Institution: Swansea University

Unit of Assessment: 17 – Geography, Environmental Studies and Archaeology

a. Context

Our research has **four** types of impact. First, we have **supported the Welsh economy** through major partnerships with end-users. More than 80 geography postgraduates across all research groups have been industry co-funded, directly addressing the research needs of the companies involved. The *Welsh European Funding Office* (WEFO)-supported projects involving physical geography staff have assisted nearly 400 companies, with more than 50 R&D projects aiding product development.

Second, most research groups have **informed policymakers, providing expert advice** on (i) **environmental change** (e.g. changing protocols for post-wildfire risk assessment in USA, Australia, Greece, and Spain, influencing rainforest management in Sabah and Malaysia); (ii) **climate change** (e.g. lead authorship of a chapter of the IPCC's *Fifth Assessment Report*, advising *Voluntary Service Overseas* in Namibia under the Welsh Government's (WG) *Wales for Africa* programme); (iii) **migration policy and practice** (e.g. on age-disputed asylum seekers in the UK, Europe and Australia; examining migrant integration in 42 European cities with the *Cities for Local Integration Policies* (CLIP) project; undertaking data collection and research for *Welsh Refugee Council* (refugee survey), *Oxfam* (destitution), *Scottish Refugee Council* (guardianship), *Shelter Cymru* (housing of EU migrants) and racism in Wales (*Race Council Cymru*)).

Third, physical geographers have **enabled technological innovation**, including supporting (i) design of new satellite instruments by UK industry; (ii) improvement of weather prediction and climate models of national agencies in the UK, Europe, and Australia; (iii) technical basis for operational satellite-data processing for *National Aeronautics and Space Administration* (NASA), *European Space Agency* (ESA), and international projects (e.g. *UN World Meteorological Organization*); and (iv) design of the UK's first mobile fast-pyrolysis unit for biochar production.

Fourth, we have **helped improve professional practice, standards and training/guidelines**, e.g. training/policy guidance on the age assessment of asylum-seeking children; on patient-centred professionalism in the NHS (funded by *Pharmacy Practice Research Trust*; *General Nursing Council for England & Wales Trust*); and expert advice on likely insurance losses associated with future global wildfire activity (commissioned and funded by *Lloyd's of London*).

b. Approach to impact

To ensure that our research activity delivers impact we have sought to involve directly the most appropriate non-academic beneficiaries – drawn from a broad range of non-academic user groups, including policymakers, agencies, and industry – in the research process from an early stage. Impact-bearing activities are embedded within our research culture in **four** ways:

1. Economic impact through building partnerships with non-academic users. We prioritized securing research partnerships with public, private, and third-sector users as a highly effective means to engage and support non-academic users. Three major partnerships have led to substantial economic impact. First, 14 Swansea staff in Geography and Biosciences are involved in WISE2. This £26m WEFO programme (2012–15) was devised at Swansea in partnership with Aberystwyth and Bangor Universities. Since 2008, WISE2 and its predecessor, WISE1, have assisted over 300 companies, with more than 40 R&D projects supporting product development. WISE has increased the profitability of our business partners by over £2m, and has helped create five companies. Second, 13 Swansea staff in Geography and Biosciences are involved in the £24m SEACAMS (2010–15) project which, with Aberystwyth and Bangor Universities, provides assistance to companies in the marine sector. In 2011/12, SEACAMS directly assisted more than 80 companies, started 17 R&D projects involving new product development, and facilitated the creation of three companies. Third, 82 Geography postgraduates (PhD, MRes, MSc, MA) were funded through the *KESS* & *ATM* schemes (>£1m funded by WG and industry, 2009–to date). These schemes link high-calibre research students with co-supervisors in industry to meet industrial research needs and to enhance the skills of the Welsh labour-force. In addition, during 2008–13, four Geography NERC/ESRC CASE PhD students were funded in collaboration with external partners (e.g. Natural Resources Wales, a film-production company, and a geophysics

consultancy company) and a student undertook a *Parliamentary Office of Science and Technology* internship involving writing policy briefings.

