research integrity across research policy and practice;
- strengthening support for research ambition and career development for PGRs and ECRs and across all career stages; and
- supporting staff to contribute to the discipline and wider academy through a culture of shared information and workload recognition.

We plan to further develop research support and increase impact through the following specific mechanisms:

- Annual **face-to-face research meetings to facilitate staff development** with the Director of Research and Research Hub manager. These are primarily for staff on open-ended contracts and optional for PDRAs. They are independent of managerial functions, forward-looking and designed to encourage development of clear research plans, supporting our strategic priorities of securing external funding to facilitate research and production of world-leading outputs. Initiated in 2019, these meetings are already enabling more ambitious and effective research prioritisation.

- **Enhanced data capture and management**. We have developed robust data systems to track changes over time and to make relevant comparisons. For each point in our research strategy, we have identified specific support mechanisms, actions, timeframes and staff responsibility, coordinated by the Director of Research. We have improved regular publication peer review and feedback procedures, supporting research development through annual staff appraisals including setting and monitoring SMART objectives.

- **Improved communication and dissemination**. We have devoted additional resources to communicating our research via social media, improving our website, internal communications and external marketing. A monthly newsletter provides an update on grant applications and awards, reporting significant research achievements.

- **A new impact strategy** (detailed below), formalising and further enhancing the wider KE cultures and infrastructures in the Unit, with a focus on producing impactful research.

Our **impact strategy** is for each research group to have a tangible impact footprint, borne from sustained relationships with key stakeholders who are beneficiaries of our research. We seek to form strategic partnerships with business, government and civil society, to co-design research in order to maximise impact on policy, practice and public understanding. This is delivered via the following mechanisms:

- **Our external advisory board** meets annually to oversee our impact activities, helping identify potential impact for further development. Its members include several Sheffield Geography alumni, in addition to the Head of the National Oceanography Centre, the Chief Executive of the Geographical Association, the Co-Chair of the UN Committee of Experts on Global Geospatial Information Management, the Chief Executive of the Lake District National Park Authority, the Chair of the University's Alumni Board, the British Library's Lead Curator for Politics and Public Life, and representatives from the Met Office, the British Geological Survey, the Environment Agency and the Department for Education.

- **Personalised support** via our departmental impact officer (Whitworth) who runs identification, training and development sessions for staff involved in impact activities. Support has also been provided by the Faculty's Partnerships, Impact and KE Team who ran events to promote connections with external audiences, helping cement partnerships between Whitworth and the DWP, Blake with local authorities and national charities (British Red Cross, FareShare), Little's work with Defra and Bigg's consultancy for Premier Oil. Staff involved in impact receive workload allocation to enable them to develop and deliver this work. In addition, the Faculty has supported us through a dedicated impact officer who has provided bespoke, disciplinary-specific expertise and support, and an Enterprise Manager, who has helped develop the market and social enterprise potential of the research of Osei-Kwasi and McGonigle via the Aspect SUCCESS programme.

- **External funding** has facilitated the development of impact, and the tracing of specific changes arising from our research. We have a strong track record of winning HEIF/Impact Accelerator and collaborative R&D awards (£383k in the assessment period), via NERC, ESRC and EPSRC (Blake, Jackson, Krzywoszynska, Poveda, Whitworth, Martin Jones, Little). Furthermore, two five-year KE research fellows (Langford, Reynolds) were appointed via the N8 Agri-Food programme, supported by HEFCE Catalyst funding.

1.3 Interdisciplinary research

To support our strategic priority of delivering **cross-cutting interdisciplinary research,** we are strongly committed to five University research institutes, two of which are directed by our staff. These address important global challenges, using cutting-edge methods and working at a scale that requires interdisciplinary collaboration.

- The ***Institute for Sustainable Food*** is one of the University's four Flagship Institutes (see REF5a). Co-directed by Jackson, it delivers basic, translational, and transformative research to improve the sustainability and resilience of the world's food supplies, via research spanning the arts, humanities, natural, social, environmental and health sciences. It has world-class research facilities including the Sir David Read controlled-plant-growth facility (£3.6m investment in 2016-7) and the Wolfson Centre for Disease Phenomics, with research pillars on 'Plant production and protection', 'Translational and transformative research' and 'Food consumption, health and sustainability'. Established in 2019, the Institute appointed Professorial Fellow Bhavani and created a permanent post for former Leverhulme Research Fellow Krzywoszynska. The Institute won ESRC funding from the 'Governance after Brexit programme' (Little) and >£1m from the STFC Food Network+ programme, led by Choudhary (Management School), with significant input from Jackson and Reynolds. Recent awards include a consortium grant from UKRI's Strategic Priorities Fund on 'Transforming UK food systems' (>£6m, 2021-25). This consortium (Healthy soil, Healthy food, Healthy people) is led by Jackson with colleagues in Leeds, Bristol, Cambridge, and City universities plus >30 stakeholders from government, business, and civil society.

- **T**he ***Energy Institute*** is another Flagship Institute, dedicated to finding safe, sustainable energy solutions. Directed from Mechanical Engineering, the Institute works across themes of 'Circular Economy', 'Wind', 'Conventional power', 'Nuclear', and 'Electrical energy storage', with members including physical (Rhodes, Swift) and human geographers (Watson, Kumar, Jackson). The Institute has won significant funding from EPSRC and other sources, including a £1.26m grant from the UKRI Centre for Research into Energy Demand Solutions.

- The ***Sheffield Institute for Sustainable Development*** *(SIID)*, co-directed by Kleine, is a sector leader in the methods, ethics and challenges of research concerning the Global South. It seeks to build meaningful partnerships with policy, practice, civil society, business and University stakeholders. Our staff (Kleine, Hammett, Kanai, Poveda, Martin) are involved in all five of SIID's research themes on: 'Cities'; 'Digital technologies', 'Data and innovation'; 'Governance, states and advocacy'; 'Health'; and 'Natural resources and rural livelihoods'. SIID is funded via NERC, GCRF, British Academy and ESRC grants.

- The ***Urban Institute*** addresses some of the major social, economic, and environmental challenges facing the world's cities. Sustained through British Academy, Royal Society and ESRC funding, it runs an Early Career Network for urban researchers involving 20 scholars from across the Faculty. Several geographers (Fields, Kanai, Pickerill) helped establish the Institute, and allied funding from the European Research Council has facilitated the research of other Unit staff (Huang and Westman).

- *The* ***Sheffield Methods Institute*** (SMI) employs innovative research techniques to address major problems in the social sciences, involving several geographers (including Bell, who is Director of Research, and Lucy Jackson), with funding principally through ESRC.

Our **interdisciplinarity** involves collaboration with researchers from a wide variety disciplines e.g. engineering, geology, agri-tech, architecture, sociology, anthropology, ethnology, literature and philosophy, and is also expedited through University investment in the Interdisciplinary Centre for the Social Sciences, the Humanities Research Institute and the Grantham Centre for Sustainable Futures. The latter has attracted considerable external funding, including £1m from EPSRC to study single-use plastics, involving Jackson and Watson.

