Institution: University of Oxford
Unit of Assessment: 14
1. Unit context and structure, research and impact strategy

1.1. Context

Geography at the University of Oxford is a large, vibrant and intellectually diverse community comprising the School of Geography and the Environment, its three research centres (Environmental Change Institute, Smith School of Enterprise and Environment and Transport Studies Unit) and several geographers based elsewhere in the wider university. We craft robust, imaginative and forward-looking answers to pressing questions about the environment, technology, geopolitics and socio-economic change. Collectively, our research seeks to innovate, shape and lead international agendas in the areas in which we have consolidated expertise and cultivated new research capacity since REF2014: particularly methodological and theoretical developments in human geography; global change analysis in physical geography; and collaborative research in human, animal and natural environments. Drawing on social and natural science expertise, much of our innovative work is interdisciplinary. Much of our research is designed to be of direct use and benefit to partners from beyond the academy, who join us in shaping and conducting our research and delivering and applying our findings. Engagement, knowledge exchange and impact are at the heart of our efforts.

Our approach is guided and framed by a research strategy that places the utmost value on academic freedom and intellectual curiosity, generating an environment that encourages adventurous approaches to research. Our staffing strategy has remained consistent: to recruit, support, develop and nurture a diverse, creative and sustainable research community. In July 2020 we comprised 103 Category A researchers (95.4 FTE, an increase of 41.6 from REF2014), 78 non-independent post-doctoral research assistants, 155 graduate research students, and 76 professional and support staff.

Post-REF2014 growth has encouraged collective dialogue about what constitutes an equitable and inclusive research environment. As a result, we have designed, implemented and embedded multiple new initiatives to support researchers across the School, including:

- a comprehensive range of career development support activities, continuing our 'research apprenticeship' approach to career development;
- processes for deepening our commitment to equality, diversity and inclusion;
- better governance and communication processes.

We aim to create researcher confidence by putting people at the heart of our research strategy, with structures to support people regardless of career stage, and to respond to their changing research needs and modes of enquiry (section 2). This creates a dynamic, inquisitive and – judging from our bi-annual Staff Surveys – happy research community committed to working with others in Oxford, the UK and internationally to understand and intervene in some of the most significant changes shaping the world today.

1.2. Overall structure

At the heart of geography in Oxford University (Figure 1) is the School of Geography and the Environment ('the School'), comprising the department of **Geography** and three research centres: the **Environmental Change Institute** (ECI, established 1991), the **Transport Studies Unit** (TSU, established 1973) and the **Smith School of Enterprise and Environment** (SSEE, established 2008; affiliated to Geography since 2013). There are a small but growing number of geographers in

the Department for Continuing Education, Oxford Internet Institute (OII), and the School of Anthropology's Centre on Migration, Policy and Society (COMPAS), as well as joint appointments with the School of Global and Area Studies and Continuing Education.

Cross-cutting the School, and embracing geographers in other departments, are seven **research clusters: Biodiversity, Ecosystems and Conservation; Climate Systems; Landscape Dynamics; Economy and Society; Political Worlds; Technological Life;** and **Environmental Interactions.** These provide thematic coherence for our research and impact activities, and engagement between researchers at all career stages from students to established academics, alongside academic visitors. Geographers participate in, and often lead, **research networks** across the University, with the School acting as the centre of interdisciplinary environmental research at Oxford.

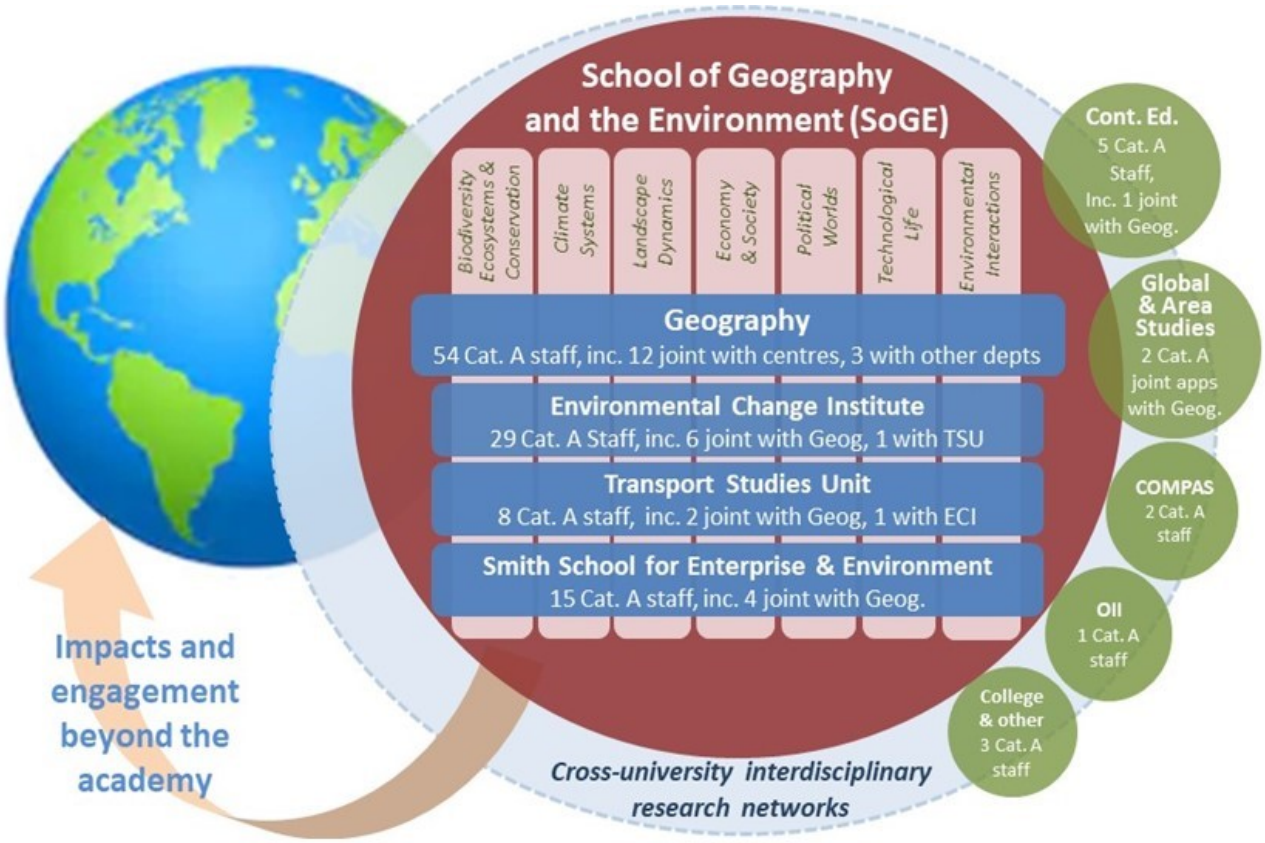

Figure 1. Geography at the University of Oxford.

Our research vision, embodied in our mission statement, is to be a world-leading innovator in geographical and environmental research, nurturing the freedom to pursue research that is both curiosity-led and contributes to solving critical societal and environmental problems. We aim to set research agendas, respond to external agendas, and conduct research of the highest possible calibre responding to the unique position of our discipline at the interface of natural and social worlds.

This assessment period has afforded opportunities for consolidation, expanded ambitions and activities, and increasing integration across our constituent parts. This has been greatly helped by core staff in the centres, including Directors, holding established academic posts, many joint with Geography. Vital for functionality and day-to-day research engagement, all parts of the School are housed in the same large physical space, the Oxford University Centre for the Environment in the

Science area, central Oxford. Since REF2014, growth in staff numbers and research income has continued in line with overall research and teaching needs and ambitions (Table 1).

Table 1. Strategic growth and change in Oxford Geography.

		RAE2008	REF2014	REF2021
Cat. A staff	headcount	29	56	103
	FTE	28.5	53.8	95.4
	early career researchers	10	17	24
	female	20.7%	28.6%	43.7%
Other research staff	Non-independent PDRAs	45.6	53	78
Doctoral degree awards	annual average	16	24	29
	total	114	121	203
Research income:	whole period	£13.2 mil	£31.6 mil	£66.9 mil
	annual average	£2,018,649	£6,321,723	£9,55,627
Number of:	research centres	2	3	3
	research clusters	5	5	7

1.3. Research and impact strategy including the next five years

To provide focus, we first formalised a research and impact strategy in 2010, with a full review in 2015, involving School-wide consultation. We carry out light-touch appraisals annually. The research strategy reflects our values and is fully integrated within the strategic plans of the School and research centres (Table 2).

Table 2. School strategic priorities, 2019-2022.

Priority	Link to REF
1. People, community, culture	Section 2
2. Research	This section
3. Teaching and learning	See section 2 regarding postgraduates
4. Communication and development	See section 4 regarding communicating impact
5. Infrastructure	Section 3

The 2015 review built on the strategic aims described in our 2014 REF5b submission, adding a further aim that, although implicit in practice, we felt needed explicit articulation: research integrity. Although we are a large unit, our strategy (Table 3) embodies the agility to respond to changing agendas, whether led by our researchers or externally-driven. Since REF2014, *what* and *how* we research has seen continuity as well as reflection and revision.

Table 3. Research strategic aims and indicators.

Aim	Indicators
1. Lead international research agendas in Geography and interdisciplinary Environmental Studies across the spectrum of natural and social science activities.	Internal structures supporting our research effectively. Winning externally competitive grants, funding innovative research. Producing high quality outputs. Leading research seeking solutions to key global problems. Research developing theory & methods.
2. Always conduct research with integrity, honesty and accuracy, producing results and interpretations that truly reflect the data and information they are based on.	Follow University of Oxford Policy on the Management of Data Supporting Research Outputs. Make research openly available through appropriate publication, data access and communications. Ethics procedures for all research with human & animal subjects.
3. Enhance the impact of our 'world class' research, making a positive difference to society and the environment.	Encourage and support all researchers to work towards impact. Develop long-term collaborations with non-academic partners. Create impact via a wide range of mechanisms.
4. Recruit and foster, in ways that enhance equalities of opportunity, the very best researchers across the spectrum of work at all levels.	All strategies and actions informed by equality considerations. Transparent recruitment practices. Career development support for all.
5. Attract excellent research students nationally and internationally and further enhance research training.	Diversity in application sources. Applicants win competitive scholarships. Students participate in training including via UKRI DTPs and CDTs
6. Sustain and enhance the resource base for communal research activities and for individual researchers and scholars, even in a period of anticipated financial constraint.	Value all research, regardless of funding needs. Opportunities for 'trialling' and applying research. Time for research. Investment in facilities. Professional research support for academic staff.
7. Encourage national, international and interdisciplinary research collaborations across the spectrum of our work.	School acts as a 'research hub'. Engagement in multinational interdisciplinary research. Visiting researcher programmes.

Over the next five years we aim to maintain a vital, sustainable, nurturing, flexible and creative working environment for all. **Collaborations and impacts beyond the academy** will occur by deepening existing engagements, many championed by our centres, and some by our leadership of investment in Oxford Net Zero from the University's Strategic Research Fund (see page 2 of the institutional-level environment statement for fund details). We will build new partnerships expanding fields where our research positively enhances lives, policies and the environment – particularly as global processes of transformation, degradation, fragmentation and dislocation extend and multiply. We will deepen our **interdisciplinary focus** in and beyond Oxford through further network activities, joint appointments and links with geographers in other departments.

