

Institution: University of Portsmouth (UoP)
Unit of Assessment: C14 – Geography and Environmental Studies
<p>1 Unit context and structure, research and impact strategy</p> <p>1.1 Unit Context and Structure</p> <p>Our submission to UoA14 comprises geographers from the School of the Environment, Geography & Geosciences (SEGG: 15.4 FTE), as well as cognate researchers (3 FTE) associated with the University ‘Sustainability and the Environment’ Thematic Area (REF5a, paragraph (p.) 9), to which the Unit makes a leading contribution. Since 2014, we have grown our submission from 11 FTE (11 staff) to 18.4 FTE (22 staff, 8F:14M). This increase in research activity has enabled the Unit to broaden its research focus and societal benefit. We have grown our total research income by 320% and RCUK/UKRI income by 390% (to £862k), increased PhD awards by 150% and extended our partnerships, networks and leadership roles involving our staff. Our research is structured across two Groups that provide intellectual and organisational focus, with extensive collaboration and synergy between them, particularly at the interface of society and the environment (<u>Group Leads underlined</u>).</p> <ul style="list-style-type: none"> • Environmental Processes and Impacts (EPI) has established critical mass in climate science, with particular expertise in paleo-environmental reconstruction, and climate change in alpine and glacial environments (<i>Barrows, Boston, Hardiman, Lovell, Pepin, Wulf</i>). During the assessment period, we have extended expertise on urban environments (<i>Rumble, Inkpen</i>) and expanded the focus of EPI to include fluvial and coastal environments (<i>Soar, Watson</i>). • Culture, Society and Governance (CSG) has established strengths in geographies of health and wellbeing (<i>Ekinsmyth, Twigg</i> (Cat B), <i>Woodyer</i>) and historical geography (<i>Healey, Southall</i>). We have extended our wellbeing focus, adding expertise on children and young people in Sub-Saharan Africa (<i>Day</i>), securing succession in health geography (<i>Pallikadavath</i>) and extending expertise in economic development (<i>Houston</i>). We have proactively anticipated retirements in historical geography by developing expertise in the sustainable use and management of water and ocean resources (<i>Brown, Fletcher, Phang, Potts</i>). <p>The merging of the Department of Geography with the School of Earth and Environmental Sciences (SEES) into SEGG in 2019 has provided opportunities for further growth around sustainable environmental management. The Unit is now in an enhanced position to produce research that influences Geography as a discipline, advances areas of interdisciplinarity and addresses global environmental and societal challenges.</p>

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1.2 Achievement of strategic aims for research and impact

Throughout the REF period, we have evaluated and updated our strategic aims, notably in Departmental and SEGG Vision Statements in 2017 and 2019, respectively. Our growth in research performance is underpinned by the achievement of four strategic objectives:

1.2.1 To increase the international recognition of our research

We have developed collaborations with researchers in over 60 countries in Africa, Asia, Europe, and North and South America. Our top collaborating institutions (by publication) include: Helmholtz Centre, Potsdam (39); Chinese Academy of Sciences (23); Nanjing University of Information Science and Technology (16). Many of our staff have held visiting positions, including: University of Malta (*Inkpen*); Chinese Academy of Sciences (*Pepin*, President's International Fellowship); St Louis University, USA (*Soar*); University of Pittsburgh, USA and Polish Academy of Sciences (*Southall*); Tampere University, Finland, (*Woodyer*, Visiting Scholar). We have also hosted visiting scientists funded by competitive international exchange grants (e.g. China Council, Royal Society) and from prestigious institutions (e.g. St Louis University, USA; Tokai University, Japan). This enhanced international profile supports a growth in research vitality, evidenced by a >300% increase in the number of peer reviewed outputs (from 80 to 322), with approximately 60% involving international authors. Our research is cited nearly twice (FWCI = 1.76) as often as the field average, with ~60% of our articles in the top 10% of journals (by CiteScore) and ~30% of our articles in the top 10% of articles ranked by view/interest online since 2014 (SciVal). Non-UK sources of research funding have increased from 4.7% to 19.6% of our income portfolio and we contribute to a range of influential international networks and fora (3.1; 4.3).

1.2.2 To enhance the integration of impact within our research culture

REF 2014 sub panel feedback noted that the Unit was at an early stage of embedding impact within its research culture. Over the census period, we have addressed this by ensuring greater alignment of our research with global challenges (1.1), incorporating impact throughout the research lifecycle, and supporting direct engagement with end-users and stakeholder groups. These approaches underpin our two Impact Case Studies (*UoP14Migration*, *UoP14Places*), as well as wider impact across the Unit (4.2).

We have employed a variety of mechanisms to support impact. These include introducing an explicit recognition of impact activities within workload allocation, appointing dedicated Impact Leads (0.1 FTE) in each Research Group to provide one-to-one guidance and raise awareness of the impact agenda, and awarding impact-focussed sabbaticals. We have also co-developed and co-funded postgraduate research student (PGRS) projects with members of our Unit's Professional Advisory Group, comprised of key regional beneficiaries. Examples include: mapping land use in the Rother Valley to inform river management strategies (*Soar*, the National Trust and South Downs National Park Authority); data collection to inform landscape recovery practices following heathland burning (*Hardiman*, Dorset Wildlife Trust); and surveying marine litter in Langstone Harbour (*Watson*, South West Water).

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The Unit has also provided “impact acceleration” funding (up to £10k per award) to support activities that directly engage with beneficiaries. This has included funding for research assistance to conduct participatory research and draft local language policy briefings on projects to improve access to water supplies in rural Uganda (*Brown*), empower women in Zambia (*Day*) and improve the social and economic well-being of ‘left behind’ families in Indonesia as a result of female worker migration (*UoP14Migration*). Closer to home, the Unit has supported the employment of a software specialist and a Research Fellow to create and maintain ‘A Vision of Britain’ and ‘GB 1900’ open access historical gazetteers that have been used to improve access to libraries’ collections and preserve cultural heritage in England and Wales (*UoP14Places*). Additional funding (total £50k) has supported stakeholder engagement events, including the launch of ‘GB1900’ attended by national libraries, archives, charities and the public (London, 2018: *UoP14Places*); policy-influencing workshops with regional and national government (Indonesia, 2017; Philippines, 2018: *UoP14Migration*); the River Restoration Northwest Symposium (*Soar*: Washington, 2015); and the ‘Playability’ Knowledge Exchange workshop with toymakers, digital games designers and play practitioners (*Woodyer*: London, 2016).