Our commitment to **open research** is progressed via a number of specific mechanisms:

- 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 867 outputs deposited over this assessment period were downloaded >97,000 times. This is our preferred route, ensuring equity in publishing opportunities regardless of available funding; we also publish outputs in fully open access journals (e.g. *Frontiers in Earth Sciences*, *ACME*, *Dialogues in Human Geography*), or hybrid where required for funder compliance. We furthermore publish in platinum OA journals (e.g. Volcanica) where there is no charge to publish or view articles, and in outlets where pre-peer review manuscripts are published. In addition, Martin Jones co-edited the first open access book for Routledge/Taylor&Francis in the social sciences.

- **Open peer review:** we publish in, and review for, journals (e.g. *Nature*) where reviewer identities, and often the reviews themselves, are disclosed.

- **Open data:** we publish in journals where underlying datasets are disclosed (e.g. *Nature*). We contribute to open data repositories including the University's ORDA, and host websites where underpinning datasets can be downloaded (e.g. Clark's BRITICE glacial map data).

- We generate **open software**: e.g. enabling volcano observatories to use the monitoring technology detailed in McGonigle's impact case study (*Volcano Monitoring*). This software has been distributed to partners spanning five continents. Furthermore, Buck directs the University-funded BCal project, which provides a free online Bayesian radiocarbon calibration facility.

- We generate **open educational resources**: including Time For Geography, the Royal Geographical Society and the Geographical Association, enabling the vision of the former to: 'support millions of young people in their journey from school classrooms to higher education, and into careers shaping the future of our world'.

- To culturally embed and widen our open research activity, we conduct **open research training** for all staff and PGRs.

We ensure a culture of **research integrity** by:

- **Mandatory training** for all staff and PGRs via the compulsory Faculty 'Research Ethics and Integrity' module and mandatory Unit-specific sessions on research integrity and ethics, delivered via staff meetings. We also provide training on working with vulnerable groups, especially in the Global South, on recent GDPR legislation and the use of social media and drones in research.

- **Robust processes:** under the framework set by the University Research Ethics Committee, all research projects undergo ethical review, administered by our Ethics Lead (Poveda), following principles of informed consent, confidentiality and anonymity. We have also introduced a new policy on co-publication between ECRs and PGRs and their

supervisors, to ensure appropriate recognition of contribution. SIID colleagues have pioneered a set of principles concerning equitable distribution of GCRF funding in collaborative projects with partners in the Global South, which are being implemented University-wide.

- **Informal support** to share best practice in an open and collegial environment, via staff mentoring, internal peer review and discussion.
- Increasingly our **commitment to social responsibility** extends to recognising the environmental consequences of our research, as evidenced by a 2019 University Green Impact award for work (led by Watson) on minimising our air travel carbon footprint.

2. People

Our **staffing strategy** is to recruit and develop excellent staff at all career stages, hiring in areas of existing and anticipated strength, e.g. within *ICERS* (Ely, Livingstone, Rowan, Sole), and professorial research fellows in interdisciplinary University priority areas (e.g. Kleine in digital society/development and Evans and Shankar in food sustainability). The latter were enabled via competitively won Faculty/University investment, such that we secured the greatest number of these appointments in the Faculty over the assessment period. Our excellence here is also manifested in recruitment of outstanding independent research fellows, supporting them from proposal development through to open-ended positions. In particular, we have hired: Davies (Leverhulme Fellowship), Ely (NERC), Krzywoszynska (Faculty then Leverhulme), Little (ESRC-Future Leaders), Livingstone (NERC then University VC Fellow), Osei-Kwasi (AXA), Reynolds (NERC Innovation), Riding (Leverhulme), Rowan (VC Fellow; then Royal Society Dorothy Hodgkin), Sauls (Leverhulme), Sole (Faculty Fellow), Véron (Leverhulme), Ilanko (Commonwealth Rutherford) and Whaley (GCRF Global Change). Of these, six (Ely, Krzywoszynska, Little, Livingstone, Rowan and Sole) have secured open-ended positions in Sheffield. This strategy has enabled us to increase our ECR complement of T&R staff in the 25-39 age bracket to >29%, up from 17% in 2014, improving the sustainability of the discipline, invigorating our research environment and investing in the future.

Since 2014, we have made 22 **academic appointments** including five professors, five professorial research fellows and 12 lecturers, with seven promotions to senior lecturer (Hammett, Julie Jones, Sole, Kanai, Livingstone, Swift, Whitworth) and two to reader (Dubow, Ng). In this assessment period, 16 T&R staff left, including two retirements, with others moving on for personal reasons or because of upward mobility following trajectories established at Sheffield (e.g. Fields to Berkeley, Mallon to Groningen). Following an **external review in 2018-19**, we were able to make new open-ended appointments in priority areas (Pering, Poveda and Temple), based on our strategy of moving staff to open-ended contracts wherever possible. Of our Category A staff, ~95% are on open-ended contracts. We have also appointed a new Departmental Manager, an additional Lab and Field technician, and eight new professional service staff in research-related roles (research and finance, media and communications).

In terms of **staff development,** we prioritise **mentoring** at all career stages. This is particularly focused on ECRs but formal elements (e.g. appraisal and face-to-face research meetings, described above) apply to all staff. Several staff have transitioned to open-ended posts, following mentoring by senior colleagues (e.g. Kleine for Poveda; Clark for Sole, Livingstone, Rowan, and Ely; Jackson for Little and Krzywoszynska; Hammett for Temple; Rhodes for Menon; Valentine for

Lucy Jackson and McGonigle for Pering). Furthermore, Pering, Ely and Krzywoszynska were initially PhD students in the Unit, evidencing the effectiveness of these interactions over multiple career stages and sustained timescales. Mentoring has had numerous positive outcomes, e.g. Ely's NERC Fellowship; papers in Nature and Science by Livingstone, Ely, Sole and Rowan; and McGonigle's mentorship of Cook which led to him becoming a Rolex Young Laureate in 2016, then a National Geographic Explorer.

Informal mentoring occurs on a day-to-day basis, in corridors and staff rooms and within research groups. Senior researchers provide support and guidance on ideas and interpretation, writing articles and grant proposals. More formal mentoring is delivered via a departmental mentoring scheme, whereby staff members request to be mentored by more senior staff. Colleagues also participate in the University's research-led Think Ahead scheme (see REF5a) which is open to all research-active staff, and which, after induction, matches each mentee with a mentor outside their department for at least six months. Dubow, Jackson and Pickerill have mentored on this scheme.

Delivery on our strategic commitment to develop excellent research staff begins with **probation**, during which an advisor coaches each probationer, clarifying role expectations and ensuring they receive relevant training (see below). Probationers are allocated reduced teaching and administrative loads, to expedite their research development. Probation normally lasts three years but, in cases of exceptional performance, can be completed earlier. Our excellence here is manifested in three staff finishing probation early (Kanai, Little and Livingstone), with all the other probationers passing at the end of third year.

Staff appraisal is delivered via the annual Staff Review and Development Scheme (SRDS), which enables research goal and planning discussions with a (trained) senior colleague to review progress against role expectations, receive feedback, identify training and support needs and plan future career development, via identified SMART objectives for the coming year.

Probation, promotion, and professorial re-banding arrangements have been updated through the University's new **Academic Career Pathways** (ACP) scheme, which provides a framework for support and progression for research, impact, PGR supervision, leadership and professional standing, thereby improving clarity and transparency. We have internal ACP leads for physical and human geography who mentor candidates through the process.