Day-to-day activities will benefit from an enhanced, more spacious, workplace (section 3). We will continue to pursue **a more inclusive and diverse research community** as new appointment opportunities arise, including those linked to three senior staff retirements by 2026 (Patricia Daley, David Thomas, Rob Whittaker) (section 2). We agreed a full research strategy review during 2020 (deferred by COVID-19 disruptions to 2021). This will provide the opportunity to react to the effects of external changes (Brexit, COVID-19, etc.) that will require us to build funding resilience, assess postgraduate recruitment sustainability, and evaluate research foci in order to deliver excellent ethical, open and game-changing research.

1.3.1. Strategy development, implementation and monitoring

Research strategy, policy and practice are co-ordinated by the School's **Research Committee**. Chaired by our Director of Research (DR), membership comprises the Head of School (HoS), Senior Research Support Officer, research centre Directors, research cluster convenors, and other academic and fixed-term research staff representatives. The committee develops strategy considering its suitability relative to changes in the external research environment. It administers the Travel and Research Fund (£18,000 p.a., with centrally-funded staff eligible to apply for up to £1,000 p.a. for conference and other research support), the 'Inspiration Fund' (£20,000 in most years since 2016/17 for new/unusual research-priming and impact activities) and research cluster budgets (up to £3,000 p.a. per cluster). In April 2020 the Travel and Research Fund was rapidly repurposed when COVID-19 curtailed research travel, to provide a support fund targeting fixed-term researchers and postgraduates in transitioning to home working.

The **Laboratory and Field Committee** oversees research equipment and facilities, with an annual budget of £30,000 new spend, £15,000 maintenance. Membership includes academic staff, researchers, postgraduates and the senior Laboratory Manager. The **IT Committee** oversees computing infrastructure. Together these committees identify and propose new areas of technical investment to support research strategy implementation. The **Graduate Studies Committee,** chaired by the Director of Graduate Studies (DGS), supports research students and comprises the HoS, academic staff and graduate student representatives. The **Postgraduate Consultative Committee**, chaired by the DGS, gives research students a collective voice.

Our research strategy is enacted through the **centres, research clusters and networks**. Activity is monitored and reviewed by Research Committee, ensuring the research environment facilitates the highest quality research and impacts. The following subsections evidence strategy implementation since REF2014.

1.3.2. Research integrity

Our **Departmental Research Ethics Committee**, reporting to Research Committee, ensures all research abides by the University's *Academic Integrity in Research: Code of Practice and Procedure*, and works with the Central University Research Ethics Committee (CUREC) on particularly complex projects. The School offers training for all researchers going through the ethics process. Everyone has access to the Social Science Division's online research integrity course. We cultivate broad dialogue about research integrity and good practice. For those wishing to go beyond required and best practice minimum training, the Division hosts a thrice-termly discussion group engaging with live matters of practical ethics.

We also view open research as a key part of ensuring its integrity. To facilitate this, researchers are obliged to deposit all papers in the Oxford Open Access Repository, with the School supporting gold open access when possible. We strongly encourage making underpinning data widely available, and will develop this element further in the next research strategy review.

1.3.3. Support for impact initiatives

We recognise that fundamental research is vital for increasing the knowledge base, shaping future academic agendas and activities but not necessarily directly impacting beyond the academy. We also recognise that much of our research *does* have an impact and can make a positive difference beyond academia, in line with our third strategic research aim. The relation of our impact case studies to our impact strategy is described in Section 4.

Activities supporting impact include:

- Impact-guidance from the School's Senior Research Support Officer throughout this REF period. Since 2018 a Divisional ***expert impact facilitator*** has been embedded in the School, contributing further to impact development. We currently have ***four knowledge exchange fellows/officers***, one in the ECI and three in larger research projects.

- Ongoing ***career development workshops*** covering topics including GCRF, knowledge exchange and impact. These have been led by external and university experts, providing perspectives and actions enhancing research effectiveness and relevance beyond the academy. These have encouraged staff at all career stages to engage in impactful research.

- ***Widespread embedding of knowledge exchange*** in research, including 49 UKRI and HEIF impact awards totally £945,000, administered competitively by the Social Science and Mathematical, Physical and Life Sciences Divisions.

- Many School ***Inspiration Fund*** awards focussing on impact development from ongoing research.

- ***Support for GCRF bids*** including 14 awards from competitive university funds allowing preparation for full GCRF bids. For example, Dustin Garrick won £24,000 for a proof-of-concept study on Tapping Informal Markets for African Cities and Towns, leading to a Philomathia Foundation award and collaboration in an EU H2020 networking grant, plus ongoing work with the World Bank.

- Externally-facing ***policy forums and executive education programmes,*** directly informed by our research and run by the research centres, have enabled long-term partnerships with non-academic partners. Co-produced research projects have ensued, including one on stranded assets that is an impact case study.

- Significant participation in the ***Oxford Martin School*** (OMS), a transdisciplinary philanthropic organisation within the University, funding solutions-focussed research programmes to translate academic excellence into real-world impact. Since REF2014, 17 School staff, including three ECRs, have been directors, co-directors or partners in 12 major OMS programmes. One of our impact case studies, the Net Zero Carbon Investment programme, is an example.

1.4. Research framework

1.4.1. Centres

A significant part of post-REF2014 research growth has been driven by our centres (Table 4), with their government- and policy-facing approaches to global challenges.

Table 4. Research Centre growth.

Centre	FTE	
	REF2014	REF2021
ECI	16	23.6
SSEE	4	12
TSU	3	6.6

The **Environmental Change Institute** conducts impactful research in climate, ecosystems, energy, water and food, shaping activities addressing the most pressing environmental and sociocultural challenges in the UK and internationally. This includes leading the interdisciplinary 'Resilience of the UK Food System in a Global Context' programme (PI John Ingram) within the cross-government programme on food security research, and the UK's Centre for Research into Energy Demand Solutions (CREDS, Director Nick Eyre). CREDS is a multi-institutional collaboration (14 UK HEIs, 8 industry partners) transforming energy demand towards a low carbon society. The NERC-funded 'Managing the Risks, Impacts and Uncertainties of Droughts and Water Security' (MaRIUS) project, (PI Jim Hall), is a collaboration of 6 universities and 5 industry partners, taking a risk-based approach to drought and water scarcity to inform management decisions and prepare households.

Internationally, climate change remains a major element of ECI research. Four staff are authors in the Intergovernmental Panel on Climate Change 6th assessment cycle (Myles Allen, Eyre, Fredi Otto, Lisa Schipper). Climate research also interfaces strongly with activities in ecosystem research, for example through international collaborative projects on tropical forest ecosystems (Yadvinder Malhi and others).

The Transport Studies Unit builds on a long-standing global reputation for research excellence on transport policy and individual mobility. Increasingly research is concentrating on the key issues urban mobility systems are facing, worldwide. Research is conceptually interdisciplinary and methodologically eclectic, as no single research tradition can fully grasp these issues. Transport is addressed through the lenses of energy, climate and environment; politics, power and governance; everyday life; and justice; health and wellbeing.

An example of this approach is TSU's contribution to the £7million GCRF-funded PEAK Urban project (Tim Schwanen Co-I): Oxford collaborates with the African Centre for Cities (Cape Town), Indian Institute for Human Settlements (Bangalore), EAFIT (Medellin) and Peking University (Beijing) to train and engage a new generation of urban scientists, conducting research to develop and shape SDG-focussed urban policymaking. Jennie Middleton's Fell Fund project on everyday mobilities of visually impaired young people, engaging with Transport for London's aim to improve access to public transport, illustrates TSU work on wellbeing.

The Smith School for Enterprise and the Environment has more than doubled in size since REF2014, growing research and executive education addressing major environmental challenges by bringing public and private enterprise together. Research embraces experts from industry, consultancies and enterprises with academics, to shape business practices and government policy towards net-zero emissions and sustainable development. An interdisciplinary approach to

environmental and social challenges focuses on six areas: water, climate, energy, biodiversity, food and the circular economy.

SSEE is a partner in many innovative projects, with a central role in six OMS research programmes. Others include the Long-Life Protection project led by Sarah McGill, funded by Zurich Insurance and building on pensions work by Gordon Clark (now retired), and REACH. This consortium (academic, practitioner and policy partners, including eight water security observatories in Bangladesh, Ethiopia and Kenya) is led by Rob Hope and Katrina Charles with DFID funding (£22.5million over nine years). REACH aims to provide decision-makers from governments to municipalities in Africa and southeast Asia with robust and accessible evidence on how to sequence investments and policies to improve water security for 5 million people.

1.4.2. Clusters

Our clusters are porous, flexible thematic groupings for research and impact activities. Adapting to new appointments and growth since REF2014, our *Technological Natures* and *Transformations* clusters evolved into three: *Economy and Society, Political Worlds,* and *Technological Life.* A new *Environmental Interactions* cluster was formed as a forum for policy-related and other impactful research at the society-environment interface. As a result, the large *Climate Systems and Policy* cluster has refocussed to address *Climate Systems.* The *Biodiversity, Ecosystem and Conservation* and *Landscape Dynamics* clusters have retained their foci.

All researchers align themselves to one or more cluster. Importantly, clusters provide linkages across all career stages from graduate students to professors, as part of our 'research apprenticeship' approach (see section 2.1.1). Clusters appoint convenors who, with a small annual budget, organise activities and events according to members' wishes, including seminar series, reading groups, workshops, conferences, weekly coffee mornings and social events.

Biodiversity, Ecosystems and Conservation addresses scientific and socio-scientific dimensions of the biosphere. Pam Berry, Malhi, Whittaker and Richard Grenyer respectively continue to lead research in ecosystem services (joined by Alison Smith); tropical forest systems (with nine NERC grants [c.£3million] and Imma Oliveras and Erika Berenguer adding new expertise on tropical fires); island biogeography; and global conservation and macroecology. The appointments of Marc Macias-Fauria, Lisa Wedding and Nikki Stevens have extended the research to the Arctic, oceans and savannas. Connie McDermott and Mark Hirons have added environmental governance and social science expertise, leading to projects on Ghana and Ethiopia's socio-ecological landscapes (NERC/DFID, WWF), and Nepal and Myanmar on governance (Rockefeller Foundation funding). The cluster's extensive range of field, laboratory and technological expertise and weekly meetings stimulate new, often cross-cutting, initiatives. These include Fell Fund start-up awards: Malhi and Macias-Fauria to investigate megafauna rewilding in Siberia, and Wedding to apply remote sensing technologies to drive adaptive coral reef management.

Climate Systems focuses on physical climate research, impacts and adaptation to climate change, and mitigation policy and science. Fundamental work on climate system functioning by Richard Washington and new appointment Neil Hart has led to progress on the dynamics and interactions of system components in the poorly-understood central and southern African regions through a series of NERC-funded projects. These include model evaluation as a central focus, permitting continental scale simulations. Simon Dadson and colleagues have implemented river flow modelling capability within the Meteorological Office Unified Model. Washington and Sebastian Engelstaedter have continued research into the interactions between climate and atmospheric dust. Additional to previously mentioned ECI/SSEE research, a significant body of work on global warming impacts on the climate system includes Allen, Otto, Karsten Haustein and others. Outreach includes an Inspiration Fund project (leader Tina Fawcett) to make climate change science accessible in state schools.