1.2.3 To exploit our unique expertise in data linkage and analysis to improve understanding of socio-economic and environmental change

We have long-standing expertise in creating and analysing unique, high-quality datasets and in making them publicly accessible. We also design database infrastructure to store, and interrogate, such datasets and link secondary datasets to enable new analyses; ~25% of our submitted outputs depend on such data. Data linkage techniques and longitudinal analyses have enabled construction of enhanced datasets that have produced new insights on the evaluation of major health trends, policies and interventions, in both the UK and the Global South. These have underpinned research on place effects on individual and community well-being (REF2/10543383) related to, for instance, deprivation and social media use on young people’s mental health, smoking prevalence, community-based treatment of psychiatric patients in the UK (REF2/25178090), post-transitional fertility (REF2/11696342), access to health care systems (REF2/18806998) and female migration in India, Bangladesh and Indonesia (*Pallikadavath, Twigg*). *Houston*’s research examines gender differences in commuting, the role of home-based businesses in incubating growth, and changing pathways into homeownership, whilst *Healey*’s encoding of employment/migration data from the 1860 USA Census has challenged *Krugman*’s theory on the role of railroads in 19th Century industrialisation (REF2/10556071). Importantly, our unique expertise is delivering societal benefits. For example, *Pepin*’s >50 million climate records (primary sensor networks) collected from mountains stretching from the Arctic to the tropics (e.g. REF2/10295523) highlighted the severity of mountain climate change. Local authorities have used *Southall*’s datasets of historical population, health and employment (REF2/11265495) to inform resource planning and *Twigg*’s estimates of youth smoking prevalence and military Reserves’ mental health have informed Local Authority smoking reduction targets and Ministry of Defence service provision, respectively.

1.2.4 To support and increase interdisciplinary research (IDR)

Our research strengths underpin a record of accomplishment in interdisciplinary working addressing, for example, the increasing challenges of environmental change, urban

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development and management of natural resources. We have extended this through investment in broader collaborations to support IDR, aligned with the University's Thematic Areas.

We have used seed corn funding (up to £25k per project) to support promising interdisciplinary collaborations. These include *Pallikadavath* working with social anthropologists on the relationship between dowry, reproductive health and domestic violence in India, and *Inkpen* working with microbiologists and bioinformaticians on innovative biofilms for heritage conservation, and with criminal justice researchers and Hampshire Constabulary to investigate geographic and socioeconomic disparities in public perception of policing. Recent ESRC funding has extended this latter project to include perceptions of policing during the Covid-19 pandemic.

Members of our Unit also play significant roles in University interdisciplinary Thematic Areas and Centres, linked to international networks. Established in 2015 and led by *Pallikadavath*, the Portsmouth-Brawijaya Centre for Global Health, Population and Policy (PB Centre) brings together our expertise in health and social inequalities (*Brown, Day, Pallikadavath* and *Twigg*) with that in the University of Brawijaya, Indonesia, and across South-East Asia, on gender and migration policies. PB Centre research on the impacts of female migration on the "left-behind" family has contributed to changes in international policies and reintegration programmes (*UoP14Migration*); the team has recently been awarded funding (£180k, EPSRC) to extend this work to incorporate the impacts of Covid-19.

In 2018, we recruited *Fletcher* who, as former Chief Strategy Officer and current Head of the Marine Programme at the UN Environment Programme (UNEP) World Conservation Monitoring Centre, brought networks that are enabling the Unit to contribute to global debates on marine policy. *Fletcher* is the Director of the 'Sustainability and Environment' Thematic Area and leads the University's 'Revolution Plastics' initiative (REF5a, p.6) that is supporting research by *Fletcher* (PI), *Houston* and *Potts* with researchers from UoAs 7, 17, 20 and 33 on urban plastic pollution in Kenya and Bangladesh. Through the Centre for Blue Governance (CBG) (REF5a, p.7), which connects expertise across UoP in aquatic resources, management of coastal environment processes, human and marine ecology, *Fletcher* and *Phang* are members of an international team awarded NERC funding to develop innovative microbial solutions to combat marine plastic pollution.

1.3 Future Research and Impact Strategy

Our Unit has engaged with the University's new Vision 2030 and Strategy 2025 (REF5a2.0) through consultation in our Research Groups. Beginning with articulation of Groups' research ambitions, we have identified four objectives to build our global reach and reputation and deliver environmental and societal impact. These are underpinned by our commitment to staff development, equality, diversity and inclusivity, and to support for PGRS.

- We will continue to grow the vitality of our research, particularly where we have established a leading position and our research positively impacts society. Examples of such areas include paleo-environmental reconstruction and climate science, and tackling inequality and supporting well-being. We will develop our emerging expertise in sustainable urban/rural development, especially linked to plastic pollution and ocean governance.

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- Continue to embed IDR within our Unit by building on the opportunities offered by the formation of the multidisciplinary SEGG and through the PB Centre, CBG and University Thematic Areas. We will access cross-Unit expertise to extend our engagement with science-led policy development in our research on climate and environmental change, sustainable development and natural resource management.
- Continue to support staff at all career-stages to realise their ambitions. As some of our Professors retire, we will have a higher proportion of mid-career staff and will support them to become recognised leaders in their field through targeted mentorship, peer support for bid writing, investment and training. We will prioritise support for female leadership programmes, moving towards an improved gender-balance at all grades.
- Maximise the benefits of our research to develop 'case studies' of impact in our Research Groups. We will enhance engagement with stakeholders beyond HE through research consortia, the PB Centre and CBG. We will support staff to identify potential links with beneficiaries through mentoring and networking, and will financially support high quality engagement opportunities, such as secondments, exchanges and events.