Our strategic objective of developing research staff is also achieved through face-to-face and online University **training** resources. Several staff have participated in the Faculty research leaders' programme as well as the University-wide Sheffield Leader programme, which develop the skills required in leadership roles. In addition, the Sheffield Leader Essentials and Impact programmes cover KE and research co-production as well as personal development and executive team development. The research institutes also provide specific training to upskill research staff (e.g. on social research methods in the SMI and on ODA-related issues within SIID). Online resources include training on creativity, decision-making, networking, project management and equality, diversity, and inclusion, including implicit bias training.

To expedite **early career development**, we have implemented the Concordat to Support the Career Development of Researchers pertaining to: recruitment, selection and retention; recognition and value; support and training; personal and career development; proactive engagement; diversity and equality and regular progress review. We have established an informal ECR networking group and a new ECR support policy. A Faculty ECR forum was established and co-directed by a geographer (Froude). ECRs are represented on the departmental Executive Committee and have served on Research Committee throughout the entire assessment period. Four of the five research groups are led by ECRs with support from senior staff members. Our

success in ECR development is manifested in 20 of our PDRAs securing University posts, with others leveraging their research skills to gain employment with organisations such as the Environment Agency, Defra, the Hydrographic Office and in GIS and other business sectors.

Full and part time staff are eligible for one semester's **research leave** after eight semesters' service, with the aims of enhancing our research environment; attracting new research funding, PDRAs and fellows; and producing influential publications. Applications must align with Departmental and Faculty priorities and contribute to the applicant's career development, facilitating work which could not be achieved within their standard workload (with 40% designated research time). 22 staff have taken study leave since 2014 leading to a range of significant outcomes, including: research monographs (Dubow, Jackson), successful application for an ERC Advanced Grant (Clark), and 14 other funding awards (e.g. Jones, Swift) and development of partnerships that underpin impact case studies (e.g. Blake - *Food Ladders*, Whitworth - *Employment Support*).

Our aim of **supporting impact** is expedited by a dedicated Impact Officer (Whitworth) and Faculty-funded Impact Associate (Black) as well as through Petley's innovation and knowledge exchange role on the University Executive. We also benefited from the University's participation in the new KE Framework pilot. We are active in supporting external partnerships including the city and regional engagement agendas (e.g. Whitworth's employment policy work with Sheffield City Region) and have provided staff with training and development sessions on impact.

We also support impact through **staff secondments** to government departments and NGOs, including Blake to Fareshare, to embed her research into their data and community support processes; Whitworth to DWP to design national employment support policy, and Little to Defra, to research bovine TB and post Brexit agricultural policy. These secondments have resulted in tangible impacts upon policy or process, resulting in two corresponding case studies. Other secondments include Reynolds to WRAP, researching food waste and sustainable diets.

Impact is included in annual appraisals and in our **reward and recognition** process, whereby the ACP framework (see above) puts impact on a par with grant capture, as a criterion for promotion.

Capacity for staff to build and enhance impact is facilitated through **workload allocation and study leave,** including support for our case studies.

Our **graduate school** is pivotal to the success of our research strategy and the vibrancy and sustainability of the Unit. We aim to attract high quality PhD students, many working on interdisciplinary topics, providing them with the skills and experience to answer compelling research questions and to develop independent research careers. We have maintained a consistent PGR cohort of around 40 across the assessment period, with an upward trajectory in completions, increasing >25% from 2014 to 2019/20 in an increasingly competitive environment. This is achieved through an active culture of PGR support, with >80% of our academic staff supervising. All of our PGRs are working towards standard PhD awards, with none registered for professional doctorates.

Our PGRs receive **studentships** from a wide variety of UK and overseas agencies including Commonwealth, ESRC, EU, NERC and CONACYT (Mexico), via University scholarships, the White Rose Arts and Humanities Consortium, and industrial funding (e.g. AXA). In total, 30 UK research council studentships have been held in the Unit over the assessment period, with around 40% of our studentships arising from UKRI, British Academy, UK Charities, international agencies and EU sources. We are active members of the ***ESRC White Rose DTP***, attracting standard (1+3 and +3) awards and collaborative (CASE) awards with partners such as the Food Standards

Agency. This Consortium has funded two PhD networks in which Sheffield geographers played a leading role: on multiculturalism (led by Phillips) and food safety and Big Data (Jackson). We also contribute strongly to the ***Grantham Centre for Sustainable Futures*** (where Jackson serves on the Management and External Engagement boards) which funded >80 PhD students including 10 in the Unit.

In terms of PhD **recruitment, monitoring and support,** all PGRs have two or more supervisors, including at least one who has led multiple successful completions, providing training to less experienced staff. Many supervisory teams are interdisciplinary.

Two staff have oversight of our PhD programmes: Blake (human geography) and Swift (physical geography), reporting to Research Committee and liaising with supervisors to check progress and encourage timely completion. Alongside a dedicated professional service staff member, they also have responsibility for: marketing and recruitment, Faculty and funding body liaison, student induction and training, confirmation reviews and appointment of examiners. Confirmation (e.g. transfer from MPhil to PhD status) involves a 5,000-word report covering research design, aims and objectives, methodology, and budgetary/timetable details, a seminar presentation and a viva with two staff members (non-supervisors). This also includes ethical approval and risk assessment, which must be completed prior to fieldwork.

Our doctoral **completion rates** continue to be very robust with 80% of thesis submissions occurring on time for PhD students who started in the assessment period (typically four years, with allowances for approved leaves of absence).

The SMI provides internationally-recognised advanced **skills development** training in quantitative and qualitative methods for 1+3 White Rose DTP PhD students as well as for all researchers across the unit. Training is also provided through the NERC-ACCE DTP (Adapting to the Challenges of a Changing Environment), the NERC-Aura CDT on Offshore Wind and the Environment, and the Grantham Centre. University awards have extended stipend support spanning 3.5 years to accommodate enhanced interdisciplinary training and public engagement. In addition, the University provides PGR courses on Thesis Mentoring, Getting Unstuck and Researcher Development, and an additional three-month bursary scheme to enable publication write-up from the doctoral work.

Our research students are fully integrated into the research environment, at research group and departmental level. There is a strong focus on publication, with over half (52%) of the PhD students who graduated during the assessment period publishing, either independently or, in most cases (72%), jointly with their supervisors. This practice begins at Masters' level where three students on the MSc in Polar and Alpine Change (PAC) published first-authored papers in *Nature Geoscience* or *Nature Communications* before beginning their PhD research. Of the 67 PAC students graduating, 31 then enrolled for PhDs in UK universities and three overseas: in Australia, Switzerland and the Czech Republic.

We have a sustained commitment to **equality, diversity and inclusion** pioneered by Pickerill who initiated monthly EDI working group open meetings. The current EDI lead (Phillips) serves on Executive Committee and Kleine is a member of the White Rose Gender Equality College. We have actively participated in Faculty initiatives on race equality, decolonizing the social sciences, and critical approaches to disability. Valentine chairs the University's EDI Committee as Senior LGBTQ+ champion for the Open@TUoS initiative, aimed at progressing LGBTQ+ inclusion across the University, leading us to become a Top 100 Stonewall Employer for seven years runing. In 2017, Valentine was named in the Financial Times OUTstanding list, also receiving an Excellence in Diversity award.