Landscape Dynamics focuses on geomorphological processes, long-term landscape dynamics and human interactions, with research on hydrological systems expanding through Louise Slater's appointment. Her Fell Fund start-up award for river behaviour and flood prediction builds on NERC collaborations with Loughborough and Brighton. The Oxford Resilient Buildings and Landscapes Laboratory (OxRBL), led by Heather Viles, investigates holistic approaches to building and heritage conservation in the face of climate change. UK-focussed research (English Heritage funding) has expanded significantly since REF2014 to investigations in China (Dunhuang, Getty Trust) and the Middle East, where rapid development and global warming threaten heritage. Drylands continue as the focus of aeolian process research, including novel approaches to the origin of dunes (Giles Wiggs, NERC), and for Quaternary environmental research (Thomas, and the Oxford Luminescence Dating Laboratory, Sallie Burrough and Richard Bailey). Since 2016, new Sandscapes, Rockscapes and Hydrology seminar series contribute to developing cross-cutting initiatives, including geoarchaeological research in African palaeolake and Indian fluvial landscapes (Leverhulme) and applying aeolian research to improve desert railway construction (Horizon2020).

Environmental Interactions focuses on the dynamic relationships of coupled human-environmental systems, working with a range of actors from intergovernmental bodies (e.g. UNEP), through government agencies (e.g. US NOAA), charities and NGOs (Ocean Conservancy, Nature Conservancy), and private sector corporations. In addition to CREDS, MaRIUS, and REACH, work includes the GCRF programme on Social and Environmental Trade-offs in African Agriculture (SENTINEL) led by Monika Zurek, conducting research targeting food security while protecting biodiversity and promoting social equity, and continued work on smart meters led by Sarah Darby and supported by DECC. In ocean resource management, the Complex Human-Environmental Systems Simulation Laboratory (Bailey and colleagues), uses cutting-edge computational methods to develop science-based policy advice. This includes supporting US and Indonesian governments to improve international fishery enforcement efforts and protection of the high seas, and a leading role in the 2020 Pew Institute's *Breaking the Wave* report on ocean plastics.

Political Worlds asks how politics and power are constituted in and across space and place. The cluster links research on relationships between geographical knowledges and regimes of power, geographies of the South, and postcolonial, feminist, decolonial and anti-racist work. An extensive programme of reading groups, seminars and open workshops explore theoretical aspects of political geography, critical and feminist geopolitics, critical race theory, geographies of resistance, and geographies of war and peace. These initiatives deepened work theorising histories of, and approaches to, geopolitics (Ian Klinke and Fiona McConnell), grassroots perspectives on power and resistance (Daley, Alex Vasudevan, Sneha Krishnan, Amber Murrey, Anna Lora-Wainwright, McConnell); anticolonial and decolonisation geographies (Daley and Murrey), peace (Daley and McConnell), postcolonial knowledge production (Krishnan), class inequalities (Danny Dorling), feminist and queer theories (Krishnan); critical race scholarship (Daley and Murrey), and geopolitics in the margins (McConnell). Cluster members have gained funding from the British Academy, ESRC and the Fell Fund. The cluster has links with the University's Refugee Studies Centre; Oxford Research Centre in the Humanities; Department of Education; OII; African Studies Centre and COMPAS. Members have been at the forefront of developing innovative approaches to digitisation, including more environmentally-sustainable South-North collaborations and decolonising digitised approaches to knowledge-sharing.

Technological Life explores how nonhuman processes and things (e.g. plants, animals, data, microbes, floods, infrastructure, and atmospheres) participate in shaping forms of life. In tracing these links, it aims to produce both theoretical and practical insights into the natures of the lived environments in which urgent political and ethical issues are conditioned, contested, and governed. Events have included workshops on 'Experiment', 'Volatile Earth', 'Mapping Microbial Ontologies' and 'Atmospheres'. Members are generating innovative understandings of digital technologies and infrastructures, including Schwanen and Brendan Doody on automated vehicles (EPSRC; British Academy), Lora-Wainwright on e-waste in China (Leverhulme) and Gillian Rose on smart cities (ESRC). The cluster hosts Derek McCormack's longstanding work on atmospheres (British Academy) and Rose's work on digital subjectivities, alongside projects focussing on nonhuman life,

exemplified by Jamie Lorimer on Anthropocene rewilding (British Academy), and probiotic life and bacteria (ESRC), Marion Ernwein on urban vegetal life (Fell Fund) and Beth Greenhough on animals in scientific research (Wellcome Trust).

Economy and Society examines the relationship between economic change, social transformation and economic and social justice. The cluster has organised and co-hosted an extensive programme including reading groups, Social Justice and the City seminars and workshops on Aggressive Architectures, Emotions and Capitalism and Subaltern Geographies. These events have helped develop our commitment to the study of spatial inequality (Dorling), uneven urban transport access (Anna Plyushteva and Nihan Akyelken), urban precarity (Vasudevan) and transnational migration. The cluster hosts longstanding research in the geographies of enterprise and financialisation, including Darek Wójcik's work on the global financial landscape (European Research Council) and Cameron Hepburn's research on economic sustainability. Other work focuses on resource extraction and environmental governance (Ariell Ahearn and Caitlin McElroy). Impact, outreach and the development of research committed to working with and alongside local communities is a major focus of the cluster. This includes collaborative work on care and austerity (Middleton), net-zero carbon transitions (Hepburn) and participatory action research on platform economies, digital labour and fair working conditions (Mark Graham).

1.4.3. Networks

Networks at Oxford maximise cross-disciplinary capabilities for responding to calls for outward-facing impactful research. The Oxford Networks for the Environment (ONE) initiative was set up in 2012 to mobilise expertise in science, technology, business and society. Three of five ONE networks are Geography-led: climate (Allen), energy (Eyre) and water (Slater), with members active in the other two, food and biodiversity. Malhi directs the inter-departmental Oxford Centre for Tropical Forests. Illustrating their value, the Water Network has grown from a 2011 £48,000 Fell Fund priming grant to generate 18 international collaborations (including REACH) in the REF2021 period, worth £16.5million in the School and far more across collaborating institutions. Energy and climate have similar origins and success (almost £12million and £3.5million respectively). Recognising these multiplier benefits, the School has made Inspiration Fund awards to further develop outward-facing networks, in financial geography (led by Wójcik), heritage (Viles) and the Oxford Polar Forum (Macias-Fauria).

2. People

2.1. Academic staff

Our Category A posts comprise:

1. fixed-term researchers on funded projects (FTRs)
2. fixed-term Department Lecturers (DLs) and MSc Course Directors (CDs) who both teach and research
3. academics appointed to Associate Professorships (APs)
4. APs promoted to personal chairs (full Professor)
5. Research Professors and Statutory Professors (full Professor)

Since REF2014, Category A staff numbers have almost doubled (Table 1), with 29 permanent posts rising to 40, and FTRs from 27 to 63 (Table 5). The proportion of female academic staff rose from 28.6% to 43.7%. Half of our staff are from the UK, and a quarter each from the EU and the rest of the world.

Table 5: Permanent and fixed term Category A staff.

	REF2014	REF2021
Fixed-term researcher, DL and CD	27 (48.2%)	63 (61.2%)
women	10 (37.0%)	30 (46.1%)
BAME (self-declared)	1 (3.7%)	5 (7.6%)
Permanent Associate and full Professor	29 (51.7%)	40 (38.8%)
women	7 (24.1%)	14 (35.0%)
BAME (self-declared)	2 (6.7%)	4 (10.5%)

The need to diversify our community, as well as the large increase in fixed-term researchers (many of whom are also ECRs), has prompted a step-change in career development support since 2014.

2.1.1. Academic staff development strategy

Aspiring to be a world-leader in research requires a robust and reflexive staffing strategy capable of supporting researchers at every career stage to achieve their very best. 'People, Culture and Community' is the first of our five overarching strategic priorities, and our third research strategy aim is to **recruit and foster, in ways that enhance equality of opportunity, the very best researchers**. We are particularly attentive to supporting ECRs and our research apprenticeship approach provides appropriate line management, mentorship, role models, training and experience to enhance their progress (section 2.1.3).

The Research Committee (section 1) identifies the support necessary to deliver the inclusive and nurturing environment that underpins excellent research. For example, it identifies SoGE-specific research training (section 2.1.2) and in 2017 established internal peer review to support grant applications.

The School's Equality and Diversity Committee (EDC) enacts our commitment to **equality, diversity and inclusion**, and career development opportunities for all. It meets twice termly, supported by our Equality and Diversity Officer (EDO, 0.5 FTE). Other members are the HoS, Divisional Equality and Diversity Officer and three each from established academic staff, research staff and ECRs, support staff, and students. Current membership comprises 9 women, 6 men. All School committees are tasked with considering the equality and diversity implications of their activities.

EDC was established in 2015 following a School commitment to improve gender equality. The first two years focussed on developing an **Athena SWAN** Action Plan, gaining us a **Bronze Award** in 2017 (our Silver application will be submitted in April 2021). The action plan has three main goals:

1. Increasing the representation of women in our academic staff by:
    - forming gender-balanced search committees and requiring all staff involved in staff recruitment to undertake **implicit bias training**;
    - proactively advertising vacancies as widely as possible;
    - holding all meetings and as many academic events as possible at **family-friendly times**.

2. Improving career progression through:

    - a **mentoring scheme,** for academic and research staff and doctoral students. Half of all academic staff now have a mentor;
    - **Personal Development Reviews** for all staff, relaunched in 2017;
    - an **Inclusive Conference Guide** helping event organisers promote diversity in attendance and inclusive participation. We expect Geography events to abide by the Guide's principles, ensuring visible role models for all people with protected characteristics;
    - a £7,500 p.a. budget, additional to University provision, for training activities, to which all staff can apply;
    - encouraging applications to the University's **Returning Carers' Fund**, supporting the research of staff who have taken a minimum six month break for caring responsibilities. Returning carers are also a priority area for the Fell Fund.

3. Improving the working environment through:

    - a **Privacy Room** for feeding and changing babies, opened in 2018;
    - four trained **bullying and harassment advisers,** whose availability to staff and research students is regularly promoted. We have delivered Responsible Bystander training twice since 2014;
    - termly **well-being sessions**, introduced in 2019, facilitated by a trained counsellor and taken up by 26 people;
    - the use of Divisional HR and University occupational health and counselling resources to support staff living with long-term physical or mental illness;
    - a full range of **flexible working** options, including career breaks, buying additional annual leave, carers' leave, fertility treatment leave, and generous parental leave options. Flexible working is encouraged, with over three quarters of our staff opting to do so;
    - changes in **communication** and **governance**, described below.

These actions have succeeded in increasing academic staff gender diversity. Nine of thirteen permanent appointments since REF2014 are women, and two identify as people of colour. Two female FTRs have been promoted to AP (Charles and Darby) and Daley and Lora-Wainwright have been promoted to personal chairs. Viles was promoted from a personal chair to Research Professor.

