Environment template (REF5)

Institution: University of Salford

Unit of assessment: UoA17 Geography, Environmental Studies and Archaeology

a. Overview

Research in Geography and Environmental Studies at the University of Salford takes place within the School of Environment and Life Sciences. The School manages research in two Research Centres: Biomedical Sciences, and Ecosystems and Environment. The Ecosystems and Environment Research Centre has 35 academic staff who, based on the fit of their work to the UoA descriptors, are submitted to UoA17 or to UoA5 (Biological Sciences). One staff member submitted to this UoA (**Nevell**) is Director of the University's Centre for Applied Archaeology, and based in the School of the Built Environment.

Much of the work of submitted to UoA17 is inter-disciplinary - crossing boundaries into ecology, biology and environmental science - and benefitting from collaborative research links within and beyond the School.

The University made a submission to Geography in RAE 2001 and to Geography and Environmental Studies in RAE 2008. Following RAE 2008 the University disbanded its long-running Research Institute structure to focus research activity in the now mature academic Schools and Colleges. The strategic development of research takes place within the School but administrative support is provided by a Research and Innovation team located in the College of Science and Technology.

b. Research strategy

The goal of the Ecosystem and Environment Research Centre is to address the major environmental challenges of climate change, biodiversity loss, resource management and emerging infectious diseases. The specific focus of the work submitted to this UoA is to enhance understanding of the nature and impacts of environmental change on the natural and human environment. Three interacting research themes drive the activities: 'Landscape Dynamics' and 'Sediment and Pollution Dynamics' represent continua from RAE 2001 and 2008, while 'Urban Environmental Change' engages two staff submitted to Architecture and Built Environment in RAE 2008 with two new staff appointments to form a new theme.

The research strategy of the Centre is set within the context of the School, College and University strategies and polices. At School level the over-arching strategy is to focus consistently on enhancing the quality and impact of the outputs from the Research Centres, while encouraging and supporting the development of inter-disciplinary research themes within and between the Research Centres in the School and within the wider College and University research communities. This strategy drives staff appointments, resource allocation, and planning for future sustainability; and supports the University's strategic research goal to develop internationally leading real-world research on contemporary issues of direct relevance to society.

Three key objectives articulated in the RAE 2008 submission have been realised:

- Research to couple remotely-sensed land cover to disease transmission models was supported by U.S. National Science Foundation funding up to 2009 and has led to significant impacts on the control of a human parasitic disease in western China and central Asia, as described in more detail in the Impact Case Study. Building on the this earlier work in western China, a major grant from the Wellcome Trust (**Danson** Co-PI,

2011-2014, £463k) is supporting research that focusses on an emerging hot-spot of the disease in Kyrgyzstan where the Salford team is combining parasite surveys, epidemiology, and landscape modelling to map parasite distributions and disease risk.

- Work on sediment-based archives of environmental contamination has been extended through international collaboration to examine, for the first time, lake sediment records of environmental change in central Europe. In addition, the appointment of **Wood**, **Mondal**, and most recently **Lin** (as Chair in Environmental Science) has extended and added significant depth to work on environmental pollution, and will form a key theme for strategic development over the next five years. The recent award of the £231k NERC TREE grant to **Wood** provides clear evidence of the potential impacts of Salford's work in this area.

- Research around ecological networks (**James**) resulted in the Greater Manchester Ecological Framework which is now adopted as part of the City's Low Carbon Strategy. Research in the related area of Green Infrastructure - expanded upon in the Impact Case Study - is now being used in re-designing part of the business centre of Beijing in a collaborative project with the University of Cambridge. With recent appointments to the Board of the Local Nature Partnership for Greater Manchester and as Chair of the Irwell Catchment Partnership, **James** is now leading the development of the ecosystems approach across the region. Issues related to the concepts of Resilient Cities (food security, climate change, governance) are new areas of work currently being developed and boosted by the appointments of **Adams**, **Hardman**, and **Wood**.