41% of our research staff are women, 16% minority ethnic, and 13% have a declared disability. Our commitment to EDI is underpinned by sector-leading research on 'living with difference', as demonstrated by Valentine's ERC-funded research on geographies of encounter. Phillips' AHRC-funded work (with Nafhesa Ali) challenged stereotypes about Muslims in Britain, while Olund is researching neurodiversity within the academy. Our PhD students have also been active on EDI issues, challenging the 'whiteness' of the discipline and rewriting its feminist historiography. We commissioned PGR student Azeezat Johnson to report on some of the key EDI issues facing the unit (and the discipline), leading to a series of recommendations for change. Olund has been prominent in the Critical Race and Ethnicity Network, leading a workshop on intersectionality, Islamophobia and queerness, and we have recently introduced a mentorship scheme specifically for researchers with minority ethnic backgrounds.

In line with the University's sector-wide leadership in EDI (see REF5a), our EDI group has implemented the following initiatives:

- A **flexible working policy** to improve work-life balance, with five T&R staff currently having flexible working arrangements, and a 'core hours' policy, with key meetings scheduled between 10am-3pm to support parents with schoolchildren.
- A proportional reduction in expected performance within the **ACP Framework** for part time staff, across all criteria, including research.
- Three of our staff have benefited from the University's **Women Academic Returners Programme** (Fields, Little, Rowan), which provides financial support to mitigate the impact of parental leave on research activities, leading to publications in leading journals and impact development work. We also provide private space for breastfeeding.
- A fortnightly staff forum is convened by the Director of Staff Development to **promote researcher wellbeing**, one result of which is that two ECR representatives now sit on Exec.
- Several staff have received support from **the Dyslexia and Disability Service** via adjustments to their work environments, additional technological support and individually-tailored occupational health plans. Services are also provided for staff wellbeing and mental health, covering stress, the menopause, neurodiversity, managing caring responsibilities and fatigue.
- All staff receive **training** to increase awareness of University and departmental EDI principles and strategy and must include an EDI objective within the annual SRDS review. Phillips ran an externally-facilitated staff development session on effective communication and a separate session on academic leadership.
- We have followed the University's **code of practice** on EDI aspects of this submission, giving equal treatment to staff on part-time and fixed-term contracts. An Equality Impact Assessment was undertaken of output scoring and selection, with particular attention to gender equality.

All staff involved in REF preparation and staff recruitment have completed implicit bias training and recent appointments (Huang, Kanai, Kumar, Menon, Poveda, Shankar) have had a positive impact on our **ethnic diversity.**

3. Income, infrastructure and facilities

Research income enables us to deliver innovative challenge-led and curiosity-driven research. Our funding strategy emphasizes highly competitive BEIS (UKRI, Royal Society, British Academy), UK charity (open competition) and EU sources, comprising 88% of our total research income since 2014 (see Fig. 1), as well as fellowship funding for ECRs. The great majority (>80%) of staff have held at least one grant as PI or Co-I and/or an externally-awarded research fellowship during the assessment period.

The spread of funding increased during the assessment period, with awards to 26 individuals in 2018-2020 compared to 19 in 2013-15. Total award values have increased to £4.1m (2018-2020) compared to £1.8m (2013-15) and the value of awards led by Sheffield-based PIs has also increased, with total PI funding (as a % of overall income) increasing from 86% during 2013-2015 to 91% in 2018-2020. Overall success rates are >30% for ESRC, EPSRC, NERC, STFC and British Council, suggesting that our research environment helps cultivate innovative ideas and confirming the effectiveness of our internal review mechanisms.

Clark secured an advanced award from the **European Research Council** for the £2.2m PalGlac (Paleoglaciology) project, following two ERC awards in the last REF cycle (Jackson, Valentine), with the latter LiveDifference project, finishing in this cycle.

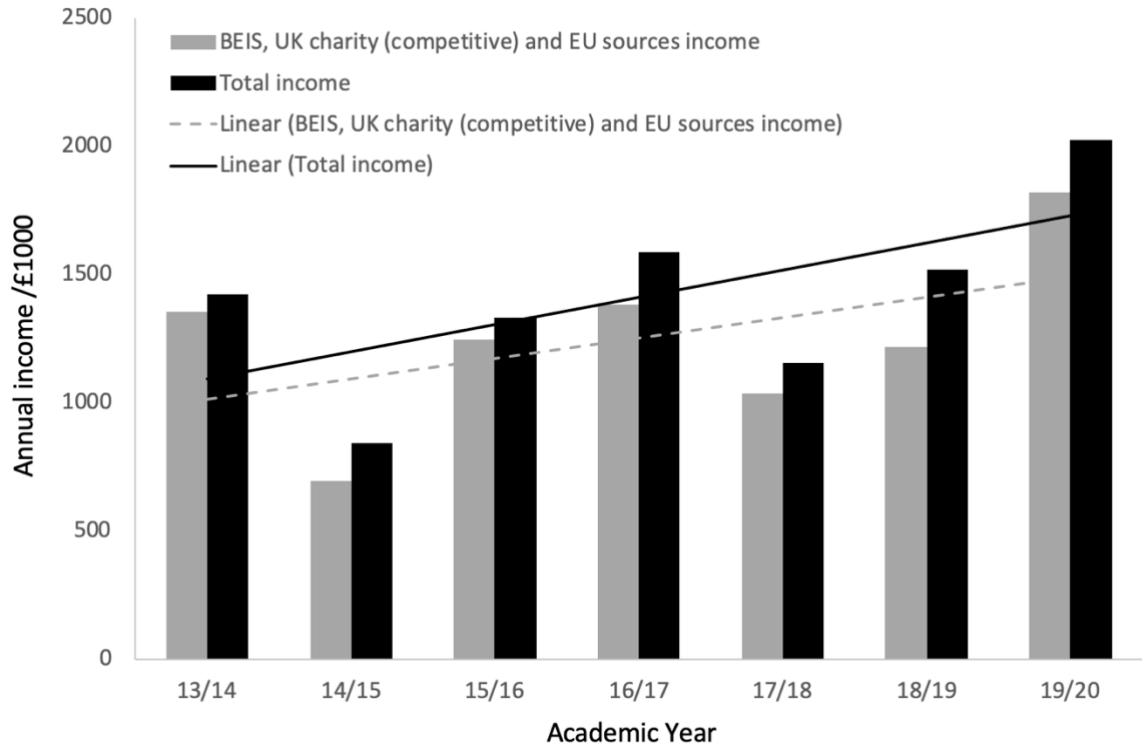

Fig. 1: Annual research income over the assessment period

PI **ESRC** grants were secured by six staff, including a £539k 'Governance after Brexit' award (Little) and a £145k UKRI COVID-19 grant (Krzywoszynska) demonstrating our agile response to current events. We received a £314k grant under the RCUK-Colciencias Research Partnership scheme (Kanai), a £249k Future Leaders award (Little), standard grants on food freshness (£297k;

Jackson) and groundwater sustainability (£289k; Cleaver) as well as an ESRC Nexus award (£112k; Watson).