EDC's remit has been expanded to address equality and diversity in relation to protected characteristics other than gender. In summer 2020 many of our students and staff were galvanised by the Black Lives Matter and Rhodes Must Fall campaigns to propose a number of changes to our research and teaching practices: EDC is facilitating their implementation, supported by an Anti-Racism Working Group of over 40 staff and students. EDC has also focussed on inclusivity, now SoGE is so large, through:

- community. Monthly coffee mornings (online in recent months). Some of these celebrate for example LGBT History Month;
- communication. Since 2018 we have termly (and during the COVID-19 pandemic, monthly online) all-staff meetings, organised by the EDO and chaired by the HoS. Open to all academic and support staff, there are on average over 70 participants at meetings, providing a gateway for ideas and suggestions to enter the School's formal decision-making structures. We have also initiated a newsletter for all staff, and the HoS updates all staff and students after every School Committee meeting;

- governance. It became evident during Strategic Plan discussions that the growth in FTRs required a change in our governance processes. We therefore established a FTR Forum in 2019, providing a mechanism for raising issues directly with the appropriate committee and/or HoS.

Finally, the University runs a staff survey every two years (administered in the School by the EDO) to monitor staff experiences of professional development and the working environment. Compared to 2016, the most recent survey (2018) revealed more staff being mentored and more feeling confident about reporting any bullying and harassment to the School's advisers; 90% of the School's staff were satisfied or very satisfied in their job, and flexible working was especially highly valued.

2.1.2. Academic staff development processes

Induction All joining academic staff, regardless of career stage, participate in induction activities designed and coordinated by our HR team. The School intranet is a repository for a wide range of information, resources and policies relevant to School research activities.

Probation Following University policy, permanent staff serve a five-year probation period (relaxed in July 2020 to six years for those impacted by COVID-19), during which a Personal Advisor (a colleague) regularly meets the new appointee to discuss progress against confirmation criteria. Following formal review, the Division confirms appointment to the Employer-Justified Retirement Age. The School avoids asking new recruits to take on significant administrative roles during probation, partly explaining the relative lack of women in current committee leadership roles. We do, however, encourage research leadership compatible with career aspirations; e.g. Slater leads the University's Water Network, while Krishnan and Murrey share convenorship of the Political Worlds research cluster.

Mentoring After surveying all staff regarding ways to improve the quality of their work experiences, we established a mentoring scheme for all staff and doctoral students in 2017, managed by the EDO and building on our research apprenticeship vision. New recruits are encouraged before arrival to sign up for mentoring. We run annual sessions to prepare individuals to become mentors. Since 2017, 42 staff have signed up as mentors (22 women, 21 permanent staff) and 78 have opted to have a mentor (58 women, 39 FTRs). Female-identified staff in leadership roles also have access to the University's Senior Women's Mentoring Network.

Permanent academic staff undertake a **Personal Development Review** with the HoS. Recent Heads have seen this as an important opportunity to explore personal aspirations, address any challenges faced by colleagues, and plan sabbaticals and promotion applications over the longer term. FTRs are offered an annual PDR with their line manager, allowing two-way discussion of all aspects of career development.

Geography offers **professional training, development and support** as a core part of staff development at all career stages. Some are delivered by the University and Division. The University's People and Organisational Development unit (POD) offers generic training on a wide range of topics. The Division's Research Office offers training in the social sciences, and physical and environmental geographers have access to Mathematics, Physics and Life Sciences Division training. The School provides training tailored to our specific needs. For example, our 2018 staff survey, feedback from appraisals, PDRs and mentors evidenced a need for more research team leader training in **people and performance management skills**; during autumn 2019, we designed and delivered a bespoke suite of people management sessions, attended by 50% of academic and FTR line managers.

2.1.3. ECR support

In addition to benefiting from the support above, our research apprenticeship model ensures that other ECR development needs are identified by line managers and through mentoring. Box 1 exemplifies ECR successes. In addition, we have three further forms of support:

1. ECRs are encouraged to gain grant application skills, with the Division holding regular grant writing workshops and on specific funding calls. Where funder eligibility criteria allow (e.g. NERC), we encourage inclusion of ECRs as Researcher Co-Investigators to acknowledge their significant inputs to proposals and projects. Malhi has included 3 Researcher Co-Is on NERC applications, while 10 of our 24 ECRs have been PIs on their own grants, with the University's Fell Fund prioritising ECR pump-priming bids.

2. We encourage ECR Fellowship applications from researchers already at or beyond Oxford, prioritising support from our internal grant peer review scheme. Since REF2014 we have hosted 2 ESRC Postdoctoral Fellowships (Ahearn and Pettit, 2 more starting in October 2020), a Leverhulme Early Career Fellowship (Jasper Montana), 4 BA Postdoctoral Fellows (Joe Gerlach, Maan Barua, Thomas Jellis, Doody), an ESRC Future Leader (Karg Kama), 8 Marie Curie Fellowships (Nevan Fuckar, Yu Mo and Nadine Strauss in-post on the census date), 2 NERC Independent Fellowships (Ben Blonder, Macias-Fauria), 2 Trapnell Fellows (Burrough, Stevens), one EPSRC Fellowship (Phil Grunewald) and one ERC Starter grant (Barua).

3. School-wide, senior researchers support ECR media engagement. Media training is provided and all researchers are supported by communications staff to develop skills, including drafting press releases, writing for outlets such as *The Conversation*, pitching op-eds, and participating in podcasts, radio and television interviews.

Box 1. Research apprenticeship trajectories and success

Seven ECRs returned in REF2014 have moved to permanent academic posts: Liana Anderson (INPE & Acre Federal University, Brazil), Barua (Cambridge), Chris Doughty (North Arizona), Bradley Garrett (Sydney via Southampton), Ben Hennig (Iceland), Rachel James (Bristol), James King (Montreal) and one, Tehri Ruitta (Imperial), to a postdoctoral fellowship. Other ECR leavers moving to lectureships/fellowships include Gerlach, Jellis and James Palmer to Bristol, Ben Blonder (UC Berkley), Daniel Bos (Chester), Kama (Birmingham), Jason Doherty (Edinburgh) and Carl Bonner-Thompson (Brighton).

Other REF2014 ECRs have moved to more senior positions within the School. Klinke is now an AP, Otto is now ECI Associate Director and Schwanen is TSU Director, all appointed in open competition. More recent ECRs won APs in Continuing Education (Akyelken) and Continuing Education/Geography (Hopkins).

2.1.4. Staff at other career stages

We strongly encourage established staff to pursue research development opportunities. Since REF2014 two Philip Leverhulme Prizes (Lora-Wainwright, McConnell), an ERC Consolidator Fellowship (Wójcik), 3 BA Mid-Career Fellowships (Lorimer, McCormack, McConnell) and an ERC Consolidator (Powell, now Cambridge) have been awarded. The ECI has also hosted two Leverhulme Visiting Professors. We also encourage retiring academics to maintain connections with

the School. Linda McDowell and Judith Pallot both won Leverhulme Emeritus Fellowships to fulfil their research plans.

2.1.5. Sabbatical leave

All permanent academic staff are entitled to one term's **sabbatical leave** in every seven. Advanced planning is encouraged in mentoring/PDR meetings. Plans must also be discussed with the HoS and formally agreed by the Head of Division, with a report submitted on completion.

2.1.6. Recruitment policy

Our staff composition has changed significantly since REF2014 through retirements, movements to other institutions, strategic growth and recruitment. Staffing strategy and staff development is led by the HoS working with key stakeholders including Centre Directors, the Director of Research, the School's Head of Administration and Finance, the EDO and HR Manager, and the School Committee, as well as in colleges, the Division and University when relevant. Our academic staffing and recruitment strategy is driven by four aims:

- increasing the diversity of our academic staff
- deepening our international research excellence
- embedding collaborations
- maintaining and enhancing teaching/educational excellence

Equality and diversity considerations are built into our recruitment practices. All appointment panel members undertake anti-implicit bias training. Oxford University may appear an unusual environment for some potential applicants, so in recent years we have made concerted efforts to share Professor and AP vacancies as widely as possible through a variety of networks. We have also implemented search committees that have been especially valuable in encouraging early career, non-Oxford, and more diverse applicants. All recruitment materials make it clear how our processes are accessible to applicants with disabilities. All-male shortlists for AP or Statutory Professor posts are discouraged and must be justified to the Division if they occur. Table 5 highlights recent progress in diversifying appointments.

We are aware though that there is much more to do, especially in relation to our limited ethnic and racial diversity. We also currently lack mid-career women and women in committee leadership roles, in part due both to retirements since REF2014 (McDowell, Pallot), but also because of progression into university roles: Sarah Whatmore became Head of the Social Science Division (retaining 0.2 FTE in Geography for research) and Viles Divisional Associate Head for Research in 2020. While currently only 4.2 FTE of SoGE's 17 full professors are women, Rose is the third female HoS in succession and, building for the future, seven of the ten APs appointed in the last five years are women. Our Athena Swan Silver Award application will guide us in addressing the School's current diversity concerns and our visions for a more equitable future.

Research excellence is specified in all Geography academic job descriptions, with appointments expected to complement and extend our research profile. Since REF2014, the School has made thirteen permanent appointments at senior and earlier career stages: Rose (Statutory Professor), Hopkins, Klinke, McConnell, Murrey, Janey Messina, Slater, Schwanen, Vasudevan and Wedding (all APs) have been appointed to vacancies, and three new AP positions filled by Greenhough, Krishnan and Macias-Fauria. As well as the TSU and SSEE appointing new Directors, Hall completed eight years as ECI Director in 2019, replaced by new appointment Michael Obersteiner, moving from 0.2 to 1.0 FTE in 2021.

With ten staff in their first five years of permanent appointment with us, we will likely use at least two of three retirement vacancies by 2026 to appoint more senior academics, with a view to improving the diversity of those in leadership roles.

2.1.7. Exchanges between business, industry and public or third sector bodies

The Social Sciences Division has hosted the University's Policy Engagement Team since January 2019, providing advice and support to members of the Oxford Policy Engagement Network (OPEN) and other researchers. This support comes in the form of project design, assisting applications for fellowships and other placements, as well as brokering interdisciplinary connections and links with policymaking communities in and outside the UK.

High profile HEIF-funded Open Policy and Business Engagement Partnerships, as well as IAA funded secondments, include Whatmore (improving social science research impact in DEFRA), Smith (Oxfordshire growth area evidence-based planning), Ahearn (contradictions between agriculture and mining policies in Central Asia), and Hall and Ives (secondment to the National Infrastructure Commission). During this period Berry has been on secondment to DEFRA for 0.3 FTE and Dadson to the Centre for Ecology and Hydrology for 0.8 FTE.

2.1.8. Rewards for research and impact

The School runs an annual internal **Recognition and Reward scheme** for FTRs (and support staff) to reward research and impact excellence with a one-off merit payment or an increment increase. The HR Manager reviews this process to ensure awards reflect staff diversity, with 43 awards to FTRs since REF2014. The University manages **promotions** and discretionary awards to APs and Professors, and processes for awarding the title of AP to experienced FTRs and promotions to personal chairs. The HoS reviews and supports potential applicants, ensuring equal consideration of all colleagues. Since REF2014, 5 FTR staff have been awarded the title of AP and 9 staff have been promoted to personal chairs (Bailey, Dadson, Daley, Eyre, Hope, Lora-Wainwright, McCormack, Schwanen, Wiggs).

Geography's public engagement success was recognised with Whatmore's appointment as the University's first Champion of Public Engagement with Research (2015-17), leading the development and delivery of the University's PER Strategic Plan. Lorimer has been a member of the University's PER Committee and Academic Advisory Network since 2017. The University runs three biennial competitions to recognise impact: Lorimer won a Vice-Chancellor's Public Engagement with Research award in 2019 for a film and exhibition sharing research on bacteria; Hope won the Vice-Chancellor's Innovation Award in 2018 for a smart water pump, and Raghav Pant was Highly Commended in 2020 for work on infrastructural resilience. The Vice-Chancellor's Diversity Awards shortlisted our Inclusive Conference Guide and the Tomorrow's Oxford Heads project in 2020.

