Unit-level environment template (REF5b)

Institution: Durham University

Unit of assessment: 14 Geography and Environmental Studies

Section 1. Unit context and structure, research and impact strategy

1.1 Overview

Durham Geography is a large, integrated department that aims to be a global node for geographical research – a destination and conduit for outstanding researchers from a wide range of countries and backgrounds. We seek to provide an attractive, supportive, and innovative research environment within which to work, in order to enable our staff to follow their academic interests and passions, to challenge existing approaches and understandings, and to be experimental and take risks. This environment is enabled by a set of guiding principles:

- To foster a research culture that is welcoming, ambitious, flexible, and adventurous, generating innovation and transformation in our practices, approaches, and outputs;
- To ensure that we maximise our collective research strengths, by enabling individuals at all career stages to realise their potential while also contributing to a culture of collective endeavour;
- To generate high-quality outputs that advance scholarship in and across a range of fields and address societal challenges at multiple scales, nationally and internationally;
- To maximise the societal relevance and impact of our research through engagement with non-academic communities, nationally and internationally; and
- To maximise access to our research through effective communication and the provision of open access to our outputs and data.

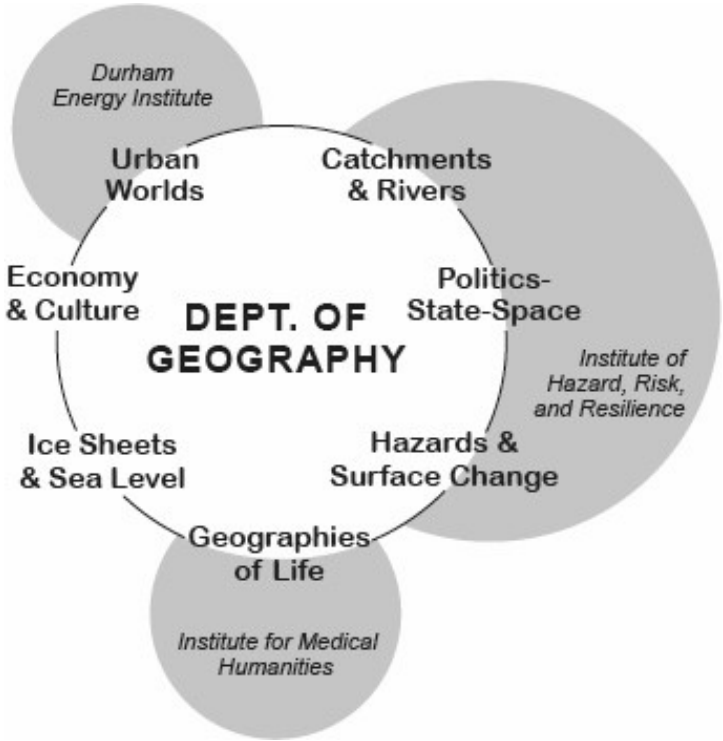

Fig. 1. Departmental research clusters (bold) and their relationship with University research institutes (italics).

Our research activity is organised into seven clusters: **Catchments and Rivers**; **Economy and Culture**; **Geographies of Life**; **Hazards and Surface Change**; **Ice Sheets and Sea Level**; **Politics-State-Space**; and **Urban Worlds** (Fig. 1). Clusters act as centres of gravity for

collective research activity, and provide the foundational means through which we generate diversity, vibrancy and innovation in our research. They are the mechanism by which we develop new collective research areas and by which we foster and maintain innovative and alternative forms of research practice, output, and societal engagement. Cluster boundaries are permeable, and most staff and postgraduate students are affiliated to more than one cluster. Clusters are also dynamic, and we routinely reflect on our organisational structure to ensure that the research environment is aligned with the interests of the current cohorts of staff and research students, as well as external drivers. During the REF2021 period, we reorganised and expanded activity in our former Geographies of Health and Well Being cluster into a new cluster focused on the **Geographies of Life**, while recruitment of new staff at the intersection of cultural and economic geography led to realignment of our former Culture-Economy-Life cluster into **Economy and Culture**. Beyond the department, our research also extends across the University's network of research institutes, primarily the Institute of Hazard, Risk, and Resilience, the Durham Energy Institute, and the Institute for Medical Humanities (Fig. 1).

1.2 Review of strategic aims during the REF2021 period

Since 2014 we have made fundamental advances across all areas of our research, and delivered against the priority research themes that were identified in REF2014. In addition, we have opened new areas of research following the development of Geographies of Life and the realignment of Economy and Culture.

Economy and Culture has advanced research at the intersection of the cultural and economic by exploring the practices and processes through which marketised spaces are made. Underpinning much of our work has been the development of approaches that incorporate insights from cultural economy work with feminist and postcolonial approaches to economic life and Marxian political economy (*Bridge*, *Crang*, *Gregson*, *Hudson*, *Knuth*, *Langley*, *McEwan*, *McGrath*, *Richardson*). As well as exploring the different concepts of culture in economic work (*Richardson*), our research has examined: (a) how new spatial configurations emerge as markets are made around natural 'resources' (*Bridge*, *Crang*, *Gregson*, *Knuth*); (b) transformations in the forms and practices of financialisation after the financial crisis (*Brekke, Bridge*, *Knuth*, *Lai*, *Langley*); (c) how economic worlds are animated by moral economies which ascribe and distribute worth (*Crang*, *Gregson*, *Martin, McEwan*, *McGrath*); and (d) how human and non-human bodily life is made productive and becomes a source of value in contemporary reconfigurations of work (*Gregson*, *Johnson*).

Geographies of Life has focused on how forms of human and non-human life are produced, governed and experienced. Conceptual work has advanced theorisations of embodied life by drawing on poststructuralisms in dialogue with feminisms and psychoanalysis to theorise the conditions – including relations, encounters, and environments – through which bodily differences emerge and persist (*Anderson*, *Callard, Colls*, *Harrison*, *Secor*, *Wilson*). We have used this conceptual work to interrogate and offer novel perspectives on a range of contemporary challenges and problems, including violence, recovery and well-being (*Atkinson*, *Laws*, *Pain, Proudfoot*), multiculturalism and Brexit (*Wilson*), neoliberalism (*Anderson*), and climate change migration (*Baldwin*). In addition to this theoretical work, the cluster has coalesced around two areas of research: first, on the novel techno-scientific practices and processes through which lives are known, governed and rendered actionable (*Amoore*, *Johnson*, *Langley, Lehman*, *Luque-Ayala, Nieuwenhuis*); and second, on how embodied differences and identities are enacted through imaginaries, technologies and artefacts (*Colls*, *Darling*, *Gregson*, *Lai*, *Laws*, *Nassar*, *Newhouse*, *Wilson*).

Urban Worlds has developed new understandings of contemporary urbanism, particularly the techniques through which cities are governed and urban life is made. We have targeted specific domains that are critical to the nature of current urbanisms, including: the making of sociotechnical and ecological infrastructures (*Bulkeley*, *Luque-Ayala*, *McFarlane*), the production and contestation of political-economic architectures (*Darling*, *MacLeod*, *Proudfoot*),

and the experience of everyday life (*McFarlane*, *Wilson*). Our work has: (a) explored the implications of a relational approach to urban spatialities for global urban theory through work on density (*McFarlane*), dispersal (*Darling*), revanchism (*Proudfoot*), and abandonment (*Leshem*); (b) traced how urban political economy, ecology, and sociality are changing in the Global South (*Luque-Ayala*, *McFarlane*, *Newhouse*); and (c) examined how emerging forms of urban management have impacted urban governance, infrastructures, and inequalities (*Bulkeley*, *Darling*, *Knuth*, *MacLeod*, *Nassar*).

Politics-State-Space has advanced understanding of emergent spatial forms of politics, by working across diverse domains, including climate change governance (*Baldwin*, *Bulkeley*, *Schmidt*), border security and migration (*Amoore*, *Darling*, *Martin, Painter*), and territorial struggles, including those relating to colonialism (*Anthias*, *Leshem*, *Schmidt*), and development (*Calkin*, *McEwan*, *Power*). Our work has addressed: (a) the ways in which political theory and concepts are challenged by considering the social-materialities of political life, including water (*Lehman*, *Schmidt*, *Steinberg*), land (*Anthias*, *Leshem*), energy (*McEwan*), and air (*Nieuwenhuis*); (b) the techniques and forms though which political life is governed and political spaces are made, principally how ways of governing the environment are assembled (*Bridge*, *Bulkeley*, *Knuth*, *McEwan*, *Schmidt*, *Steinberg*, *Williams*) and the role of new actors in contemporary development strategies (*Calkin*, *Power*); (c) the potentialities of novel forms of belonging in the context of transformations in identity, citizenship, and nation (*Newhouse*, *Wilson*); and (d) how objects animate the space of the political, with emphasis on contemporary technoscience (*Amoore*, *Brekke*, *Johnson*, *Lehman*).

