

<b>Institution:</b> Swansea University
<b>Unit of Assessment:</b> 14 Geography and Environmental Studies
<b>Section 1: Unit Context and Structure, Research and Impact Strategy</b>

**Swansea Geography** is an ambitious and vibrant research community – one of six units in the College of Science. We conduct cutting-edge and challenge-led interdisciplinary research spanning the environmental and social sciences, and arts and humanities. Building on our REF2014 **strategy** we achieved *growth through excellence* by further empowering our research groups; recruiting, retaining, and nurturing outstanding staff at all career stages, including research students and fellows; and cultivating strong external partnerships to expand the scale, scope, and reach of our impact in the UK and abroad. We are driven by our collective ambition, supportive culture, and core values of collegiality, collaboration, integrity, equality and inclusivity, and openness and transparency. Our **success** is demonstrated by a significantly enriched community, with more early career researchers (ECRs), fellows, and PhD students, more projects co-produced with external partners, all supported by outstanding research infrastructure and resilient income streams, especially from UKRI and EU (Table 1).

Table 1. Highlights Since REF2014		
<b>Our community</b> 100% increase in ECRs & Fellows 30% of staff promoted 59% increase in PhD awards	<b>Our achievements</b> Athena SWAN Bronze >500 published outputs 8 medals, prizes & awards	<b>Our co-produced research</b> 20% PhD projects co-produced 6.2% Outputs co-authored with our non-academic partners

Since REF2014, we increased from 27.7FTE to 29.7FTE Category A staff (Table 2), doubling our number of female (Senior) Lecturers, and growing our professoriate by 2 colleagues (which is now 22% female). Our department achieved an **Athena SWAN Bronze Award** in 2020, and we appointed our first female Head of Department. We lead the **ESRC Wales DTP Human Geography Pathway** (for Aberystwyth, Cardiff, and Swansea Universities), yielding a sustainable flow of PhD students, with 46% men and 54% women over the REF2021 assessment period.

Table 2. Change Since 2014	REF2014	REF2021
Category A staff (FTE) at census date	27.7	29.7
Category A ECR (Headcount) at census date	4	6
Research fellows (Headcount) over period	3	9
Total PhD degrees awarded (REF4a)	29	46.0
Total research income (REF4b)	£7,374,155	£10,173,614
Average annual research income over period	£1,474,831	£1,453,369

Note: £853,829 research income-in-kind (REF4c) reported in REF2014. Negligible in REF2021

Our four **research groups** underpin our success: (1) **Critical Human Geography**; (2) **Environmental Dynamics**; (3) **Glaciology**; and (4) **Global Environmental Modelling & Earth Observation** (GEMEO). Our key objectives (set out in REF2014) of empowering our groups and encouraging cross-group activity delivered innovative projects and novel outputs. **Co-production** with non-academic partners is now fully embedded, as demonstrated by our impact case studies and many collaborative PhD projects (see Table 4 in section 4).

Collaborations within our College enable **impactful, interdisciplinary research**: e.g. with bioscientists on poverty alleviation and ecologists on wildfire (BBSRC/Newton Fund and NERC); with computer scientists on digital preservation of decommissioned asylums (EPSRC); and with physicists on science outreach to deprived communities (Welsh Government). Our well-resourced College ensures resilient financial planning and comprehensive professional-service support.

**RESEARCH AND IMPACT STRATEGY: GROWTH THROUGH EXCELLENCE**

We share the University's **vision** of being recognized internationally as *principled, purposeful, and resilient*, and we are committed to its **mission** of making a difference, being socially responsible, striving for excellence, and maintaining a global outlook (REF5a). Our **research** is driven by scientific curiosity and critical enquiry, practical relevance, and value to society and the planet. Our **motivation** is to rise to the global challenges of social injustice and environmental change, and we lead on the University's determination to respond effectively to the climate crisis by aligning with the UN's Sustainable Development Goals.

Our REF2014 research and impact strategies have been aligned to the University's strategic focus on increasing the *quality, scale, and impact* of our research. We placed our research community and its talents at the heart of our refreshed REF2021 strategy. We addressed 7 **strategic aims** that built on our community's research passions and scientific expertise (AIMs 1 & 2) and the **research drivers** (*optimizing outputs; maximizing income; ensuring research integrity*) and **impact priorities** (*building partnerships; co-producing with stakeholders*) laid out in our REF2014 submission.

Progress is reviewed at biannual away days, and we adjust our **delivery enablers** as necessary. Our 7 **strategic aims**, main **enablers**, and key **achievements** over the assessment period are detailed below.

ENABLERS	ACHIEVEMENTS
<b>AIM 1. Nurture talent for all career stages in an equal &amp; inclusive research environment</b>	
<ul style="list-style-type: none"> <li>• Athena SWAN action plan</li> <li>• HR Excellence in Research</li> <li>• Concordat to Support Career Development of Researchers</li> <li>• Family-friendly &amp; flexible-working policies</li> <li>• Equal-opportunities recruitment policy; mandatory equality, diversity &amp; inclusivity and unconscious-bias training</li> <li>• 3 distinct academic career pathways: Research, Innovation, and Teaching</li> <li>• Research-leave (typically 4-year cycle)</li> <li>• Research-leave after parental leave</li> </ul>	<ul style="list-style-type: none"> <li>○ 9 research fellowships including 6 women (e.g. AXA, ESRC, UKRI Future Leader, Marie Curie, Royal Society)</li> <li>○ 2 Fellows became permanent colleagues</li> <li>○ ECRs now 6 (33% women), up from 4</li> <li>○ 30% of staff promoted</li> <li>○ 8 external awards and prizes</li> <li>○ 24 staff enjoyed research leave, including 2 after parental leave</li> <li>○ Biennial working-culture survey</li> <li>○ Regular community events, wellbeing sessions, email charter, family friendly core-hours policy, community champion</li> </ul>
<b>AIM 2. Recruit and train excellent research students to enrich our research community</b>	
<ul style="list-style-type: none"> <li>• Fully funded PhD studentship e.g. ESRC Wales DTP, EU Social Fund (ESF) &amp; EU Knowledge Economy Skills (KESS)</li> <li>• Matched and in-kind funding from co-producers; placement opportunities</li> <li>• Pursuit of interdisciplinary PhD projects</li> <li>• Vitae Researcher Development Framework &amp; PhD student training</li> </ul>	<ul style="list-style-type: none"> <li>○ 59% increase in PhD awards</li> <li>○ 28% of PhDs moved to research posts</li> <li>○ 20% of PhDs co-produced with non-HEIs</li> <li>○ 16% of outputs authored by PhD students (~2 papers per PhD student)</li> <li>○ £500 p.a. training grant for PhD students</li> <li>○ Co-supervision with other disciplines, e.g. Biology, Computer Science, Engineering</li> </ul>
<b>AIM 3. Shape research agendas with world-class outputs, dissemination, and impact</b>	
<ul style="list-style-type: none"> <li>• Internal peer-review to enhance quality</li> <li>• Writing retreats and writing sessions</li> <li>• Open access and page charge funds</li> <li>• Conference attendance funds</li> <li>• Authorship policy to ensure integrity</li> <li>• Proactive College &amp; University Press Office</li> </ul>	<ul style="list-style-type: none"> <li>○ Influential outputs, e.g. field-weighted citation impact of 2.10 (SciVal analysis)</li> <li>○ Committee roles, e.g. AAG, AGU, RGS</li> <li>○ Media coverage of our research, e.g. ~20 BBC News items</li> <li>○ Policy influence, e.g. Welsh, Scottish, and UK Governments</li> </ul>

**AIM 4. Maximize grant capture with enhanced support for funding bids**

- Complete pre- & post-award support
- Quality enhancement of bids: Eols; internal peer review; mock interviews
- Research incentive & seed-corn funds
- Pitch-to-peer ideas cafés to shape bids
- Support for ERC grant capture with Université Grenoble Alpes, France
- Sustained level of research income (£10.2M total; £1.5M per year)
- NERC standard grant currently at 40% success rate, well above the 20% demand-management threshold
- 9 research fellowships
- ERC Starting grant

**AIM 5. Facilitate research integrity and open research and scholarship**

- Research Integrity Policy Framework aligned with UKRIO Code of Practice
- Signatory to Concordat to Support Research Integrity and DORA
- Embedment of responsible innovation
- College Research Ethics Committee
- Mandatory research integrity training
- Institutional Publications Repository (Cronfa) includes underpinning data
- We subscribe to Epigeum research integrity training for all researchers
- College ethical approval process for all research (UKRI and UKRIO compliant)
- Responsible innovation integrated into funding proposal development process
- Sustainable facilities & infrastructure budget
- Underpinning datasets archived in open-data repositories
- Funded open access for 3 book chapters