1.4 Open research, ethics and integrity

The University Strategy commits us to the highest standards of academic, professional and research integrity. At School level, this is supported through quality assurance processes, which ensure sound research design, participant safety and adherence to ethical codes, openness and transparency. The Faculty Ethics Committee oversees a mandatory ethical review process in line with the University's commitments under the Concordat to Support Research Integrity, the UKRIO Code of Practice for Research, and DORA (REF5a, p.22); consideration includes ethics, integrity and due diligence in environmental and human-participatory research.

We are committed to an open research environment: 98% of our outputs have been published under open-access licences since 01/04/2016, 100% of our in-scope REF2 outputs meet Research England's Open Access requirements and all submitted staff are ORCID registered. Datasets are routinely deposited on University and national open-source repositories, (e.g. [CEDA](#), UK Data Service). Since 2018, 85% of the Unit's outputs have been assessed as compliant with the University's Research Data Management policy (REF5a, p.24). The Unit also facilitates primary research that supports open data (1.2.3).

2 People

Category A staff (FTE) in this submission comprise 3.6 Professors, 6 Readers / Principal Lecturers, 7.8 Senior Lecturers and 1 Research Fellow.

2.1 Staffing strategy

Our Category A staff submission has increased from 11 to 18.4 FTE (7F:11.4M) since REF 2014; allowing for personnel changes, this includes 7.2 FTE (3F:4.2M) new staff. Our staffing strategy has focussed on: (i) investment in senior positions to extend our expertise in

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environmental change research; (ii) succession planning around retirements in human geography; (iii) increasing capacity and capability in IDR and sustainable development.

Strengths of the EPI group '*in the application of geochemical techniques in environmental sciences*' were noted in REF2014 and have been further enhanced by recruitment of *Wulf* (Reader) and *Barrows* (Professor) who provide new expertise in geo-chemical proxies (including tephrochronology) and senior support to other group members. *Wulf* and *Hardiman* have since demonstrated how tephra in sediment /ice-cores can date and synchronize past environmental records to reveal spatial patterns of climate change (REF2/10517459/15594192). *Lovell's* expertise in glaciology supports the strategic expansion of our climate and cryospheric research whilst *Rumble* (green infrastructure) supports research at the interface of EPI and CSG in sustainable urban development. CSG has benefited from staff investment that reflects succession planning around professorial retirements (*Healey, Southall, Twigg*) and the refocussing of our strategic priorities towards sustainable development. Professorial appointments maintain leadership and expertise in quantitative human geography (*Houston*) and provide new expertise in ocean governance and policy (*Fletcher*). Research at the science-policy interface is also supported by *Phang* (governance of aquatic resources), whilst *Day* extends strengths in health and wellbeing to children and young people.

2.2 Staff development

The University has held an HR Excellence in Research Award since 2013 and is a signatory to the Researcher Development Concordat (REF5a, p.41). Our staff development strategy aims to grow the capability and profile of our researchers through resourcing their time and providing a portfolio of support at all career stages. Since REF2014, we have introduced a workload model, streamlining administration and teaching activities to enhance staff efficiency and giving research goals greater priority. Research-active staff (those regularly publishing research articles) are allocated a minimum of 0.2 FTE for research, with additional time for grant-writing, externally-funded research and impact activities, and as awarded through research leave and sabbatical schemes.

Research Group leads contribute to annual Performance and Development Reviews (PDR) that link individual and Unit-wide research objectives and identify development needs. New staff are allocated an experienced mentor, receive a 0.2 FTE additional research workload (Year 1) and are eligible for research 'start-up funds'. Early-career academic researchers (ECRs) continue to receive enhanced research workload in Year 2 (0.1 FTE), are preferentially considered for internally-funded PhD studentships as first supervisor (with additional supervisors to provide mentorship), and have access to ring-fenced ECR funding to support pilot data collection and the development of collaborations.

All early- and mid-career staff have an experienced mentor from within the Unit and workload hours are allocated to both mentor and mentee; senior staff are mentored from outside the Unit. All staff have equal access to funding for staff development (study leave, sabbaticals, conference attendance) and to a variety of internal funding opportunities (up to £20k per award) that support pump-priming of pilot projects, providing impetus for new ideas, grant applications and external collaboration. Project examples include studies of aspirations of youth in Zambia (*Day*), glacial retreat in Kazakhstan (*Lovell*), effects of deforestation on Kilimanjaro (*Pepin*) and

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water management in Uganda (*Brown*). Field data have contributed to research outputs (REF2/10295523/*Pepin*) and grant applications (e.g. *Lovell*, Royal Society; *Day*, UKRI GCRF).

Eight staff (6F:2M) have benefitted from research leave or sabbaticals in this census period. This support enabled *Boston* to quantify the contribution of small glaciers and ice caps in Greenland to sea-level rise (REF2/13876992) and facilitated successful grant applications by *Ekinsmyth* (Urban Studies Foundation award to reconceptualise the urban landscape of work) and *Rumble* (INTERACT funding for work on Arctic soil ecology). *Pepin*'s sabbatical at the Institute of Tibetan Plateau Research, Beijing, facilitated novel research on Tibetan Plateau temperature change (REF2/14709508), which was subsequently supported by Royal Society International Exchange funding. Sabbaticals have also supported researchers to develop impact, including *Brown* working with community organisations and NGOs in Uganda implementing schemes to improve rural water access (REF2/20741917) and *Inkpen* to incorporate non-destructive methods into stone heritage conservation with Heritage Malta.