- Development of a novel ground-based lidar system (Salford Advanced Laser Canopy Analyser - SALCA) to measure 3d vegetation structure was supported by NERC (**Danson** 2009, 2011) and Royal Society (**Danson** 2013-14), and collaboration with University College London, University of Newcastle, and Forest Research UK and now represents a major area of activity within the group. The Salford group (**Danson**, **Armitage**, and **Ramirez**) now holds a world-leading position with this innovative research including collaborating with the key terrestrial laser scanner research groups internationally (Boston University, University of Massachusetts, and CSIRO Australia) as part of the Terrestrial Laser Scanner International Interest Group established in 2012. Novel methods to measure and map fuel moisture and forest fuel structure for fire risk modelling have also been developed including the first demonstration of vegetation moisture content measurement using the ground-based lidar system.

Two objectives articulated in RAE 2008, but not fully realised, are the development of the Salford Urban Environmental Research Base (SUBERB) to facilitate work on the atmospheric boundary layer, and the development of a new focus on wildlife behaviour and environment. The former is the result of a strategic shift to establish and strengthen work on 'Urban Environmental Change', with new appointments following staff departures, and the latter to establish a wildlife ecology and behaviour research cluster submitted in REF2014 to UoA5 Biological Sciences.

The main objective for the next five years is to develop at least two world-leading, and one internationally excellent, research foci within the group. The main thrust will be on the three research themes of landscape, pollution, and urban change. The key priorities are to secure further significant research bids within each theme by exploiting the inter-disciplinary strengths across the group and research centre, support the development of the early career researchers appointed since 2012, and further extend the Postgraduate Research student group attracting high quality candidates.

c. People, including:

i. Staffing strategy and staff development

The staffing policy of the School has a clear strategic direction to build and sustain the Research Centres, and to exploit the research themes outlined above. All new staff appointments in the School are required to have a PhD, a strong publication track record (taking into account career stage expectations), and the potential to generate research income.

Early career researchers receive support through a range of mechanisms: i) workload protection of 20% of average School workload for the first 12 months, ii) eligibility to bid for a Vice-Chancellor's Research Scholarship, which provides a start-up fund of £2500, a further 20% allocation for research in their workload, and the allocation of a research mentor, and iii) eligibility to bid for, and recruit to, an internally funded Graduate Teaching Studentship (GTS) who undertakes a PhD under their supervision, with an experienced co-supervisor as part of the team. In the last three years the School has provided funds to support nine new GTS supervised by new members of staff. Newly appointed staff are placed on a one-year probationary period, and are allocated a mentor from amongst senior staff in their disciplinary area to support them through their first year of employment at the University.

Staff development is facilitated through the Personal Development Review process which reviews and monitors all aspects of academic work. Each review includes a target-setting meeting, mid-year progress review, and end-of-year meeting. Objectives for these reviews are set within the University's Academic Career Path descriptors, which provide expectations for academic staff for career progression. Research objectives are set at the start of the 12 month review cycle and achievements against those targets assessed at mid-year and end-of-year review meetings with a senior colleague. Staff development and support needs are identified through the same process and actioned through the Reviewer and Head of School where appropriate. All staff in the School are given the opportunity for review annually against the Academic Career Path criteria, either for HERA regrading to Senior Lecturer (in the case of Lecturers), or for promotion to Reader/Professor by the University Professorial Promotions Committee.

Staff workloads are managed through a Workload Balancing Model that takes into account all aspects of academic work. A Research Allocation is derived by a simple model based on the number and quality of publications in the preceding 12 months, the amount of FEC income generated, and the number of PhD students supervised. A maximum of 50% of School average workload is allocated for research, except where FEC income exceeds this amount, in which case it may be higher.

Supervisory training is provided to all PhD supervisors as part of improving supervisory skills as well updating staff on new regulations associated with PhD provision. Such training also includes equality and diversity and widening participation. All members of staff are positioned within one of the Research Centres in the School, and can also become associate members of other centres. This allows members visibility and active participation in the development of thematic research strategies, making explicit research synergies across centres, and ensuring research cohesion. In 2010, the University was one of only 10 UK institutions recognised by the European Commission for its work in supporting the professional development of its researchers, and meeting the 'Concordat to Support the Career Development of Researchers'. The researcher development opportunities offered at Salford played a significant role in the University retaining its European Commission HR Excellence in Research Award in October 2012.