2.2. Research students

Our fifth strategic research aim is to **attract excellent research students nationally and internationally and further enhance research training**. Over this REF period we have awarded over 200 doctorates. None are research-based professional doctorates. We have a large and diverse body of postgraduate research students, playing a full part in our activities including through the research clusters. Research students have their own Joint Consultative Committee chaired by the DGS, and a representative on the School Committee.

2.2.1 Recruitment of research students

We recruit on average ~30 DPhil (doctoral) and 6 MPhil students a year from a wide range of disciplines. Intake increased through the REF2021 period: a total of 240 research students included 174 non-UK nationals from 54 countries (Figure 2). 43% were BAME, as were 12% of UK research students. We also have an active programme of visiting research students from around the globe, usually spending one year in SoGE.

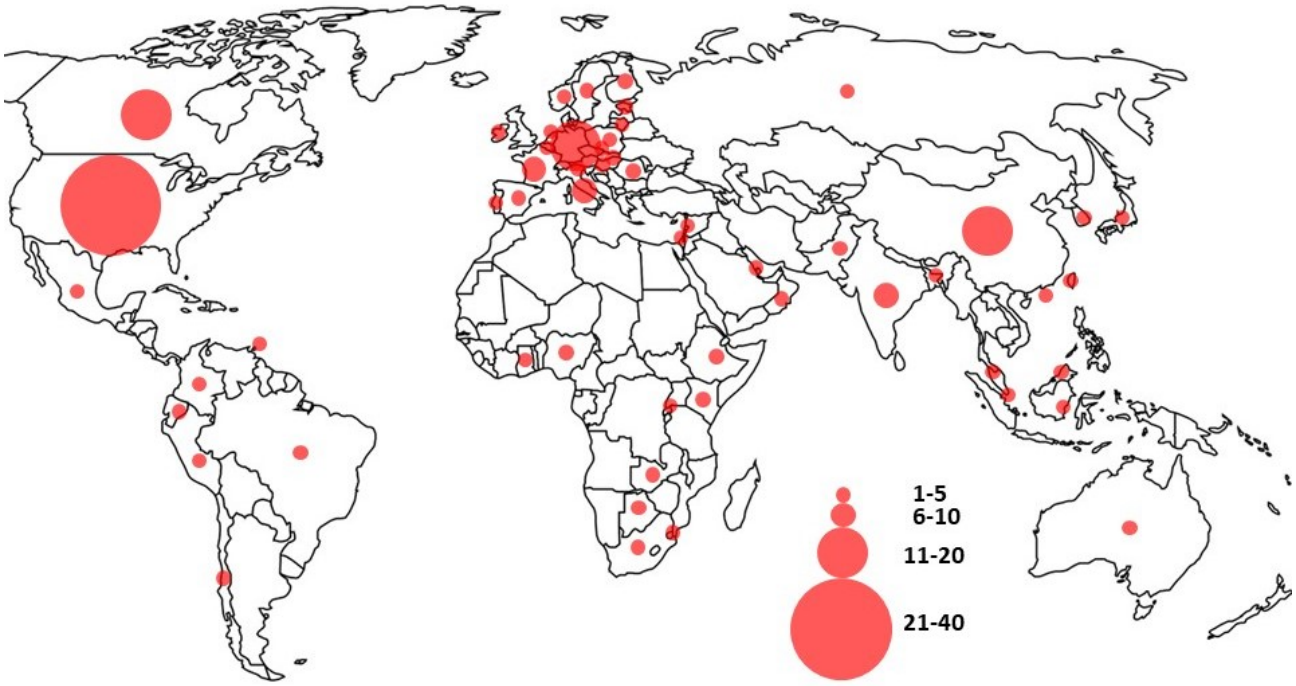

Figure 2. Country of citizenship of non-UK research students in the assessment period.

With input from our doctoral students, we have made the application process for postgraduate research more transparent. For direct applicants to the School, recruitment is based on an application form, research proposal, submitted writing and academic references. We seek evidence of potential research excellence in terms of previous degree achievements, referee comments and submitted work. We take account of our supervision capacity and any equipment and training required for individual projects. Students entering via doctoral training programmes may have additional assessments, including interviews. Regardless of entry mode, applicants commonly engage in pre-submission enquiries and discussion with potential supervisors. On being awarded and accepting a place, doctoral students are allocated to a college either of their choice or through open placement.

Many non-UK PGRs have won scholarships or awards from their home countries. Others secure funding through competitive programmes (e.g. Commonwealth Scholarships), or Oxford-specific schemes (e.g. Rhodes and Clarendon Scholarships). For the latter, we nominate our best unfunded applicants to a University-run process. The REF2021 period saw a significant increase in PGRs with competitive research council awards, via the three UKRI doctoral training programmes we participate in (ESRC, NERC, EPSRC-Science and Engineering in Arts Heritage and Archaeology).101 doctoral students secured funding from UK-administered sources, 52 from RCUK (Figure 3).

Following the university's decision to allow part-time doctoral study, we admitted six part-time students in 2018 and five in 2019. Geographers in the Department for Continuing Education supervise part-time DPhil students on their Sustainable Urban Development programme which is run jointly with Oxford Brookes and UCL; there are currently 22 students. Part-time study further diversifies our doctoral cohort, particularly in terms of allowing professionals to study with us, broadening the peer learning experience of all research students.

Disability does not affect the chances of application success, with support offered before and during study from the University's Disability Advisory Service. This confidentially shares student details and any special adjustments required in the working environment with our Disability Co-ordinator.

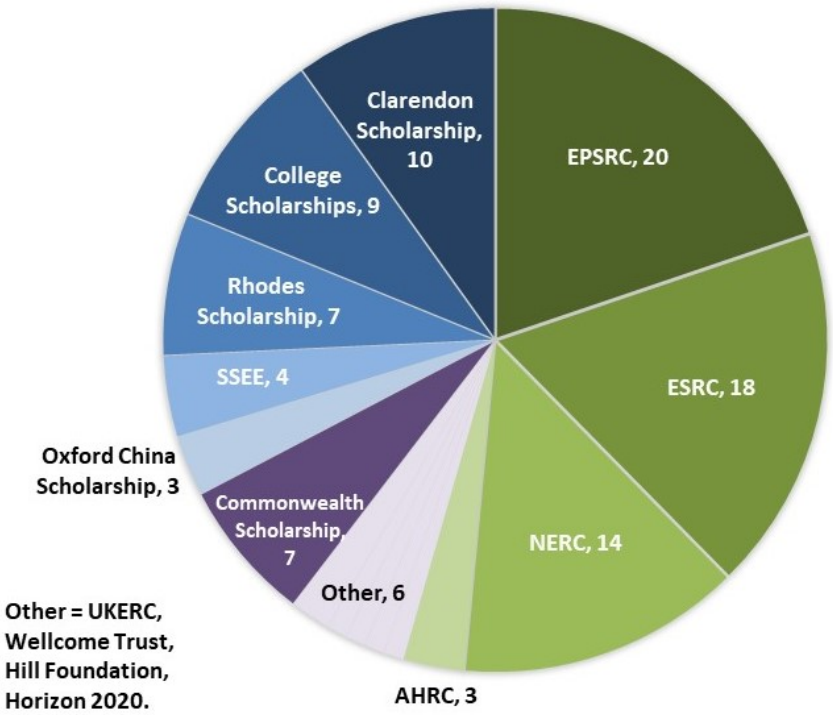

Figure 3. Doctoral studentship and scholarship sources.

2.2.2. Research student monitoring and support

Students normally have two academic supervisors, some more, including relevant specialists from other departments or beyond academia; all students also have a college advisor who acts as a third party, mentoring and, if necessary, dealing with any supervisory issues. All new academic staff undertake online training in doctoral supervision to ensure they understand university processes and resources.

We aim to provide desk space in the building for all PGRs (pandemics permitting). For physical and environmental geography-based students, this is commonly within the appropriate laboratory group (the largest are currently climate, ecosystems, rock breakdown, Quaternary/luminescence). Here postgraduates are integrated with researchers at other career stages, providing opportunities for peer learning and support. Some PGRs are provided with desks in research centre spaces. We have three more rooms operating on a six-week duration desk-booking system owing to capacity issues. The 2021 building expansion (section 3) will provide a necessary opportunity to provide additional space for our large graduate community.

PGR progress is reported online each term by both students and supervisors, with reports reviewed by the DGS and interventions made if necessary. The formal assessment points are Transfer of Status (after 9 months of full-time study or equivalent) and Confirmation of Status (c.5 months before thesis submission). For each, submitted work is assessed by two independent staff members. Written feedback is provided ahead of a meeting with the student; following which a formal report precedes approval to progress. Since REF2014, only one student has been unsuccessful in transferring to doctoral status (successfully completing an MLitt), while all confirmations have succeeded.

Following Transfer of Status, all doctoral students have access to £500 of School funding for conferences or other research support. Postgraduates are encouraged to participate in, and lead, research cluster activities. Undergraduate teaching opportunities are offered via open advertisement to all PGRs, and some may undertake limited research assistance activities for academic staff.

2.2.3. Skill development and career preparation

Research students are expected to participate in a range of training sessions and in their first six months engage in weekly research skills sessions. Thereafter a wide range of training opportunities are provided by the School (including in laboratories), Division and University, as well as DTPs. We run regular sessions on risk assessment and research integrity, ensuring that these themes are integral to the research process. Many of our ESRC-funded students have taken advantage of the ESRC's Overseas Institutional Visit scheme. Students are also encouraged to make good use of the University's outstanding Careers Service.

2.3. Equality and diversity in constructing this REF submission

The School convened a REF Working Group in 2017, with activities conforming to the University's REF Code of Practice. The Group comprised the HoS (Chair), Research Centre Directors, all Statutory Professors, School Head of Administration and Finance, and representatives from Continuing Education and OII. It was supported by the Senior Research Support Officer; four members were women. Following Divisional practice, the HoS was the unit's REF Lead and another group member the REF Co-ordinator. Members of the Group ran three information sessions open to all staff to discuss the REF process, and the Group has communicated regularly with all researchers throughout the preparation process.

Output selection was a rigorous process to ensure parity of treatment across all researchers. Starting in autumn 2018, with calls for additional nominated outputs in 2019 and 2020, all Category A staff nominated up to six outputs they considered their most REF-suitable work. This led to a meeting for each with two members of the REF Working Group. These were constructive discussions to identify the three strongest outputs for initial consideration. We trained all full professors in the School in REF output grading; each nominated output was reviewed by two of the group according to the REF criteria for output excellence. From the pool of assessed outputs, grades were used to inform selection to meet output excellence criteria and the minimum one per Category A staff. This process was handled confidentially by the REF Lead, REF Coordinator and Senior Research Support Officer. The output data in Table 6 evidences our commitment to the career development of ECRs and female staff, and to collaborative working within the School.

Table 6. Distribution of Geography REF outputs 2021.