Workshops on funding, publishing, open research and dissemination are offered via the Research and Innovation (RIS) Staff Development Programme (RISDP: REF5a, p.33); this is supplemented by Research Group activities, e.g. discussion groups, paper writing workshops, grant "hothouses", impact away-days and "Dragon's Den" style pitching sessions to stakeholders. The Unit runs a unified research seminar series that includes external speakers (e.g. Sir Nigel Thrift and Professor Iain Stewart), presentations from visiting scholars, and provides staff and PGRS with opportunities for external collaboration and networking.

Postdoctoral research staff are integral to our Unit; in this assessment period, we have supported 3.5 FTE research positions. Although usually supported by external grants, we have provided bridging funding to retain individuals with specialist skills and on projects of strategic priority, e.g. 'Vision of Britain' and 'GB1900'. Research staff are mentored by permanent researchers, have an annual PDR and are supported to publish, apply for funding and present at conferences. They can access career development training and coaching via RISDP and are represented through a Research Staff Forum (REF5a, p.42). As a result of this support, *Phang* has developed an independent research programme and publications.

The principal mechanism for recognising and enabling research and impact activities is workload allocation, which includes dedicated time for external networking, public and user engagement. Staff are recognised and rewarded for research and impact leadership through promotion; the University's Policy on Promotion and Appointment to Reader and Professor includes a broad range of relevant activities and recognises co-authorship of publications and income generation as PI or Co-I. All staff are encouraged to attend annual promotion workshops; those applying are offered mentoring and peer review of applications. In this census period, 67% of staff in the Unit have been promoted, including *Inkpen*, *Pepin* and *Watson* to Reader.

2.3 Equality and Diversity

The University is a signatory to the Race Equality Charter, a Stonewall Diversity Champion, Disability Confident employer, and holds an Institutional Athena Swan Bronze Award. All staff undertake mandatory training including Bullying & Harassment, Unconscious Bias, and Equality, Diversity and Inclusion (EDI). SEGG has an Equality and Diversity Group and an EDI lead (0.1

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FTE) who oversees promotion of equality and diversity within the Unit, from staff recruitment onwards. Prior to merging with SEES, the Department of Geography held an Athena Swan Bronze award; reapplication as SEGG is underway (for 2021). We are committed to foster an inclusive environment for all; 82% of eligible Category A staff are included in this submission and the overall profile of our Unit broadly reflects that of academic and research staff in the discipline (Table 1). No staff in our submission declared a disability although the Head of School manages teams inclusively to give people the confidence to disclose a disability. The age profile of our Unit is slightly older than the sector average, reflecting recruitment of more senior staff to provide succession for Professorial retirements. 19% of our Unit are on part-time, and 7% on fixed-term, employment contracts.

Table 1: Unit profile and demographics

Indicator	Proportion of Cat A staff		Doctoral degrees awarded
	Sector	Unit	
Gender (Female)	40% ¹	38%	47%
Ethnicity (BAME ²)	5% ¹	12%	20%
Declared disability	5% ¹	0%	7%
Age (36-55)	52% ¹	61%	n/a

1-Geography, environmental studies [Advance HE, 2020](#); 2-Reported as Black, Asian and Minority Ethnic

We are committed to supporting female staff into senior research leadership positions; currently, women are well-represented at Senior Lecturer/Research Fellow (60%F) levels but there is underrepresentation at senior grades (33%F Reader / Principal Lecturer; 0%F Professorial). We will address this as a priority going forward. This will include renewing our Athena Swan Award, continuing our sabbatical leave programme, providing funding for external female mentorship and supporting more of our female staff to participate in the HE Aurora Leadership Programme.

Research seminars and essential meetings are scheduled within core hours and staff with caring responsibilities have access to flexible teaching arrangements where practical (REF5a, p.46). All staff are able to conduct research from home and remote and flexible work patterns were the norm, even before Covid-19. The University has guidance for staff and managers on maternity, paternity, shared parental and adoption leave and funding is available to support research re-engagement after periods of extended absence. Over the assessment period, one member of staff has taken adoption leave and the Unit has supported four staff through difficult circumstances (details confidential) by altering fieldwork requirements, reducing workloads, purchasing specific equipment and providing additional research assistance for laboratory analyses.

REF submission: All staff involved in Unit REF decision-making attended specialist EDI training (REF5a, p.50). Outputs were reviewed and selected according to the UoP Code of Practice and the gender balance of our output reviewing committee (2F:3.6M FTE) was representative of the

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Unit. An EIA has confirmed that our REF2 outputs reflect the profile of submitted staff for ethnicity (13% BAME), contract (7% fixed term, 17% part-time) and career stage (7% ECR). Outputs by female staff (14/50; 28%) constitute a slightly lower proportion of the overall submission, reflecting the higher proportion of female staff in the CSG group and publication practice in human geography (predominantly fewer, and single-author, outputs).

2.4 Recruitment, training and supervision of research students

Our PGRS completions (7F:8M) have more than doubled relative to REF 2014 and have been supported by external sponsorships, internal bursaries and self-funding.

Table 2: Annual PGRS completions

	13-14	14-15	15-16	16-17	17-18	18-19	19-20
PhD	3	3	1	1	4	1	1
Prof Doc	0	0	0	0	0	0	1

PGRS selection procedures differ according to funding stream but all selection panels are gender-balanced, supported by trained interviewers and all members complete the UoP “Best practice in the Selection & Admissions of PGRS” training. Where appropriate, online interviews are offered. PGRS supervisory teams typically consist of three staff, including external supervisors where they bring additional expertise. All PGRS undertake a major review after one year (full-time) that assesses progress and enables early identification of outstanding development requirements. In addition, there is an annual review of progress, irrespective of full-time/part-time pathway, and students are offered a mock viva with their supervisory team to help prepare for their *viva voce*. Supervisory team meetings typically occur at least monthly with the primary supervisor, and quarterly for full-team meetings; records of these meetings are recorded on an online platform (SkillsForge). These processes enable our PGRS to enjoy exceptional supervision; satisfaction scores for supervision in the Postgraduate Research Experience Survey (PRES) have been in the top quartile since 2014 (95%, 2019). Satisfaction in many other PRES categories, including overall satisfaction, has also consistently attained the top quartile. We attribute this to our open-door policy and staff accessibility.