**AIM 6. Co-produce research with external stakeholders**

- College Impact Officer
- Geography impact-seminar series
- Impact sabbaticals
- EPSRC Impact Acceleration Account
- Co-produced & co-funded PhD projects
- Co-location of Natural Resources Wales (NRW) water-analytical facilities
- Media training and Press Office support
- Impact rewarded & promotion criteria
- Honorary positions for research partners
- Sabbaticals e.g. Forest Research, US Forest Service
- NERC research with water agencies
- Funding from stakeholders & knowledge-exchange reports e.g. ESA, DEFRA, Forest Research, Ordnance Survey, Woodland Heritage
- Leverhulme Artist in Residence
- Honorary Staff (Environmental Systems, Forest Research, British Antarctic Survey)

**AIM 7. Cultivate strategic, interdisciplinary, and global partnerships**

- College international ECR visitor scheme, global mobility and seed-corn funds
- Overseas visiting researcher positions (outgoing & incoming)
- International PhD agreements
- College interdisciplinary research sandpits
- Support fund for research networks
- Strategic partnerships with Université Grenoble Alpes, and 8 institutions in Texas
- 8 visiting researcher positions
- We lead 3 University Research Centres
- PhD agreements and co-supervision: Paris-Sorbonne, Grenoble, Tromsø, China Scholarship Council, Waikato
- Honorary Staff, e.g. Luke Natural Resources Institute, Finland; Scripps Oceanography, Universities of Auckland and Vienna
- 72% of our >500 outputs in census period have international co-authors (Figure 4)

**RESEARCH GROUP STRUCTURE**

Our Unit of Assessment (UoA) has four research groups, which nurture and support our community of 75 researchers on the census date (Figure 1):

- **Critical Human Geography** (10 Cat. A staff; 1 post-doctoral researcher; 16 PhD students)
- **Environmental Dynamics** (10 Cat. A staff; 7 post-doctoral researchers; 10 PhD students).
- **Glaciology** (5 Cat. A staff; 2 post-doctoral researchers; 4 PhD students).
- **Global Environmental Modelling & Earth Observation (GEMEO)** (5 Cat. A staff; 2 post-doctoral researchers; 3 PhD students).

## ENVIRONMENTAL DYNAMICS

Reducing uncertainty in past and present climate dynamics

Effects of environmental hazards in sensitive regions

Sustainable management and carbon capture in agricultural and forested land

Geoarchaeological applications

## GLACIOLOGY

Ice dynamic processes: iceberg calving, ice fracture, basal motion & surge mechanics

Glacier climate response & contribution to sea level

Permafrost, glacier & snow hydrological processes

Ice-crust interactions

Acquisition of global land & atmosphere data-sets from past and new satellites

Forest health & productivity

Quantifying regional and global land-atmosphere fluxes of carbon, water and radiation

Advancing weather forecast and climate models

## GLOBAL ENVIRONMENTAL MODELLING &amp; EARTH OBSERVATION (GEMEO)

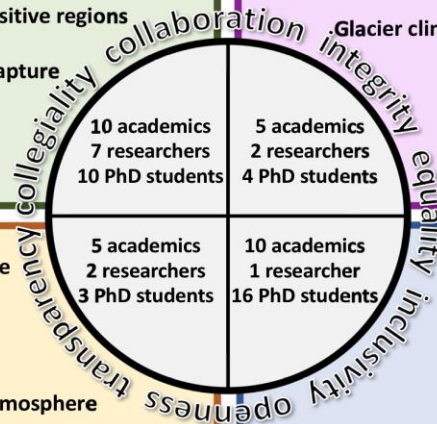
Social theory and urban space

Migration, boundaries and identities

Political economy: values, space, nature

Creativity, culture & politics: performance, motion, effect

## CRITICAL HUMAN GEOGRAPHY



**Figure 1.** Our research-group structure, key research foci, and underpinning values  
(Staff headcounts at census date; PhD headcounts for AY2019/20)

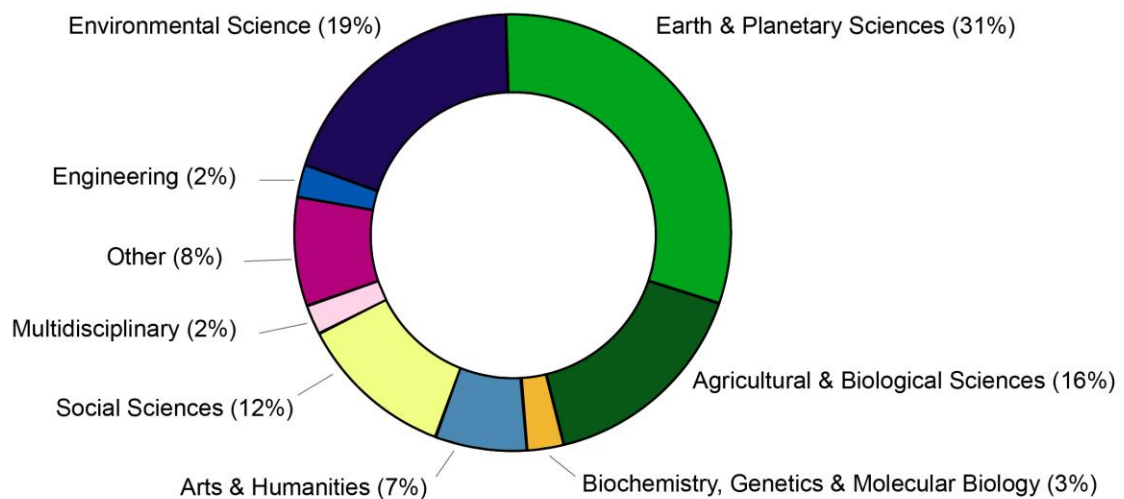
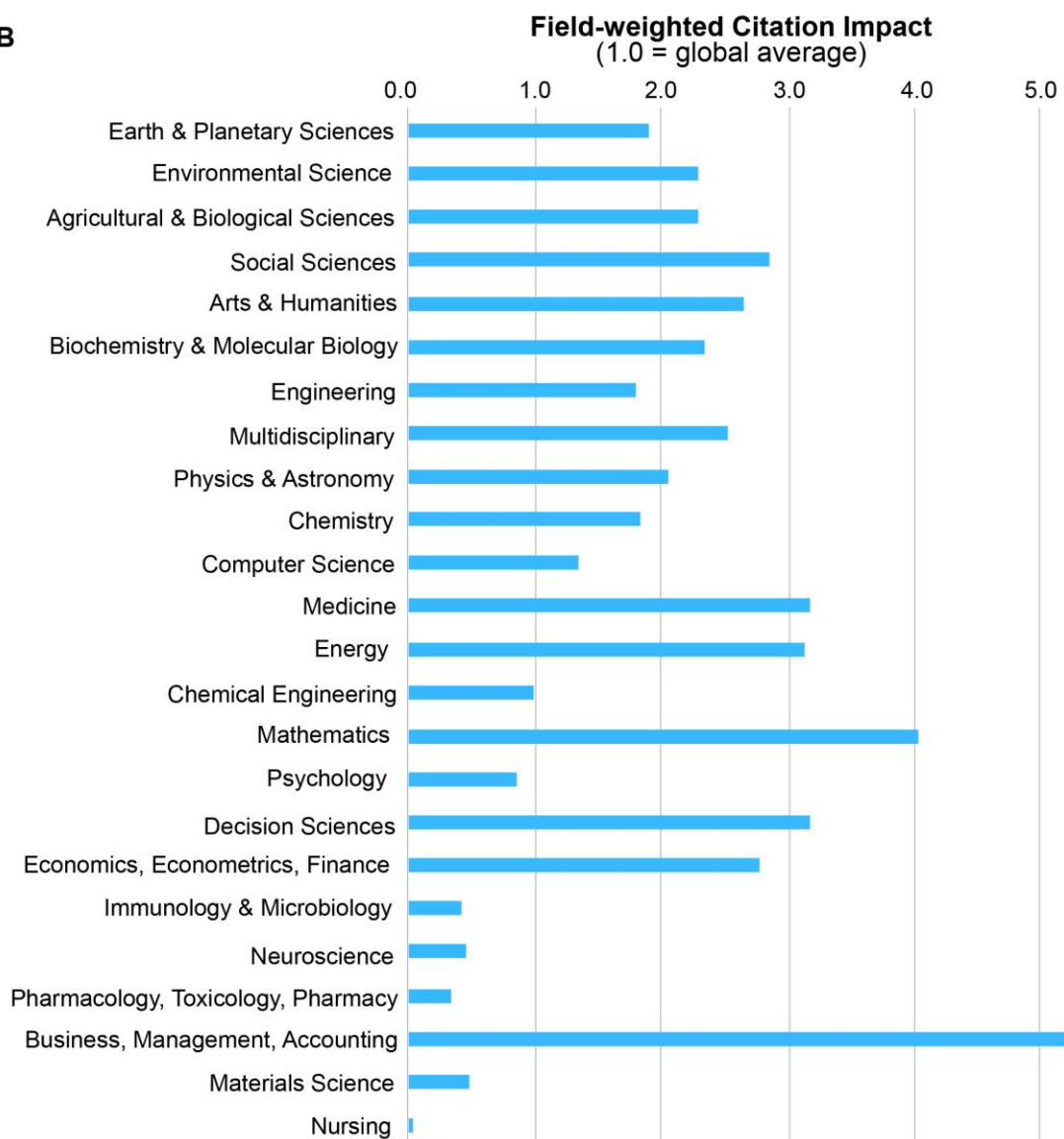
We continue to lead two University Research Centres – **Centre for Migration Policy Research** (CMPR) and **Centre for Urban Theory** (CUT) – and established a new University **Centre for Wildfire Research** (CWR). Although the Met Office *National Centre for the Impact of Extreme Weather* anticipated in our REF2014 submission did not come to fruition, we nevertheless strengthened our expertise in environmental hazards and forest health via new appointments.