PI **NERC** awards were obtained by 11 staff, including an Independent Research Fellowship (£483k; Ely), joint NSF-NERC grant (£223k; Rhodes), large grant (£353k; Hodson and Hanna), a £309k split award (Jones), a standard grant (£272k; Cleaver) and a JPI Climate award (£321k; Hodson). NERC Urgency funding was received for earthquake research by Rhodes and Bryant, and the Giant Pine Island Iceberg (Bigg) and Banwart was Co-I on a £593k soil security consortium grant. NERC funds were also secured via the international opportunities fund (Rhodes), Antarctic Funding Initiative (Hodson), the NERC Radiocarbon Facility (Clark), Innovation Projects (Bigg) and the Provisioning of ecosystem services in the Montane tropics (Petley, Kanai).

PI **AHRC** funding was secured by Reynolds and Phillips, including the latter's £369k storying relationships grant. **British Academy** funding was won by Kanai, Schindler, and Fields, including a £271k Urban Infrastructure of Wellbeing award (Kanai). We also won funding from **BBSRC** (Banwart), **MRC** (Blake), **STFC** (Menon and Reynolds) and **EPSRC** (Watson), and Jackson and Reynolds have both been Co-Is on further EPSRC awards.

Leverhulme funding was received for Early Career Fellowships (Davies, Krzywoszynska, Sauls and Véron) and Research Fellowships (Dubow, Julie Jones, McGonigle and Ng).

We have secured £232k **contract research funding**, which, with consultancy income, supports technical staffing and lab equipment (with awards from the Laboratoire Mediterraneen de Prehistoire Europe et Afrique, National Science Foundation, Amaterra Environmental Inc., Coastal Environments Inc., Natural Sciences and Engineering Research Council of Canada, Natural England, and a range of universities for dating sediments in our luminescence lab (Bateman, Rhodes).

We have won £376k in external funding to support **impact** in addition to the Acceleration Awards detailed above: from Premier Oil, for Bigg's research on iceberg hazard prediction; from Sheffield City Council, for Blake's work on Food Poverty; from Defra, for Little's work on bovineTB; from the National Assembly of Wales and Sheffield City Region, for Whitworth's case study (*Employment Support*), and from the Rolex Institute and EPSRC-GCRF, for McGonigle's case study (*Volcano Monitoring*).

Widening our funder portfolio, we have received £787k from 16 further funders including the Royal Society (Pering, Rowan), RGS-IBG (Hodson; Ralph Brown Expedition Award), the Royal Academy of Engineering (Kanai), the AXA Research Fund (Jackson), the Norwegian Research Council (Bigg, Cleaver), the Regional Studies Association (Schindler), EC Marie Curie Fellowship scheme (Oldekop and Ngwenya), US-AID (Oldekop), the White Rose University Consortium (Romero-Gonzales), WRAP (Reynolds), Geneva Water Hub (Cleaver), the Academy of Medical Sciences (Menon), Commonwealth Scholarships Competition (McGonigle), HEFCE's Catalyst fund (Banwart, Jackson et al. for the N8 agri-food programme), the Daiwa Foundation (Nem Singh), the Mount Everest Foundation (Livingstone, Sole), the Urban Studies Foundation and the Independent Social Research Foundation (Pickerill).

We have secured multiple awards from the **Global Challenges Research Fund** leveraging our strong links to SIID, for projects focused on: volcanic hazards in Vanuatu (Pering), electrification in Tanzania (Watson), land and water access in Uganda (Whaley), and digital innovation in development (Kleine). Kanai won a GCRF sustainable partnership award for his work on green fences in Argentina, while Cleaver received a HEFCE ODA award to research development

corridors in East Africa. **Newton funding** was secured via NERC by Banwart and Petley and from UKRI and STFC for GCRF impact acceleration by Reynolds, Menon, and Rhodes.

Finally, significant funding is already in-hand for the next REF cycle including a major award from **UKRI's Strategic Priorities Fund** on 'Transforming UK food systems' (£6.1m, 2021-25, led by Jackson) to drive food system change, increasing environmental sustainability and improving public health.

As detailed above, our research is structured into five research groups which have vibrant research cultures, supporting research bids and career development. These groups have benefited from **investment** through:

- a departmental **research fund** (c.£200k over the assessment period, supporting 21 PGRs and 56 staff), with the strategic aims of pump-priming new research ideas and collaborations and expediting research dissemination through conference attendance and organisation, with clear criteria and rapid decision-making to respond to urgent needs. This fund has also supported group meetings in Sheffield, e.g. the NERC Centre for Observation and Modelling of Earthquakes, Volcanoes and Tectonics' volcanic gas meeting (Pering; *Landscape Dynamics* group).
- **instrumentation purchase**, e.g. £150k unit investment plus £35k from consultancy income, on luminescence reader technology for Rhodes (*Landscape Dynamics*).
- **Research fellowships**, in areas of research strength funded via University/Faculty schemes e.g. GCRF Fellowships to Whaley and Martin in SIID, and VC Fellowship to Rowan in *ICERS*.

The research groups also have strong **impact footprints**, with fundamental research directly driving impact. For example, Bigg's iceberg-tracking work arose from cryospheric science in *ICERS*; McGonigle's volcano technology arose from natural hazards and Earth observation research within *Landscape Dynamics*; the impacts on food insecurity (Blake) and UK employment support (Whitworth) originated within *Economic Transformations and Social Change*, as did Little's work on Defra's agricultural policy.

Research time is protected via the **workload allocation mode**l which provides all T&R staff with a 40% allocation for research, increased for staff with above-target research income or a funded 'buy-out' (with replacement teaching).

Our **research support** capacity has increased significantly (to nine staff) since 2014 and further bespoke research support is provided to the ISF, SIID and SUI. Our research hub includes a manager and support officer, who provide expert advice and support on funding opportunities and the development, costing and administration of grant applications; a finance manager and officer who manage post-award finances; a PGR officer; and an impact support officer. The former also participates in the annual face-to-face research meetings between the Research Director and staff, to advise on upcoming funding and to help coordinate our bid pipeline. A wider pool of Faculty and University staff support commercialisation, research integrity, contract development and impact. Our laboratories are supported by three research technicians, and our IT technician supports the computational research infrastructure.

In terms of **IT support**, each staff member has a computer with a wide range of pre-installed programs, for GIS and remote sensing (ArcGIS, Erdas Imagine), statistical and qualitative data analysis (SPSS, Minitab, NVivo) and scientific programming (Python, Labview, Matlab, Mathematica, Ansys Fluent). We have invested in a computational suite, containing higher

performance machines, for computationally intensive GIS, image processing and climate modelling, and for the most demanding applications in physical geography (e.g. in glaciology and volcanology). Staff routinely use the University ShARC and Iceberg high performance computing clusters. Staff also have access to excellent **library facilities** including institutional journal subscriptions and electronic resources such as the EDINA Digimap online data service (covering Ordnance Survey, historical, geological, LiDAR and marine maps and spatial data) and specialist sources such as MINTEL's New Products Database and market insight reports.

Our extensive **laboratory facilities** enable us to perform virtually all our experimental work in-house, save that which requires major research council facilities. This infrastructure is focused on luminescence dating (Bateman, Rhodes), soil science (Menon) and remote sensing instrumentation (Bryant, McGonigle), with analytical/geochemical capacity including ion chromatography, particle size analysis, high performance liquid chromatography and FT-IR spectroscopy.