The School Research Degrees Coordinator is responsible for the monitoring and development of PGRS and there are PGRS representatives on the School Equality and Diversity and Research and Innovation Committees, as well as the Faculty Research Degrees Committee. In line with Vitae recommendations, PGRS attend at least 10 days of researcher development training each year. The University Graduate School Development Programme provides professional and generic skills training (REF5a, p.38) whilst the Unit provides specialist subject training, for example, on software (e.g. ArcGIS), climate/glacier interactions, tephrochronology and Bayesian age-modelling, and the philosophy of research. All PGRS are active members of our research groups, through which they participate in ‘Journal Clubs’, discussions on thesis and grant-writing, and peer support for developing research projects. As well as presenting within research groups, our PGRS organise an annual Geography summer conference, which includes oral and poster sessions and invited keynote speakers, and take part in the SEGG seminar series, the

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annual University Festival of Doctoral Research and 3-minute thesis presentations. A bursary is available for all PGRS to attend at least one conference over the course of their studies.

Our PGRS engage in a range of additional development activities to improve their employability. External networking is facilitated by supervisors' extensive collaborations and the Unit's engagement with key stakeholders. A PGRS placement scheme has supported students to spend time at academic and non-academic institutions e.g. Geological Survey of Ireland, Norwegian Water Resources and Energy Directorate, Dutch WASH Alliance and GGD Amsterdam, where they learn techniques and methods to support their research and develop their networks. PGRS have also secured external funding, for example from INQUA, Prix du Quebec Award and British Geological Survey (BGS), to support additional placements and fieldwork. Our PGRS contribute to impact activities (4.2) and public engagement (4.5) and all students involved in teaching are enrolled on the University Graduate Students Professional Development programme that is aligned to accreditation by the UK HEA. Our training and development portfolio prepares our PGRS to progress to a range of successful careers. Example first destinations include academia (Plymouth, Goteborg); local/national government (Environment Agency, West Sussex County Council, Maltese Government, Nigerian Boundaries Commission); NGOs (PRACTICA Foundation) and industry (Ricardo EE). One of our PGRS is now Chair of the Responsible Whale Watching Working Group of the World Cetacean Alliance. Links with our PGRS continue into their subsequent employment, contributing to the wider vitality of research in the Unit and growing pathways to impact. For example, *Brown's* research on the application of WaterTime (a method for water pre-payment and governance in Uganda) is conducted with PRACTICA, where a former student is Head of Drinking Water.

Members of our Unit also contribute to national and international research training. *Twigg* and *Houston* have been deputy directors for the ESRC South Coast DTP (Southampton, Portsmouth and Brighton). In 2018, *Boston* secured €6000 to support a European Geosciences Unit workshop on 'Glaciers, Moraines and Climate'; attended by 19 participants from 12 countries, this workshop trained PGRS and postdoctoral researchers to integrate different lines of paleo-glaciological evidence.

3 Income, infrastructure and facilities

3.1 Research funding and strategies for generating research income

During this assessment period, our income strategy has focused on developing the expertise and profile of our researchers to support successful funding applications (2.2), extending our national and international collaborations (4.1), and capitalising on the extended scope of our research (1.1). This strategy has been extremely successful; our total research income has grown from £515k to £2.16M (an equivalent increase from £47k/FTE to £117k/FTE). We have secured funding from increasingly diverse sources including: UK Research Councils (e.g. AHRC, ESRC, MRC and NERC); trusts and charities, such as the Heritage Lottery Fund, MQ Data science and River Trusts; the European Commission; UK government bodies, such as National Institute for Health Research, Public Health England, British Council and Natural England; local authorities and industry. Significantly, our income portfolio sourced from outside the UK has

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risen from £24k to £423k (from 4.7% to 19.6% of our portfolio), reflecting the growth in our international profile.

We have adopted a mixed approach to income generation that reflects individual staff circumstances. This has included:

- facilitating earlier-career staff to target seed-corn funding for the generation of pilot data to underpin publications and grant applications (2.2). For example, a BSG ECR grant supported field modelling of plateau icefield stability (*Boston*) and INTERACT-supported access to Arctic field stations enabled *Rumble* to investigate soil community response to climate change;
- using small/medium projects to demonstrate success and secure larger grants. For example, Soar conducted a scoping study for the US Army Engineering Corps that underpinned a subsequent award (>£300k) to develop river management tools to mitigate against flooding on the Mississippi;
- supporting collaborations with researchers in other institutions. For example, Unit funding enabled *Hardiman* to develop novel proxy data on paleo-wildfires that led to funding as part of a consortium (NERC, £2M), led by Manchester University, developing a UK fire danger-rating system. Similarly, *Pallikadavath* and *Twigg* were supported by the Unit to conduct primary research in India that consolidated collaborations with the Centre for Development Studies and forged new collaborations with the Sree Chitra Institute of Medical Sciences, which subsequently underpinned a project to investigate financial incentives to access health services in India and Bangladesh;
- strategically targeting European funding to reflect the collaborative nature of the Unit's activities. Notable successes include programmes on: open data archiving standards and infrastructure (*Healey*, [E-ARK](#)); water quality in coastal basin catchments (*Watson*, 3C) and management of inter-tidal habitats on the South coast of England (*Watson*, [TEMITH](#), European Space Agency); and on gender and entrepreneurship (*Ekinsmyth*, [Accelerating Women's Enterprise](#); *Rumble*, [PONToon](#));
- seeking funding from UKRI and equivalent sources to support areas of established strength. This includes, for example: examining the impacts of alternative health services financing systems on maternal and child health in India and Bangladesh (£560k, MRC) and of female worker migration on the "left behind family" in Indonesia (£81k, British Council), both to *Pallikadavath* and the latter underpinning *UoP14Migration*; modelling complex data to investigate place effects on rates of mental health compulsory admission (*Twigg*, NIHR) and subsequently undertaking novel analyses of administrative data to uncover differential use of Community Treatment Orders (ENCORE, *Twigg*, £241k, NIHR); and exploring the links between productivity, underemployment and other local labour market conditions (*Houston*, £35k, ESRC Productivity Insights Network).