Ice Sheets and Sea Level has focused on explaining and quantifying the dynamic response of ice sheets to external and internal forcing and their contribution to past and contemporary sea-level rise. We have integrated field observations and remote sensing with numerical modelling to understand the decadal to millennial trajectory of the polar ice sheets in response to climatic and oceanic forcing (*Bentley*, *Jamieson*, *O'Cofaigh*, *Whitehouse*, *Stokes*) and how subglacial processes affect ice-sheet dynamics (*Evans*, *Jamieson*, *O'Cofaigh*, *Roberts*, *Stokes*). We have deepened our understanding of the interactions between ice sheets and sea-level change, especially across major climate transitions and during the last interglacial period (*Engelhart*, *Lloyd*, *Long*, *Woodroffe*), as well as the dynamics of the British-Irish Ice Sheet and its impact on the UK landscape (*Bridgland*, *Roberts*). Our work has placed important new constraints on the role of the oceans in climate shifts over both short and long time scales, and has used past environmental analogues to understand the potential future impacts of climate change (*Moffa-Sanchez, McClymont*). We have also developed and applied new sea-level indicators of seismic activity in order to reconstruct earthquake recurrence and impacts in a range of settings (*Shennan*).

Catchments and Rivers has monitored and modelled the interactions and feedbacks between geomorphology, hydrology, vegetation, and water chemistry in hillslope and river systems. In particular, we have generated new process-based understanding of how water, nutrients, and sediment move through catchments (*Bovolo*, *Hilton*, *Reaney*), in part by quantifying flow and sediment transport within the mixed bedrock-alluvial channels that are ubiquitous in many montane rivers (*Hodge*, *Warburton*). Related work has developed novel uses of high-resolution imagery to measure topography and habitat characteristics along riparian corridors (*Carbonneau*). We have also investigated the interactions of vegetation with water flow and sediment transport, including the effects of vegetation on hillslope stability and erosion (*Turnbull-Lloyd*, *Wainwright*) and the role of plants in modulating flow and flooding in river channels (*Hardy*, *Warburton*). Our fundamental process-based approach to catchment dynamics has informed policy recommendations around water transfers (*Bracken*).

Hazards and Surface Change has advanced holistic approaches to understanding hazards as the outcome of recurrent physical processes that occur within specific societal settings, rather than as one-off events. We have made fundamental progress on the physical mechanisms of landslides and gravity flows, coupling novel laboratory- and field-based approaches with

numerical modelling, to allow assessment of slope stability at societally-relevant scales both onshore and offshore (*Brain*, *Pope*, *Rosser*). This includes some of the first observations of submarine turbidity currents that flush tremendous volumes of sediment to the deep ocean (*Cartigny*, *Pope*). We have placed quantitative constraints on the long-term and large-scale impacts of mass movements on the sediment and terrestrial carbon cycles, including systematic assessment of how debris flows and earthquake-triggered landslides shape the landscape and mobilise and transport sediment and organic carbon (*Cox*, *Densmore*, *Hilton*). We have also documented impact of ENSO cycles on the numbers of people affected by disasters (*McGregor*) and the ways in which scientific understanding of hazards can be used in decision-making, including simple rules to reduce exposure to earthquake-triggered landslides (*Densmore*) and new approaches to earthquake risk assessment (*Rosser*). At the same time, new remote-sensing techniques allow us to characterise surface morphology and change at unprecedented scales, ranging from objective identification of channel heads (*Clubb*) to mapping of archaeological looting (*Donoghue*).

1.3 Research vision beyond REF2021

Economy and Culture's central concern will be how economic worlds in the Global South and North are made, unmade and remade in the context of changes to the global economy. By developing concepts and techniques at the intersection of cultural economy, postcolonial and political economy approaches, our work will: (1) examine the geographies and politics of new types of resource extraction, production and circulation; (2) continue to track changing forms of financialisation, whilst expanding the geographical scope of our work to Asia and new types of digital finance; (3) create new understandings of the actors, structures and places of the green economy, especially in relation to value creation through renewable energy and decarbonisation; and (4) explore how livelihoods in the Global South are made through diverse, everyday labour and consumption practices.

Geographies of Life will explore how the boundaries of life and non-life, and human and non-human life, are at stake across a range of contemporary transformations. We will: (1) document the production and experience of life and death for different peoples and non-humans in the midst of environmental change and climate crisis; (2) continue to examine the configurations of life that are emerging at the intersection of contemporary capitalism and technoscience; (3) produce new understandings of how livable worlds are created in harmful and damaging conditions, with particular emphasis on migration and displacement; and (4) interrogate the emergence of inequalities associated with multiple forms of social difference. Underpinning this work will be the continued creation of concepts and ways of researching attentive to embodied human and non-human life.

Urban Worlds will advance understanding of how urban life is made and lived in the context of the major challenges facing today's cities. Through empirical work on a range of global urbanisms, we will: (1) explore the implications of African, Asian, and Middle Eastern urbanisms for urban theory, method, and representation; (2) explain the mechanisms producing and intensifying urban inequalities and evaluate the potential for alternatives in different types of cities across the Global North and South, including urban equality and sites of generosity; (3) continue to examine and anticipate the infrastructural futures of cities, particularly in relation to forms of smart and sustainable urbanism; and (4) initiate new understandings of the promise and pitfalls of forms of green urbanism in response to climate change and processes of uneven development.

Politics-State-Space will examine the existing and emerging forms of power through which contemporary political spaces are organized. Our work will: (1) continue to develop conceptualizations of power and the spaces of the political that begin from the materiality of human and non-human life, principally water, land, and air; (2) examine how forms of violence and harm are enacted and experienced, including in relation to the emergence of new development actors, and indigenous struggles over land and territory; (3) generate new

understandings of how contemporary governing practices, actors and forms intersect with the state and formal politics, for example through novel types of data and analytics; and (4) explore changes in ways of governing and living with difference in the context of migration, pluralisation, and shifting political attachments and identifications.

Ice Sheets and Sea Level will advance our understanding of the coupled ice-ocean-climate system. We will emphasise: (1) understanding marine ice sheet dynamics at a range of spatial and temporal scales via two main approaches: (a) reconstruction of high spatio-temporal resolution ice sheet behaviour using field-based and remote sensing techniques, and (b) investigation of topographic, subglacial, oceanic, and ice shelf controls on past and present ice sheet dynamics through combined data-modelling approaches; (2) using new and existing sea-level records to document catastrophic events impacting coastal areas; (3) developing novel geochemical approaches to reconstruct sea ice extent, ocean circulation, temperature, and salinity, ecosystem change, and carbon cycling; and (4) drawing on our combined expertise in ice sheet, sea level, and environmental reconstruction to further our understanding of global-scale feedbacks operating between the climate, ocean, and cryosphere.

Catchments and Rivers will focus on process understanding of source-to-sink sediment, carbon and geochemical fluxes from montane environments to coasts and deep-sea sinks. We will deliver: (1) enhanced understanding of sediment transfer from mountain and upland landscapes after extreme events; (2) improved tracking of carbon from minerals through soil to river catchments, making pioneering measurements of CO_2 release along with the reactivity and age of organic matter in weathered sedimentary rocks; (3) improved understanding of how river form affects drag by investigating how flow structures are influenced by boundary roughness and aquatic vegetation; (4) greater clarity on the feedbacks between flow processes, channel evolution, and deposition in terrestrial and deep-sea channel systems impacted by powerful sediment flows; and (5) interdisciplinary approaches to connectivity that allow us to better understand, adapt to, and manage complex systems.