**Our groups** enjoy **research autonomy**, setting their own agendas and goals. We prioritise support for ECRs, including research students, and treat career progression as a strategic objective (AIMs 1 & 2). We regularly **share best practice** at research away days, and benefit from **collective endeavour**: seminar series, reading groups, writing retreats, internal workshops, ideas cafés, mock interviews for fellowship applicants, and viva training for PhD students.

The College facilitates **interdisciplinary research activity** through science cafés, away days, sandpits, festivals of ideas, and substantial seed-corn funding and investment in PhD studentships (>£600K per annum), especially where 50% match-funding is required. The generosity of the latter enabled us to establish a collaborative PhD programme with Paris-Sorbonne University (Cluster of Excellence in Territorial and Spatial Dynamics – *LabEx DynamITe*) for example.

We published **>500 outputs** during REF2021, with **72% having international co-authors** (AIMs 3 & 7). Their **interdisciplinarity** is very well-illustrated by:

- SciVal topic-cluster analysis of our outputs in Elsevier's Scopus database, with 50% in the fields of Environmental Sciences and Earth & Planetary Sciences, and 19% in the Arts & Humanities and Social Sciences (Figure 2a).
- Our field-weighted citation impact within the Scopus database is over **twice** the global average in 13 fields, and over **three times** the global average in 5 fields (Figure 2b).
- Doerr received a Clarivate Web of Science, cross-field **Highly Cited Researcher Award** (2018), with multiple papers ranking in the world's top 1% by citations.

**A****B**

**Figure 2.** SciVal analysis of our >500 outputs published in REF2021, held in the Scopus database: (a) *topic-cluster analysis*; and (b) *field-weighted citation impact*, in rank order of number of outputs.

## Unit-level environment template (REF5b)

Each research group has embedded our **co-production ethos**, tackling key challenges (AIM 6). Our impact case studies arose from our embedment of extensive co-production, and benefitted considerably from the enablers listed under AIMs 6 and 7. Beyond our case studies, we influenced migration policy (Scottish Government); biochar production (NRW); managing oak-tree decline (Woodland Heritage, Woodland Trust) and deleterious insect outbreaks (DEFRA, Forest Research); contaminated-land remediation (Salix River Wetland Services) and panada-habitat restoration (Chinese Academy of Forestry); and volcanic-hazard scenarios (Ascension Island Government & British Geological Survey). Our broader impact strategy has been enabled by UKRI impact-acceleration funding, knowledge-exchange training, impact sabbaticals, and co-produced PhDs. **6.2% of our outputs have non-academic co-authors**, which is well above the disciplinary norm, with a field-weighted citation impact over **three times** the global average [3.24] (SciVal).

Supported by the University's Research Data Manager we are rapidly expanding our **open-research culture** to cover **datasets, source code, e-theses (PhD)**, and the **reproducibility of our research**.

- We have a long-standing policy of funding **open-access articles** (including page charges) and now fund **open-access book chapters** when publishers allow.
- We have released **open-source code**, such as the FLIGHT model of land-surface radiative transfer used by NASA, via the Automated Radiative Transfer Models Operator site (ARTMO).
- We make **datasets** available via the Centre for Environmental Data Analysis, UK Data Archive, NERC Data Analysis Service, Polar Data Centre, and Copernicus Climate Data Store.
- Our own **institutional repository** (Cronfa) enables the effective governance of funders' open-access requirements, including underpinning datasets and source code, and we encourage researchers to use ORCID identifiers and apply FAIR (Findable, Accessible, Interoperable, and Reusable) data practices.
- Enabling **open-access monographs** is a key objective for the next REF period.

Our **research integrity and ethics processes** are shaped by an institutional framework aligned to the **Concordat to Support Research Integrity** and **UKRIO Best Practice**. This framework was developed by one of our professors, who is Deputy Pro-Vice-Chancellor (Research & Innovation). All researchers, including students, complete mandatory research-integrity training. We have a Research Integrity Champion who sits on the College's Research Ethics Committee, which approves all research in the UoA. All staff participate in the ethical review process. We also benefit from the University's **Research Institute for Ethics and Law**, which provides our community with ethical research insights, guidance on best practice, and a series of seminars, workshops, and events.

## FUTURE STRATEGY

From October 2020, we will join a new **Faculty of Science and Engineering**. Its academic strength and financial resilience – spanning 8 UoAs, 321 Category A eligible staff, with annual income of £120M (including £48M research income) – will allow us to deliver our **2021–2026 Strategic Plan for Swansea Geography** – pursuing *growth through excellence* by: (1) enhancing existing areas of excellence and investing in challenge-led research in *climate change, environmental hazards, international migration, and urban change*; and (2) establishing a world-leading and transformative **One Earth Institute**, shaped by pioneering researchers from across the Faculty, equipped with cutting-edge facilities and high-performance computational capability. This will be accomplished by:

- **Empowering groups** to nurture our community's talents, exploit core competences, identify new areas for strategic appointments, pursue large challenge-led projects, and host more international researcher and stakeholder events.
- **Extending our innovative interdisciplinary research** by leveraging our position within the new Faculty, via new centres of excellence and joint appointments in **Data Science**, with the University's **Computational Foundry** (Computer Science and Mathematics), and with **Environmental Engineering**, to respond to the climate, societal, and environmental crises.
- **Enhancing equality and diversity** via our Athena SWAN action plan, increasing women in senior roles, supporting diverse career progression, and employing more BAME staff.

- **Expanding impact** by broadening the range of projects co-produced with influential stakeholders, strengthening knowledge-exchange partnerships, and pursuing secondments.
- **Expanding our PhD community** by renewing the ESRC Wales DTP, and leveraging existing and new UKRI DTPs and CDTs in the Faculty through interdisciplinary research, and co-funding PhD projects with strategic partners.
- **Boosting research-incentives** with a much bigger return of overheads to PIs and research groups, allowing further strategic investment in new PhD awards and research infrastructure.
- Undertaking **responsible research for climate action**, promoting climate-science literacy, and reducing our own carbon footprint (e.g. virtual conferences and sustainable travel).
- Extending our **open-research culture**, working towards full compliance with the Concordat on Open Research Data, to embrace open scholarship, open-lab books, and open-source code. We will prioritize open-access monographs for our Critical Human Geography group.
- Continuing to ensure that all researchers are well trained in **research ethics and integrity**, and **responsible innovation**, and that all projects face robust **ethical scrutiny** and **governance**.

**Section 2: People** – *Note: All staff-related data in this section refer to Cat. A **submitted** staff*

We pride ourselves on having a collegiate, inclusive, supportive, and stimulating research community, culture, and environment (AIM 1). **All 30 Category A eligible academic staff (29.7FTE) have been submitted to REF2021**, comprising;

- 13 Professors.
- 6 Associate Professors.
- 9 Lecturers/Senior Lecturers and 2 Fellows, 6 of whom are ECRs.