These mechanisms have enabled us to support a wider group of staff to submit to a broader range of funders; 62% of submitted staff have contributed to income generation as PI and we have received support from 40 different funders, indicating the vitality of our funding base. This

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growth in volume and diversity of funding also demonstrates the increased relevance of our research to national and international strategic priorities.

3.2 Organisational infrastructure supporting research and impact

Research and impact are supported across the Unit at School level. In 2016, designated (0.3 FTE) Associate Heads (AH) for Research and for Innovation were appointed, the latter to support non-academic collaboration and knowledge exchange. The School Research and Innovation Committee (SRIC) identifies research priorities, agrees the priorities for the strategic distribution of internal investment (e.g. in studentships and small grants), considers EDI issues, manages research integrity and monitors delivery against KPIs and the Research Concordat. Current membership includes the AH Research / Innovation (retained and consolidated since the SEGG merger), Research Group leads (*Houston, Inkpen*), Head of School, the Research Degrees Coordinator and representatives of ECRs and research staff. The SRIC reports to the School Management Group and Faculty RIC. The REF Unit Coordinator (*Pepin*) is a member of the Faculty and the University REF Steering Committees.

Our Research Groups operate a peer-support system at the early stages of research design to improve project rigour and bid quality. Competitive external bid applications are reviewed through the University's peer-review college. In addition to Unit-specific support, staff in the Faculty and central RIS teams (REF5a, p.56-57) provide support for bid development (including finances and co-ordinating internal reviews), developing pathways to, and evidencing, impact, research ethics applications, post-award administration of externally funded research projects and commercialisation (Intellectual Property, patenting and contracts).

3.3 Facilities

Our Earth Surface Materials Laboratory contains extensive analytical equipment, including an atomic absorption spectrometer, laser particle size analyser, flume, rainfall simulator, and ion chromatograph. Aligned with our strategic priorities, we have targeted investment to support work in environmental reconstruction, including techniques for tephra analysis (muffle furnaces, centrifuge, polishing machine, micro-manipulator); coring equipment (Russian peat corer, gravity corer (lake sediments)), Gouge auger and Glue corer microscopes, sediment traps, and metal detectors. Within SEGG, we have access to scanning electron microscopes with energy dispersive X-ray spectroscopy, an inductively-coupled plasma mass spectrometer, and an X-ray fluorescence spectrometer. These investments have expanded our capabilities in tephrochronological analysis and palaeo-environmental reconstructions (e.g. REF2/10573656).

We have invested >£250k in field equipment to support our work in climate change and in glacial and fluvial systems. This includes two differential GPS (Leica), a 20 micron 3D laser scanner (for non-invasive field measurement of earth surfaces), a new ground penetrating radar, new drone technology (UAV), two automatic weather stations (Campbell), and expanding our pool of >400 logging sensors. These have enabled projects spanning the monitoring of cloud patterns and microclimate on Kilimanjaro (REF2/10295523) to surging glaciers in Svalbard, and RFID-technology for monitoring boulder movement on the Isle of Wight. Our growth in fluvial science research is supported by an Acoustic Doppler Current Profiler, which has been used to identify habitats critical for ecological conservation. Photogrammetric software includes BAE Systems

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Socet Set, the Leica Suite, and we have extensive GIS and imaging tools (REF2/18845046/11861359/13876992/13877088).

We have invested >£50k in database infrastructure, in particular servers and data protocols, to support our work on large scale secondary datasets (1.2.3) and public use web databases. This includes a high performance back-end Big Data Server with optimized RAID storage and front-end network security hardware. Servers run the latest Oracle 19c enterprise and data analytics software, and one server has the Oracle Data Integrator suite to support data warehousing applications (REF2/10556071/10556095/10555622).

Our coastal and marine research is enabled by the Institute of Marine Sciences (IMS), a marine research station situated at the mouth of Langstone Harbour, Portsmouth that provides direct access to the Solent European Marine Site and coastal habitats across the Solent. The IMS supports extensive public engagement (4.5) and facilitates IDR by bringing together research expertise in marine ecology (*Watson*) with that in molecular biology, gene regulation and ecotoxicology to underpin research on the impact of climate change and environmental contaminants on aquatic ecosystems (REF2/18845046).

Our extensive field equipment and laboratory resources are supported by 2.0 FTE technical staff, with specialisms in GIS and IT support, and 4.5 FTE laboratory staff (27%F) who support research and impact across SEGG. All staff and PGRS have equal access to infrastructure, irrespective of seniority, Research Group or availability of external income. Our facilities and instrumentation are accessible to wider academia and industry via the [University Research Portal](#) and equipment sharing databases, such as [Equipment.data](#) and [Konfer](#). We will continue to invest in infrastructure, ensuring that future enhancement is driven by our strategic priorities and maximises the opportunities for shared resource use.

Our researchers also access research facilities that complement those in the Unit. For instance, in collaboration with Heidelberg University and the University of Oxford, *Hardiman* has secured NERC in-kind resources (£42k) for C-dating of tephra deposits from Tenaghi Phillipon in Greece. As Office for National Statistics Approved Researchers, *Houston* and *Twigg* have access to secure social, economic and population datasets (REF2/25178090).