Hazards and Surface Change will advance understanding of the processes that shape Earth's surface, and their role as persistent hazards that affect communities around the world. We will focus on: (1) improved understanding of mass movements, using innovative laboratory tests and remote sensing techniques at scales ranging from single hillslopes to seismically-active mountain ranges; (2) quantifying the impacts of mass movements on landscape form and sediment cascades, combining geochemical provenance tracers in river and lake sediments with numerical modelling of hillslopes and rivers; (3) new knowledge of the land-sea interface by monitoring the controls on sea-level change and the evolution of rocky coasts; and (4) enhanced understanding of, and preparedness for, complex cascading hazards that repeatedly impact lives and livelihoods, along with the role of local knowledge for informing policy and practice before and after disasters.

1.4 Achieving our research aims: policies and practices

Our research culture is embedded in the daily life of the department. We recognise that the inspiration for research can be mercurial and hard to anticipate, and we therefore mix formal research events with spaces for more *ad hoc* conversations. The department operates a research budget of approximately £100,000 per year, which is split between top-down and bottom-up mechanisms:

- Research development funds (£76,000 per year) are available to support staff and postgraduate students in undertaking and organising research activities. Funding can be used for a wide range of activities, such as the development of research networks, pilot research, or trialling certain aspects of larger proposals. We use a rolling call to maximise flexibility, and we prioritise applications from early-career researchers and colleagues returning from leave.

- Clusters are supported by internal funding (totalling £10,000 per year) to organise activities and events, and provide space for internal reflection on ongoing work. Clusters are enriched by visits from external speakers; in human geography speakers are scheduled around intra- or cross-cluster events, while in physical geography we use additional funding (£7,000 per year) to support a regular cross-cluster seminar series.

- We run an international visitors scheme (£9,000 per year) to bring in prominent external people who can extend and invigorate our research (16 during the REF2021 period).

- Additional funding is specifically reserved for outreach and impact activities, described in section 1.5.

- We organise an annual celebration of departmental research to further build community and provide all staff and postgraduate students with the opportunity to learn about one another's research and impact work, and build future collaborations. We also use away days to reflect on strategic research topics with involvement from all staff.

- We organise regular research and impact development activities for specific groups within the department, such as early-career researchers, principal investigators, and applicants to specific grant schemes or fellowships. Examples during the REF2021 period include: independent fellowships; the peer-review and publication process; being a PI; and writing workshops for staff at all career stages.

In addition, all staff receive an allowance of £1,000 per year (£1,500 for assistant professors) to support conference travel, field work, or miscellaneous research and impact costs.

Research activity is directed by a departmental research committee, led by two co-directors of research who span human and physical geography. This co-director model extends the breadth of experience and leadership across the broad range of research topics and approaches within a large department.

1.5 Support for impact

Our research culture is designed to generate research that is both intellectually innovative and of wider public and societal benefit. Impact is thus an integral part of the day-to-day research process, from the inception of ideas to the conduct of the research and its outputs and outcomes. We also acknowledge that impact within the scope of REF2021 represents only one strand of a broad range of important activities, including outreach, public engagement, knowledge transfer or exchange, and collaboration. We see impact as something that all staff will engage with at different points, rather than being the preserve of a particular cluster or subset of staff.

Our aim is to create and maintain an environment that allows all staff to identify and nurture the impact of their research, broadly defined. Much of our impact stems from the relationships and trust between staff and external partners and beneficiaries, and our support for impact is tailored to protect and enhance those relationships – both during the research and after it has ended.

- The co-directors of research and departmental impact officers provide strategic oversight and direction of impact-related activities. Their specific roles include interpretation and communication of impact definitions and requirements; coordination of impact support mechanisms; and embedding impact in departmental research culture, including informal monthly round-table impact discussions as well as feedback on impact plans.

- The departmental impact officers provide direct support to staff in the identification and development of impact at all stages of research.

- Impact work is explicitly recognised in our departmental workload model as a routine part of research. An allowance of 50 hours per year is given to all staff for impact-facing activities of all kinds, whether or not they fall under the REF2021 definition of impact. Colleagues leading significant areas of impact are allocated additional workload time.

- We operate a departmental impact fund (£16,000 per year) dedicated explicitly to furthering and developing impact. These funds are allocated by an open call to allow for responsiveness and flexibility. Staff are also encouraged to apply to University impact seedcorn funds and to ESRC and EPSRC Impact Accelerator Accounts, with support provided by the Impact Officers. Within the REF2021 period, 27 staff (40% of current permanent academic staff) received a total of £330,000 of impact funding, showing the reach of impact activity across the department. Examples of work that was supported by this funding, beyond our impact case studies, are given in section 4.3.

1.6 Support for interdisciplinary research

Interdisciplinary research across the natural and social sciences and humanities is a core part of our activity and is enshrined within our guiding principles, particularly our focus on global and societal challenges. As evidenced by the thematic focus of our clusters, we are committed to experimenting with new forms of geographical thought which cross conventional disciplinary boundaries. New staff are recruited from a broad range of disciplinary backgrounds; 12 of our current permanent academic staff (19%) have PhDs outside of geography.

The research support mechanisms described in section 1.4 enhance our ability to secure large, complex grants that require broad interdisciplinary or transdisciplinary collaborations. Major interdisciplinary projects that have resulted from these mechanisms within the REF2021 period include the ESRC-funded Move project (*Curtis*, 2012-2014), involving education, geography, and health; the NERC/ESRC-funded Earthquakes without Frontiers consortium (*Densmore*, 2012-2018), involving natural scientists, social scientists, and practitioners in earthquake risk reduction; the European Commission-funded Nature-based Urban Innovation project (*Bulkeley*, 2018-2023), involving urban development, geography, innovation studies, and economics; and the European Commission-funded i-CONN ITN (*Turnbull-Lloyd*, *Wainwright*, 2019-2022), involving astrophysics, computer science, ecology, geomorphology, hydrology, neuroscience, systems biology and social science.

During the REF2021 period we have prioritised interdisciplinary doctoral training programmes that can support diverse cohorts of postgraduate students, leading to department staff playing key roles in a number of programmes: the alumni-funded Action on Natural Disasters (2016-2020), the Leverhulme-funded Durham Arctic Research Centre for Training and Interdisciplinary Collaboration (DurhamARCTIC, 2018-2023), the GCRF-funded Durham Global Challenges Centre for Doctoral Training (2019-2021), and the NERC/EPSRC-funded Aura Centre for Doctoral Training in Offshore Wind and the Environment (2019-2027).

The department's research culture also benefits from leadership of and engagement with the University's network of interdisciplinary research institutes, particularly the Institute of Hazard, Risk and Resilience (IHRR), the Institute for Medical Humanities (IMH), and the Durham Energy Institute (DEI). This engagement extends and complements our research expertise, provides the capacity to respond to wider funding calls, and facilitates new collaborations. During the REF2021 period, department staff have undertaken major leadership roles in each of the Institutes (*Curtis* and *Bracken*, executive director of IHRR; *Atkinson*, associate director of IMH; *Bulkeley* and *Marvin*, deputy directors of DEI). Staff also lead interdisciplinary University centres; *Steinberg* directs the University's Centre for Borders Research (IBRU), *Crang* directs the Centre for Visual Arts and Culture, while *Leshem* serves as co-director of the Centre for Modern Conflicts and Cultures.

1.7 Support for open research

As stated in our guiding principles, the department is committed to making research outputs and data openly accessible to the greatest possible extent. In October 2014, we developed a policy and mechanism to deposit all of our research outputs in the University's searchable open-access repository (Durham Research Online, DRO). This was well in advance of the REF2021 policy on open access. Within this framework, 1,526 departmental outputs were made openly available during the REF2021 period. All of the 90 submitted outputs that are within the scope of the REF2021 open-access policy are compliant. Department staff serve on editorial boards of a number of open-access journals, including *PAGES* (*McClymont*), *Earth Surface Dynamics* (*Hilton*, *Hodge*), *Cryosphere* (*Stokes*, *Whitehouse*), *Open Quaternary* (*Engelhart*), *Climate of the Past* (*McClymont*), and *GEO: Geography and Environment* (*Steinberg*).

We use the University Research Data Management Policy, effective from August 2017, to guide the governance, storage, and disposal of research data. The University Research Data Service maintains the research data catalogue and provides support for staff on best practice regarding data access. Specific guidance on how to implement the policy within the department is provided by the co-directors of research. Our standing position is that, wherever possible and in compliance with ethical and legal considerations around personal and commercial sensitivity, research data should be made publicly available to the greatest extent possible.