The Head of Department line manages our community, drives our research-and-impact strategy (via our Research Group Leaders and Impact Champion), and ensures our research culture is vibrant and inclusive for everyone, including PhD students and visiting scholars. The Head is a member of the College's Leadership Team, and the College's Director of Research and two of the University's Deputy Pro-Vice-Chancellors for Research & Innovation belong to our UoA.

Our research groups, in which post-doctoral and PhD researchers play an integral role, are vital for our collective endeavour. Empowering groups to define their own objectives has driven our success. Their sustainability and vitality have been ensured via **10 permanent academic appointments**, including 4 more women and 1 more BAME colleague, to replace 8 colleagues who retired/left during the assessment period (net change: +2.0FTE). This large reinvestment in talent has **strengthened key areas**: cultural, economic, and political geography; migration studies and urban modelling; and cryospheric modelling, forest health, soil science, and volcanic processes. Two of our appointments held prestigious fellowships at Swansea, evidencing our career development of researchers (AIM 1) and planning for succession. A **Royal Society Fellow** and **UKRI Future Leaders Fellow** further strengthened our GEMEO and Environmental Dynamics research groups, respectively.

Our **demographic profile** across career stages became more balanced due to the promotion of 5 mid-career colleagues to personal chairs and the arrival of new ECRs and Fellows into our community. **97% of our submitted staff hold open-ended contracts**, an increase of 7% since REF2014. The number of part-time staff remains low (2 people; 1.7FTE), largely due to the uptake of family-friendly and flexible-working policies, which proved invaluable during the coronavirus pandemic for those with caring responsibilities. Women comprise 29% of our submitted staff (8.7FTE) and 22% of our professoriate (2.9FTE), and 13% are BAME (4.0FTE), equalling the UK average for 'Geography & Environmental Studies' (AdvanceHE Staff Statistical Report 2020).

We support **our ECRs' career development** through:

- 3-year **staff-development programme** to ensure capable performance in all aspects of the role.
- **Mentoring** by an experienced researcher, and supported by a research group community.
- At least **20% reduction in teaching load** and no significant administrative duties for two years.
- **Start-up funds** for two years and priority access to all other research-support mechanisms (e.g. conference funds; open-access publication funds).

## Unit-level environment template (REF5b)

- Priority funding via College International Visitor scheme.
- Tailored training, mentoring, and support for grant capture and research impact (e.g. Florence Mockeridge Fellowship Group; ERC grant development).

Two ECRs were promoted to Senior Lecturers within two years of appointment. ECRs also benefit from all of the University's support arising from our commitment to the **Concordat to Support the Career Development of Research Staff** and our **HR Excellence in Research Award** (REF5a).

Reward and recognition of excellence in research and research impact are further reflected in the **promotion of 30% of our submitted staff since REF2014**. Women account for 55% of these promotions (AIM 1). Our top priorities for succession planning, aligned with our Athena SWAN action plan, are to improve the gender balance of senior roles (Associate Professor and Professor), and appoint more BAME staff.

Our approach to **staff development reflects our collegiality**: reciprocal care and mutual support in the face of both individual and collective disappointments and successes. Our **performance-enabling programme (PEP)** ensures systematic appraisal via biannual professional development reviews (PDR). PDRs are conducted by the Head of Department: a coaching style establishes mutually agreed training needs and research goals to inspire, drive, and deliver our collective ambition. Indicative performance levels for publications, grants, PhD supervision, and impact underpin three distinct **Academic Career Pathways** (Research; Teaching & Scholarship; Innovation & Engagement), tailored to each of the career stages on each pathway, from Lecturer to Professor. This ensures career progression and promotion criteria are equitable and transparent, and adds clear **reward-and-recognition impetus** for each of our strategic aims. Our 30 submitted staff are on the 'Research' pathway, with 50% of time devoted to research and impact (AIMs 1 & 3). Our UoA is supported by another 7 lecturers on the 'Teaching' pathway, who undertake pedagogic scholarship and contribute to our research culture, especially via PhD training.

Our probation system for ECRs merges seamlessly with PEP and PDR. Training needs identified in PDRs are co-ordinated by the University's **Development & Training Services**, and all submitted staff have benefitted from this training. We also fund staff to attend external leadership courses. A third of our female colleagues participated in such courses, including the **Aurora Leadership, Welsh Higher Education Leaders**, and **Welsh Crucible for Future Research Leaders** programmes. Female staff have also benefitted from the All-Wales **Women in Universities Mentoring Scheme**.

**Post-doctoral staff** are full members of our research groups. Our commitment to them is demonstrated by our celebration of external awards and academic progression (AIM 1; Figure 5 in section 4). Many secured prestigious fellowships and academic positions (e.g. Marie Curie at Bern; Leverhulme at Oxford and Durham; posts at Queen Mary, Leeds, and Alfred Wegener Institute). Others returned to Swansea as academic staff and research fellows. Post-doctoral staff enjoy a comprehensive skills development programme co-ordinated by the University that is mapped onto the **Vitae Researcher Development Framework**.

The University demonstrates its ongoing commitment to the implementation of the **Concordat to Support the Career Development of Researchers** by publicly reporting against Concordat action plans, and we have continuously held the European Commission's **HR Excellence in Research Award** since 2010 (REF5a). **Post-doctoral staff** are also fully supported by our Research Hub and Research Group Leaders when submitting bids. The Head of Department holds a termly post-doctoral forum to consult on their career development, which complements the work of the University's Research Staff Working Group. Research staff have a standing item on our staff meeting agendas and they lead away-day sessions to foster an inclusive research culture.

Our **research-leave scheme (sabbaticals)** relieves staff of all teaching and administration for one semester and adjoining summer (~8 months) (AIM 1). This enables substantial programmes of research and extended visits to research partners, often overseas (AIMs 6 & 7). Research leave is especially important for Human Geographers completing research monographs. Staff are eligible for research leave, typically every four years. Staff on **parental/adoption leave** get an additional period of research leave when they return to work, and 2 colleagues have benefitted from 3 such additional periods over the assessment period.

In total, **24 staff have enjoyed research leave**, including **6 periods focused specifically on impact** (e.g. an extended stay at Melbourne University for our 'wildfire' case study, and frequent visits to Forest Research to foster new impact using novel remote-sensing techniques). We will fund more **secondments to co-producers** and host more stakeholders (e.g. US Forest Service), augmenting the 3 honorary researchers from key partners (British Antarctic Survey, Environmental Systems Ltd, and Forest Research). We will extend more honorary and visiting researcher invitations to broaden and deepen our impact.

**Recognition-and-reward mechanisms** promote a vibrant research culture, including grant capture (AIM 4). Our own research-incentives scheme rewards staff for grant submissions and securing PhD studentships, and we return some research-overheads to PIs and Co-Is, which will substantially increase in the new Faculty. New staff receive start-up funds, and everyone can apply for Departmental, College, and University research-support funds, spanning blue-skies and proof-of-concept funding to impact-acceleration and grand-challenge funding. We fund activities promoting impact, such as knowledge-exchange visits, research-translation reports, and public engagement.

Our **Departmental Impact Champion** assesses the potential impact of all our research and directs support to ensure its realization (e.g. via the College's Impact and Engagement Officer, and the University's Impact Manager). 6 potential case studies were supported over the assessment period, and the most mature submitted. We will continue to cultivate these and other areas of impactful research in the future. 3 have already won Swansea University **'Research and Innovation Awards'**:

- **'Outstanding Impact in Research'** – for our use of satellite data to improve climate models (*submitted case*). It was also nominated for the 2015 **Queen's Award**, reaching the final 30.
- **'Global Reach and Significance'** – for our wildfire research (*submitted case*).
- **'Outstanding Contribution to the Arts, Culture, and Society'** – for our participatory action research to alleviate poverty in aquacultural communities in Bangladesh and India.

## RESEARCH STUDENTS

**PhD students** are integral members of our research groups (AIM 2). PhD awards were 46.0 in REF2021, compared to 29.0 in REF2014 (Tables 2 and 3), with an average of 1.55 PhD awards per Category A submitted staff FTE over the REF2021 assessment period. We are proud to have sustained a thriving and gender-balanced PhD community (46% men; 54% women), partly through gender-balanced recruitment panels, unconscious-bias training for all selectors and supervisors, and recruitment policies sensitive to protected characteristics and neurodiversity.