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

4.1 Research collaborations, networks and partnerships

Our increased strategic focus on supporting collaborations to enhance the quality and profile of our research is evidenced by 83% of our publications in this assessment period being with international (59%) or national (24%) co-authors (SciVal). Collaboration with academic partners is facilitated by mentoring, financial and workload support for visiting positions, providing office and research facilities to host researchers (1.2.1) and establishing PGRS supervisory teams with external members. Unit policy influencing activities (4.3) also consolidate partnerships and extend our networks. Our participation in funded research consortia promotes open science, produces rigorous research outputs and contributes to international reach. Examples include; *Pallikavadath's* research with Padjadjaran, Gadjah Mada and Hanoi Medical Universities

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evaluating financial incentives to health services use in India and Bangladesh; *Soar* working with the University of Nottingham and the University of St Louis (USA) on river channel stability; *Hardiman* with Manchester University, Royal Holloway and the Wildfire Forum to develop a UK fire danger rating system; and *Twigg* with the Universities of Southampton, Sheffield, Newcastle, Warwick and UCL to produce small area health indicators for service planning and evaluation.

4.2 Relationships with key research users and contributions to the economy and society

Linked to our strategic objectives for impact (1.2.2) and IDR (1.2.4), we have focused support to increase the breadth and depth of engagement with users of our research. This has led to collaborations with over 100 national and international companies, public sector organisations and agencies, and charities. The proportion of our research income from projects with at least one named non-academic partner has grown from 3% in 2013/14 to 30% in 2019/20, evidencing a step change in partnership development as part of our impact strategy.

Notable examples include projects enhancing social and economic inclusion and equality through working with: clinicians from medical schools and the Mental Health Foundation to develop and evaluate interventions to reduce rates of mental health compulsory admission (*Twigg*: acknowledged in the Wessely Review of the Mental Health Act); economists to investigate the impacts of under-employment (*Houston*); human resource specialists, creative technologists, training organisations and local authorities in France and England to promote skills development and accelerate women's enterprise (*Ekinsmyth*, *Rumble*); local theatre and arts organisations on issues facing the creative economy sector (*Ekinsmyth*); and local communities, regional and government agencies in the Global South to explore alternative systems for access to health services (India and Bangladesh) and implement policy changes to support female migrants and their families in Indonesia (*Pallikadavath*).

We have also supported sustainable urban and rural development by working with: ecologists, town planners and architects in the UK and Brazil on Renaturing Cities (*Rumble*); planners, councils, and social scientists in the UK, US, Scandinavia and Taiwan to improve urban climate resilience (*Brown*, CRUNCH); local authorities, environment and conservation agencies on management and governance of natural freshwater and marine resources in the UK (*Watson*); and with international agencies (UN International Organisation for Migration, UNHCR), charities (Action Against Hunger), NGOs (PRACTICA Foundation, WASH Alliance), and community organisations to develop a sustainable management model for rural water infrastructure in villages, town and refugee settlements that has been adopted into the National Operation and Maintenance Framework for Rural Water Infrastructure in Uganda (2019) (*Brown*).

Engagement, collaboration and dissemination with non-academic organisations are also embedded in the activities of our PGRS, promoting impact and enhancing their training and employability. For example, a work-based PGRS placement with Forest Research resulted in the publication of a new guidance note on managing UK wildfires, since shared with DEFRA, Forestry Commission, Met Office and National Fire Chiefs Council. Other PGRS have worked with local councils to report on youth tobacco and cannabis smoking and develop a school smoking survey across Southern England, with the South Downs National Park Authority to

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improve management schemes for the River Rother, and with NGOs in Africa to help implement water management policy.

4.3 Contributions to the sustainability of our disciplines and responsiveness to national and international priorities

Alongside research-focussed papers submitted in REF2, the Unit supports the development of review and position papers in order to develop scholarship and the evolution of policy/practice. A [Nature Climate Change](#) review paper on elevation-dependent warming (EDW) (*Pepin*, 791 citations, SciVal) placed rapid mountain warming on the international research agenda. EDW was subsequently highlighted in the Intergovernmental Panel on Climate Change (2019) [Special Report on Oceans and Cryosphere in a Changing Climate](#) (*Pepin* contributing author). *Pepin* also contributed to the Hindu-Kush Himalaya Assessment (*Bolch et al.* 2018), amongst the most highly cited climate publications. *Fletcher* co-authored the UNEP report [Land Restoration for Achieving the Sustainable Development Goals](#) (2019) and led on a forthcoming report on governance of coastal resources for the UN Environment Assembly that highlights the impact of land-based management on our oceans. *Healey* has made a significant contribution to the published EC standard for archiving of electronic databases, E-ARK, at the forefront of European e-data storage and internet policy development. Other substantial outputs include *Southall's* co-edited book on 'Data in Society' and *Twigg's* co-authored book on 'Smoking Geographies' (the first monograph using a geographical approach and based on over a decade of international research and collaboration).

Our staff also contribute to science-led practice and policy development on the national and international stage. *Fletcher* is Ocean Lead on the invitation-only UN International Resource Panel that provides independent scientific advice on sustainable coastal and ocean management to G7, G20, and UNEP. He is an invited member of the UNEP Sustainable Blue Economy Working Group and hosted a two-day UNEP-sponsored workshop on ocean plastic (March 2020). *Pepin* leads the elevation-dependent climate change working group of the Mountain Research Initiative, an NGO connecting the global mountain research community with stakeholders. In 2018, he co-organised an international workshop of the GEO-GNOME network to identify Essential Climate Variables for mountains for development and incorporation into global Sustainable Development Goals (SDGs). *Potts* is a member of the Education and Training Steering Committee of the Society for Underwater Technology, which acts as an interface between industry, academia, government and the UN to promote "Ocean Literacy" towards the 2030 SDGs, and is an invited member of the East Head Coastal Issues Advisory Group, Solent Forum and Standing Conference on Problems Associated with the Coastline, advising on coastal management schemes in the south of England; *Rumble* was on the panel that developed the British Green Roof Substrates standard (BS 8616:2019) and is a member of the team that is updating the Green Roof Code. She is also on the review panel for the British Ecological Society's Nature Based Solutions report, informing government biodiversity strategy.