Several examples illustrate our commitment to open research. *Reaney* made his diffuse pollution risk mapping framework SCIMAP freely available for non-commercial use in 2016, as both a web application and as a stand-alone programme under a Creative Commons license. *Bentley* and colleagues developed iceTEA, a set of free online tools for consistent analysis of cosmogenic isotope data. *McClymont* serves on the open data advisory board for the PAGES programme, which provides leadership and guidance on data management for global palaeosciences research.

1.8 Mechanisms for maintaining research quality and integrity

The mechanisms in section 1.4, as well as the mentoring schemes described in 2.2, maximise the quality of the department's research. The department's Research Ethics and Governance Committee (REGS) is responsible for all matters of research integrity. REGS leads on the inculcation of an ethical culture in all elements of departmental research, spanning rigorous ethical review before research commences, training in research ethics for staff, and the development of postgraduate research skills and practices. As well as advising on issues such as data protection and intellectual property rights, REGS also leads on our dedicated process for assessing work in challenging political environments, involving a team of off-site advisors drawn from staff with experience of working in locations with political tension, civil unrest, and/or intensive surveillance.

Section 2. People

2.1 Overview

We aim to recruit and develop a vibrant community of academic staff, research staff, and postgraduates who work with technicians and administrative staff to conduct excellent research and impact, in an environment in which all staff and ways of working are equally valued. We offer all staff and postgraduates a supportive, inspiring, and collegial environment in which they can pursue their research interests and passions and address important questions and problems.

We remain one of the largest geography departments in the world, with a 6% increase in the number of Category A staff since REF2014 (67 in 2014, 71 in 2020). Of the 15 permanent staff who have departed since 2014, five retired (*Atkins*, *Burt*, *Curtis*, *Dunn*, *Innes*), four moved to academic posts outside of the UK (*Hörschelmann*, *Macnaughten*, *Rigg*, *Staeheli*), and six moved

within the UK (*Callard*, *Closs-Stephens*, *Marvin*, *Pain*, *Petley*, *Tolia-Kelly*). We used replacement positions and new posts to build upon our existing research strengths, advance new strategic priorities, and maintain a welcoming, ambitious, flexible and adventurous research culture. When replacing leavers and mindful of existing promotions, we have invested in the future by prioritising entry-level positions, appointing 14 assistant professors (nine female, five male), one associate professor (female), and two professors (one female, one male).

- In human geography, we reinvigorated each of our research clusters. We invested in work on financialisation and resource extraction (*Anthias*, *Knuth*, *Lai*) as part of Economy and Culture, and strengthened work on the embodiment of social differences (*Newhouse*, *Secor*, *Wilson*) and on how non-human life is known and governed (*Johnson*, *Lehman*) in Geographies of Life. As well as bolstering work on digital urbanism in Urban Worlds (*Luque-Ayala*), we added new expertise on migration to Urban Worlds and Politics-State-Space (*Darling*, *Martin*), and on the relation between materiality and the political to Politics-State-Space (*Nieuwenhuis*, *Schmidt*).

- In physical geography, we renewed our research in Ice Sheets and Sea Level by appointing in the area of sea-level change (*Engelhart*) while at the same time developing new capacity at the interface of climate change and ocean circulation (*Moffa-Sanchez*). *McGregor* joined Durham as a college head and bolstered our expertise in climate-change impacts. We also strengthened quantitative Earth surface processes across the Catchments and Rivers and Hazards and Surface Change clusters (*Clubb*). Two NERC independent fellows transitioned to assistant and then associate professors during the REF2021 period (*Jamieson*, *Whitehouse*).

Independent postdoctoral fellows and research staff are crucial to the dynamism of our research culture, being active members of our research clusters, collaborating with academic staff, and, in the case of independent postdoctoral fellows, co-supervising PhDs with experienced staff. During the period, we hosted 34 independent postdoctoral fellows, including four funded by the ESRC, six Leverhulme, three NERC, two Marie Curie, one Royal Society, and one NWO. A further 17 independent research fellows were supported by the EU COFUND scheme. We also appointed 68 non-independent PDRAs during the period. Fixed-term appointments provide cover for staff funded via fellowships or prizes and all include protected time for research as well as mentoring, as described in section 2.2. As of the REF2021 census date, eight Category A staff are on fixed-term contracts.

2.2 Staff development

We invest in development to ensure that all staff are fully supported to undertake outstanding research and teaching in a collegial environment with a healthy work-life balance. We do this through a broad range of processes designed to provide the guidance, resources, and time necessary for people at all career stages to flourish:

- A workload management group chaired by the head of department and including directors of research and education ensures balanced workloads. New appointees are supported with a reduced workload.

- We use a medium-term (3-5 year) planning model to allocate administrative roles. All staff have opportunities to contribute to research administration, commensurate with interest and workload and unconstrained by assumptions of what is appropriate at different career stages. We are careful, however, not to burden early-career staff with onerous responsibilities.

- We use departmental resource to provide staff with one year's research leave after four full years of teaching, supplementing the standard Durham University allowance. A total of 37 staff took this leave in the REF2021 period. Staff are also encouraged to take

shorter patterns of research leave if this suits their circumstances, and this was adopted by 11 staff.

- All academic staff have a departmental mentor, and our mentoring policy is underpinned by two core principles: that mentoring is relevant to academic staff at all stages of their careers, and that it is concerned with the development of the individual and is not directly linked to promotion or performance.

- We provide additional support for the development of high-quality research outputs to all Category A staff and teaching fellows through a one-to-one mentoring scheme. Mentoring extends from advice on strengthening individual outputs through to long-term consideration of publication plans.

- The department maintains an annual training budget (£8,000 per year). Where research training needs are identified by staff or mentors, we have often used the opportunity to bring external training on-site for a wider group of staff and postgraduates.

- All staff receive annual tailored feedback from the department Progression and Promotion Committee as part of the university's progression system.

The success of our support processes is evidenced by our track record of internal promotion. A total of 21 academic staff have been promoted during the REF2021 period: 12 to associate professor (six female, six male), and nine to professor (three female, six male).

The above mentoring and feedback mechanisms are available to all independent research fellows. The success of our support processes is evidenced by 16 independent research fellows transitioning into permanent lectureships in Australia, Canada, China, Germany, the Netherlands, Spain, and the UK (including *Luque-Ayala*, *Jamieson*, *Whitehouse* at Durham).

We have adopted the Research Concordat for Research Staff and train PIs to ensure uptake, clarify contract renewal procedures, and establish career development as a formal part of the annual review process. A representative of research staff sits on Research Committee. One of the co-directors of research is designated as Research Staff Champion. We also provide regular training and guidance workshops for research staff on career development. The effectiveness of this support programme is evidenced by 16 PDRAs moving to permanent lectureships in Australia, the Czech Republic, the Netherlands, Ireland, France, and the UK.

2.3 Equality, diversity, and inclusivity (EDI)

EDI considerations are enshrined in the principles that underpin our research environment (section 1.1), and are critical to our open, inclusive research culture. A major achievement over the REF2021 period has been to continue the process of tackling longstanding gender imbalances in recruitment and research leadership. Of the 17 permanent Category A appointments made in the period, 11 (64%) were female and six (36%) were male. The proportion of female FTE is now 37% (from 35% in REF2014). We strive to maintain gender balance on all major committees and Departmental Management Group, which comprises all senior leadership positions. Women have played prominent roles in departmental research leadership over the REF2021 period, as co-Directors of Research (*Bulkeley* and *Woodroffe*, 2017-2020), Director of Services (*McClymont*, 2017-2020), Directors of Postgraduates (*Colls*, 2016-2019, *Atkinson*, 2019-present), and Deputy Head of Department (*McEwan*, 2017-19; *Amoore*, 2019-2020). During the period, the department supported *Atkinson* to serve as Deputy Head of Faculty (Research) (2015-2018), *Bambra* as Director of the Wolfson Research Institute for Health and Wellbeing, *Curtis* and *Bracken* as Directors of the Institute of Hazard, Risk, and Resilience (2015-2019), *Bracken* as Deputy Vice-Provost Research (2019-present), and *Staeheli* (2012-2015) and *McEwan* (2015-2018) as Directors of the ESRC-funded NINE Doctoral Training Programme. In 2019, we appointed *Ross* as our first female Laboratories Manager.

Atkinson and *Woodroffe* are two of the six organisers of the University's Mothers and Mothers-to-be Support Network.