Since REF2014, our **PhD community grew by 59%**, and **28% of doctoral graduates have secured research and fellowship positions** in the UK, Europe, and Canada. We are particularly proud that 3 fellows returned to us for their fellowships (AXA, ESRC, and Royal Society).

**Table 3. Panel C Supplementary Criterion – Disaggregation of Doctoral Awards (REF4a)**

AY	13/14	14/15	15/16	16/17	17/18	18/19	19/20	Total
PhDs Awarded	8	8	11	6	4	5	4	46
Professional Doctorates	0	0	0	0	0	0	0	0

**Our PhD topics and supervisory teams** increasingly reflect interdisciplinary projects with other departments and co-production with partners. Our **ESRC Wales DTP Human Geography Pathway** ensures a sustainable flow of studentships, most of which are co-produced (Table 4). We also benefitted considerably from University scholarships, and our participation in the **EU's Knowledge Economy Skills Scholarships (KESS)** scheme, which is supported by European Social Funds and the Welsh Government. Other PhD studentships come from a diverse range of funders, such as AXA, China Scholarship Council, Commonwealth Commission, ERC and NERC projects, National Centre for Earth Observation, Royal Society, and Coleg Cymraeg Cenedlaethol, which is testimony to the breadth and reach of our impactful research.

**Research-student supervision** occurs in a framework of effective induction and comprehensive training tailored to individual needs. Robust **progression monitoring** is ensured via the online 'e-

vision' research-monitoring system, which entails monthly engagement and quarterly progression reporting. PhD students enjoy **discipline-specific training**:

- **Human Geographers** select modules from the research-training element of our ESRC Wales DTP 1+3 programme (MSc Social Research Methods). This includes an annual Postgraduate Conference, annual Theory School, and series of Methods Masterclasses delivered in conjunction with Aberystwyth and Cardiff Universities (open to other UK-based PhD students).
- **Physical Geographers** select modules from our MSc programmes in Environmental Dynamics & Climate Change, and Geographic Information & Climate Change.

**Skills-development** workshops by the University include public engagement, academic writing, research integrity, research methods, interdisciplinary thinking, achieving impact, networking, and entrepreneurship. Supervisors also receive mandatory training in PhD supervision and progression monitoring. During the pandemic our PhD community benefitted from online group-supervision meetings, virtual writing retreats, and online symposia. Along with real-time reporting on 'e-vision' of any adverse impact of coronavirus on their work, these virtual events sustained students' wellbeing.

Our PhD community is a major asset for our Unit and contributes vitality to our research culture via a wide range of activities, such as **seminar series** and **reading groups**. A research-student forum with the Head of Department occurs termly and a postgraduate representative joins our departmental staff meetings. We have away days with research students to reflect on their experiences and needs, and we appreciate that postgraduates are influential ambassadors for Swansea, especially when they present their research at conferences and in print.

All PhD students have their own desks and personal computing equipment in recently refurbished offices, and we provide ergonomic furniture when it is required for their health and wellbeing.

We welcomed **visiting PhD students** into our community from as far afield as China, Denmark, Finland, Germany, Iceland, New Zealand, Russia, Slovenia, and Sweden, which was particularly enriching for our own PhD students and ECRs.

## EQUALITY AND DIVERSITY

Our commitment to equality, diversity, and inclusivity (AIM 1), including statutory Welsh Language Standards, accords with the University's Strategic Equality Plan and Welsh Language Standards Action Plan. The University holds an **Athena SWAN Silver Award** (2017), is a **Race Equality Charter** member, and subscribes to **Stonewall's Diversity Champions Programme**, creating an inclusive workplace for LGBTQ+ and non-binary staff and students. Swansea ranks 6<sup>th</sup> among educational bodies in **Stonewall's Workplace Equality Index**, placing us in the top 50 of all UK employers (REF5a). The Geography Department holds its own **Athena SWAN Bronze Award** (2020), and we are proud to work for a 'Living Wage' employer recognised for its commitment to the **European Charter for Researchers** and **Code of Conduct for Recruitment of Researchers**.



Our Athena SWAN Self-Assessment Team (SAT), which includes PhD students, devised a 5-year Equality Action Plan. Our former Head of Department (Clarke) was awarded the 2018 **Mary Williams Award** for advancing equality and diversity within the University. Our current Head (Davies) serves on our SAT, ensuring equality, diversity, and inclusivity suffuse everything we do. We held 14 Athena SWAN events in the assessment period, ranging from dignity at work to decolonizing the curriculum.

**Research applications and awards** within the assessment period for our submitted staff reveal that women made relatively more bids than men, given that women comprise 29% of our staff complement. Women submitted 42% of our applications and won 41% of our awards, with an **average award value** of £104,127. This compares well with the average award value won by men: £117,769. This testifies to our concerted effort to ensure our grant submissions are competitive and genuinely inclusive (AIMs 1 & 4).

In 2018, we launched a biennial staff **research-culture survey** to inform our strategy. Our equality, diversity, and inclusivity practices range from a family-friendly flexible-working policy to mandatory equality and unconscious-bias training for all staff. This training has been invaluable for research endeavours ranging from Departmental decision-making, staff and PhD recruitment, and reviewing academic performance and student progress, as well as for our REF2021 preparation activities, including our selection of outputs and impact case studies for submission.

All submitted staff, and all post-doctoral researchers, are eligible for our **research-support schemes**, including those employed part-time or fixed-term, and all are treated equitably (e.g. research-leave, research-support, and research-incentives schemes). Staff on the Teaching & Scholarship pathway are also supported in their pedagogic research. Some schemes, such as the College International Visitor Scheme, prioritize ECRs but do not exclude others.

Staff with **disabilities and long-term illnesses** (7% of submitted staff: 2.0FTE) are supported by the University's Wellbeing and Occupational Health units, and we make reasonable adjustments to their work where necessary. We adopt a flexible, bespoke approach to support individuals returning from periods of leave and those managing long-term illness and disabilities. Our practices include automatic research-leave (~8 months) for staff returning from **parental leave**, establishing a schedule of meetings with the Head of Department to monitor wellbeing and adjust workload, co-developing individual action plans, and blocking teaching into one semester, where appropriate.

The University was the first in Wales to join **Employers for Carers** and has an established Carers Network, and provides very extensive health and wellbeing services, including a **Health and Wellbeing Academy** for the University community and wider population of South Wales (REF5a).

Our flexible and caring approach extends to our **PhD community** and we have supported several PhD students during maternity/parental leave, long-term illness, and caring responsibilities. We provided funded extensions for PhD students experiencing significant disruption, especially during the coronavirus pandemic. The University offers PhD students extensive emotional support, including an array of wellbeing resources, counselling, and mental health services.

To promote **work-life balance** all staff are required to take all of their annual leave. For wellbeing, a range of institutional workshops, events, and support is available, and we have our own community champion and include wellbeing in our Athena SWAN action plan. To nurture a caring environment, we have developed an **email charter** to ensure its responsible use. We also hold social events to bring staff and PhD students together, ranging from fieldwork talks to geographical quizzes.

Abiding by the University's Code of Practice, and our UoA Statement of Intent, the **distribution of outputs across staff** reflects our unwavering commitment to equality and diversity. The submission comprises the best-quality output from each Category A submitted staff member with the balance made up of the remaining best-quality outputs from the available pool of outputs, which includes outputs of former eligible colleagues. All outputs were assessed in line with our Statement of Intent.

The University's Equality and Diversity Sub-Group carefully considered all self-reported **individual staff circumstances** that may have impaired productivity over the assessment period, and made consistent recommendations on reductions to an individual's expected contribution to the output pool, which we have respected. The disproportionate cumulative effect of these individual reductions led us to request a unit-level reduction, which we have applied according to our Code and Statement.

### Section 3: Income, Infrastructure, and Facilities

We increased our **external research income (REF4b)** from £7,374,155 in REF2014 to £10,173,614 in REF2021 (Table 2, AIM 4). This overall 38% uplift, once annualized, has ensured that we have **sustained** our research-income level for the UoA at £1,453,369 per annum (compared to £1,474,831 per annum during the REF2014 assessment period). This equates to an **average annual research income** per submitted staff FTE of **£48,935**. This is significantly above the median figure for HESA cost centre 124 (Geography & Environmental Studies), which ranged from £27,040 to £37,350 between FY2013/14 and FY2018/19, and is on a par with our performance during REF2014.

