

Institution: University of Northampton
Unit of Assessment: Geography and Environmental Studies (UoA14)
<p>1. Unit context and structure, research and impact strategy</p> <p>1.1 Unit context and structure</p> <p>This REF submission continues a longstanding history of research in Geography and Environmental Sciences at the University of Northampton (UoN) and its antecedent institutions. Interdisciplinary research, evidence-based practice, and innovative research-led pedagogies continue to be central to our work in relation to diverse contemporary geographical and environmental issues.</p> <p>All members in the unit are associated with the Environment Research Group (ERG), led by Ollerton, which offers a wide range of opportunities for discipline-specific community-building and researcher-development activities, aligned with a wider offer of interdisciplinary research support and community-building activities offered within the Faculty of Arts, Sciences & Technology. In the current REF cycle, ERG's research and impact priorities have been:</p> <p><u>Geomorphology</u> Work led by Foster and Livingstone has focused on physical changes in UK agricultural landscapes, South African soil erosion, and long-term dating of arid areas in the south-west USA. A common theme has been the use of advanced methods of sediment dating in order to understand geomorphological processes and the development of methodologies for identifying sediment sources and background sediment yields in river catchments to inform erosion management strategies and provide targets for sediment yield reduction respectively.</p> <p><u>Wastes management</u> Major projects by Bates and Tudor have dealt with waste streams coming from the health sector and from consumer electronics. A particular priority has been understanding the fate of this waste and how it is being dealt with in the Global South.</p> <p><u>Contemporary social and environmental geographies</u> Interdisciplinary social scientific research by colleagues has engaged participatory mixed methods studies in diverse contexts. Waite and Tucker continue to develop and theorise qualitative research with children and young people via collaboration with colleagues in other disciplines, while Waite and Hulme also track diverse globalised human and material mobilities. Work by Tudor, Banga, Hulme, Jackson and Holt has explored behaviours and decision-making in relation to range of contemporary environmental issues, especially in the Global South.</p> <p><u>Biodiversity and biogeography</u> The ecologies of natural and urban habitats, including medium- to long- term changes in the diversity and abundance of plants, birds, pollinators and mammals has been a particular focus of the work by Ollerton, Grant, McCollin and Crockett. In addition, they have studied biogeographic patterns and processes as they relate to islands and widely-distributed plant groups.</p> <p><u>Assessing environmental quality and environmental radioactivity</u> This work has focused on naturally-occurring radioactivity in the environment and its potential health consequences (Crockett) and on dating lake, reservoir, wetland and floodplain sedimentary sequences for paleoenvironmental and archaeological reconstructions (Foster). A development of particular interest has been interdisciplinary collaborations around anthropogenic radon concentrations in the built environment arising from manufactured objects containing radium and uranium.</p>

1.2 Unit Research and impact strategy

During the current REF cycle, we have built on objectives that were set out in REF2014, which was the first time that UoN a Geography and Environmental Studies UoA:

1. To significantly grow numbers of academic staff, contract research staff, and postgraduate researchers

The number of colleagues submitted to Geography have increased from 10 to 14 since 2014, reflecting an ongoing strategic commitment to grow numbers of research active colleagues. In particular, during this period, we have recruited quality research active staff on full-time, permanent contracts (**Grant, Hulme**) and early career researchers (ECRs) such as **Waite** to continue the unit's development of a vibrant and sustainable research culture. Alongside this recruitment, we have developed and mentored staff within the ERG to become research active as independent researchers. The ERG has contracted postdoctoral colleagues (Dr Jim Rouquette and Dr Stella Watts) on major externally-funded projects including the Nene Valley Nature Improvement Area Project. Geography have also strategically engaged visiting postdoctoral researchers around ERG priorities for sustained periods (e.g. Dr Pablo Gorostiague, funded by the National University of Salta, has collaborated with colleagues around conservation biology). Colleagues have supervised 12 postgraduate researchers (PGRs), up from nine during the last REF, to completion with a further six supervisions ongoing.

2. To increase both the breadth and depth of research being conducted within ERG

The number of research projects, and the range of interdisciplinary collaboration, evident within the ERG has increased in the current REF period. Examples include **Ollerton's** BBSRC funded project on Modelling landscapes for resilient pollination services in the UK (2017-2020) and **Bates'** project on Palestinian ewaste (GBP34,850 funded by Cesvi and GBP97,287 by EuropeAid). The collaborative and cross-institutional reach of our research activities has broadened to include visiting posts at other institutions such as **Tudor** (Visiting Professor at the University of Brescia in Italy), **Ollerton** (a Visiting Research Fellow at the University of New South Wales, Australia) and **Foster** (Visiting Professor at Rhodes University, Greece).