2. Involving non-academic users in the research process. Our research centres/groups hold events to engage non-academic users and stakeholders throughout the research process from formulation to completion (e.g. quarterly Migration Policy Research stakeholder meetings; annual biochar stakeholder meetings; and biannual Danum Valley Management Committee Meetings). This activity is supported by the University's *Department of Research and Innovation,* which manages our programmes that bring together businesses, academics, and research groups.

3. Public engagement and communicating the relevance of our research to non-academic users. Our impact-oriented seminar series (e.g. *Climate Change Consortium of Wales* (C3W) *Lectures*; *ESRC Migrant Seminar Series*) and events (e.g. *Mike Barnsley Memorial Lecture*), bring together non-academic users, academics, and the public. We gave public lectures on climate change and migration to numerous regional, national and international groups (e.g. *National Eisteddfod* and *Science Café Wales, Royal Geographical Society*, *European Science Open Forum,* and *American Association for the Advancement of Science*). We showcased our research at the *Royal Society Summer Science Exhibition, National Eisteddfodau,* and *Cheltenham Science Festival*. We also engaged the public through documentary films that we produced or commissioned (e.g. '*A GLIMPSE of Greenland*'; '*Ash-Ice-Mud*'), and high-profile websites/publications (e.g. *nationalgeographic.com*; *NERC Planet Earth*; *Physics World*; and *New Scientist*). We communicated directly to both policymakers (e.g. policy briefing on IPCC *Fifth Assessment Report* at the National Assembly for Wales) and companies (our Glaciology Group's NERC-funded 'Networks of Sensors in Extreme Environments' project includes annual knowledge-transfer briefings to approximately 30 companies, and biannual meetings with our industry partner, Thales Research & Technology). Finally, we communicated our research through frequent media appearances (e.g. *Guardian*; *BBC News*; *BBC Radio 4 Material World*; *NBC News*; *ITN*), and social media (e.g. *Facebook* (Centre for Migration Policy Research); *Twitter* (e.g. @SwanseaTephra); Swansea Glaciology YouTube (>135k views)).

4. Providing staff with incentive, time and resources to engage with non-academic users. The University, College, and Department support staff to achieve impact through initiatives designed to encourage and promote impact deriving from pure or applied research, and to engage with non-academic users. The University's award-winning *Performance Enabling Scheme* and *Career Pathways* model for staff promotion specifically support and reward innovation and engagement/impact activity. We grant extended research leave (six months) to enable staff to focus on enhancing impact. All of our impact case study authors had research leave within the last five years to engage with non-academic users. The Department utilises internal and external resources to bridge academic research and non-academic users. For instance, in 2010–13 our staff were awarded £26k of *EPSRC Pathways to Impact* funding to pump-prime new initiatives.

c. Strategy and plans

Our strategy for maximising research impact is to build on our proven success, particularly in relation to some of the world's most pressing issues, by: (i) improving models for **weather prediction and climate** through integration of global satellite observations and better process understanding; (ii) contributing to policy, mitigation, adaptation, and public understanding of the consequences of **climate/environmental change**; and (iii) investigating the social, economic, and political implications of increased **mobility, international migration, and settlement**. In each area the intention is to (a) **intensify collaboration** with non-academic users to capitalize on our existing partnerships; (b) **strengthen nascent links** and identify new audiences, beneficiaries and users for research initiatives and knowledge by mapping out impact potential from each research group's expertise; (c) **establish new partnerships** identified via existing links; and (d) **promote collaborations** with non-academic users to increase the visibility of established collaborations and the transferability of research expertise. Thus, our specific goals and plans in each area are to:

i) Earth observation and numerical model development: produce (a) key satellite datasets; (b) new process understanding; and (c) an improved range of models that will include weather forecasting, climate prediction, and ice-sheet sea-level contribution. This will entail the modelling of extreme events at high resolution within the *Met Office Unified Model*, jointly with the new £10m *Swansea University-Met Office National Centre for the Impact of Extreme Weather*, as well as ice-

sheet-scale observations of ice melt, flow speed, and process-based modelling of glacier calving dynamics. We will take advantage of close relationships with NASA, ESA, *Met Office*, *European Centre for Medium-Range Weather Forecasts*, *UK Forestry Commission,* and other agencies.