While we reported £853,829 **research income-in-kind (REF4c)** in REF2014, we only had £27,300 in REF2021. Rather, we benefitted hugely from **research-partner support** and use of their **key research infrastructure** (e.g. Figure 3), enabling some of our very best and most impactful research: **research forests** in Australia, Canada, China, Malaysia, Sweden, US, and UK; **FLUXNET** global network of meteorological sensors; the Oxford Dendrochronology Archive; **ice-drilling sites** at EastGRIP (Greenland) and **ice-core facilities** at Niels Bohr Institute; **tephra-analytical facilities** at Oxford University and Royal Holloway; **field logistics** and scientific support from British Antarctic Survey; **data-and-equipment packages** from Ordnance Survey and Natural Resources Wales, whose water-analytical facilities are on our campus; and NERC Geophysical Equipment Facility.



**Figure 3.** An array of Swansea Geography field sites: experimental forests in **Canada**; drones in **Germany**; Monitoring Helheim Glacier, **Greenland**; and Ice-cores at EastGRIP, **Greenland**.

We increased our research income from **Research Councils** by 7% per annum, to £5,221,812 in total (equating to 51% of our total research income over the assessment period), particularly from NERC, where a series of awards and a 40% success rate in 2020, meant that we avoided demand-management restrictions (REF5b). This is an important strategic achievement (AIM 4).

We **further diversified our income sources**, with a big increase from **UK Central Government Bodies** (£862,193 in total; fourfold increase) and **EU Industry** (£191,895 in total; 2.4-fold increase).

Our diversification includes new income for public engagement and science communication (e.g. Welsh Government and ESF-funded All-Wales STEM Outreach Consortium, Leverhulme-funded Artist in Residence, and Royal Society), and impact-boosting awards from organizations as varied as DEFRA, European Space Agency (ESA), Forest Research, Historic England, Lloyd's of London, and Sydney Catchment Authority.

**Grant capture is supported by a comprehensive University framework.** Our well-resourced Research, Engagement & Innovations Services (REIS) support the entire lifecycle of research, from grant capture and horizon scanning to project management and commercialization. This is complemented by our College Research Hub (established in 2015), which provides a researcher-centred approach to enhance the quality and quantity of bids (**pre-award**, including bid development, demand-management, and quality enhancement) with agile support for project delivery (**post-award**, including legal and contract services, IP expertise, and research governance).

**The Hub's pre-award support** improved the quality and competitiveness of NERC bids by working with researchers in the year prior to submission. We extend this support to non-Swansea researchers seeking fellowships with us. The Hub has also professionalized our networking and partnering with key funders, especially UKRI, and we benefit from the Hub's Bid Writer, Impact and Engagement Officer, and Research Development Officer. This comprehensive professional service support complements our own research groups' quality enhancement activities, such as peer-review and mock interviews.

Since 2014, the University has invested heavily in pump-priming funds. It established the **Swansea University Research Grant Enabler**, which supported many proof-of-concept projects seeking to lever UKRI awards; a **GCRF Funding Scheme**, which helped us win a Royal Society GCRF award; and a **Fellowship Group** that mentors researchers to develop competitive bids. The value of this support is evidenced by our sustained increase in funding from a more diverse portfolio of funders.

**Notable successes** range from **prestigious individual awards** – e.g. ERC Starting Grant, Royal Society Dorothy Hodgkin Fellowship, Royal Society University Fellowship, Philip Leverhulme Prize, and UKRI Future Leaders Fellowship – to a **succession of collaborative projects**. The latter include 7 NERC Discovery Science awards, 3 NERC Strategic grants, AHRC GCRF award, BBSRC and NERC Newton Fund awards, 3 European Commission awards, and ESRC awards. Many other awards sustain the diversity of our research, including British Academy, British Council, EPSRC, Heritage Lottery Fund, National Geographic, and STFC.

We have been very successful in securing **research fellowships** for our academics, including 4 Leverhulme/Royal Society, and 8 visiting positions. These have been instrumental for nurturing talent (AIM 1), expanding our global networks (AIM 7), and enabling monographs to be written. Partnership building and interdisciplinary collaboration have been boosted by funding 3 early-to-mid-career researchers from the College's International Visitor Scheme and CHERISH Digital Economy Centre.

Our **visiting researcher positions** include Fulbright Scholar Award (University of Maine); University of California Humanities Fellowship; Haury Visiting Scholar Fellowship (University of Arizona); and visiting professorships at Nicolaus Copernicus University (Poland), and the Universities of Angers, Monash, and Tasmania. We also hosted many **overseas researchers**, including an Association of Commonwealth Universities' Fulton Fellow from Macquarie University (Australia), and numerous domestic and international PhD students.

**We enjoy exceptional research infrastructure**, including wonderful **laboratories** and important **field sites** (e.g. Figure 3), and extensive **refurbished social and meeting space**. The College's 22 research technicians support their use, with 7 dedicated to laboratories and 5 to computing. The University provides all researchers with an extensive suite of software, including Adobe, DigiMap, Endnote, MATLAB, Microsoft Office, NVivo, and SPSS, and specialist software for modelling and simulation, illustration and visualisation, and video editing. We also enjoy access to many research databases and unlimited interlibrary loans.

Our infrastructure reflects **sustained strategic investment** to meet the ambitions of our groups:

- Our **climate-reconstruction capabilities** are underpinned by laboratories for: (1) *stable-isotope analysis*, with 3 mass-spectrometers; (2) *microscope/image analysis* for pollen, macrofossils,

tephrochronology, and dendrochronology; (3) *biogeochemical analysis*, including XRF, FTIR, GC-IRMS; and (4) use of the University's £10M Advanced Imaging of Materials facility.

- Our **wildfire, forest, and soil research** has laboratory and field facilities including: (1) full access to *experimental field plots* for controlled burns in the UK and as far afield as Australia, Canada, Spain, and US that are run in collaboration with external stakeholders such as United Utilities, Water New South Wales, and US Forest Service; (2) autologging *thermal sensors* and high-temperature thermal cameras to monitor wildfires and experimental burns; (3) South East Asia Rainforest Research Project (SEARRP) in Malaysia; (4) *CO<sub>2</sub>-flux-measurements* (Li-Cor); (5); *soil and sediment fingerprinting* (lab-based and portable XRFs, mineral magnetic sensors, and automated sediment capture); (6) mobile *fast-pyrolysis unit* for biochar research; and (7) DEFRA-licensed storage/disposal facilities.
- Our **Glaciology and GEMEO groups** benefit from innovative monitoring capabilities, including: (1) a network of *cryospheric sensors*; (2) *geophysical exploration instruments*, including the College's new £1.3M large boat for seafloor surveys and oceanography; and (3) *drones* with multiple sensors for cryospheric and vegetation investigation.

Our **laboratory infrastructure** enticed external fellowships and visiting researchers seeking novel methods training, underpinned impact, and enabled scientific breakthroughs. For example:

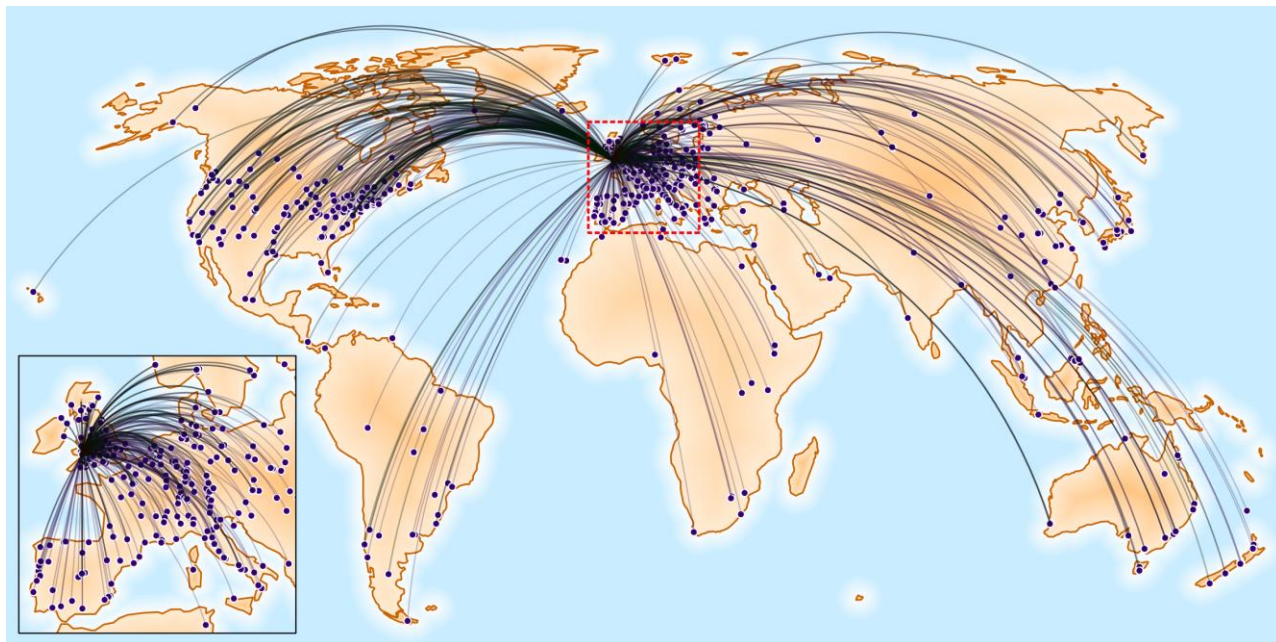
- **Stable-isotope analysis facilities** allowed the development of an annually resolved record of tree-ring oxygen isotopes for the last 800 years. This provided a uniquely strong reconstruction of past summer rainfall and led to a new approach for dating timbers in historic buildings (e.g. the Tower of London's portcullis windlass). Our infrastructure and expertise enabled us to train researchers from China, Fiji, Germany, New Zealand, Slovenia, Sweden, and UK.
- **Tephra-analysis facilities** underpin our ERC work on advancing the use of tephrochronology to constrain rapid climate changes and reconstruct far-travelled ash clouds. Our clean room and micro-manipulation facilities have been crucial for extracting microscopic ash particles from Greenland ice-cores. Our capabilities and reputation in this field attracted a UKRI Future Leaders Fellow, and we trained researchers from Denmark, Finland, New Zealand, Norway, Russia, and UK, many of whom then established their own facilities.
- **Fire and erosion monitoring capabilities** applied at our experimental field plots have enabled advancements in wildfire research and management (*impact case study*), and were instrumental to us securing 3 NERC and 3 EU grants, and a Marie Curie fellowship.
- Notable research enabled by our **field capabilities** include using **geophysical instruments** and **sensor networks** to investigate glacial earthquakes during iceberg calving, and **seismic and radar equipment** to demonstrate how seawater, not temperature, controls suture zones and Antarctic ice-shelf stability. Our glaciological and remote-sensing capabilities, including drones and satellites, helped us secure 4 fellowships (AXA, Marie Curie, Royal Society, Sêr Cymru).

**Our modelling and monitoring of ice and vegetated landscapes** is enabled by state-of-the-art **high-performance computing facilities**, including access to Wales's £16M supercomputing facility through its Swansea University Hub, which was updated in 2018 to deliver exceptional computational power (1 petaflop), the National Centre for Environmental Data Analysis, and National Centre for Earth Observation (NCEO). Our resulting satellite datasets underpin our weather-prediction impact case study, and they have been widely adopted by stakeholders:

- Our **open datasets** are used by the European Centre for Medium-Range Weather Forecasts and UK Met Office, and their migration to the NCEO facility safeguards them for future use.
- Our **FLIGHT model** has been used by NASA, and has informed the development of a new ESA satellite mission to observe global photosynthesis.
- We are co-developing the NERC Centre for Polar Observation and Modelling's **BISICLES ice-sheet model** and **land-ice component** of the Met Office's **UK Earth System Model** with Lawrence Berkeley National Laboratory and US National Energy Resource for Supercomputing.
- Our cryospheric computational abilities also helped secure EU Horizon 2020 funding for the PROTECT project and NERC funding for Antarctic ice-sheet modelling.

#### Section 4: Collaboration and Contribution to the Research Base, Economy and Society

Collaboration with scientists, artists, industry, policy makers, and other users is vital to our work. We enjoy worldwide collaborations through the University's strategic partnerships with the Université Grenoble Alpes and 8 institutions in Texas (REF5a); PhD agreements and co-supervision with Paris-Sorbonne, Tromsø, and Waikato Universities; visiting researcher positions overseas; honorary appointments for key collaborators; and extensive funding for incoming and outgoing exchanges, especially to foster interdisciplinary and impactful research (AIM 7). Our networks span the globe, as evidenced by the worldwide distribution of the **co-authors** of our >500 outputs published in the assessment period (Figure 4).



**Figure 4.** Location of our output co-authors in the REF2021 assessment period.  
(Note: Each location may represent several co-authors and/or outputs)

We lead and participate in many major **international networks and programmes** (AIM 7). For example, Doerr co-leads **EU COST ACTION** on 'Fire in the Earth System,' which includes 132 scientists from 37 countries, and Shubin participates in an EU Horizon 2020 consortium of 15 partners examining migrants' perceptions of Europe.

We also contribute to **networks** such as the Association of Southeast Asian Studies, ESA's Climate Change Initiative and Fluorescence Explorer Mission Advisory Groups; East Greenland Ice-Core Project (EastGRIP); the IPCC; Integrating Ice-Core, Marine and Terrestrial Records Network (INTIMATE); Past Global Changes (PAGES), including PAGES2k and Volcanic Impacts on Climate and Society working groups; SEARRP; and several Australian Research Council Antarctic projects.

We play many **national roles**, for instance in NERC Centre for Polar Observation and Modelling; Northern Network of Medical Humanities; Political Sociology Network; Quaternary Research Association (QRA); Royal Geographical Society (RGS); Wales Institute of Social and Economic Research, Data and Methods (WISERD); and the UK Arctic and Antarctic Partnership.

Engagement with **research users**, typically as co-producers, drives our impact strategy (AIM 6). We engage with local, national, and global stakeholders and engagement includes co-produced projects, co-managed field sites, policy advice and knowledge transfer, and co-authored outputs and datasets.

We have established relationships with **policy makers and civil servants** to facilitate knowledge transfer and provide expert advice on topics such as climate change, forest health, wildfire impacts, carbon capture, forest management, soil restoration, volcanic activity, and language and migration policy (Table 4). Our outputs co-authored with non-HEI partners have a field-weighted citation impact of 3.24, which is over thrice the global average (SciVal).

**Table 4. Swansea Geography: Key Research Co-Producers, Collaborators & Stakeholders**

Co-Produced PhD Projects		
Arts Council of Wales	Frog Environmental	Salix Environmental
Brecon Beacons National Park	National Museum of Wales	SE Asian Rainforest Prog.
British Antarctic Survey	Natural Resources Wales	South Wales Police
Coastal Housing	National Botanic Garden, Wales	Trussell Trust
Fire and Rescue Service	Ordnance Survey	Woodland Heritage
Forest Research	Refugee Council	Woodland Trust
Co-Produced and Collaborative Research Projects		
British Geological Survey	EUMETSAT & ESA	Scottish Government
Brockmann Consult GmbH	Fire and Rescue Service	Sydney Catchment Authority
Cabildo de Tenerife	Forest Research	US Forest Service
Cambodian Living Arts	Government of NW Territory	United Utilities
Chinese Academy of Forestry	Lloyds Global Insurance	Welsh Water
DEFRA	Melbourne Water	Wildfire Operation Research
Policy Advice and Knowledge Transfer		
Ascension Island Government	Welsh Government	UK Government / Parliamentary Committees (Office for Science)
Forest Research	Woodland Heritage	
Scottish Government	Woodland Trust	
Co-Authorship of Outputs and Datasets		
Access Arctic	Forestry Museum	Shelter
Aerodyne Research	GeTech Group	Sigma Space Corporation
Brockmann Consult GmbH	Gamma Remote Sensing	TerraDat UK Ltd
Centre for Science Ltd	LiCor Biosciences	Thales group UK
CSIRO Land and Water	Met Office	UN Environment Programme
ECMWF	NASA	UNICEF
Earthwatch	National Botanic Garden, Wales	US Department of Energy
ENVEO IT GmbH	Oxfam	US Forest Service
Environmental Protection	Remote Sensing Solutions	US Geological Survey
FP Innovations	Science Advisory Council Wales	VTT Technical Research

Impact beyond our case studies focuses on the **environment and society**. For instance, software developed by our GEMEO group feeds into developing the atmospheric data-capture capabilities of the Sentinel-3 satellite mission by ESA and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT). Funding from Forest Research and Woodland Heritage has facilitated the co-production of growth histories of oak trees in England based on our tree-ring-analysis expertise to inform management tools to combat oak decline. Other examples of our impact include engagement with children to effect attitudinal change towards migrants, travelling theatre to address post-conflict identity amongst young Cambodians, and co-produced PhD projects with Coastal Housing and NRW on studentification and contaminated-land remediation, respectively.