3. To increase the variety of our external bidding sources and undertake major research bids in collaboration with large consortia of colleagues from other institutions supported by current investment in research facilities.

Since 2014 we have been involved in a wide range of research projects. **Ollerton** collaborated on multiple research council funded projects with partners across three continents that have a combined value in excess of GBP2,000,000. **Foster** has undertaken a number of funded collaborative projects with Rothamsted Research valued at approximately GBP100,000. **Bates** led Work Package 1 for the Horizon2020 funded project, Post-Consumer High-tech Recycled Polymers for a Circular Economy (PolyCE 2016-2020). The LAWEEDA project (2016-2019) was an Erasmus+ project led by **Bates** and **Tudor** which developed and delivered training for the management of waste electrical and electronic equipment (WEEE) by third sector organisations in Brazil and Nicaragua.

Within Geography and the wider Faculty there has been a strategic investment in staff research time and regular internal opportunities for colleagues to bid for both University and Faculty funds (University Big Ideas Fund, Innovation Fund, URB@N Bursaries and Seedcorn Funding, QR impact support). These funds have enabled development of networks and research bidding opportunities which have helped foster new collaborations with larger multidisciplinary consortia. For example, investment in ERG networking activities has enabled us to develop projects and links with:

1. Imperial College and the Natural History Museum, London (“Genetic and morphological changes in UK bees to a century of agricultural land-use change”, funded by the Natural Environment Research Council)
2. The Centre for Ecology and Hydrology and multiple UK and Latin American partners (“SURPASS2 - Safeguarding Pollination Services in a Changing World”, funded by the Newton Fund Latin America Biodiversity Programme)
3. The University of Reading and University of Huddersfield (“Modelling landscapes for resilient pollination services in the UK” funded by the Biotechnology and Biological Sciences Research Council)
4. The University of New South Wales and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) (“Understanding when biocontrol and enemy release affect plant populations”, funded through the Australian Research Council)
5. The LAWEEDA project noted above was conducted in partnership with the Technical University Berlin and the Fraunhofer Institute for Reliability and Microintegration (Erasmus+ project)

Geography is currently undergoing a period of transition with the recent departure of a number of experienced colleagues who have subsequently committed to Emeritus (**Foster**) and Visiting (**Bates, Ollerton**) Professor roles. This has provided us with an opportunity to reflect, refresh and refocus the research and impact priorities, with new and ECR colleagues progressing to leadership roles, with discipline-specific mentoring and development opportunities supported by the new Emeritus and Visiting Professors. In this context, colleagues have co-developed our goals in a way that will allow us to grow our research and impact capacity in a number of ways, whilst building on ERG’s existing thematic priorities and aligning with a new, wider Faculty research plan. Key priorities for the next REF period are as follows:

1. To continue to nurture a postgraduate research community within Geography and Environmental Science

To enhance the research capability of the department it is important to nurture future talent by continuing to develop our postgraduate research community within Geography and Environmental Science. From 2014-2020 the department has supervised multiple PGRs through to successful completion on a wide range of topics and it is vital to maintain this moving forward. There are a number of experienced supervisors who have acted both as research supervisors and Directors of Studies for PGRs at the UoN and partner institutions. Alongside this, support will be provided to enable the ECR staff to complete the necessary training to supervise postgraduate researchers. By taking these steps it will enhance the overall research expertise of the department, as well as increasing the academic and impactful outputs produced by the team. The community welcomes PGRs being supervised on multidisciplinary topics by colleagues from elsewhere in the institution, and from partner institutions, developing a strong multidisciplinary theme within the community. In striving to create a legacy from this collegiate environment for doctoral students and ECRs we intend to develop a subject-specific alumni network so that research and peer-support partnerships can be maintained even if staff and former students move on from the institution.

2. To seek to create collaborative research opportunities with other subject areas in our Faculty, the wider institution and external stakeholders.