We have also invested in **infrastructure to facilitate impact** including spectroscopic and optical instrumentation which facilitated the research and development underpinning McGonigle's case study (*Volcano Monitoring*), focused on pioneering novel sensing approaches for global volcano monitoring, and for a NASA lunar lander unit intended to measure hydroxyl in the lunar exosphere. Our computational resources enabled Bigg's iceberg tracking work, and Rhodes used our luminescence facilities to gain new insights into faulting in New Zealand, driving a revised approach to seismic hazard assessment.

Staff have made considerable use of **shared research infrastructure** in the UK and overseas, increasing the ambition and scope of our research. Clark has made extensive use of the NERC Radiocarbon Lab, the Scottish Universities Environmental Research Centre, and NERC Marine programme facilities, with two month-long research cruises aboard the RRS James Cook in his BRITICE-CHRONO work, reconstructing the British-Irish Ice Sheet. Rowan, Clark, and Livingstone have also used the NERC Cosmogenic Isotope Analysis Facility, and Rowan, the Isotope Geosciences Laboratory at the British Geological Survey in her research on climate change and glaciation. Working with Clark, Bradley uses the US National Centre for Atmospheric Research supercomputing to run coupled climate/ice sheet simulations of the northern hemisphere and Jones used the US National Energy Research Scientific Computing Center (NERSC) Cori supercomputer, for climate simulations. Petley's work on landslide risk used geotechnical equipment from New Zealand's national GNS Landslide Laboratory and data from New Zealand's national Geonet geophysical hazard monitoring network. Rhodes used the University of Manchester Electronic Paramagnetic Resonance (EPR) facility in research on safe nuclear waste disposal and Menon accessed the Rutherford Appleton Laboratory Diamond Light Source and ISIS Neutron and Muon Source to study soil-water-plant interactions.

Our research has benefited from significant (£1.4m) **in-kind financial support**, much of it by competitive bidding. For example, the NERC radiocarbon dating (for Clark) was provided free of charge with a cumulative in-kind value of £340k for 588 dates. Rowan's isotope dating was likewise funded in-kind (£31k for the Beryllium dating), as was Jones' NERSC access, Rhodes' EPR work and Bigg's use of the NERC stable isotope facility to study North West Pacific marine cores.

We have also received in-kind support from: the private sector (Krzywoszynska's EPSRC and HEIF-funded work was supported by the Small Robot company, a precision agriculture start up); charities (Blake's food poverty work was supported by Fareshare UK and The Bread and Butter Thing); Museums Sheffield part-funded a collaborative AHRC studentship (Phillips); Defra and Natural England supported Little's ESRC-funded agri-environmental governance research;

Krzywoszynska received citizen science support from Earthwatch, and Reynolds from WRAP. The breadth of these funding sources evidences the relevance of our research to a wide variety of stakeholder organisations.

We run several vibrant **seminar series** as a vital part of our research culture. The seminars support our strategic objective to address global challenges and to highlight curiosity-driven research. The weekly physical geography series is typically attended by 30-40 researchers from MSc students to professors. The human geography series combines high-profile speakers such as Dick Walker (Berkeley) with ECRs working on topics that are of particular relevance to Sheffield researchers. We have named **Visiting Lectureships**, in human (Hart) and physical geography (LR Moore), whereby visitors meet informally with staff and PGRs, present a specialist seminar and a public lecture. Recent visitors have included Elspeth Probyn (Sydney), Rick Wilk (Indiana), Geoff Malpas (Tasmania) and Ruth Lane (Monash). We have also recently instituted an annual **Garnett lecture**, honouring our first female professor (1958), and hosted Naomi Hart as Leverhulme Trust **artist-in-residence** in 2017-18.

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

Consistent with our aim of working with external partners to address major global challenges, we have secured a range of collaborations with key stakeholders in government, business and civil society. We have also contributed to the research base and to the learned societies, supporting the health of the discipline and the wider academic environment, working to the benefit of the economy and society.

Staff have **research collaborations** with colleagues from >30 UK universities, with the British Antarctic Survey and the British and Irish geological surveys. We also work with the N8 agri-food programme (Blake, Jackson, Krzywoszynska, Little and Reynolds), which funded professorial appointments and KE research fellows via an £8m HEFCE Catalyst grant (with £1m matched funding from each partner university) and worked with the EPSRC DEMAND centre.

Our excellence in **international collaboration** is manifested in high-profile outputs including a *Nature* paper involving Ely (led by Kingslake, Columbia University), as well as major funded research programmes (e.g. Clark's ERC project, with partners in eight European and North American countries). Jackson's ERA-Net SUSFOOD project included collaborators in Denmark, Sweden, and Germany. Kleine provides University leadership on GCRF via multiple ICT4D projects, funded by ESRC, GCRF and Newton grants, with collaborators in Africa and Latin America. Menon has conducted GCRF research with partners in India and Bangladesh and GCRF-funded partner workshops have been run by McGonigle (Perù) and Krzywoszynska (South Africa).

Research collaborations have been supported by funded internships (e.g. Little's Defra secondment, which facilitated her successful ESRC bid); research leave (enabling Jones to write a Leverhulme bid for collaborative work with New Zealand's National Institute of Water and Atmospheric Research); hosting conferences (Krzywoszynska obtained Grantham Centre funding to organise a conference which led to an *Environmental Humanities* special issue); and external funding for exploratory trips (enabling Kanai to develop a Newton project with Colombia).

Staff have made strategic visits to key overseas partners in the USA (Buck; to contribute to the NSF Earthcube programme), Australia (Pickerill, Bateman), Denmark (Krzywoszynska), Singapore (Rhodes), China (Bateman, Bryant) and Chile (Petley). These links are reinforced via numerous honorary affiliations: e.g. Hammett at the University of the Free State, South Africa; Rhodes at the Southern California Earthquake Center and at UCLA; McGonigle at the University of Sydney;

Davies at the Institute for Latin American Studies; Ng at Otago; Dubow at the Institute of Advanced Judaic Studies (University of Michigan); Kleine at the Berkman Center for Internet and Society (Harvard); and Bateman at the University of Western Australia.

In line with our strategic objective to deliver world class impact through external partnerships, we have significantly increased our engagement with **external stakeholders** including our Advisory Group (described above). Staff have engaged with a wide variety of organisations in multiple sectors, including civil society (e.g. Hammett with RCN Justice et Démocratie in Rwanda); NGOs (e.g. Kleine with UNICEF and Oxfam); industry (e.g. Bigg's consultancy for Premier Oil); and local government (e.g. Whitworth's secondment to Sheffield City Region Combined Authority, working on regional employment policy) and national government (e.g. Jackson's work with Defra and FSA, detailed below). Clark's work on glaciated landscapes led to NERC-funded KE activity with Natural England, Scottish Natural Heritage and National Resources Wales, concerning geological conservation sites, as well as commercial consultancy for Boliden mining company, Sweden. Swift is a scientific advisor to the Swiss National Cooperative for the Disposal of Radioactive Waste (NAGRA), resulting in c.£100k of research funding and a PhD CASE award.