Four staff submitted to Geography and Environmental Studies in RAE 2008, and associated with a Hydrometeorology research group, left the University but were not directly replaced as the work was not consistent with the emerging strong new research foci in the Ecosystems and

Environment Research Centre. Strategic new appointments have been made to further strengthen work on the groups' key themes, and since 2008 they include, at Lecturer level, **Mondal** and **Wood** to work on environmental pollution and contamination, and **Adams** and **Hardman** to work on Resilient Cities, and most recently, at Chair level, **Lin** to provide leadership in the environmental pollution area.

ii. Research students

Postgraduate research studies and activities within the University are managed by a Postgraduate Research Director within each School. The University implements a formal Learning Agreement between the Postgraduate Research (PGR) Student and University, allowing optimisation of student experience and expectations. Salford is a member of the UK GRAD Programme which is committed to working with universities, supervisors, and other national organisations to support doctoral researchers.

PGR student recruitment has been a target for improvement in the School and over the REF period the number of new entrants has almost doubled from 11 in 2008/09 to 20 in 2012/13. The School currently has 65 PGR candidates. Each postgraduate is supported by a supervisory team (a minimum of two supervisors) and a Personal Tutor. Postgraduate Research Representatives are elected from the student body, to work closely with academic staff, and sit on school committees to make sure that the voice and expectations of students are heard and acted upon. The University offers diverse PhD pathways including opportunities for full-time, part-time, split site, and PhD by submitted works, thus maximising recruitment.

All PGR students complete their doctoral studies under the University regulatory framework for progression. Students are required to meet three formal points in their studies in order to proceed (the timings given here are for full-time candidates): i) the Learning Agreement, completed with their supervisors within three months of registration, to identify a broad research plan, training and development needs, and doctoral timeline, ii) the Interim Assessment, at the end of the first year, and iii) the Internal Evaluation, at the end of the second year. These are accompanied by annual progress reports by supervisors, and self-evaluation documents by the students, which are scrutinised by the School's Postgraduate Research Director. Regular supervision is ensured by the requirement for at least 10 fully recorded supervisory meetings in each academic year.

The University, College and School together provide extensive opportunities for generic and subject-specific skills training for PGRs. The University Research and Innovation (R&I) unit provides generic training through its Salford Postgraduate Research Training programme (SPoRT) workshops, which are aligned with the national Researcher Development Framework. SPoRT workshops cover aspects of doctoral study, such as expectations at the progression points, and introductions to core research skills, such as getting published, making presentations and writing conference papers. They also provide introductions to key methodological approaches and software – interviewing techniques, focus group research, NVivo and SPSS. This programme has grown significantly since 2008, with the number of annual sessions offered rising from 51 in 2008-9 to 76 in 2012-13; participant numbers across the University have increased similarly, from 441 participants in 2008-09 to 844 in 2012-13.

SPoRT sessions are largely delivered internally by academic staff, R&I development staff, HR, and careers & employability, with specialist sessions delivered by external facilitators. Review of this provision is conducted annually, based on attendance figures, supervisors' views and student feedback collected at each training session. Developments in national and institutional strategy relating to researcher development are also taken into consideration. For example, in response to the evaluation of the 2011-12 programme, R&I introduced additional sessions on Getting Started with the PhD as part of PGR induction, an expanded suite of sessions on academic writing, and new sessions on impact, project management, focus groups, and

personal branding. Using Blackboard Collaborate, R&I and the Library have also expanded the availability of off-campus one-to-one online support for PGR students.

The University runs the Salford Postgraduate Annual Research Conference (SPARC) where students and early career researchers across the disciplines can present their research and gain feedback. SPARC has run for over 12 years and attracts students from many other institutions including the Universities of Reading, Bristol, Exeter, and the Open University. The aim of the programme is to assist researchers in developing effective research skills as well as transferable skills to enhance employability. The programme maps fully onto the national Researcher Development Framework (RDF).

At the College level PGR students are encouraged to present their work at the annual College of Science and Technology Showcase, which includes a poster session and prizes for the best PhD and poster paper. At the School level all PGR students are expected to make a presentation in their first and final year to the Environment and Life Sciences Seminar Series which takes place fortnightly.