The university has undergone a series of restructures, with the most recent changes seeing the Department of Environmental and Geographical Sciences becoming part of the ‘Science’ subject area with the Faculty of the Arts, Science and Technology in Summer 2019. Looking forwards, this provides us with the ideal platform from which to explore and develop new collaborative research opportunities with wider university colleagues. For example, looking at subjects closely allied with geographical and environmental research, the research expertise of the team is now particularly well placed for collaborative working with colleagues in Biological Sciences (**Jackson** and Dr Atish Vadher (appointed post-July 2020)) and sport and physical activity (**Spellman** and **Waite**). From 2020 – 2025, in line with the University’s institutional Research Plan, we will maintain

and look to expand collaborative research activities, within the university and beyond, to include both academic and non-academic stakeholders. Internally, this will include the well-established relationship between the Human Geography staff and colleagues based in the Faculty of Health, Education & Society. As evidenced throughout this submission, staff members within this Unit of Assessment already work closely with academic colleagues at other higher education institutions as well as with other stakeholders. In the coming years we will look to maintain and grow these partnerships to continue to produce excellent, impactful research.

3. To increase the breadth and impact of research activity, aligning ourselves to relevant United Nations (UN) Sustainable Development Goals (SDGs)

We will create processes to assure quality, constituting supportive processes to enable colleagues to enhance the quality of research outputs, bids, environments and impacts. Where appropriate, we will seek to utilise localised funding opportunities to expand areas of interest within Geography through the initiation of pilot research projects before seeking larger external funding. There is local support from colleagues in place helping less experienced colleagues prepare project proposals alongside the institutional support delivered through the Researcher Development Programme and the Research and Innovation Funding Support (RIFS) team. We will continue the development of strategic partnerships with national and international bodies developing new opportunities for social impact, user-involvement and public engagement around research activities. We are committed to UoN's focus on the UN SDGs with Geography aligning itself to SDG7: Affordable and Clean Energy, SDG11: Sustainable Cities and Communities and SDG13: Climate Action.

4. To expand the portfolio of research being conducted within the human/social and environmental geography subdisciplines

This reflects the growth in the number of staff in Geography whose research is classified in this subdiscipline and therefore provides an opportunity to strengthen the presence of the human geography within the Environment Research Group in the future. This goal will be facilitated by the other goals that have been proposed for the next REF period, including the peer-support of ECRs and increasing the breadth of interdisciplinary research within the research group and with other institutional colleagues. Alongside the continuing research priorities of individual staff members, the pursuit of collaborative opportunities within geography has significant potential to enhance the social impact of projects by integrating a human geography component.

1.3 Impact

Sustaining high quality geographical and environmental research with significant national and international impacts is a key aim of Geography and the Faculty's strategic plans. In order to develop impacts from research projects the Faculty of Arts, Science and Technology (FAST), and the University as a whole, have committed resources to individuals to allow them to develop and explore impacts, gather evidence, and assess scale of impact. This includes time built into workload agreements which frees up staff to engage in activities that are not directly related to their research (e.g. the Nenescape project). In addition, the UoN has employed a dedicated impact projects officer to advise on defining pathways to impact. ERG colleagues will work to develop tangible processes to offer discipline-specific events, training, mentoring, peer support, impact-development and researcher-development opportunities for colleagues at all career stages, to provide a stronger, consolidated infrastructure for our peer review process, research support, governance, impact enhancement and public engagement. In particular, plans are specifically designed to develop:

1. Strategic partnerships, supporting colleagues to extend national and international networks of external collaborators and develop new opportunities for social impact, user-involvement and public engagement around research activities;

2. Quality assurance, constituting supportive processes to enable colleagues to enhance quality of research outputs, bids, environments and impacts;

Since 2015, all colleagues are allocated at least one specific research-focused objective each year (objectives reflect current faculty/institutional research KPIs and typically include targeted activity in terms of bidding, publications, impact or sectoral and international network-building. We also now are supported by a larger, consolidated and interdisciplinary Faculty infrastructure for researcher development and research support, peer review, governance, integrity, impact enhancement and public engagement, enabling scaled-up strategic support for researcher development, closely linked to wider institutional research and innovation funding support, development and guidance.

1.4 Interdisciplinary research

Geography and environmental studies are, by their very nature, highly interdisciplinary subjects and, being a relatively small UoA in terms of numbers of staff, there is a considerable exchange of ideas and approaches within the group. We have collaborated with disciplines allied with geographical and environmental research such as Biological Sciences (Jackson) and Sport and Physical Activity (Spellman and Waite). We also run cross-disciplinary events fostering collaboration such as seminars that are available for staff members across the university and visiting guests to attend. In addition, the annual UoN Research Conference involves mixed sessions by academic and postgraduate researchers from all of the university's Faculties, resulting in a broad interchange of knowledge across disciplines.