(ii) Climate and environmental change: enrich existing, and form new, partnerships with stakeholders to focus on (a) reducing uncertainty in climate and sea-level-rise forecasts; (b) wildfire impact forecasting and mitigation; (c) sustainable tropical forest management; (d) ice loss from glaciers and ice sheets; (e) production of pyrogenic carbon (biochar) as a viable tool for offsetting carbon emissions and improving soil quality; and (f) using geophysical tools for solving environmental problems. We are increasing the number and types of beneficiaries of our research to strengthen our ongoing engagement with policymakers and industry. For instance engagement with *Lloyd's of London* led to a commissioned report on global wildfire risk, and further planned engagement with the insurance sector on the issues of flood risk and climate-forecast uncertainty.

(iii) International migration/settlement/inclusion: extend and further strengthen close engagement with stakeholders/agencies through frequent events on (a) the process of disputed age assessment (ensuring government commitments to improved procedures are delivered in practice and engaging with policy developments in source countries); (b) gender issues in procedures for Refugee Status Determination (through new comparative research with *United Nations High Commissioner for Refugees* and the *Council of Europe*); (c) social/community cohesion (building on the success of CLIP, and new ESRC-funded research on Eastern European migrant settlement and social security which directly involves UK, EU, and other international stakeholders); (d) alternative back-to-the-land settlement and low-impact developments (our *Leverhulme* funded research informs exponents, planners, and UK local authorities); and (e) *British Academy* funded research on British East Asian representation in the UK's theatrical arts (e.g. *Arts Council England*; *Equity UK*'s Ethnic Minority Members' Committee; and the *National Theatre*).

Impact delivery and non-academic engagement will be further supported by enhancing the good practice currently utilised. New pathways to impact from all of our research will be facilitated by targeting resources through the *Departmental Research Strategy Group*/*College Research Committee* to ensure that staff/research groups/centres are supported to enable them to maximise impact through engaging non-academic users. Specifically, **four new strategic initiatives** have been introduced: (i) the University now holds an *EPSRC Impact Acceleration Account* (2013–2016: £638k) to fund an institution-wide impact award scheme to support and celebrate research impact; (ii) the Department now funds staff attendance/participation at events centred on non-academic users; (iii) our *staff loading model* recognises participation in knowledge-transfer activities and industrial projects; and (iv) academic appointments are considered in light of their potential to engage with non-academic users and deliver impact. This has involved revising our Performance Enabling professional review process and our career progression pathways, which now provide a route to full Professorship based on exemplary innovation and impact.

d. Relationship to case studies

We have learnt how the success of our case studies is built on **engaging and enrolling non-academic users into the research process from an early stage.** It is on that basis that we have developed our approach and strategy in the Department to support staff in their engagement with users to maximise the impact of our research. It was extensive collaboration with policymakers, immigration lawyers and paediatricians prior to and during the course of the research into the age-assessment of separated asylum-seeking children that led to significant changes in policy and practice. The adoption of our research outputs by the main UK/European weather forecast agencies, and by NASA and ESA, was a consequence of direct collaboration from the outset, and competitive award of research funding in which these agencies were partners/funding providers. Our research on Australian wildfire impacts involved partnership from the outset with the *Commonwealth Scientific and Industrial Research Organization* and *Sydney Catchment Authority*, which led to direct land-management implications and was the platform for subsequent collaborative research with the *US Geological Survey*. Finally, the longstanding *Royal Society South East Asia Rainforest Research Programme*, of which our research in Sabah forms a substantial part, provides scientific expertise to underpin sustainable rainforest-management policies for the Malaysian Government, which was involved throughout the research process from approving projects and collaborating in research, to benefiting directly from our research findings.