No. outputs in submission	Cat. A staff	Cat. B staff
5	11	
4	12	1
3	17	1
2	17	3
1	51	1
Average outputs per ECR		1.6
Average outputs per Cat. A female		2.0
Outputs with >1 Cat. A author in submission		67

Final selection of impact case studies was made by the REF Working Group in December 2020 on the basis of impact significance and reach. The environment statement was co-authored by the REF Lead and REF Coordinator, working with data to ensure all significant activity has been mentioned regardless of the gender or other characteristics of its leads.

3. Income, infrastructure and facilities

3.1. Research funding, strategy and support

We value high-quality research regardless of funding requirements. Grants are pursued to fulfil research visions, whatever their size or whether or not full economic costs are provided. Throughout the School, individuals have the freedom to pool expertise to generate innovative ideas for research and the funding to make it happen. Our size, diversity and networks are especially beneficial in responding to external calls for increasingly impactful research. In this submission, 60 Category A staff, including 10 ECRs, have been or are Principal Investigators on successful external awards. Many others have been Co-Is, since much of our work is collaborative. A further 23 Category A staff no longer in the School, either through moves to other institutions (17) or retirement (6), were PIs in the REF2021 period.

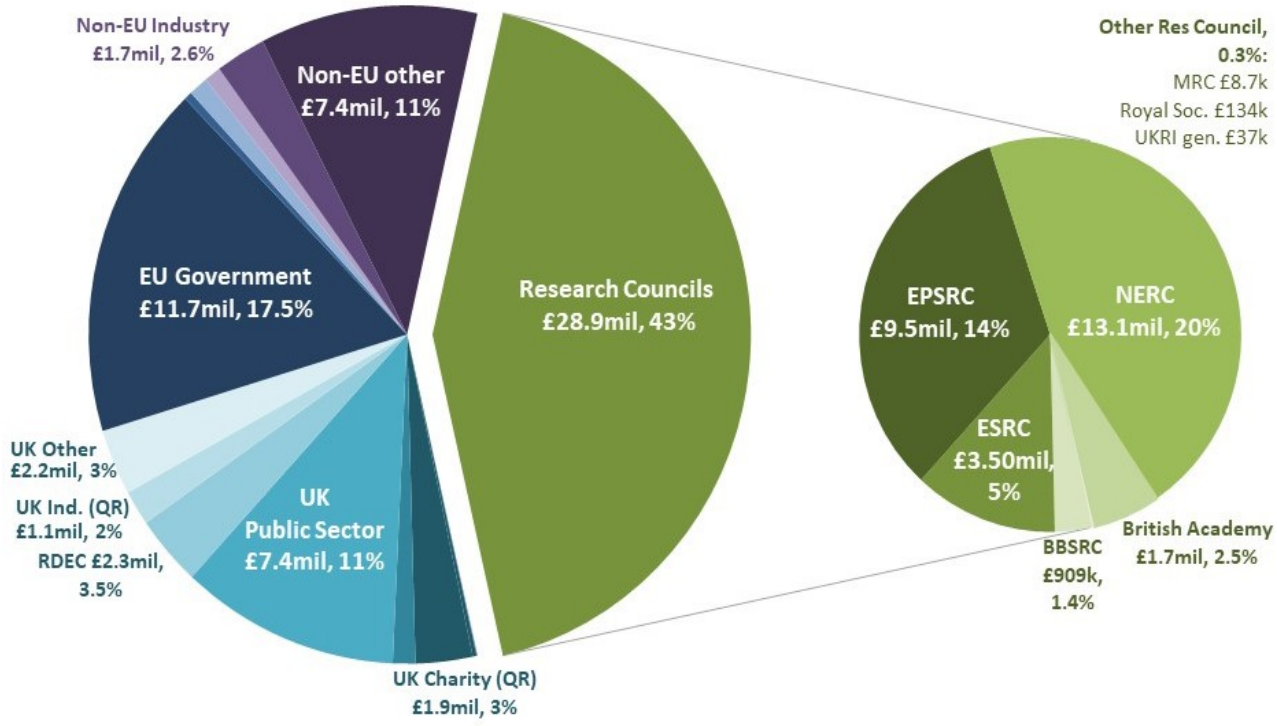

Figure 4. Research income (HESA categories) during the assessment period.
Smallest categories are not named. Research Council breakdown on right.

Total income more than doubled from £32million (REF2014) to £67million (REF2021). Just under half continues to be sourced from research councils (Figure 4), while the decline in UK public sector funding has been offset by increases elsewhere, notably EU government, and sources outside the UK and EU (Figure 5; Table 7). UK Government energy strategies saw DEFRA cease funding the ECI-hosted UKCIP, but our energy group has secured new sources for its policy- and public-facing research, notably from RCUK/UKRI for CREDS and from a range of charity, industry and European sources.

Our range of UKRI funders is testimony to the diversity of our research and its relevance to different research councils. A total UKRI spend of £28.9million included five councils in the assessment period (Figure 4), with 23 different PIs leading 44 new awards. Our NERC income of over £13million is more than that of any other Oxford department.

Table 7. Contribution changes from major funding sources

	REF2014	REF2021
Research Councils	44.16%	43.16%
UK public sector	23.99%	11.10%
EU government	8.62%	17.45%
Sources outside UK &EU	9.50%	14.45%

European funding growth (Figure 5) has been School-wide, including aeolian and heritage research in the Landscape Cluster, impacts of the Eurozone crisis on the service sector in the Economy and Society cluster and climate impacts on finance (SSEE), and includes 8 Marie Curie Fellowships.

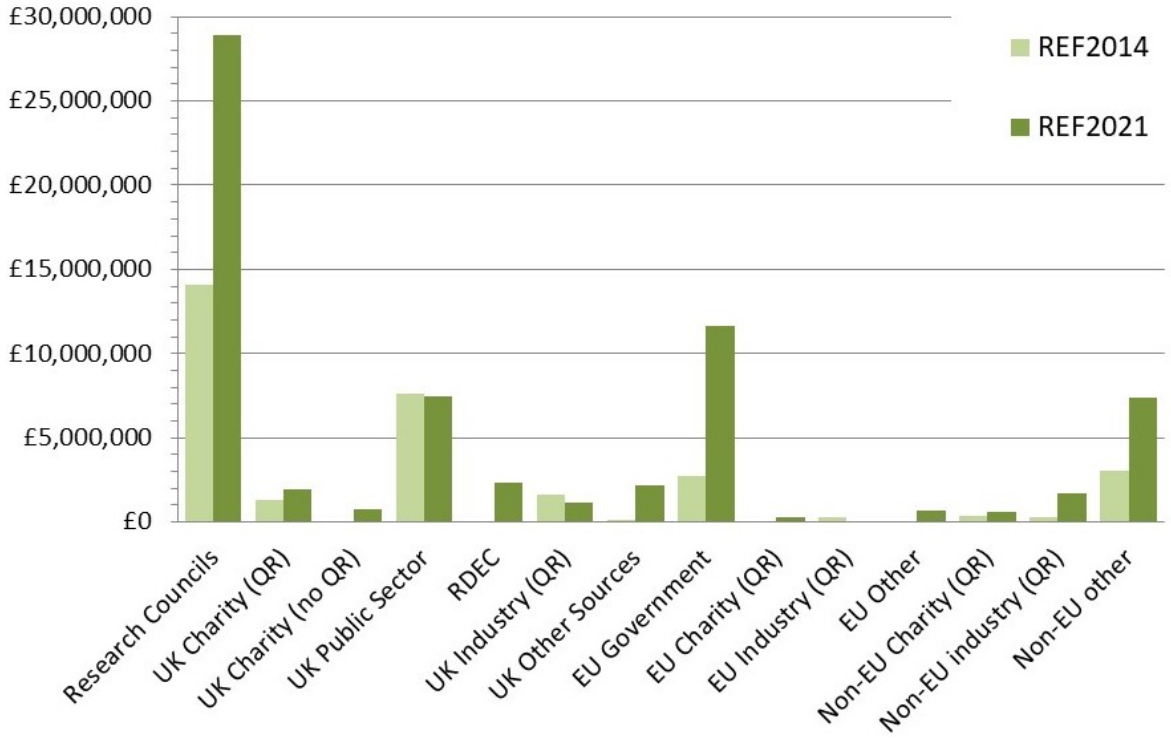

Figure 5. Research income by category, REF2014 and REF2021

We are aware of the likely impacts of Brexit on future access to European funding. However, during the REF2021 period we have won research funding from over 180 different sources, including more than 30 charities, ranging from the Leverhulme Trust, our first award from the Wellcome Trust, the Ashden Trust, Elephant Family, WWF to the Children's Investment Fund Foundation. We anticipate continuing this diversification of our funding sources in the future.

The School's Research Office (1.5 FTE) plays a vital role in research application processes, from alerting researchers to new opportunities, through pre-submission grant preparation, especially costings, and managing internal peer-review and ethics guidance, to ongoing and post-grant

reporting, and impact evidence-gathering. The School's Finance Office (3.7 FTE) and research support staff in the centres (2 FTE) add capacity, freeing researchers to conduct the innovative and impactful research they wish to undertake. Every large Geography grant embeds programme management, communications and knowledge exchange into its staffing.

3.2. Facilities

Infrastructure investment is a key priority within the School's Strategic Plan (Table 2), linking to our sixth research strategy aim, to sustain and enhance the research base. Key elements include our building, our computing provision, and our laboratory provision.

The School moved into the refurbished Oxford University Centre for the Environment building in 2005. A £3.3million reconfiguration of the upper floor and northern elevation, completed in 2015, improved staff office space and the suites occupied by the research centres, and enhanced graduate teaching space, including an IT suite. Continued growth has subsequently significantly increased pressure on space. Although our centres and their staff are within the building, only the TSU has its entire staff co-located in one area, and space for doctoral students is constrained.

In response to these pressures, the University confirmed a £3.5million refurbishment of the Victorian part of the building vacated in 2018 by Chemistry, for completion in 2021. The primary occupant of the new workspace will be the ECI which, for the first time in its history, will be co-located. This will in turn free space for research students and allow the SSEE to achieve in-house co-location. We also plan to make parts of the additional space a key site for future public engagement activity.

IT provision has undergone a dramatic transformation since REF2014 (Table 8), as computational research is widely used across the School. Our systems allow for new and imaginative uses of computational resources by projects, and provide a strong platform when applying for external funding. New virtualised systems can be created and removed quickly, and allow prototyping and efficient research dissemination through the web. Our platforms encourage the development of reproducible research, through the use of version control (Git/Gitlab) and containerisation (via Docker), ensuring that computational results can be reproduced both within the School and elsewhere. We have invested in the resiliency of our solutions, with all data mirrored off-site as well as to offline tape.

Table 8. Key IT investments since REF2014

Enhancement	Benefit
Collaborative Filesharing tools	More effective co-working in projects
High Performance Computing enhancements	Easier use and School-wide availability
Database self-service facilities	Wide access to data and geospatial databases
x50 storage increase to 4PB	Serve needs of large staff & student research body
Enhanced 40Gb/100Gb network backbone	Capacity to handle large data workloads
New GPU computing facilities	Serving machine learning and AI research
Upgrades to building-wide wifi & ethernet	High speed data transfers throughout building

With an increase in IT support staff from 5 in REF2014 to 6.1 at the census date, we have developed a portfolio of tailored training offered throughout every year, ensuring researchers can make

informed decisions of how to proceed effectively with IT appropriate to their projects. When COVID-19 forced changes in practices from March 2020, we assisted researchers and support staff to work effectively from home by establishing a School-only VPN network to complement and reduce pressure on the university-wide system. This ensured effective access to remote desktops, data, the library and other resources.