1.5 Open research

Staff within Geography receive training and support in open access, copyright and data-management. In 2019 the University launched its CRIS (Current Research Information System) enabling greater visibility of not only research outputs, but also research activities and datasets. In 2020 the University purchased a platform for digital preservation, and staff are now moving towards a more open research environment, where open research has progressed from being encouraged, to being an integral part of the research life-cycle. Datasets are uploaded to the CRIS on submission, where they are checked for replicability and long-term digital preservation. A data management plan is required for all research projects as part of the ethical approval prior to any research being carried out. To facilitate this, staff are encouraged to use [DMPonline](#) and examples of well-written data management plans, and one-to-one training sessions are available to all staff. A strong emphasis is placed on ensuring that our data adheres to the FAIR (findable, accessible, interoperable and reasonable) principles of sharing of data, striving to be as open as possible, but understanding when necessary restrictions are required.

Staff have been provided with training in the selection of places for publication, use tools such as Sherpa/Romeo and the creative commons to check funder requirements, restrictions relating to copyright, and the selection of appropriate licencing of research outputs. The University of Northampton has a small institutional fund to cover the cost of open access where a green (non-payment) route is either not an option, or where the embargo period is extensive. This fund covers the payments for articles, chapters and monographs. Where possible scholarly chapters are made open access. Research activities, such as presentations at conferences, workshops and educational resources are made available under a creative commons licence.

1.6 Research integrity

Geography support a culture of research integrity. It works within the UoN's Research Integrity Policy, which seeks to: maintain the highest standards of rigour and integrity in all aspects of research; ensure that research is conducted according to appropriate ethical, legal and professional frameworks, obligations and standards; support a research environment that is underpinned by a culture of integrity and based on good governance, best practice and support for the development of researchers; use transparent, robust and fair processes to deal with

allegations of research misconduct should they arise; and work together to strengthen the integrity of research and to reviewing progress regularly and openly.

Ethics statements for funding applications are peer-reviewed prior to submission by the university's Ethics Committee which until recently was chaired by **Crockett** who continues to maintain a strong interest in questions of research integrity. **Waite** has also served on the University and Faculty ethics committees since joining the institution in 2016.

2. People

2.1 Staffing strategy and staff development

Geography has seen growth over the REF period, with an increase in the number of staff we will be submitting increasing from 10 submitted in REF2014 to 14 submitted in this cycle. The vast majority of staff (88%) teaching and researching in Geography and Environmental Studies already possess PhDs. Those who do not are working towards completing their doctorates. This is being supported by the Faculty in terms of reduced teaching load, particularly during the writing up process, and negotiating with colleagues to block teaching into particular months. Some have completed their PhDs since being appointed at Northampton (**Spellman** and **Jackson**).

For all colleagues, researcher development is principally managed and audited through the University's PDR process, whereby individual objectives and key performance indicators are agreed annually with line managers and appraised after six and twelve months. Since 2015, all colleagues are allocated at least one specific research-focused objective each year (objectives reflect current Faculty/institutional research KPIs and typically include targeted activity in terms of bidding, publications, impact or sectoral and international network-building). The PDR is also the process through which individual research training needs are identified, workload hours are allocated to research, and plans are made for dedicated 'research and scholarly activity' hours. In addition to line managerial support, the Faculty Research Leader is responsible for mentoring colleagues at all career stages, supporting the development and delivery of individual research KPIs. ERG provides a focus, network and support structure for all research active staff, PGRs, and colleagues seeking to develop research skills within Geography and Environmental Sciences

The unit endorses the [Concordat to Support the Career Development of Researchers](#); all new members of staff are provided with mentors and have a lower teaching load when they first join the department. The Faculty development programme is designed to mesh with an extensive range of wider institutional support and development opportunities offered by the University RIFS team, Staff Development unit, Graduate School, and tailored mentoring processes for Associate Professors and Professors. All new members of staff automatically join the ERG when they are recruited. Sabbaticals are available if they can be externally funded and/or teaching schedules can be restructured; for example, **Ollerton** spent November 2019-January 2020 as Visiting Research Fellow at the University of New South Wales in Australia. This was funded by the university and by an Australian Research Council grant on which he is a Co-Investigator, and was facilitated by negotiating changes to his pattern of teaching with colleagues. This negotiation commonly occurs between staff when they have research deadlines to meet such as grant submissions.

Since 2014 **Tudor** and **McCollin** have been accepted on to the university's Associate Professor scheme that provides mentorship, ring-fenced time, and dedicated research-focused workshops with an aim to develop them to Full Professor level. The expectation is that these Associate Professors will enhance their research profiles to fulfil UoN Full Professor criteria.