We have had significant impacts on natural hazards stakeholder groups, with Petley delivering commissioned research for the New Zealand government to assist their recovery from the 2016 Kaikoura Earthquake and Rhodes' NSF-NERC funded work leading to revision of seismic hazard assessment protocols in New Zealand. McGonigle and Pering have devised new approaches for monitoring volcanoes, resulting in contract work (>£130k) for national and local governmental projects in Chile and Perù, and a NASA contract to adapt this technology for future lunar space exploration applications. Jones is joint lead of the World Climate Research Programme Polar Climate Predictability Initiative, funded by the WMO and UNESCO, and Bigg is a Member of the Pool of Experts for the UN Second World Ocean Assessment.

Staff have had major impacts on **government and civil service bodies**. Jackson chaired the Social Science Research Committee for the Food Standards Agency. He serves on Defra's Social Science Expert Group and chaired the oversight committee for the National Food Strategy public dialogues. He also chaired an evidence review on sustainable food systems, which shaped the European Commission's new 'Farm to Fork' strategy. Blake gave evidence to the UN Rapporteur for extreme poverty and the House of Lords' Select Committee on Food, Poverty, Health, and the Environment. Watson represented UK social science in devising the G7's microplastic pollution policy, as well as engaging Defra, the FSA, and Ofgem on sustainability policies. Little has contributed to Defra's Biosecurity Action Plan. Krzywoszynska is a member of the Assembly for the Horizon 2020 Mission for Soil Health and Food, and Bryant has worked with the Namibian Ministry of Environment and Tourism. Valentine developed a policy brief on climate change and sustainable development with Sheffield City Council and Baroness Bennett, former leader of the Green Party, and participated in a Westminster Forum event on 'Priorities for the National Adaptation Programme Addressing Climate Change'. Furthermore, Buck's work has had key impacts on the development of global climate change policy, via its contribution to the 5th IPCC report.

With colleagues in SIID, we have engaged **NGO, governmental and IGO partners** (e.g. Cleaver with Wateraid, the WWF, UNESCO, the French Institut de Recherche pour le Développement, and government ministries in Ethiopia, Malawi, and Uganda). Kleine has been an advisor/consultant for the South African Council for Scientific Research and Innovation, Oxfam, the World Bank, and the Canadian government, and served on the Strategy Group for Malala's Fund. Sporton facilitated the South Yorkshire International Development Network of c.20 NGOs and Kanai worked with the Centre for Popular Research and Education in Colombia to upgrade their human rights abuse

digital database. Since the COVID-19 pandemic, Blake has informed local and national food response planning (with FareShare UK, Manchester Council and Defra).

As well as leading intellectual agendas, we seek to translate our research via knowledge exchange and **public engagement.** Sole and Livingstone's work on Greenland has attracted significant media attention (e.g. BBC news, The Independent, Newsweek and the Washington Post). Blake's work has been covered in Sky News, BBC Sunday Morning Live and The Independent; Pickerill's by the BBC; McGonigle's Rolex-funded work has been showcased in The Economist, Time Magazine, National Geographic, Süeddeutche and Billionaire Magazine; Hammett appeared in Al Jazeera's 'Inside Story', Krzywoszynska in The Guardian, and Valentine was interviewed on BBC Radio 4 by former Foreign Office Minister Douglas Alexander. Cook has presented at the National Geographic Explorers' Festivals and in a film 'Ice Alive' which premiered at the RGS-IBG, narrated by Jim Al-Khalili. Staff are also active in using social media: for example, Petley runs the Landslide Blog, hosted by the AGU (1.8 million visits since 2015). Krzywoszynska pioneered the Soil Care Network, an online community of over 350 soil scholars, activists, and publics with a monthly newsletter.

Numerous staff have presented at 'Festival of the Mind' events (a collaboration between the University and local creative industries), which attracted 53,000 attendees in 2018. In particular, Ely, Bigg and Jones spoke at the 'Sounds of the Antarctic' event in 2018; and Dubow introduced 'Mountain, Son, Priest', an award-winning documentary film by departmental PhD student Vaibhav Kaul. Pering spoke at the city's 'Pint of Science' event, while Blake, Kanai, Cleaver and Jackson led events for the ESRC Festival of Social Science; Valentine hosted the documentary film 'Osbomb, Love & Supershop: Performing Sustainable Worlds' arising from her research, a public lecture by political scientist, Danielle Allen, and partnerships with the creative sector e.g. celebrated sculptor Anthony Bennett, whose *Sustainability Dancer* is now permanently installed on campus. Blake presented at the Sheffield Food Festival and the Doncaster Food Hack, while Phillips' AHRC-funded work was showcased at the Batley Theatre, Huddersfield and The Bradford Literature Festival.

Clark, Hammett, and Jackson have spoken at Geographical Association (GA) events and made podcasts for the GA website. Jackson gave an RGS-IBG Monday night lecture on food security and joined a panel discussion on the future of food (combined audience >800). Pering presented an RGS-IBG podcast, while Clark and Ely led a public engagement event at Dynamic Earth in Edinburgh and distributed the BRITICE glacial landform map to all UK secondary school geography departments. Clark has presented at the East Midlands branch of the Geological Society of London and to several regional societies. Bateman coordinated a Yorkshire Geological Society meeting, focused on departmental research. Rowan presented at the Royal Society Summer Exhibition and the Manchester Science Festival and >10 staff have written articles for *The Conversation* and other popular outlets. Finally, we organise the 'Headstart' summer school each year, for c.50 A-level students, as well as conducting regular outreach events for schools, including tutorials on interdisciplinary climate change research with KS4 students through the national widening participation charity The Brilliant Club.

Staff have made significant contributions to the **sustainability of the discipline** via all the major associations representing British Geography. Jackson chaired the RGS-IBG annual conference in 2016, while Blake, Hammett, Little, Pickerill, Krzywoszynska and Kleine have all convened sessions at this conference and Valentine served as an invited panellist in 2019. Jackson is Honorary Vice-President of the GA, and Phillips has spoken on the new A-level content at numerous GA events, having served on the A-level Curriculum Advisory Board, co-writing the 'Changing Places' sections. Martin Jones served as vice chair of the Regional Studies Association

while Pickerill chaired the RGS Participatory Geographies Research Group and serves on the HE Committee. Hammett is Secretary of the RGS Political Geography Research Group. Kleine has chaired AGMs of the RGS Digital Geographies Research Group since 2016. Clark serves on the REF2021 UOA-14 sub-panel (nominated by the RGS). We hosted the 2015 RGS Postgraduate conference when McGonigle gave the keynote address. Valentine serves on the Council of the Academy of the Social Sciences and chairs its nominations committee. She is an external assessor for the Royal Irish Academy Gold Medal, an international expert for the Dutch version of REF for Geography and Planning, and a panel reviewer of the School of Advanced Study for Research England. Valentine was also appointed as a Trustee of the Academy of Social Sciences, STEM Education Learning Board and the Assay Office.

Consistent with our strategic goal of contributing to the research base and supporting the vibrancy of the discipline, 17 staff have had **editorial roles** in leading geographical journals, spanning the discipline. They include:

- As *editor or co-editor*: Area (Bryant), Antipode (Pickerill), International Development Planning Review (Hammett), Geography (Jackson), Ocean Challenge (Bigg), Water Alternatives (Cleaver) and Territory, Politics, Governance (where Martin Jones was founding editor).