Within the College, a specialist adviser on PGR careers is available. The Students' Union elects a dedicated postgraduate Vice-President (two previous Union Presidents since 2008 themselves being postgraduates). In the last internal Postgraduate Research Satisfaction Survey carried out by the University of Salford, PGR students in the School of Environment and Life Sciences recorded a Satisfaction Score of 92% in terms of their overall experience as students in the University. Details of specialist technical facilities available to postgraduate research students are given in section d below.

d. Income, infrastructure and facilities

The overall research income for the group over the census period was £1.4 million. Major research grants have been awarded by a wide range of sponsors illustrated by the following:

DEFRA: Soundscapes, £44,595, Researcher co-I **Adams**(30%), 2009
Halton Borough Council: Environmental Innovation Hub, £21,500, PI **James** (100%), 2010
DfID: Systematic review of glacier melt in the Himalaya, £75,000, PI **Collins** (100%) 2011
EPSRC: Adaptation and Resilience of Coastal Energy Supply (ARCoES), £10,742, PI **Wood** (100%) 2012
EU FP7: Adaption to changing water resources availability in northern India with respect to Himalayan glacial retreat and changing monsoon pattern, €3.1 million Co-PI **Collins** (11%), 2008
NERC: Testing a multispectral full waveform lidar for vegetation canopy characterization, £121,386, PI **Danson** (100%), 2011
Wellcome Trust: Multi-species transmission of Echinococcus on the Tibetan plateau, £462,630, Co-PI **Danson** (20%), 2010
NERC: TRansfer - Exposure Effects (TREE): integrating the science needed to underpin radioactivity assessments for humans and wildlife, £231,487, PI **Wood** (100%) 2013
Association of Greater Manchester Authorities (AGMA): Dig Greater Manchester, £427,053, PI **Nevell** (100%), 2012

In the census period the School has made an investment of more than £2 million in field and laboratory equipment. Key facilities purchased to support the work of staff submitted to this UoA include a Varian Inductively Coupled Plasma-Optical Emission Spectrometer (ICP-OES) for trace metal measurements in soil and sediments, a field portable x-ray fluorescence (XRF) analyser used for *in-situ* assessment of soil contamination, a Horiba Partica laser diffraction particle size analyser, Molspin magnetometer and Bartington Instruments magnetic susceptibility system with sensors for magnetic measurements in soils and vegetation, a dual-wavelength full-waveform terrestrial laser scanner (TLS) for 3d vegetation characterization,

and an ASD Fieldspec4 field portable spectroradiometer for remote sensing measurements.

Staff are supported in research bidding by a dedicated team in Research & Innovation and can access the Research Bidding Support Fund to provide pump-priming for building research bids. New staff with a Vice Chancellor's Research Scholarship award are expected to write at least one significant research bid during the period of the award.

e. Collaboration and contribution to the discipline or research base

National and international collaboration is a strong and prominent feature of all the research submitted here, and these collaborations include academic partners, non-governmental and voluntary organisations, and community groups. Evidence of these collaborations is fully evidenced in the co-authorship of publications submitted for assessment, and in the Impact Statement. Staff in the group make significant contributions to their disciplines through representation on learned societies, refereeing for journals and Research Councils, external examining, and through research activities with a range of public and private sector organisations. Highlights in the census period include the award of:

- Society for Radiological Protection's 'Jack Martin Prize' to **Wood**, in recognition of his contributions to radiation protection (2013)
- Royal Society Leverhulme Trust Senior Research Fellowship (2013-14) to **Danson**
- RGS-IBG Transport Geography Research Group Alan Hay Award for contributions to transport geography to **Knowles** (2010)

In the census period staff have organised workshops, conferences, and convened conference sessions for:

Royal Geographical Society-Institute of British Geographers (**Adams:** London, August 2013);
GIS Research-UK (**Armitage:** University of Salford and Manchester Metropolitan University, June 2008);
European Union COST Action 734 (**Danson:** University of Salford, April 2010);
Natural Environment Research Council - Earth Observation Technology Cluster (**Danson and Ramirez:** University of Leicester April 2011);
UK/Ireland Annual Planning Research Conference (**Hardman:** University of Birmingham, November 2011);
International Carrot City Series (**Hardman:** Birmingham City University, April 2012);
11th International Symposium on Paleolimnology 2009 (Mexico) and 12th International Symposium on Paleolimnology 2012 (UK) Special Session Convener and Chair (**Hutchinson**);
International Association of Landscape Ecology European Congress 2013, Changing urban areas using landscape scale ecological processes (**James**: Manchester, September 2013)
Joint Conference of the 6th International Acid Sulfate Soil Conference and the Acid Rock Drainage Symposium (6ASSARD) (**Lin:** Chair, Guangzhou, China, 2008);
UKIERI PRAMA Workshop on Arsenic Contamination in Ground Water: Remediation (**Mondal:** University of Manchester, June 2008);
Council for British Archaeology (CBA) and English Heritage – organised eleven training workshops (2009-11) across England on recording industrial-period listed buildings (**Nevell**);
Annual Conference for Institute of Archaeologists (IfA), Widening the Audience for Community Archaeology session (**Nevell:** University of Reading April 2011);
American Society for Historical Archaeology's Annual Conference on Historical and Underwater Archaeology (**Nevell:** University of Leicester January 2013);
Annual Conference of the Institute of Archaeologists (IfA) (**Nevell:** University of Aston, April 2013) Conference April 2013.
Annual conference of the Co-ordinating Group on Environmental Radioactivity (COGER) (**Wood:** University of Liverpool, April 2009);
International Conference on the Economic Valuation of Regulating Services of Ecosystems

(**Wood:** Bangalore, India, June 2009);
International Symposium on the development of non-lethal methods for measuring contaminant burdens in wildlife (**Wood:** University of Cambridge, September 2012).

Staff have also made a wide range of other contributions through work for national and international learned societies, UK government and international organisations, and editorial work, including:

Armitage: Vice-Chairman and Director of the Remote Sensing and Photogrammetry Society (2013-date); Member of Council and Trustee of Remote Sensing and Photogrammetry Society (2008 – 2013); Member of Technical committee for GI_Forum (University of Salzburg, Austria, July 2013). UK Assessor for the Otto Von Gruber Award of the International Society for Photogrammetry and Remote Sensing (2012)

Collins: International Union of Geodesy and Geophysics (IUGG) Council member (2003-date), re-elected to IUGG Finance Committee (2011-2015), elected Chair of IUGG Finance Committee and Bureau (2011-2015); Royal Society Chair of UK Panel for IUGG (2003-date)

Danson: Editor of International Journal of Remote Sensing (2008-date); UK Representative and Management Committee member for EU-COST Action 734, Climate variability and Impact on European Agriculture (2006-2011)

Hardman: UK Representative and Management Committee member for EU-COST Action TUD1201; UK Spatial Planning Representative for EU-COST Action TUD1106

Hutchinson: International Committee member and keynote speaker, PAGES 1st Carpathian Balkan Workshop (Romania, 2011); Invited key-note speaker 1st International Workshop on Interdisciplinarity in Geoscience in the Carpathian Basin (Romania, 2012).

James: Founder member of the Society for Urban Ecology (2008); Member of editorial board of Urban Ecosystems (2008-date); Member of standing committee of Swedish Research Council Formas (2009-2012)

Knowles: Founding Editor of Journal of Transport Geography (1993-2012); Co-Editor of Transport and Mobility Book Series, Ashgate Publishing (2000-date); President and elected Chair of the International Geographical Union's Research Commission on Transport and Geography (2009–date); Presented Hoyle Lecture in Transport Geography at RGS-IBG Conference, Edinburgh, July 2012.

Lin: Associate Editor-in-Chief, Pedosphere (2010-2013); Associate Editor, International Journal of Environmental Pollution and Solutions (Columbia International Publishing LLC) (2012-date); Member of Editorial Board, Global Journal of Environmental Science and Technology (2009-date).

Nevell: Editor of Industrial Archaeology Review (2010-2015); Chair, Institute for Archaeology Buildings Archaeology Group (2011-date); Council member of the Institute for Archaeology (IfA) (2012-date); Trustee of the Council for British Archaeology (CBA) (2013-date)

Wood: Chair of International Task Group on Non-lethal Methods in Radioecology (International Union of Radioecology) (2011-2016); Invited UK representative for six International Atomic Energy Agency (IAEA) expert groups on environmental radiation protection (2008-date); member of the International Atomic Energy Agency (IAEA) expert group on dynamic modelling of radiation impacts on wildlife (2012-date).