There is significant collaboration between staff at different stages of their career, particularly with respect to joint supervision of PGRs, including external visiting staff. These comprise Emeritus Professors, Visiting Professors, and Visiting Researchers associated with the ERG, including Prof. Tony Denman (Emeritus Visiting Professor in Medical Physics), Prof. Paul Philips (Emeritus Professor of Wastes Management), Prof. Tom Brereton (Head of Monitoring at Butterfly

Conservation), Prof. Kate Rowntree (Rhodes University – Visiting Professor in Geomorphology) and Dr Simon Pulley (Rothamsted Research - Visiting Researcher in Geomorphology). Dr Christopher Groves-Kirkby (Visiting Fellow in Radon and Environmental Radioactivity), Dr Hilary Erenler (a former PGR now carrying out independent research), Dr Jim Rouquette (a former PDRA, now Director of Natural Capital Solutions). These Emeritus and Visiting staff play a full and active role within the ERG helping to mentor ECRs and those on the Associate Professor Development Scheme, work with researchers to develop funding bids, publish research papers with academics from the department and play a role on PGR supervisory teams. In addition, Denman sits on the Science Research Degrees Board and contributes to the work of that committee in assessing and approving PGR registrations, etc.

2.2 Postgraduate researchers

Associated with ERG there are six current PGRs and 12 PGRs who completed their studies over the REF period. Depending upon the balance of expertise required, including both relevant research background and prior experience of PGR supervision (in line with UoN PGR regulations), these PGRs are supervised by members of the ERG, university staff from other areas, and external/visiting researchers. Where possible supervisory teams are comprised of experienced individuals plus ECRs, and all staff have completed, or are undertaking, the Postgraduate Certificate in Research Supervision which is run by the Graduate School. PGRs themselves take part in a range of training workshops and it is notable that in recent Postgraduate Research Experience Survey's (PRES) UoN has scored highly being ranked 4th in 2018 and ranked 1st in 2020 for overall satisfaction. This includes being in the top eight institutions in all categories, including 1st for "Resources" and "Responsibilities", and 2nd for "Progression", "Research skills" and "Professional Development".

Our PGRs are funded from diverse sources, including Defra, the Butterfly Conservation, Faculty budgets, charities and self-funded. On the whole a majority of our PGRs are self-funded, a clear indication that the expertise of our staff is in demand. Students for whom English is not their first language can access university workshops and support for writing skills. In addition, they are provided with training on an as-needs basis in statistical analysis (e.g. Geographical Information Systems), PGRs have representation on the Science Research Degree Board and the Faculty Research and Enterprise Committee.

Once accepted onto the university's PGR programme, all PGRs go through a week-long induction (including both generic for UoN and more discipline-based within the Faculty). They then subsequently take part in a wide range of generic researcher-development training from the University's Graduate School. This is run alongside further discipline-based and project-specific training delivered by members of geography and external organisations. The University's central Assist, Learning Development and Educational Linguistics teams provide additional support as required.

The PGR programme is structured such that there are milestones that the PGR must pass before moving to the next level, including an initial probationary period, a project proposal, and an ethics application plus risk assessment for field and laboratory work. The next stage is 'Transfer' which involves giving a seminar that is advertised to everyone in the university (we encourage undergraduates to attend) and a viva with the supervisory team along with a member of staff who is external to the team but works in a cognate discipline and is qualified to be a supervisor under UoN regulations. All of this plus an annual review of progress, involving the PGR and the full supervisory team, ensures that there is suitable engagement and progress with the research, taking into account individuals' circumstances.

PGRs are entitled to claim a payment for annual development (part-time and fulltime), equipment or conference attendance. Any unspent funds can be rolled over into subsequent years. There are also additional internal funding sources that may be applied for, e.g. the Mike Daniels Fund and the Research Environment Enhancement Fund (REEF) initiative. Both the Faculty and the Graduate School have worked hard during the present REF cycle to increase opportunities for

PGR career development, for example by providing paid teaching roles, in the SuCCEED@8 programme, and to include PGR representatives on all Faculty and University committees.