Considerable **laboratory and field equipment investment** has been made through the School's annual equipment fund, Divisional funding and external awards, developing and expanding cutting-edge facilities for geomorphology, Quaternary, water and ecosystem research and postgraduate training. The Oxford Resilient Buildings and Landscape Laboratory (OxRBL) has seen investment and refurbishments facilitating additional heritage science projects linked to EPSRC-SEAHA doctoral training. Luminescence dating, underpinning dryland Quaternary science and new geo-archaeological research, underwent investments in 2019-21 including upgrades to two existing Riso readers and purchase of a new violet-light reader, extending the dating range to >1million years (NERC Capital and Divisional funding). The growth of physical ecology and biogeography in both tropical and arctic spheres has seen the installation of advanced optical microscopy to support pioneering research in leaf venation networks and their role in plant function. In 2016 we invested in an ICP Mass Spectrometer to support our ecological research, including compilation of a global database of plant leaf and wood traits, as well as dose-rate measurements for luminescence dating. We created a new technician post to support ICP-MS use, increasing laboratory technical staff to four. We receive additional expert technical support from the Earth Sciences department team, where we increasingly use facilities for some sedimentary and mineralogical analyses, as well as accessing Scanning Electron Microscopy in the adjacent Research Laboratory for Archaeology. DNA analyses are a growing part of ecological and environmental research with new equipment investment supporting research in both the Biodiversity and Technological Life research clusters.

Field research underpins many activities, and we invest annually in an extensive collection of generalist and specialist field equipment to support research and teaching. We have also made extensive use of shared NERC field geophysical equipment facilities, such as ground penetrating radar. The School has developed major infrastructure at Wytham Woods, Oxford's ecological research site. Major investments since 2013 include construction of a 30million tall forest-atmosphere research tower and upgrading and extension of a canopy walkway, complementing a £1.5million university upgrade of the central field station. Two NERC-funded projects totalling £1.6million (Malhi), on tree architecture and on multitrophic impacts of ash dieback, have benefited from these investments. The facility is now a hub for collaborative research including with the Smithsonian Institute, National Physics Laboratory NASA, UCL, Cranfield, Nottingham and Cambridge universities.

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

Engagement, knowledge exchange and impact are at the heart of our efforts. Much of our research is designed to be of direct benefit to partners across and beyond the academy, evidenced by the size of REF2021 income from the UK public sector (£7.4million), charities (UK, EU, non-EU combined: £3.5million), industry (£2.8million) and a diverse range of other sources (£10.2million), including UN agencies, the Consultative Group on International Agriculture and the German agency GIZ. We encourage researchers to build the most appropriate teams to conduct their research most effectively, whether partners are from within Oxford or other academic institutions, in the UK or elsewhere. For example, in addition to projects and collaborations already described, Washington's successive NERC-funded climate projects involve longstanding collaborations with researchers at Exeter, Leeds, Manchester and Reading, the Meteorological Office and overseas institutions. Similarly, Wiggs aeolian process research has involved over 20 years of grant collaborations with Sheffield, Loughborough and Southampton. Connections are often reinforced or developed anew when former postgraduates and researchers take up appointments elsewhere.

Long-term international partnerships have led to co-produced research and shared graduate student supervisions with universities in Africa (Universities of Botswana, Cape Town, Nairobi, Namibia, Yaounde: Thomas, Washington, Wiggs) and South America (Federal University of Pará, Brazil; Universidad Austral, Chile; and Pontifical Catholic University, Peru: Malhi, Oliveras). Links in the USA with the Getty Institute (Viles), NASA (Malhi) and the Pew Foundation (Bailey), and in Australia (ANU, James Cook U: Malhi), have developed into sustained engagements benefitting wider researcher groups. Similar growth is occurring in China (e.g. Dunhuang: Viles, Nanjing: Thomas) and Mongolia (Ahern, Sternberg) and through the new Oxford-Berlin partnership.

In 2015 our Visiting Research Associate scheme, reported in REF2014, evolved into Honorary (two years renewable for two) and Short-term (six months or less) Research Associate schemes. Since REF2014 this has linked 254 overseas researchers and 90 non-academic researchers in the UK to the School for joint research activities, with 44 SRA visits to Oxford and the remainder engaged in longer term partnerships (Figure 6). We have also had our first visitor, from Zimbabwe, under the university's AfOx scheme.

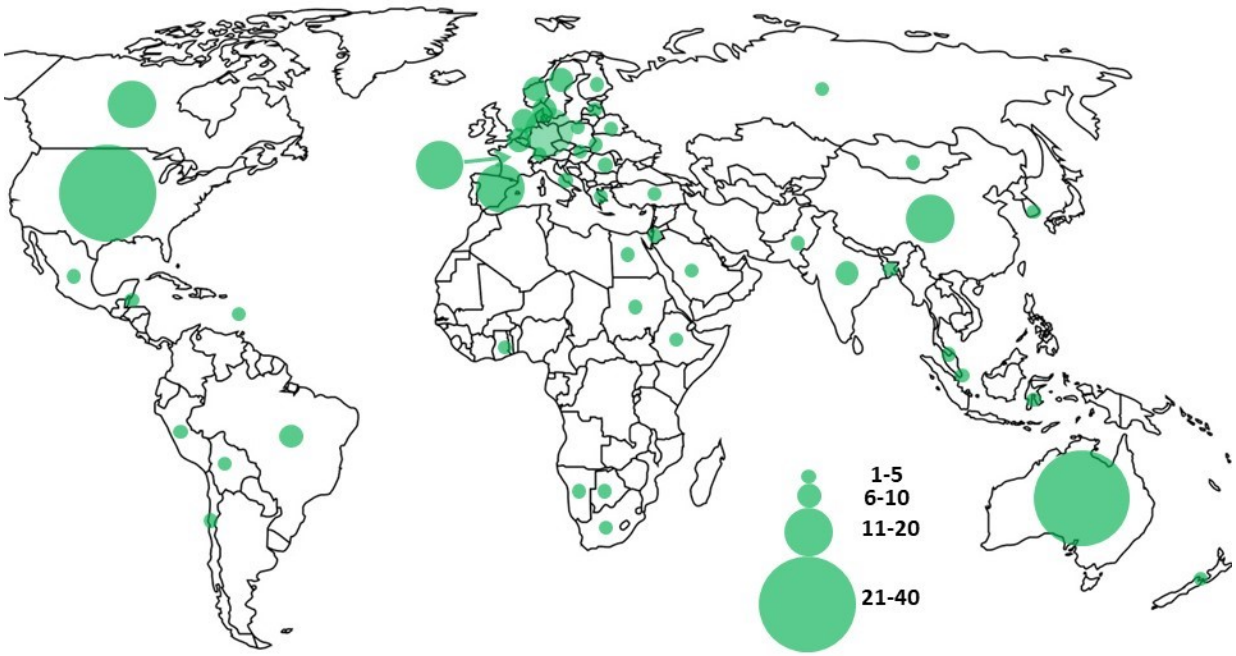

Figure 6. Country of institutional affiliation of non-UK research associates in the assessment period.

4.1. Supporting and developing key partnerships with non-academic collaborators and audiences

Collaborations with non-academic partners are founded on the principles of equal partnership and long-term commitment. Many of our research events feature non-academic experts. Pump-priming funds are often used initially for a small piece of co-produced work, building to more significant funded projects, which are then deepened with further impact-facilitating funding. The 2018-20 Gobi Framework project is exemplary here (£769,000 ESRC GCRF award, McConnell PI, Co-Is Troy Sternberg and ECR Ahearn). The project designs sustainable infrastructure development for inclusive welfare in states where the Chinese Belt and Road initiative is generating significant environmental and social risks; pump-priming by the Fell Fund funded its co-production with the Mongolian Independent Research Institute and University of Central Asia. In total, over the past two years, Geography researchers have won £476,000 of GCRF funding both to initiate partnerships and for further joint work. 70 Impact Accelerator Awards have been won since 2015 (19 ESRC, 13

EPSRC, 12 HEIF), supporting a wide range of activities including Knowledge Transfer Fellowships, Knowledge Exchange Dialogues, workshops, secondments, toolkits and prototypes.

The School has a Development Office which works proactively with alumni and others to fundraise for masters and doctoral studentships; it has also generated donations for specific research activities, especially linked to our research centres. TSU and SSEE have developed long term partnerships through engaging with participants in their Executive Education programmes.

Geography has become much more proactive in engaging audiences en masse and social media since REF2014. We now have 2.5 FTE staff disseminating research news and offering media training in the School. Coverage of our research has increased significantly, across all our clusters and research centres (Figure 7).

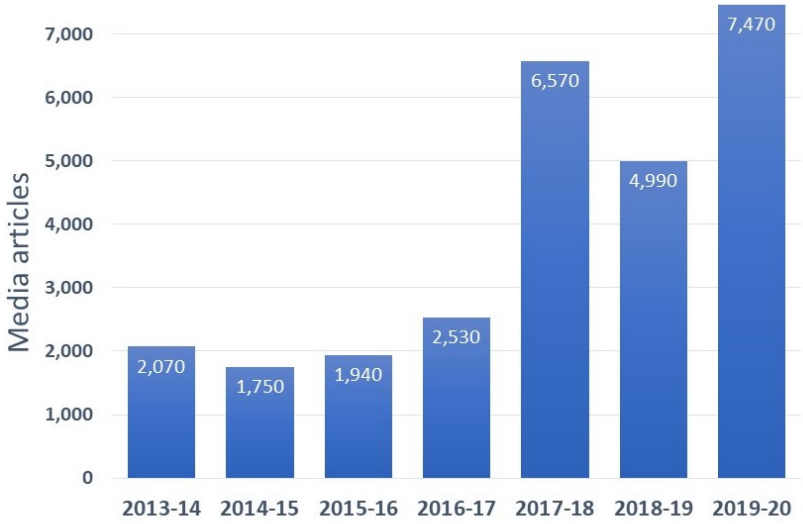

Figure 7. Mainstream media articles (print & online) citing School research.
Data collected using Meltwater software.

4.2. Wider contributions to economies and societies

We make significant contributions to many social and economic challenges in the UK and globally. This section describes some highlights.

Impacts on the health and wellbeing of people:

- Water and food security. Major projects include REACH, and the many case studies generated by the NERC-funded Risk in the Environment: Diagnostics, Integration, Benchmarking, Learning and Elicitation project (Oxford PI Hall). Several smaller projects on water security include Dadson's work on London's water security linked to the MaRIUS programme on drought risks, uncertainties and impacts, as well as community engagement learned from the RELU project (Whatmore). All give particular attention to local social, political and environmental situations in order to *co-design* effective solutions with non-academic partners, often using innovative participatory methods. In this regard Ahern's ethnographic research in Mongolia has allowed the social, health and physiological risks faced by herders during winter *Dzud* climate extremes to be detailed, influencing changes in agency support packages, including the Red Cross-Red Crescent climate centre, to go beyond short-term cash loans. Food security research has also been enhanced by *capacity-building* with partners in Africa to analyse food as a total system, initiated through Zurek's GCRF SENTINEL project. Capacity-building is also central to REACH, which funds graduate studentships in Oxford.

- Transport. Recent TSU work has focussed on delivering effective driverless car mobility and electric car charging. The latter includes current Innovate UK projects working with local councils and electricity suppliers to evaluate different charging infrastructure, and to design effective charging infrastructure for the 30% of households without access to home charging.