The department achieved a first-round Gender Equality Charter Mark and an Athena SWAN Bronze award in 2018. Our Gender Equality Working Group, led by *McClymont* and then *McGrath*, was transformed into an Equality, Diversity, and Inclusivity Group during the REF2021 period, chaired by *Crang*, in order to centre EDI issues in all departmental activities. Our strategic aim remains to continue our progress in addressing longstanding EDI inequalities within the department. Below are examples of how we are working toward this aim by embedding EDI considerations related to all protected characteristics in how we recruit staff, manage workloads, and support diverse ways of working:

- Appointment panels for all posts are gender-balanced. To ensure that we recruit the widest possible pool of applicants, the department uses gender-balanced search committees for all permanent Category A posts. These committees carry out systematic and proactive searches to reach a diverse global field of applicants beyond our own networks. We routinely monitor the proportions of applicants by all characteristics, and respond to those patterns through new targeted advertisements. As a result, all of our applicant pools for permanent academic staff during the period have exceeded Russell Group averages in terms of gender and BAME composition. Of the 17 permanent Category A staff appointed in the period, 11 originated overseas in six countries (Canada, Colombia, the US, Singapore, Spain, and the Netherlands).

- We operate a range of processes to ensure equality in administrative responsibilities within the department. Since 2013, we have implemented formal role descriptors and open calls for all major leadership roles, and we scrutinise the language of these to minimise any potential bias and to ensure they allow for flexible working arrangements, fractional working, and job shares. We ensure that adequate workload hours are allocated to these roles.

- In order to ensure that excellence is sustainable, we have adopted and developed a set of work-life balance principles and practices, including ensuring that major departmental meetings are held between 0930 and 1500. The default timing for research events is 1300-1500. Our principle aim to recognise the diversity of people's lives outside of university work, the uneven distribution of caring responsibilities, and the presence of different ways of working. We strive to ensure that departmental social occasions are fully inclusive of all staff and postgraduates, for example by supporting regular postgraduate-led 'Pizza Fridays' in our departmental social space.

- All requests for a shift to part-time working during the REF2021 period have been granted (three female, three male). We have twice enabled fractional workers to develop their career profiles by supporting job shares of leadership roles (as co-directors of research and of postgraduates). The opportunity for staff to transition back to full-time work is supported through mentorship and discussion with the head of department.

- We also support requests for flexible working, operating in an appropriate, fair and consistent manner. Of 80 requests, 70 were approved and 10 partially approved.

- During the REF2021 period, we supported 10 maternity leaves, three paternity leaves, and two parental leaves. We strongly encourage staff to consider the University's provision of one term of research leave upon return from a period of 26 weeks or more maternity, adoption, or parental leave, which was introduced in 2015. Four staff have been granted this research leave, which is additional to the entitlement detailed in section 2.2. This includes one leave which was not strictly allowable under the policy but for which the department argued strongly on the grounds of fairness. Conversations with the head of department before and following leave consider relevant additional support. We

prioritise research development fund applications for returning staff for one year from return date.

- Led by the EDI committee, we have undertaken a range of actions to promote inclusivity. These include the provision of gender-neutral toilets, support for cross-cluster research events on race and humanism, and reading groups focused on the decolonisation of development research and queer geographies.

EDI considerations have also been central to how we have prepared for REF2021. Our approach to output selection follows the University's Code of Practice, but goes beyond it in the provision of mentors (section 2.2) and transparency to the department over the distribution of outputs by protected characteristics and career stage. All possible outputs have been double-evaluated by a group of departmental readers at different career stages and with a balanced gender composition. In the interest of transparency, data on the distribution of selected outputs and estimated grades were discussed by the department in 2018/19 and 2019/20.

2.4 Research students

2.4.1. Overview

Our large, vibrant international community of research postgraduates is integral to our research environment. We currently supervise 92 PhD students registered in the department (c. two-thirds of whom are from outside the UK) and 15 in other Durham departments**,** with an average of 21.1 PhD completions per year, up from 15.4 completions per year in REF2014. All doctoral degrees were PhDs rather than professional doctorates. Postgraduates work together with staff to initiate new ideas and themes, organise innovative events that develop our research priorities, publish, and contribute to our impact. By putting postgraduates at the heart of our research culture and providing outstanding training and support, we aim to enable our postgraduates to generate excellent research and equip them for successful careers.

The quality of our students is indicated by the award of 69 competitive UKRI studentships during the REF2021 period. Our UKRI success has been rooted in our leadership of doctoral training centres and partnerships. *Staeheli* led the ESRC North East Doctoral Training Centre (2012-2015), *McEwan* led the ESRC Northern Ireland and North East Doctoral Partnership (2015-2018) with seven partners, and *Donoghue* and *Wainwright* have successively led the IAPETUS NERC Doctoral Training Programme (2012-present), with nine partners. Concurrently, we have diversified our sources of funding during the period and prioritised the recruitment of high-quality international students, receiving 82 competitive studentships from non-UKRI sources. We also recruit students through our leadership of interdisciplinary training networks. For example, we lead a Leverhulme Trust Doctoral Scholarships Programme to support Interdisciplinary Understanding for a Changing Arctic (DurhamARCTIC, 2018-2023, directed by *Steinberg*) and a Marie Skłodowska-Curie Innovative Training Network (ITN) on connectivity science (i-CONN, 2019-2023, directed by *Turnbull-Lloyd*). We previously co-led and were the largest participant in a second ITN, on the glaciation of north Atlantic continental margins (GLANAM, 2013-2017).

2.4.2. Training and support

Every postgraduate has two or more supervisors, with a 50/50 supervisor split the norm. Progress is monitored through a first-year progression report and literature review, along with an interview by a panel of two other members of staff and presentation at a first-year conference; a second-year report; and a third-year report and conference presentation. Strategic oversight of research postgraduate matters is provided by Research Postgraduate Committee.

We provide additional support and training in five principal ways:

- All postgraduates receive bespoke training in research approaches and design, specialist skills and techniques, and professional development.
- We provide supplemental funding to postgraduates for fieldwork and conference attendance. Our Research Development Fund is available to postgraduates, and we also allocate c. £20,000 per year to a postgraduate hardship fund to enable rapid response to particular circumstances.
- We offer bespoke annual sessions organised within the department on aspects of the PhD process, including 'Writing Up' and 'Preparing for the Viva'.
- We run regular briefing sessions on academic careers, including advice on applications. We also provide information on non-academic careers in 'Beyond the PhD' sessions.
- Academic support is provided by a departmental academic progression officer.

2.4.3 Involvement in research culture

Postgraduates play a central role in our research culture through their close involvement in the annual planning of cluster themes and activities and by leading and participating in cluster events, including reading groups, workshops, and major conferences. Since 2018, most clusters have had a postgraduate co-convenor (rotating yearly) to ensure linkages between the programme of research activities and postgraduate interests.

Evidence for our strong and integrated postgraduate research culture is provided by the 34 research cluster events that have been organised or co-organised by postgraduates since 2014. Postgraduates have organised or co-organised workshops (e.g. 'Geopower', 2020; 'Google Earth Engine', 2020), international conferences ('Public Moods', 2019; 'UK Antarctic Science Conference', 2018), alternative activities (e.g. urban tour on the theme of 'housing and crisis'), as well as regular informal discussion and reading groups.

Our postgraduates develop capacities in research leadership through these activities, learn to forge and sustain networks, gain national and international recognition, and become immersed in conversations and ideas that enrich their own research and the collective work of the department. As well as delivering a multitude of conference papers, organising sessions, publishing, and editing special issues, postgraduates are co-authors on 18 of the outputs returned by the department in REF2021 (11%), including nine as first author.

The success of our processes is evidenced by the 38 postgraduates who have secured permanent lectureships, including 14 in UK geography departments and a further 8 in UK non-geography departments. As a hub for global research, our postgraduates secure academic positions globally, including 16 permanent lectureships in 13 countries. Additionally, a further 18 postgraduates have been awarded independent postdoctoral fellowships in Canada, Finland, Germany, Poland, UK, and USA, 28 have held PDRA roles, and nine have held teaching fellow roles. Outside of academia, students use their research skills in business (e.g. Total, General Electric, RMS), civil society (e.g. Natural England, Waterplan), and government (including in Nepal, Pakistan, Thailand, and the UK).