2.3 Equality and diversity

We adhere to regulatory requirements around equality and diversity, supported by a central institutional Equality and Inclusion Unit and Faculty Equality and Inclusion Champions. This is further bolstered by a wide range of institutional and Faculty support for the individual needs and wellbeing of colleagues as detailed in the institutional environment statement. In practice, colleagues' supportive inclusive practice through sustained, routine activities including, but not limited to:

1. Ensuring that all research policies and strategic plans undergo formal Equality Impact Assessment
2. Constituting a disciplinary ethics committee to offer specialist guidance and development regarding equality and inclusion issues in educational and pedagogic staff, PGR and undergraduate research
3. Enhancing annual Centre reporting processes to evidence the ways in which geography research demonstrates positive impacts in terms issues of equality, inclusion, and social mobility
4. Continuing to develop discipline-specific training and mentoring processes to develop positive social change through innovative and impactful research activities and outputs considering protected characteristics, sociodemographic factors and intersectional identities in educational research, spaces and practices

In addition, many colleagues participate in a growing number of colleague-led institutional support and advocacy groups such as the BAME Staff Network, LGBTQ+ group and Staff Disability Network. Many colleagues have also benefited from the University's 'Navigator' (men and transmasculine) and 'Springboard+' (women, trans and non-binary) staff development programme in academic or professional services roles which provides an opportunity for staff to undertake personal and professional development and receive support for leadership, goal-setting and strategic visioning skills.

3. Income, infrastructure and facilities

3.1 Research income

Since REF2014 staff within the ERG have been part of large collaborative bids from a range of funders, including UKRI, with colleagues at other institutions in the UK and internationally. This was a deliberate strategy to broaden our network of collaborators and increase our chances of securing funding in a highly competitive funding environment. Examples include:

1. Modelling landscapes for resilient pollination services in the UK: **Ollerton** with Prof. Simon Potts and Dr Tom Breeze (University of Reading), Prof. Helen Lomax (University of Huddersfield) and Dr Jim Rouquette (Natural Capital Solutions) funded by BBSRC (2017-2020)
2. Chequered skipper reintroduction project: **McCollin** and **Ollerton** with Prof. Tom Brereton (Butterfly Conservation and our Visiting Professor in Conservation Science) funded by Butterfly Conservation (2018-2021)
3. Genetic and morphological changes in UK bees to a century of agricultural land-use change: **Ollerton** in collaboration with Dr Richard Gill (Imperial College, London) and Prof. Ian Barnes (Natural History Museum, London) funded by NERC (2017-2020)

4. Understanding when biocontrol and enemy release affect plant populations: **Ollerton** with Prof. Angela Moles and Dr Stephen Bonser (University of New South Wales) and Dr Raghu Sathyamurthy (CSIRO) funded by the Australian Research Council (2019-2022)
5. Safeguarding Pollination Services in a Changing World (SURPASS2) – a new international partnership to improve knowledge, build research capacity and initiate new collaborative actions for the conservation and sustainable management of pollinators across Latin America: **Ollerton** with Dr Claire Carvell (Centre for Ecology and Hydrology) and multiple UK and Latin American partners funded by NERC (2019-2022)

In addition to these research projects **Ollerton** acts as a board member of the Nenescape environment and heritage project involving multiple Northamptonshire partners, with the University of Northampton acting as the Competent Authority, funded by the Heritage Lottery Fund (2016-2021)

At a university level there is support for bidding activity and grant management provided by the RIFS team. Staff have access to GRANTfinder and Funding Institutional to identify funding opportunities that are suitable for both their specialism as well as stage of career. RIFS provide support on navigating the internal award management approval process. Support is provided to guide staff on Early Career Fellowships, helping to work out costings, funder guidelines and obtaining institutional sign-off. Specific training has been provided in relation to developing and writing research to influence and change policy.

3.2 Operational and scholarly infrastructure supporting research and impact

The University has recently invested significantly in infrastructure and facilities with the move to Waterside Campus, a new site for the university costing GBP330,000,000. This included a GBP20,000,000 investment in IT systems and services. The campus has received several nominations and awards including the Learning Hub receiving the 2019 Royal Institute for Chartered Surveyors 'Design Through Innovation' award. This move to waterside, offering a more interdisciplinary environment for our researchers to work in, has fostered much collegiate dialogue. PGRs have also benefited from this move, being relocated to a space within the Senate building giving them a dedicated home on campus facilitating a strong sense of community. This close proximity with other PGRs, their supervisors and laboratories has improved their experience at UoN, as can be seen in the promising PRES results (section 2.2).