- As *associate or review editor*: Journal of Maps (Clark), Frontiers in Remote Sensing (McGonigle), Journal of Geophysical Research (Rowan), Geografiska Annaler A (Swift), International Association of Sedimentologists (Bateman), European Journal of Soil Science (Menon), Frontiers in Quaternary Science (Rhodes), Environmental Humanities (Krzywoszynska), Frontiers in Earth Science (Ng, Sole) and Frontiers in Environmental Science (Bryant).

Staff have also served on *editorial boards or guest editors* for >20 other journals.

We have served on 17 **grant review panels**. For example, Valentine chaired the Final Awards Panel for the British Academy's Newton Fund programmes (2018) and ESRC's GCRF Network Grants Commissioning Panel (2016-17). She also served on the Philip Leverhulme Prize panel for Geography and on the ESRC Evaluation Committee, Large Grant and Centres Review Panel, CDT Commissioning Panel, Research Methods Task and Finish Group and on ESRC's Research Committee (2015-2018) and Strategic Advisory Network (2018-present). Jackson chaired the commissioning panel for the ESRC-Brazil Nexus awards while numerous staff have served on peer review colleges for ESRC (Hammett, Jackson, Kleine); NERC (Bateman, McGonigle, Ely, Livingstone); EPSRC (Watson); AHRC (Phillips) and GCRF (Kleine). Staff have also served on funding panels for BBSRC and UKRI Future Leaders (Jackson); Carnegie Trust (Hammett); NSF-NERC joint programmes (Ng); NERC Large Grants, AXA Research fund, French Agence Nationale de la Recherche and Portuguese Fundação para a Ciência e a Technologia (Bigg); the RGS (Pickerill), Mount Everest Foundation (Clark) and the White Rose College of Arts and Humanities (Dubow).

We have given several national and international **keynote presentations.** McGonigle was an invited speaker at the Lindau Nobel Laureate meeting in 2019 in a joint presentation with Nobel Laureate John Mather. Jackson gave a keynote address at a White Rose event in Brussels attended by the Vice-Chancellors of York, Leeds, and Sheffield universities. Keynote talks have also been given at: the International Quaternary Association (Ely); European Geosciences Union (Bateman, Ely, Clark, Bryant); International Luminescence and ESR Dating conference (Rhodes); Quaternary Research Association, Geological Society and British Society of Geomorphology (Clark); International Symposium on Landslides (Petley); Irish Geographers' conference and

Intentional Communities conference (Pickerill); International GIS Conference (Kleine); RSA Latin American Regional Conference (Kanai); and American Association of Philosophy and Literature (Dubow). Cleaver gave keynotes at the Copenhagen Climate Workshop while Valentine gave thirteen invited keynotes, in seven countries, including the David M. Smith Lecture at the University of London.

Staff have been invited to speak at numerous prestigious institutions and universities including: Woods Hole Oceanographic Institution, Harvard, Shanghai Normal, Wollongong, Macquarie, Western Sydney, Tasmania, Melbourne, Bayreuth, Tubingen, Roskilde, St Gallen, Aarlborg, Aarhus, Bergen, Oslo, Roskilde, Oxford, and Cambridge.

Staff have **hosted 11 conferences** e.g., for the British Society of Geomorphology (Ely, Rowan, Bryant); NERC Arctic conference (Bigg, Swift, Sole); Windy Day workshop (Bateman, Bryant); National Luminescence Dating conference (Bateman, Rhodes); NERC COMET Volcanic Gas meeting (Pering); Re-discovering Soils (Krzywoszynska); Developing Best Practice for Ethical Research in the Global South (Lucy Jackson); The Future of Social Relations Prejudice and Togetherness in Times of Crisis (Valentine); and we are hosting the Quaternary Research Association annual meeting in 2022 (Ely, Clark, Bateman et al.). Finally, Phillips led the Georges Perec Symposium in Sheffield.

Staff have also convened sessions at key international gatherings including the EGU (Ely, Clark); INQUA (Clark); AAG (Kleine, Watson); Nordic Geographers and Postcolonial Studies Association (Phillips); World Congress of Rural Sociology (Little); Development Studies Association and the Latin American Studies Association (Kanai). Julie Jones was a Programme committee member for the International Conference on Southern Hemisphere Meteorology and Oceanography in Chile; Kleine served on the Senior Programme Committee for ICT4D conferences in Singapore, Ann Arbor and Ahmedabad; and Davies organised a symposium on Race, Space and Activism in Latin America, for the Institute for Latin American Studies.

Staff have reviewed **grant proposals** across a wide range of funding bodies including AHRC, BBSRC, EPSRC, ESRC, NERC, British Academy, Leverhulme Trust, Carnegie Trust, The Marsden Fund, National Geographic, The Royal Society, DFID, RGS-IBG, European Commission, European Research Council, NSF, AXA Research Fund, and for national funding bodies in a further 15 countries.

We have **reviewed for high-profile journals** such as Nature, Nature Geoscience, Nature Climate Change, Nature Communications, Nature Food, Science and Scientific Reports, in addition to >70 further physical geography and >80 human geography journals, plus scholarly books for Cambridge, Oxford, Edinburgh and Chicago University Presses, Bloomsbury, Palgrave and Routledge and book series for the RGS-IBG, Routledge, Sage, Edward Elgar and MIT Press.

We have provided **collaborative PGR training** with colleagues from Leeds, York, Aberystwyth, Liverpool, Hull, Oxford, Oslo, Southampton, Palermo, Cranfield, Newcastle, ETH Zurich and Brock, and delivered cross-disciplinary training with eight other Sheffield Departments. PGR training has involved non-academic partners including Water Aid, Carbon Plus Capital, UPGRO Hidden Crisis and UNESCO, and our PGR training was commended in the ESRC mid-term review of the White Rose Social Sciences DTC.

Finally, to underscore the strength of our research environment, Jackson and Valentine were elected as **Fellows of the British Academy**, Robinson became a Fellow of the Academy of Social Sciences and Jackson was elected as a Member of the Academia Europaea. Staff have also received numerous **prizes and awards.** Rowan received the European Geosciences Union

Outstanding Early Career Scientist award, delivering the prestigious Penck lecture to an audience of >400, as well as the President's Award of the Geological Society of London. Valentine received the RGS-IBG Murchison Award for her work on difference, equality and diversity, a Sage Prize for her article in Sociology (2017) and a Solidarity Award as an Editor of Gender, Place and Culture (2019). Cook was named a Young Laureate of the Rolex Awards for Enterprise. Rowan and Ely were (separately) awarded the Dick Chorley Award of the British Society of Geomorphology. Pering won an Outstanding Student award at the AGU fall meeting; Bateman, the Yorkshire Geological Society Sorby Medal; Livingstone, the Quaternary Research Association Lewis Penny medal; and Kanai, the Ashby Prize for most innovative paper in Environment and Planning A (2015 and 2019). Finally, Bigg won the Institute of Marine Engineering, Science and Technology Denny Medal for the best paper in the Journal of Operational Oceanography and Whaley won the Best Emerging Regions Article for Environmental Research Letters, both in 2019.