Section 3. Income, infrastructure and facilities

3.1 Overview

Our ambition to be a global node for geographical research is underpinned and sustained by the research income and infrastructure that enable that work to happen. Over the REF2021 period,

we have grown and diversified our research income, with our support processes (as detailed in 1.4 and 2.2) enabling a larger number of staff to be involved as PIs or Co-Is than in REF2014. We have also continued to develop our research infrastructure and equipment. We now run nine laboratories with a unique combination of world-class sedimentology, geochemical and geotechnical facilities, supporting research both within and across our research clusters. This breadth of expertise and capacity allows us to address a wide range of environmental problems, from the direct response of hillslopes to earthquake shaking to the respiration of carbon in a mountain belt.

3.2 Income

We have delivered on our strategic priority to maintain a bedrock of UKRI income while increasing income from other funding sources. Research income has totalled £29,824,243 over the REF2021 period on 292 awards, averaging £4,260,606 per year (up from approximately £3.5M per year in REF2014). Our income from UKRI sources has stayed consistent in the face of flat or falling budgets, averaging £1,324,983 per year on a total of 137 awards (compared with £1,331,754 per year in REF2014). In contrast, and in line with our long-term research strategy, we have significantly grown funding from EU government bodies (£973,175 per year, up from £122,424 in REF2014), and increased our funding from both industry (£514,586 per year, up from £312,577) and charities (£500,006 per year, up from £211,965). A total of 80 individual staff have been PIs on research grants during the period, including 46 current Category A staff (65%).

Headline achievements include five European Research Council grants, worth a total of over €10M, that were awarded during the REF2021 period: one Starting Grant (*Hilton*, €1.5M, 2016-2021), two Consolidator Grants (*McFarlane*, €1.4M, 2018-2022; *McClymont*, €2.0M, 2020-2025), and two Advanced Grants (*Amoore*, €2.2M, 2020-2025; *Bentley*, €3.4M, 2020-2025). *Bulkeley* leads a Horizon2020 project on nature-based innovation involving 13 partners across six countries (€7.8M, 2016-2020). Significant ESRC grants include projects on social innovation in austerity (*Painter*, £638,465), transformation in the UK oil sector (*Bridge*, £683,912), financial inclusion in refugee governance (*Martin*, £975,074), and smart urbanism and resilience (*Luque-Ayala*, £363,297). Department staff collaborated on four large NERC consortia during the REF2021 period: Lake Ellsworth (*Bentley*, 2009-2014), iGLASS (*Long*, 2011-2015), BRITICE-CHRONO (*O'Cofaigh*, *Roberts*, *Evans*, 2012-2018), and ChAOS (*Hilton*, 2017-2021).The department has also hosted a number of Leverhulme awards during the period, including Philip Leverhulme Prizes to *Anderson, McFarlane, McClymont*, and *Hilton*, a Major Research Fellowship to *Amoore* and Fellowship to *Bridge*, and Early Career Fellowships to *Calkin*, *Cook*, *Harker*, *Pope*, *Richardson,* and *Silver*.

In addition to the support mechanisms detailed in sections 1.4 and 1.5, our increase in yearly income and diversification of sources has been achieved through (a) rigorous demand management and internal peer review of applications, supported by faculty-level peer review for large or complex bids and review by University UKRI liaison groups, and (b) the use of research clusters to provide supportive mentoring of staff as they develop ideas for grant proposals. We operate a proactive process of call monitoring, supplemented by peer review and by mock UKRI and ERC panel interviews where appropriate. We recognise that levels of grant income will vary among staff according to subject, career stage, and experience. Correspondingly, there are no targets for individual staff with respect to grant capture.

A departmental research office provides bespoke support to staff in research grant applications, post-award grant administration, advertising and coordinating activity around grant calls and supporting cluster activities, research visitors, and administration of internal research funds.

Our strategic aim post-REF2021 is to support the research vision outlined in section 1.3 by continuing to diversity our income via (1) UKRI, including GCRF and schemes at the interfaces between councils; (2) bilateral and multi-lateral international funding schemes, including but also beyond European national funders; and (3) industry sources, including knowledge transfer

partnerships. We will leverage our successes in capturing large research consortia, mentoring less-experienced staff and giving them the capacities and confidence to apply for future large grant programmes.

3.3 Infrastructure and facilities

The breadth of our research activity is supported by a comprehensive, state-of-the-art research infrastructure. All of our facilities are shared across the department, ensuring that all staff and postgraduates can benefit from them, irrespective of funding. Our facilities are supported by a pool of dedicated technical staff (currently 12 FTE) and a research computing officer, and comprise the following major items:

- The alumni-funded Laithwaite Landslide Laboratory contains geotechnical apparatus for understanding controls and impacts of mass movements, including a range of innovative shear boxes and triaxial cells developed in-house with industry partners. This facility underpins, for example, our recent research on the response of hillslopes to earthquake shaking and the importance of wave phase in landslide triggering.

- A Geotek multi-sensor core logger (comprising magnetic susceptibility, linescan imaging, XRF, gamma density, and resistivity measurements), along with a bespoke vertical X-ray 3-D CT system designed for the department, provides rapid, non-destructive and micron-scale characterisation of sediment cores. The system is used to reconstruct high-resolution, multi-proxy records of environmental change. The XRF spectrometer is supported by a dedicated XRF/XRD facility, with lab- and field-based instruments, to allow rapid qualitative and/or quantitative information on sediment chemistry and mineralogy.

- A purpose-built gamma dating laboratory that measures Cs and Pb isotopes, used for dating recent sediments.

- A dedicated biomarker facility, including a state-of-the-art GC-IRMS for isotopic measurement of individual biomarkers, used to determine hydrological changes, carbon cycling, reconstruction of climate and sea-level change, ocean-ice sheet interactions, and sediment provenance. This facility underpins a number of major recent projects, including ERC awards to *Hilton* (2016-2021) and *McClymont* (2020-2025), as well as NERC standard grants to *McClymont* (2016-2019), *Roberts* (2016-2021), and *Hilton* (2017-2020).

- A sediment and water geochemistry facility, including ICP-OES, ICP-MS, ion chromatography, and elemental analyser systems, used to determine elemental compositions in waters, sediments and soils. The facility has been used, for example, to track sediment inputs to rivers as a way of tracing carbon transport through large catchments, including in the aftermath of large earthquakes, and the impacts of mineral extraction on the coastal environment in North Yorkshire. The facility underpins an ERC award (2016-2021) and NERC standard grant (2017-2020) to *Hilton* and a large project funded by Cleveland Potash Limited to *Brain* and *Rosser* (2014-2021).

- A particle size facility, including two Beckman Coulter laser diffraction particle size analysers and a Beckman Coulter Multisizer Coulter Counter.

- A microscope facility, includes research-grade compound and stereo microscopes used in micropalaeontological (diatoms, pollen, foraminifera, chironomids) and sedimentological analyses.

These instruments are housed within climate-controlled clean laboratories for sample preparation, geochemical, and sedimentological analyses. A new on-site cold store (purchased

during the REF2021 period) has increased our capacity to archive sediment cores at Durham, and provides flexibility when samples are temporarily transferred to Durham from NERC storage facilities. Inventory software allows us to more efficiently manage our portfolio of sediment and water samples.

Field research in the department is supported by a wide range of sampling equipment for use on- and offshore. Survey equipment includes three differential GPS systems and three terrestrial laser scanners, along with a unique bespoke permanent laser scanner at Whitby, North Yorkshire, to monitor cliff failure to millimetre resolution. This capacity has supported the first quantitative investigation of how monitoring interval affects rockfall magnitude-frequency relationships as well as integration of optical imagery with airborne Lidar for tracking surface change. A fleet of five DJI Mavic 2 and Phantom 4 Pro un-crewed aerial vehicles supports research on new applications of structure from motion. The department also owns six vehicles, two deep-water and one shallow-water acoustic Doppler current profilers, and a deployable network of c. 10 meteorological stations and data loggers, and runs a network of c. 30 GPS receivers that are currently deployed across West Antarctica.

Research in the department is further served by a dedicated cartography unit comprising 2 FTE, with skills that include photography, videography and video production, web design, drafting, poster design, and large-format printing.