The ERG has access to well-equipped laboratories at UoN including a scanning electron microscope suite housed and maintained in the Institute for Creative Leather Technologies which shares facilities with FAST. Specialist equipment includes a suite of equipment used for radionuclide measurement using gamma spectrometry that was designed and installed by **Foster** for his work on sediment tracing. Dr Atish Vadher is employed as a technician in Geography and Environmental Sciences, during which time he completed his PhD. In addition, Paul Stroud provides specialist IT support for GIS.

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

Staff engage in interdisciplinary research with a wide range of fellow academics at UoN and at other institutions in the UK and internationally. Examples of such collaboration can be observed in the work of **Ollerton** and **Foster**. **Ollerton** worked with taxonomists and molecular phylogeneticists at institutions across the world (for example the Royal Botanic Gardens, Kew, the University of Bayreuth in Germany, the University of KwaZulu-Natal in South Africa, Saint Louis University in the USA, Universidade Federal do Rio de Janeiro in Brazil, and the Kunming Institute of Botany in China) to produce what is, to date, the most comprehensive assessment of the biogeography and evolution of pollination systems in a large family of flowering plants (**Ollerton et al.** 2019). He worked with climatologists to assess the influence of present day and paleoclimates on the distribution of wind and animal pollinated plants. In addition, his research

has involved working with ecological economists in the BBSRC-funded project “Modelling landscapes for resilient pollination services in the UK; ancient DNA specialists studying genetic and morphological changes in UK bees to a century of agricultural land-use change”; local heritage groups and environmental NGOs in the Nenescape project; and sociologists (Barons *et al.* 2018 Journal of Apicultural Research) on collaborative publications. **Foster** has recently worked with a large number of international scientists to further develop sediment source fingerprinting protocols. The collaborations with US, Canadian, Brazilian, European and Iranian scientists, including freshwater biologists, geochemists, geologists, modellers, social scientists and archaeologists, have produced two recent papers developing the protocols and identifying gaps in knowledge.

The research of other members of the ERG is interdisciplinary such as **Tucker’s** work which spans human geography, childhood studies and health geographies, the work of **Waite** which crosses over from geography to sociology and education, **Hulme** which spans geography and economics and history. Likewise, **Crockett’s** work has involved collaborations with ecologists and geologists, geoscientists and earth-system scientists and, latterly, ethicists.

One of the main objectives of our REF2014 submission was to create regional, national and international collaborations between members of the ERG and external universities, research institutions, government agencies, and business and third sector organisations. During the REF period the peer-reviewed outputs published by the ERG involved collaborations with colleagues from 236 separate organisations. These included academics at other universities and collaborators at organisations such as the Environment Agency, Fera Science Ltd., Desert Research Foundation of Namibia, Game & Wildlife Conservation Trust, Natural England, Natural History Museum of Los Angeles County, Rothamsted Research, Royal Botanic Gardens, Kew, RSPB, RSK Group plc, Northampton County Council and the United States Geological Survey.

Collaborations such as these have developed from both formal research collaborations (e.g. co-investigators on grants) and informal networks of scholars in the same discipline. These relationships have resulted in invitations for members of the ERG to travel to other institutions in the UK and abroad to present seminars and take part in workshops, e.g. **Foster** to South Africa, **Livingstone** to Namibia, **Ollerton** to Australia and the USA, **McCullin** to Italy, **Bates** to Brazil and Nigeria, **Crockett** to France. As well as interacting with other researchers, these visits have provided an opportunity for the ERG to engage with a wider community of citizens. For example, **Ollerton** during his time as a Visiting Research Fellow at the University of New South Wales presented a public lecture and Q & A session at the Royal Botanic Gardens, Sydney, that was attended by over 50 people and streamed live on the Garden’s Facebook page.

Locally, the ERG has hosted visiting scholars from other institutions in periods lasting from one day to one year; for example: Prof. Mentore Vaccari (University of Brescia, Italy), Ms Kaouther Maaroufi (University of Bizerte, Tunisia), Prof. Chao-Dong Zhou and Dr Michael Orr (Chinese Academy of Sciences), Dr Pablo Gorostiague (National University of Salta, Argentina), Prof. Leila Bendifallah (University M’Hamed Bougara, Algeria), Laura Bannatyne (Rhodes University, South Africa), Prof. Art Horowitz (US Geological Survey), Alexandra Martins Fragoso (Unversidade Estdual Paulista, Sao Paulo). Some of these visitors have presented in seminars and timely convergences of guests have resulted in impromptu research symposia.