Impacts on commerce and the economy. SSEE works with a wide range of private sector partners to support moves to a net zero-carbon economy. Christian Brand has had significant involvement with the development of the health economic assessment tool for walking and cycling, funded by an FP7 project to quantify the impacts of physical activity, air pollution, injuries and carbon impact assessments. Significant work on sustainable finance has been undertaken by Ben Caldecott and colleagues. *Targeted policy briefings, secondments, consultancy and tailored education programmes* play a key role in the way that research impacts are delivered to practitioners in this sector.

Impacts on culture and heritage. OxRBL has a sustained track record of working with non-academic partners in the heritage sector on building stone decay and conservation. Currently this includes work with the Getty Conservation Institute, LA, where the built heritage research initiative aims to extend and enhance the scientific basis of applied conservation activities. Ongoing work is in the UK, USA and China. OxRBL's Tomorrow's Oxford Heads project is a collaboration with Oxford's History of Science Museum to enhance the visibility of under-represented groups in the University's public sculptures. Leverhulme Trust-funded science-based geoarchaeology in Botswana (Thomas, Burrough) is informing both the government's pending World Heritage Site submission for the Makgadikgadi palaeolakes system and local at-risk Stone Age site conservation through work with local communities and schools. Lorimer is a *Trustee* of Oxford's Natural History Museum.

Impacts on enhancing the performance of infrastructure delivery is an important part of work in the ECI, including the EU-funded Enhancing Risk Management Partnerships for Catastrophic Natural Disasters. The EPSRC MISTRAL project is led by Hall with seven HEIs and 55 private sector partners; it is building the world's first digital 'systems of systems' modelling capability to understand failure criticality of the UK's national infrastructure networks. This informs NIC, Department of Transport and Treasury planning, including climate change risk assessments for HS2 by Raghav Pant, as well as the UN Office for Project Services. Since REF2014 research on infrastructure resilience has developed in other parts of the School. Funded by an Open Policy Fellowship, Smith and Berry have worked with three county councils and Natural England to evaluate green infrastructure, developing a decision-making support tool for the Oxford-Cambridge Arc. Work by Alex Money and others, variously funded by GCRF, Pepsico and banks, uses private sector investment to deliver sustainable infrastructure services in developing countries, consistent with SDGs. As with the Gobi Framework infrastructure project, these projects usually deliver *models and toolkits* for local users to deploy.

Impacts on the environment. Work here is extensive and includes:

- investigating energy use in order to expedite the move to net carbon zero in the context of the climate crisis. In addition to the CREDS programme, work includes Radhika Khosla's OMS project on net zero cooling and the Dryland Bioenergy programme (Co-Director Thomas), funded by the OMS with industry, HEI and NGOs partners in Africa, developing energy sources suited to dry and degraded environments;
- mitigating forest degradation. A team led by Malhi has undertaken extensive work with local partners in the Amazon over many years. Most recently they have won GCRF and NERC funding, led by Oliveras, to better understand how to mitigate fires in the Amazon. McDermott works on forest governance and on effective certification policy for harvested wood;
- improving the management of ocean environments has focussed most recently on tracking plastic pollution (Bailey), nudging towards sustainable fishing (Bailey) and sustainable coral reef management (Wedding).

Geography also has researchers impacting **the public's understanding and learning** through popular books, discussion events and media work. For example:

- Dorling has published a string of books on geographical inequality, Brexit, the UK housing market and global slowdown, undertakes an extensive programme of public talks (over 500 in the assessment period) and has 20,100 followers on Twitter. His TED talk on *Maps that show us who we are* has had 1.6 million views.
- Otto was responsible for one of the biggest climate stories of 2019: evidencing that Europe's record-breaking heatwaves were more likely and more intense due to climate change. As co-lead of rapid, real-time weather event analyses, Otto gave numerous media interviews and was quoted in 1,560 news articles (including the *New York Times*, the *Sun* and German *Vogue*). Her media engagement is helping to change the global climate change conversations.
- Hepburn intervened in global debates on the economic and environmental benefits of a green recovery from COVID-19. A report co-authored with Joseph Stiglitz and Nicholas Stern, published in May 2020, has featured in over 650 mainstream media outlets around the world, helping to underpin the current global focus on 'building back better'.
- Malhi undertakes significant media work in relation to the Amazon rainforest (one of his YouTube videos has 10,500 views). Erika Berenguer was quoted 500 times in media outlets in 2019 in relation to her work on Amazon fires.
- 18 researchers across SoGE participated in the University's innovative #TruePlanet research campaign, which was shortlisted in the Guardian University Awards in 2020. Highlights included the Futuremakers podcast series, ranked top in Apple's 'Nature' category, which garnered over 5,000 listens per episode.

The outward-facing nature of our research is recognised by the **policy advisor roles** taken by staff. For example, in the UK Dieter Helm chairs the Government's Natural Capital Committee, Eyre sits on the OFGEN Sustainable Development Advisory Group, and Charles on DFID's Water and Sanitation for the Urban Poor Advisory Group; Hall is an Expert Advisor to the UK National Infrastructure Commission and the 2016 National Flood Resilience Review, and Hepburn was a UK Treasury Review Advisor for Economics and Biodiversity. Internationally, Brand is a member of the WHO Health Economic Assessment tools group, Eyre an Ambassador for the European Council for an Energy Efficient Economy, Daley a member of the Independent Advisory Group on Country Information of the Independent Chief Inspector of Border and Immigration, and chair of Fahamu the Board of Trustees, a pan-African social justice organisation. Hall is a member of the Science Advisory Committee of the International Institute for Applied Systems Analysis, and Hope a member of the UNICEF/WHO Joint Monitoring Programme on water, sanitation and hygiene.

Our impact case studies align with our impact strategy as summarised in Table 3 in that they all draw on a broad range of research activity, depend on long-term collaborations and deploy a diverse range of pathways to impact. They all sit within the key areas of impact just listed. Two focus on health and wellbeing (Smart Handpumps, Fairwork), two on infrastructure performance (Smart Meters, Infrastructure for Sustainable Development), two on economies (Mainstreaming Net Zero Investment, Climate Risks and Banking) and two on environment (Angry Weather, Resilient Cocoa Farming).

4.3. Contributions to, and recognition by, the research base

Our geographers play major roles in the wider academic community. In the current assessment period, 52 staff were members of UKRI and major funder **peer review colleges** and grant boards (including British Academy: Baptista, Rose, Vasudevan; AHRC: Mykhnenko; EPSRC: Darby, Fawcett and Hall; ESRC: Caldecott, Rose; ESRC-GCRF: Baptista, Caldecott, Hope; Leverhulme

Trust: McDowell; NERC: Bailey, Berry, Dadson, Oliveras, Otto; Wellcome Trust: Dorling), while Malhi is a member of the Royal Society Nominations Panel. Outside the UK, grant board memberships include Belgium (Oliveras), Ireland (Berry, Vasudevan), Norway (Hopkins, McDermott), Portugal (Baptisa), Sweden (Thomas). Thomas was also a panel member for the Hong Kong RAE2020.

In **learned societies**, Thomas was RGS-IBG Vice-President for Research and Higher Education (2013-16), and chaired the 2017 Benchmark Review of Physical Geography in the UK. Rose was co-founder and Secretary of the RGS-IBG Digital Geographies Research Group. Slater was Outreach and Education Secretary for the British Society for Geomorphology (2017-20), of which Viles has been President since 2019. Dorling was Honorary President of the Society of Cartographers until 2017 and Malhi President of the Association for Tropical Biology and Conservation (2017-19). Burrough chaired INQUA's Early Career Research Group (2014-16). Grenyer was Secretary of the British Ecological Society Macroecology Group (2015-18). Wiggs is a Board Member of the International Society of Aeolian Research (2016-). Ingram was a member of the Royal Society's Global Environmental Research Committee (2013-18), chairing its Future Earth Working Group.

Many staff engage in **journal editing,** with 24 senior editorial roles in the School during the assessment period. In 2020 Lorimer became Editor of the new *Progress in Environmental Geography,* and Thomas Editor-in-Chief of *Journal of Arid Environments.* In 2019, Whittaker became Editor-in-Chief of *Frontiers in Biogeography* and Viles Editor of *Earth Surface Dynamics.* Schwanen was Editor-in-Chief of *the Journal of Transport Geography.* Vasudevan has been Co-Editor of *Environment and Planning D* since 2015*,* Hall Editor of *Water Resource Research* and Slater Editor of *Hydrology and Earth System Sciences* since 2017. Daley is co-editor of *Environment and Space C.* Other staff are journal Associate Editors, handling significant numbers of manuscripts each year, including Berry (*Environment, Science & Policy),* Dorling (*Environment and Planning A),* Hepburn (*European Economic Revie*w), Hopkins (*Journal of Sustainable Tourism* and book review editor for *Annals of the American Association of Geographers),* Lorimer (*Environmental Humanities* and *People & Nature*)*,* McConnell (*Political Geography*), Oliveras (*Journal of Ecology*), Otto (*Bulletin, American Meteorological Society*), Slater (*Hydrology & Earth System Science*) and Thomas (*Aeolian Research*). 26 staff are members of 51 journal editorial boards.

Across the unit, 36 staff gave 276 invited **keynote and plenary addresses** at international conferences in the assessment period. **International fellowships or honorary professorships** were held at Beijing Normal University (Wojcik) and the universities of Copenhagen (Whittaker), Queensland (Ingram), Gothenburg (Schwanen), McMaster and Waterloo (Garrick), Witwatersrand and East China Normal (Thomas), Stanford (Bailey), Karlstad and Pretoria (Rose).

The contributions of our researchers to the academy have been recognised by prestigious **awards and fellowships**. Malhi was elected a Fellow of the Royal Society (2017), a rare occurrence for a geographer; he also received the British Ecological Society's Marsh Award (2016). Dorling was elected an associate Member of the Royal Society of Medicine (2015), and Rose a Fellow of the British Academy (2015) and Academy of Social Sciences (2019). Malhi (2018) and Viles (2020) were awarded the RGS-IBG Founders Medal, and Thomas the Victoria Medal (2019). Whatmore was awarded a DBE for environmental services (2020), Malhi a CBE for services to environmental science (2020) and McDowell a CBE (2016) for services to geography and higher education. Daley received the AAG James Blaut Award (2014), Viles the EGU's Ralph Bagnold Medal (2015) and AAG Geomorphology Group Melvin Marcus Award (2019). Lora-Wainwright received the BBC/BSA Thinking Allowed Ethnography Prize (2017) for her book *Resigned Activism* (revised version published in 2021). Schwanen was awarded the Edward L. Ullman Award (2018) by the American Association of Geographers for significant contributions to transport geography, and Akyelken the OECD International Transport Forum Young Researcher of the Year Award (2016). Garrick won the Botin Foundation (Spain) Sustainable Water Management Prize (2018) and 2019 Philomathia Foundation Prize for break-through research in an area of global concern. Ernwein won the Academic Society of Geneva's 2016 Prix Louis Casai and Schipper the 2016 Emerald Literati Network outstanding paper award. Journal best paper awards have been won by Brand (*Energy*

Efficiency, 2019), Khosla (*Environmental Research Letters,* 2018), McConnell (Ashby Prize, *Environment & Planning A*, 2017), and Rose (*City & Society* 2016).