Our remote-sensing expertise underpins our new methods for monitoring forest change, including forest inventories and forest health, thereby enhancing time-saving and cost-saving opportunities for DEFRA and Forest Research. Remote-sensing expertise also underpinned our GCRF-funded monitoring of the restoration of precious Giant Panda habitats in China's Sichuan province after their destruction by the Great Wenchuan earthquake. Our innovative approach to dating lava shed new light on volcanic hazard risk scenarios for the Ascension Island Government.

We contribute significantly to **public understanding of science** through many outreach activities, such as a six-part climate-change documentary series (*Her yr Hinsawdd*) for the Welsh-language television channel S4C, the English version of which (*Climate Challenge*) enjoyed global distribution via Sky Vision/NBC Universal Distribution/Apple TV; extensive global press coverage of the Larsen C ice-shelf calving event (impact case study); and contributing our tephrochronological findings to the Varve Museum (Lake Suigetsu, Japan), which is the first such museum in the world.

We often contribute to the **media** (e.g. Al Jazeera, BBC Online News, BBC World News, Euronews; The Conversation, The Independent, and National Geographic). We regularly contribute to **national outreach events** (e.g. Geography Presidential Address at the British Science Festival; National Eisteddfod of Wales; Cheltenham Science Festival; and Hay Festival), and to **regional outreach events** (e.g. Swansea Science Festival; Soapbox Science; and Oriel Science).

We worked hard to reach **new and diverse audiences**, especially children from deprived communities with low participation in STEM. Led by Gagen, Swansea Science for Schools Scheme (S4), which has already reached >5,000 'Key Stage 3' pupils in South Wales, is now part of the £8.2M **All-Wales STEM outreach consortium 'Trio Sci Cymru'**, with Aberystwyth, Bangor, and Cardiff Universities, Institute of Physics, and Welsh Government's National Science Academy.

Our **PhD students** and **post-doctoral researchers** also contributed to the research base, through peer reviewing and organizing conference sessions. A PhD student co-ordinated ECR events for the International Glaciological Society (IGS), and another served as the QRA's Postgraduate Representative. A post-doctoral researcher and fellow contributed to the Association of American Geographers' (AAG) Covid-19 Rapid Response Task Force.

We hosted and trained a great many **visiting international research students** from as far afield as China, Denmark, Finland, Germany, Iceland, New Zealand, Russia, Slovenia, and Sweden, as well as many UK students. Luckman served as Adjunct Professor at the University Centre in Svalbard (2013–2018). Closs Stephens taught at the 2018 PUC-Rio Institute of International Relations Winter School on Affective Nationalism. We also served as **external examiners** in the UK (including Aberystwyth, Bristol, Cambridge, Cardiff, Exeter, Open, Oxford, and Leeds) and overseas (including Australia, Canada, Denmark, and Norway).

We gave extensive service to the discipline via **journal editorship, editorial board membership, and guest editorships** of international journals (Table 5), and **peer-review work** for >100 journals and **publishers** and many **funding agencies** (e.g. Austrian, French, German, Icelandic, Irish, and Norwegian Research Councils; European Commission and ERC; AHRC, ESRC, NERC; British Academy and Leverhulme Trust; and US National Science Foundation).

Our **contributions to professional associations** include AGU Cryosphere Sciences Section Vice-President and President (Murray), and Tree-Ring Society Vice-President and President (Robertson), and service for AAG, EGU, QRA, and RGS. During the coronavirus pandemic, we organised and delivered a virtual seminar series for the IGS, reaching >500 researchers around the world.

We hosted **prestigious seminars and workshops**, notably *Border Struggles*, *Migrant Digitalities*, *Migrants' Europe*, and *Populisms*, and helped organize **international events**, for instance *Meanings of the Rural* (Portugal 2015), *New Rural Geographies in Europe* (Germany 2017), *Transnational Families and Care* (Iceland 2018), and *Applied Baudrillard* (Oxford 2018). We also convened many **conference sessions** for AAG, AGU, EGU, RGS, International Association of Sedimentologists, International Union for Quaternary Science (INQUA), Nordic Geographers, and PAGES.

We gave **keynote addresses** at many international meetings, such as AGU, EGU, ESA, EURODENDRO, EUROSIL, INQUA, INTAV, INTIMATE, QRA, and RGS; Association of Hydrological Sciences, Conference on Forest Fire Research, and Workshop on Rural Research; and Living Planet, Rural Sociology Congress, and Society of Exploration Geophysicists).

We contributed to **special meetings, lecture series, and international panels**, such as *Dead Reckoning/Crossing the Med* (Tate Modern 2017), *Baudrillard's Photographic Theory* (Rome 2018), and *Journeys Festival International*, as well as Geological Society of London lecture series, and the International Association of Volcanology and Chemistry of the Earth's Interior Workshop.

Table 5. Contribution to the Research Base		
		Number of roles
<b>Journal Editorships</b> (In Chief, Associate Editor, Assistant Editor, Scientific Editor, Book Review Editor)		11
Annals of Glaciology	Baudrillard Studies	SOIL
Citizenship Studies	Environmental & Engineering Geophysics	Tree-Ring Research
Cultural Geographies	Journal of Glaciology	The Holocene
International Journal of Wildland Fire	Quaternary Geochronology	
<b>Editorial Board Membership</b>		12
AGER: Depopulation & Rural Development Studies	Baudrillard Studies	Proceedings Geologists Association
Agricultural & Forest Meteorology	Quaternary Science	Scientific Reports
Environment and Planning D	Journal of Rural Studies	Social Cultural Geography
Geographical Journal	Urban Cultural Studies	Sociologia Ruralis
<b>Guest Editorships</b>		4
Geophysics	Children's Geographies	Remote Sensing
ISPRS Journal of Geo-Information		
<b>Service to Publishers</b>		11
Bloomsbury	Oxford University Press	Routledge
Edward Elgar	Palgrave Macmillan	Rowman & Littlefield
IB Taurus	Policy Press	SAGE
Nebraska University	Polity Press	
<b>Service for Peer-Review Colleges</b>		9
NERC	ESRC	EU
<b>Committee Service for Professional Bodies</b>		13
AAG (Disability Speciality Group)	NERC Geophysical Equip. Facility	RGS Research Groups: <ul style="list-style-type: none"> <li>• Economic</li> <li>• Health &amp; Wellbeing</li> <li>• Population</li> <li>• Rural</li> <li>• Social &amp; Cultural</li> </ul>
Association of SE Asian Studies	NERC Radiocarbon	
American Geophysical Union	Research Advisory Board, National Museum of Wales	
International Glaciological Society	UK Arctic and Antarctic Partnership	

We invested considerable effort in **co-operative postgraduate-research training**, both nationally and internationally (AIMs 2 & 7), particularly through our leadership of the ESRC Wales DTP's Human Geography pathway, our Welsh-medium capacity-building role for the Coleg Cymraeg Cenedlaethol, and our joint supervision of PhD students with key partners (e.g. Grenoble, Paris-Sorbonne, Tromsø).

Three more staff were elected Fellows of the **Learned Society of Wales** (Davies, McCarroll, Street-Perrott), and Davies was awarded Honorary Life Membership of the **International Focus Group on Tephrochronology and Volcanism** (INTAV).

## Unit-level environment template (REF5b)

We celebrate all research-related **prizes and awards** within our community, of which there have been 8 in the assessment period (Figure 5):

- Coleg Cymraeg Cenedlaethol's **Eilir Hedd Morgan Prize** (Davies 2016).
- Quaternary Research Association's **Croll Medal** (Street-Perrott 2016).
- Learned Society of Wales's **Dillwyn Medal** (Rogers 2017).
- Clarivate Web of Science Cross-field **Highly Cited Researcher Award** (Doerr 2018).
- Learned Society of Wales's **Hoggan Medal** (Murray 2019).
- British Society for Geomorphology's **Linton Award** (Murray 2019).
- Dutch Tourette's Association's inaugural **Hans Eijsackers Award** (Beljaars 2020).
- European Geosciences Union's **Katia & Maurice Krafft Award** (Meara 2020).



**Figure 5.** Swansea Geographers receiving awards from LSW, QRA, DTA, and The Coleg.

As we look beyond our 2020 Centenary, the vitality and sustainability of our research environment will be ensured through our enduring values, our collegiality, our empowered research groups, and our commitment to addressing the global scourge of environmental crisis and social injustice.