Opportunities to present research to a wider audience have come from invitations to present keynote talks at national and international conferences. For example, **Crockett**: (2010-2019 European Geoscience Union Annual General Assemblies) presented a sequence of short-courses (cf. master-classes) on Fourier and time-series analysis, targeted at early career geoscience researchers. This education and outreach activity led to the book ‘A Primer on Fourier Analysis for the Geosciences’ ([Robin Crockett, Cambridge University Press, 2019](#)). As part of the Royal Geographical Society with the Institute of British Geographers (RGS-IBG) Annual International Conferences in 2016 and 2017. **Waite** was invited to facilitate round-table sessions with postgraduate researchers exploring issues related to research on the topic of Population Geographies. These invitations were a reflection of **Waite’s** participation on the committee of the

Population Geographies Research Group of the RGS-IBG and her own experiences as an early career Population Geographer.

The creation of impactful research is fundamental to the culture of the University of Northampton via its Changemaker initiative and membership of the Ashoka U network. Research by Geographical staff is influenced by this ethos and by the desire of the researchers to make meaningful changes at local, national and international levels. Our research therefore engages with non-academic users and beneficiaries of our work across a wide range of sectors. This can involve everything from giving talks to special interest groups to reviewing public statements and reports, including: government from local to international levels (e.g. Northamptonshire County Council, Transition Town Northampton, Defra, ADAS, IPBES, EA National Geomorphology Annual Conference); non-governmental organisations and campaign groups (Extinction Rebellion, Arun and Rother Rivers Trust and Farming Groups); SMEs and large businesses; private watch and clock collectors and museums holding collections of radium-painted radioactive objects (Imperial War Museum and allied military museums); and the public via a diverse range of media including radio, television, newspaper interviews and blogging.

Staff within the ERG have actively worked to establish networks and relationships with individuals and organisations that can gain from the expertise being developed from our research. This is being facilitated through our deep understanding of how environmental policy and practice is used by our partner organisations and how it affects the lives of citizens in the region, in the rest of the UK, and elsewhere in the world. As examples of international impact, **Foster's** work with agricultural and land management organisations in South Africa directly affects the livelihoods of farmers in that country. Likewise, **Ollerton's** contribution to the NERC-funded SURPASS2 project is focused on developing pollinator conservation strategies that will enhance crop yields for farmers in Latin America. All of these organisations influence activities, policies and practices, at all levels from local authorities to supranational bodies.

All the staff in the department are committed to contributing to the sustainability of the discipline and undertake a wide range of roles to facilitate this. For example, in the sub-discipline of Human Geography **Tucker** is Book Reviews Editor and a long-time member of the editorial board for the international journal Children's Geographies. Over the REF period she has reviewed manuscripts for journals including Social and Cultural Geography, Transactions of the Institute of British Geographers, Space and Culture, Environmental Communication and The Canadian Geographer. She has also reviewed grant proposals for the New Zealand-based Marsden Fund and for the Swiss National Science Foundation, and book proposals for Routledge and SAGE. Likewise, **Waite** has acted as a peer reviewer for, amongst others: Urban Geography; Journal of Rural Studies; Population, Space and Place and Local Environment and has reviewed books proposals for Rowman and Littlefield.

In support of research being conducted across the discipline members of the department have served on a wide range of national and international grant committees and review boards. **Tudor** has reviewed grants for the UK-India Education and Research Initiative (UKIERI), the European Union's COST Action and the Newton Prize. **Crockett** has reviewed grant applications for the Israeli Science Foundation, Austrian Science Fund and Hungarian National Research – Development and Innovation (NKFI) Fund.

Researchers also serve as members of committees and groups outside of the university, as appropriate to their expertise. For example, **Ollerton** represents the University of Northampton on the Northamptonshire Local Nature Partnership and the Nenescape Project Board; **Jackson** is a member of the Nene Valley Catchment Partnership; **Foster** served for 3 years on a DEFRA funded advisory panel and is on an ad hoc local advisory group focusing on sediment mitigation options in South Africa.

All staff in the ERG are Fellows or members of one or more professional organisations as appropriate to their disciplines, e.g. Royal Geographical Society (with Institute of British Geographers), British Ecological Society, Chartered Institution of Wastes Management, Advance

HE, Institute of Mathematics and its Applications, Institute of Physics, International Association for Promoting Geoethics. **Hulme** is the current Chair of the Global Studies Association. Additionally, **Foster** was elected as a Fellow of the British Society for Geomorphology in 2016 and **Ollerton** was awarded a Visiting Research Fellowship at the University of New South Wales, Australia (2019-2020).