Research computing facilities are provided at university rather than department level. High-performance research computing requirements are supported by access to the Hamilton Linux cluster with 4700 cores; use of the cluster is free for UKRI-supported research and is routinely costed into research funded by other means. Department staff benefit from the Advanced Research Computing (ARC) facility, a dedicated computing support unit within the University, which provides facilities and expertise ranging from simple coding assistance through to help with computationally intensive tasks. All research staff in the department receive personal research storage of up to 5 TB of industry-standard storage housed in two data centres.

The sustainability of our infrastructure and facilities is ensured by both targeted investment and routine recharging from the use of departmental equipment. The department and University have invested approximately £2,000,000 in both replacement and new equipment during the REF2021 period. Shared usage is promoted by the integration of our departmental equipment into an equipment database across the N8 Universities that has operated since 2014. The department maintains an annually-reviewed priority list of equipment that is due for replacement or could support emerging research areas. Technical staff are regularly re-trained on our equipment pool; we use our annual development review process to identify areas where training is necessary, and we routinely include training costs for multiple staff members in bids for new equipment.

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

4.1 Overview

We work with other academic and non-academic partners in order to generate important, transformative research, lead strategic activities within and beyond the discipline, and support, engage and enthuse researchers. As a key node in a global network of research and impact activity, we achieve this aim by: (1) fostering exciting research collaborations leading to new knowledge, agendas and capacities; (2) establishing mutually beneficial relationships with key non-academic partners and users; (3) professional service that provides disciplinary leadership and guides strategic developments; and (4) leading postgraduate and early-career initiatives. Our prioritisation of collaboration and service is embedded in our research principles and policies, cluster activities, and staff support mechanisms (as detailed in sections 1 and 2).

4.2 Research collaborations

Collaboration is a normal part of how we work. Our returned staff have been involved in funded research projects that comprise collaborations with 44 UK HEI partners and 82 overseas HEI partners across 31 countries in all regions of the world. Our outputs returned to REF2021 involve colleagues in 236 institutions across 33 countries. These returned outputs are just a fraction of our collaborative activity. For example, staff have edited 59 journal special issues and 30 books or proceedings volumes, including major reference works such as the *Wiley-Blackwell Companion of Political Geography* (*Secor*), *The Edinburgh Companion to Medical Humanities (Atkinson), Handbook of Sea Level Research* (*Shennan*) and the *Routledge Handbook of Political Ecology* (*Bridge*).

Collaborations also happen through events that develop ideas, share research and build new agendas and communities. During the period, staff co-organised 84 external conferences and 146 distinct conference sessions, including 44 at the AAG, 36 at RGS-IBG, 15 at EGU and 7 at AGU. As well as this external activity, our clusters organised 42 national and international conferences, as well as smaller workshops and symposia**.** We also lead, facilitate and contribute to externally-funded networks, seminar series and workshops. We are PIs or named co-Is in Leverhulme Trust International Networks (e.g. 'Indeterminate and Changing Environments', *Steinberg*, PI), ESRC seminar series (e.g. 'Researching Arts, Health and Well-Being', *Atkinson*; 'Psychological Governance', *Anderson*, *Painter*), EU COST actions (e.g. 'Connecting European Connectivity Research', *Turnbull*, *Wainwright*; 'Decolonising Development', *McEwan*), and an ESRC Newton Fund network ('International Network on Comparative Urban Low Carbon Transitions', *Luque-Ayala*, *Bulkeley*), as well as networks and series funded from a wide range of other sources, including The Sociological Review, the Antipode Foundation, and the National Science Foundation.

As well as welcoming at least 1,800 external delegates to Durham events, we have hosted a total of 77 academic visitors from 20 countries, of whom 59 were self-funded and 18 were funded through our Distinguished International Visitors scheme. In turn, a third of current permanent academic staff have held a total of 26 visiting positions at institutions in 14 countries.

4.3 Relationships with users, beneficiaries, and audiences

Engagement with non-academic partners is one of our core principles and embedded in our support mechanisms (as detailed in 1.5) and research cluster priorities and activities. During the period, current academic staff undertook collaborations with 51 UK and 60 overseas non-academic organisations, including UK and international governments and regulatory bodies, businesses, NGOs, charities and other third sector organisations. Our wider contributions to economy and society occur through four main types of work, with examples below and in our impact case studies.

4.3.1 Policy influence and change

We work closely with governments and third sector organisations to influence policy, using several distinct pathways. We use research briefs to shift policy agendas; for example, research by *Bambra* on the differential geographies of access to pharmacy care in the UK shaped national campaigns and was cited in the Department of Health's impact assessment around reducing community pharmacy funding. In collaboration with anti-trafficking organisations, *McGrath* produced a policy brief setting out principles for addressing trafficking, forced labour and slavery in supply chains. We also use direct engagement with regulatory organisations to embed research in policy. *McGregor* served as lead editor for World Health Organization and World Meteorological Organization guidelines on the implications of heatwaves for public health authorities. Finally, we work directly with third sector organisations. *Darling* has provided advice around UK asylum accommodation for a wide range of organisations, including Asylum Matters, the Scottish Refugee Council, the Northern Ireland Community of Refugees and Asylum

Seekers, and the No Accommodation Network. *Luque-Ayala* produced, in collaboration with Arup, an Urban Resilience Framework which formed the conceptual framework for the Rockefeller Foundation's 100 Resilient Cities programme.

4.3.2 Co-production with communities and third sector organisations

Based on a co-production model of impact that involves sustainable, mutually beneficial partnerships with non-academic users, our work has supported a variety of communities and third sector organisations. We launched the Participatory Research Hub in 2015 to facilitate co-produced research between Durham researchers and the local community, with more than 370 participants. *McEwan*'s research with Newcastle has underpinned the production of a field guide for sustainable harvesting in partnership with Flower Valley Conservation Trust, an NGO working for sustainable wildflower harvesting and conservation in South Africa's Cape Floral Kingdom. The field guide and training tools have created a rigorous environmental audit within a wildflower harvesting supply chain which extends to UK and South African high street retailers. *Oven* worked with communities in Nepal to evaluate the successes and limitations of a set of minimum characteristics for disaster resilience, which informed programming by the Red Cross and the design of local disaster management plans by the Government of Nepal.

4.3.3 Environmental management

We use our expertise in environmental monitoring and modelling to help government, businesses, and third sector organisations improve their environmental management processes and practices. Our expertise in detection of grain size from high-resolution imagery (*Carbonneau*) is being used in river management in northern Italy by the Italian environmental protection agency ISPRA. Research by *Rosser* and *Brain* on the evolution of rocky coasts has been supported since 2002 by a collaboration with Cleveland Potash Limited, with total funding during the REF2021 period of c. £4,000,000. This research has provided the company with critical evidence of environmental risks associated with future mining activities at the UK's largest non-hydrocarbon extractive mine. We also build and lead collaborative networks of non-academic partners around key environmental problems. For example, the Water Hub is a collaboration between Durham University, Durham County Council, the Environment Agency and Northumbrian Water, funded by the European Regional Development Fund and led by *Bracken*. It engages with small and medium-sized enterprises in northeast England to develop innovative, practical solutions to challenges in the region's water sector.

4.3.4 Public engagement and outreach

Public engagement and outreach happen across all areas of our work, and involve traditional exhibitions and public materials as well as more experimental outlets. *Leshem* worked with Google Arts and Culture to produce a digital exhibition on the theme of 'no man's land' – the first collaboration between a UK university and Google Arts and Culture, with more than 15,000 unique visitors to date. *Bentley*, *Jamieson*, *Stokes*, and *Whitehouse* collaborated with the British Antarctic Survey on an exhibition at Durham that showcased objects from the Scott and Shackleton expeditions alongside modern scientific equipment and footage of Antarctic research. In addition to >3,000 visitors, a set of resources for teachers were developed with school visits and teacher CPD. *Warburton* and the artist Laura Harrington used a Leverhulme Artist-in-Residence award for an exhibition entitled *The Liveliest of Elements, an Extraordinary Ordinary Material*, using sound, images, and words to explore the Moss Flats, an upland peat flat in the North Pennines. We also produce materials for interested publics to enhance their engagement with place. Examples include field guides to *The Quaternary of The Lower Thames and Eastern Essex* (*Bridgland*) and a *Guide to a Glacial Landscape Legacy* for the Vatnajokull National Park, Iceland (*Evans*). As a more experimental approach to outreach, the department hosted a band, Ribbon Road, under another Leverhulme Artist-in-Residence award, leading to an album of original songs about the housing crisis in Durham. *Bulkeley* and others collaborated with writers on 'Weatherfronts', a set of stories to explore alternative post-carbon futures, and

produced an event at the 2016 Durham Book Festival entitled 'Tipping Points: Climate Change and the Stories We Tell'.