4.4 Contributions to and recognition by the research base

Staff have provided expert review for UKRI Councils (AHRC, EPSRC, ESRC, NERC and the MRC) and for funding bodies outside the UK (US National Science Foundation, Chinese Academy of Sciences, Netherlands Space Office and the Norwegian Research Council). In

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2018, *Southall* received an AHRC Gold Standard Letter for his 'outstanding contributions...made to the Peer Review College'. Staff have also been members of grant assessment panels e.g. UKRI 'Constructing a Digital Environment' Strategic Priorities Fund (*Healey*), ESRC (*Houston*, 2015-2017) and NERC Discovery Science Panel B (*Pepin*), and contribute to forums making recommendations on strategic funding priorities, e.g. 'UK in a Changing Europe' Advisory Group (*Houston*).

Our reviewing (>50 journals) and editing of journals is extensive and is recognised as an important contribution through workload allocation. Editorship board positions include *International Small Business Journal* (*Ekinsmyth*), *Geomorphology* (*Inkpen*), *Journal of Population Research* (*Pallikadavath*), *Arctic, Antarctic and Alpine Research* (*Pepin*), *Marine Policy* (*Potts*), *Health and Place* (*Twigg*), *Quaternary Science Reviews* (*Wulf*). Staff have also guest edited journal special issues, such as *Frontiers in Ocean Science* (*Fletcher*), *Geopolitics* (*Woodyer*), *Journal of Biosocial Sciences* (*Pallikadavath*).

Our staff contribute to the RGS-IBG including Chair of the Social and Cultural Geography Research Group (*Woodyer*), Membership Secretary of the Children, Youth and Families Research Group (*Day*) and Committee Member of the Coastal and Marine Research Group (*Potts*). Staff have convened sessions at international conferences, e.g. EGU, AGU, INQUA, RGS-IBG and AAAG, and organised conferences at UoP. CSG co-hosted the 2014 RGS-IBG Geography of Health Research Group young researchers 'ENRGHI' meeting, and we will host the Quaternary Research Association (QRA) 2021 meeting (online) for the first time, highlighting the increasing reputation of our paleo-environmental research. Staff regularly convene sessions within broader meetings, including a session on inclusive growth at the European Regional Science Association in Cork, Ireland (*Houston*, 2018).

Recognition for contributions to research include the QRA Lewis Penny Medal (2019) to *Boston* for her contribution to understanding the Quaternary stratigraphy of the British Isles, Honorary Professorship to *Pepin* (Institute of Tibetan Plateau Research, Beijing, 2017) and Visiting Professorships to *Fletcher* (World Maritime University in Malmo, Sweden, and Greenwich Maritime Centre, London).

4.5 Engagement with diverse communities and the public

We are passionate about engaging the public with our research and employ several mechanisms to do this. Researchers in both our Research Groups have led on national "citizen science" projects. Building on his expertise with creating accessible digital databases, such as the 'Great Britain Historical GIS', 'A Vision of Britain with Time' and 'Old Maps Online' projects, *Southall* led the 'GB1900' project (2016-2018) that involved over 1,000 online volunteers in the digital recording of place names in Great Britain. Since launch in July 2018, there have been 1,044 data downloads from the 'GB1900' site by local historians, researchers, libraries, archives and organisations across the public, private and voluntary sectors. 'GB1900' data was incorporated into the 'Ramblers' "citizen geography" 'Don't Lose Your Way' campaign that has identified more than 49,000 miles of potentially missing rights of way (*UoP14Places*). Between 2015 and 2018, *Watson* led a regional hub of the marine citizen science programme, '[Capturing our Coast](#)' from the IMS. Funded by the Heritage Lottery Fund, *Watson* and his team delivered training, field days, laboratory sessions, social events and beach events to over 300 citizen

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scientists who conducted transect surveys of marine species on UK rocky shores to monitor responses to environmental change. This team also partnered with the charity One Ocean on the 'Sea Bin, Sea Change' campaign to tackle marine plastic pollution. Between December 2017 and September 2019, the team held four public events, each attracting over 200 people, as well as a series of beach cleaning days on the south coast and the Isle of Wight and a 'Problem with Plastic' fringe event at the King's Theatre, Portsmouth, attended by 100 visitors.

Staff also take part in international festivals and exhibitions: *Healey* was adviser on 19th century industrial photography for the 'East of Mississippi' exhibition in the National Gallery of Art, Washington DC, reaching over 60,000 people. *Brown* is a member of the Advisory Panel for the Venice Biennale 2021 (postponed from 2020 due to Covid-19) that will feature *Rumble* and *Brown's* work on how we view urban nature and resilient communities, respectively.

Unit staff and their PGRS have participated in regional outreach activities that include public talks and visits to schools and colleges. We offer a "G2U" programme that provides research-oriented lectures in local schools. Sessions cover aspects of geography ranging from glacial retreat (*Lovell*), to culture and urban regeneration in Los Angeles (*Ekinsmyth*). We also "teach the teachers" with a highly successful programme across Hampshire in which staff use their research to inform the school curriculum (e.g. measuring microclimate on the South Downs: *Pepin*). *Houston* and *Ekinsmyth* co-wrote two educational documentaries produced by Time for Geography for schools, drawing on their research expertise on cities and identity. Staff and PGRS also present at public events (e.g. Pint of Science, Portsmouth Victorious Festival, Science in the Pub) and meetings with local community groups (Uo3A, Havant Rotary Club and Friends of Langstone Harbour).

Our research also features in national and international media. Examples include: opinion pieces on children, play and violence (*Woodyer*, 2016); Brexit and the fishing industry (*Potts*, 2018) and Greta Thunberg's carbon neutral travel to the USA (*Fletcher*, 2019)); interviews e.g. with *Pallikadavath* on health in Indonesia (CNN, 2018) and *Pepin* in the Arrow-Media Channel 5 documentary on Kilimanjaro (2018); and *Inkpen's* contribution to research on the D-Day map at Southwick House (Reuters, BBC Breakfast, June 2019). Four staff (*Fletcher*, *Houston*, *Woodyer*, *Potts*) have published in *The Conversation*; *Houston's* critical review of 'Five Maps That Will Change How You See the World', has been read by over 500,000 people since 2017.