4.4 Research leadership and professional service

Our research influence and leadership is recognised through membership of learned societies (*Bulkeley*, *Hudson*, *Painter*, Fellows of the Academy of Social Sciences; *Bulkeley, Curtis, Hudson*, Fellows of the British Academy; *Burt*, AGU Fellow), and the award of 12 prizes or awards to nine current academic staff (*Anderson, McFarlane, McClymont, Hilton,* Phillip Leverhulme Prizes; *Shennan,* 2016 QRA James Croll Medal; *Evans*, 2017 RGS-IBG Busk Medal; *Bulkeley*, RGS-IBG Back Award; *Cartigny,* 2018 Early Career Scientist Award, International Society of Sedimentologists, and 2018 Roland Goldring Award, British Sedimentological Research Group*; Whitehouse*, 2016 Bullerwell Lecture, British Geophysical Association; *Hilton*, 2014 Outstanding Young Scientist of the European Geosciences Union, 2018 Blavatnik Award for Young Scientists finalist). Staff have delivered more than 250 keynote presentations and public lectures.

We play a key role in shaping UK and international research agendas through involvement with major funding bodies. Physical geography staff play a wide range of roles for NERC. *Bentley* is Chair of Panel A, while *Donoghue* chaired the NERC Airborne Research and Survey Facility Steering Committee. Staff have also served as members of the Strategic Programme Advisory Group and NERC Advisory Network (*Densmore*), and the Cosmogenic Isotope Analysis Facility (*Long*, *Densmore*), and Radiocarbon (*O'Cofaigh*, *Lloyd*) Steering Committees. *Hardy*, *Long*, and *Woodroffe* have served on standard grant panels, and *Woodroffe* has also served on panels for Global Partnership Seedcorn funding and Independent Fellowships. *Donoghue* was Vice-Chair of the Constructing a Digital Environment strategic programme panel and panellist for the Big Data Centre for Doctoral Training, and *Crang* was Vice-Chair of the NERC/AHRC Newton Columbia Biosciences Panel. *Bentley* served on the National Excellence Panel for Evaluation of NERC Centres. Human geographers have similarly helped to shape strategic programmes within the ESRC. *McFarlane* sat on the scoping panels for the ESRC-DIFID Education and Development Funding call, and ESRC-Brazilian-Dutch Urban Sustainability initiative. He also served on the ESRC Off-Grid Cities panel. *Luque-Ayala* helped to develop the specification for the CONACYT-ESRC Newton Call for collaborative research on smart cities, and *Langley* sat on the online scoping platform for the GCRF Digital Innovation for Development in Africa call. *Bulkeley* served on the advisory group for the ESRC Climate Change Programme and Urban Transformations programme. *McEwan* sat on the ESRC Doctoral Training Network Directors Committee, overseeing postgraduate training in the social sciences. In terms of wider UKRI initiatives, *Bracken* served on the panel for GCRF large grants, and *Gregson* is on the Steering Committee for the UKRI's interdisciplinary Circular Economy research programme. In addition to these strategic roles, staff at all career stages regularly contribute peer review of proposals, with 11 members of staff on the NERC peer review college, seven on ESRC, and two on AHRC. Staff have also contributed to panels and the development of strategic initiatives for the British Academy (*McFarlane*, *Bulkeley*), and as peer reviewers for a wide range of funders, including the Royal Society, Leverhulme Trust, Wellcome Trust, and Carnegie Trust.

Internationally, current staff have reviewed proposals for 31 funding organisations across 20 countries. As well as sitting on grant assessment panels for the European Commission (Advanced Grants, *Bulkeley*; MSCA Fellowship Programme, *McFarlane, Painter*), staff have sat on assessment panels for 10 national funding bodies in Denmark, Norway, Portugal, Italy, Sweden, and the USA. We also play a strategic role shaping high-profile initiatives which coordinate science across national programmes. *O'Cofaigh* chaired the International Arctic Science Committee Thematic Network 'Palaeo-Arctic Spatial and Temporal Gateways'. *Bulkeley* sits on the EU's JPI Climate Transdisciplinary Advisory Board as the ESRC and NERC's nominee, while *Bentley* is one of two UK Delegates to the Scientific Committee on Antarctic Research. Rosser is co-lead for landslides on the NASA Committee on Earth Observation Satellites Disasters Working Group.

Within the discipline, we provide significant intellectual leadership and service through our extensive contributions to journal editorship. In the REF2021 period, staff have served as editors for 15 journals, including *Progress in Human Geography* (*Amoore*), *The Geographical Journal* (*Anderson*), *Antarctic Science* (*Bentley*), *Progress in Physical Geography* (*Bracken*), *Transactions of the Institute of British Geographers* (*Bridge*, *McFarlane*), *Journal of Geophysical Research-Earth Surface* (*Densmore*), *Economy and Society* (*Langley*), *Journal of Quaternary Science* (*Long*), *Climate of the Past* (*McClymont*), *Geography Compass* (*McEwen*), *Quaternary Science Reviews* (*O'Cofaigh*), *Environment and Planning C: Politics and Space* (*Bulkeley, Painter*), *Cultural Geographies* (*Secor*), *Political Geography* (*Steinberg*), and *The Cryosphere* (*Stokes*, *Whitehouse*). We have acted as associate editors or book review editors for 14 journals, and have served on the editorial boards of 57 geography and interdisciplinary journals and eight book series.

We also support and shape professional associations and learned societies in the discipline. We co-edit two of the RGS-IBG journals (*TIBG*, *McFarlane*, previously *Bridge*; *The Geographical Journal*, *Anderson*). Staff have served on RGS-IBG council (*Painter*), small grants committee (*Leshem*), and in roles on multiple research groups, Economic Geography (*Lai*), Political Geography (*Leshem*), Gender and Feminist Geographies (*Colls*), Social and Cultural Geography (*Anderson*, *Wilson*) and working groups (Carceral Geographies, *Martin*). Similarly, we have played key roles in major UK professional associations, including the Quaternary Research Association (*Bridgland*, vice-president; *McClymont*, awards officer; *Woodroffe*, editor of the Quaternary Newsletter), the British Society for Geomorphology (*Wainwright*, chair; *Hodge*, honorary secretary), the Geologists' Association (*Bridgland*, council member and vice-president), the Remote Sensing and Photogrammetry Society (*Donoghue*, UAV Special Interest Group and Archaeology Special Interest Group convenor), the Royal Society (*Bentley*, Global Environmental Research committee member), and the UK Palaeoclimate Society (*McClymont*, committee member). *Bentley* is chair of the UK National Committee on Antarctic Research. We also contribute to international associations and societies, including the American Association of Geographers (*Secor,* board member), International Critical Geography Group (*Painter, Secor*, steering committee member), and the Fluvial Archives Group (*Bridgland*, chair and executive member).

4.5 Postgraduate and early career training beyond Durham

Staff contribute to postgraduate training beyond Durham in three ways, in addition to having served as external examiners for 228 PhD students, including 83 overseas in 22 countries. First, we lead cross-institutional (NINE DTP, IAPETUS/IAPETUS2, GCRF CDT, Aura CDT) and interdisciplinary collaborations (Durham ARCTIC, i-CONN). Second, we organise novel postgraduate-focused initiatives and events. Examples include *Newhouse*'s involvement in developing the Academy for African Urban Diversity hosted in Johannesburg, *Anthias'* co-organisation with the University of Copenhagen of a summer school on governance, and *Whitehouse's* organisation of the POLENET-SERCE Glacial Isostatic Adjustment Training School in Gävle, Sweden. Third, we have contributed invited lectures and workshops to 42 international postgraduate-focused summer schools and workshops in 14 countries, on research topics (e.g. *Engelhart*, sea level changes, CoChE EGU summer school, Sardinia; *Nieuwenhuis*; geopolitics, Maastricht; *Johnson,* political ecology, Wageningen), methodologies (e.g. *Crang*, qualitative methods, University of Oslo), and skills and career development (e.g. *Wilson*, RGS-IBG Geoforum Early Career Event; *Clubb,* E4 DTP careers workshop).