

Institution: University of Worcester
Unit of Assessment: 17 Geography, Environmental Studies and Archaeology
<p>a. Overview</p> <p>At the University of Worcester (UW), the Geography, Environmental Studies and Archaeology subject areas are grouped together strategically within the Institute of Science and the Environment (ISE), one of six Institutes in the University. This is a continuation of the previous academic structure as detailed in RAE 2008. The purpose of this co-location is four-fold: to maximise effectiveness of the deployment of staff and resources for research; to advance planning and strategy in core areas of research excellence; to provide support for emerging researchers often at the start of their careers; and to encourage cross-fertilization of research ideas and build teamwork between the unit's disciplines. Staff are facilitated by the Institute structure to co-operate on research projects, jointly supervise interdisciplinary research studentships and share research practice. Each discipline is enabled to develop its own areas of research expertise, exemplified by the focus on rural geography and rivers research in Geography, ecology in Environmental Studies and the prehistoric in Archaeology. Research is conducted by staff across all three disciplines. Geography, which has the longest pedigree has a strategic focus on research groups in hydrology and rural geography, as evidenced by the Geography submission to RAE 1992 and all subsequent research assessment submissions. This is represented respectively in the present submission by the activities of the River Science Research Group (RSRG) (Klaar, Maddock, Milner, Visser) and the Centre for Rural Research (CRR) (Evans, Storey). The Research Groups have been used to help inform staff recruitment, focus research project activity and guide the selection of external research consultancy work. Even so, within the current period, initiatives have been taken which are more developmental, both in terms of linking the established research fields more closely together and investing in new areas of research potential. This includes emerging contributions from the Archaeology (Loney, Lewis) and Environmental Studies (Westbury) areas. The strategy has been to position research in 'Rivers' and 'Rural' subjects at the core of activity in the unit, whilst including contributions from a wider group of staff, especially from Early Career Researchers (ECRs) who are beginning to deliver outputs (Klaar, Milner, Stepney). This is evidenced by a more than doubling of the number of staff returned in REF compared with that in 2008.</p>
<p>b. Research strategy</p> <p>This section is divided into two parts reporting specifically on the evaluation of existing research strategies and the planning of future research, including emerging initiatives. For the purposes of providing a coherent discussion, the identification of priority developmental areas (including research topics), funding streams, postgraduate research activity, facilities, staffing, administration and management are addressed where relevant under these two main headings.</p> <p>(i) Evaluation of research strategies outlined in RAE 2008</p> <p>As detailed in the RAE 2008 submission, the research strategy for that assessment period concentrated research resources on the sub-fields of river science and rural geography, representing established areas of research strength within Geography at UW. Guided by the RAE 2008 submission, the University developed a new five-year Research and Knowledge Transfer (RKT) Strategy in 2009 to define its strategic approach to investment in research at institutional and Institute level. In essence, this comprised two main dimensions. In essence, this comprised two main dimensions: to build depth in areas of existing research strength within the UoA; and put in place initiatives to broaden research excellence across the UoA. First, in RAE 2008 we stated the policy intention to expand identified sub-fields in Geography. A new staff appointment in river science (early career researcher) commenced in January 2011 to increase critical mass and range of expertise. Evidence for the successful achievement of the first objective is demonstrated externally by the continued record of high quality output, as endorsed in RAE 2008, from the RSRG and CRR research groups in international peer-reviewed academic journals and research volumes, and the production of research consultancy reports. Further, RSRG and CRR, have secured five full-time research students from the University since 2008. In the case of RSRG, investment has been made in hydrological monitoring and remote sensing equipment, mapping hardware and software. It has assisted these units to continue to attract external research income.</p>

Clients include national and international agencies (e.g. Environment Agency, Natural England, Institute of Water for the Republic of Slovenia), government departments and advisors (e.g. Commission for Rural Communities), local authorities (e.g. Worcestershire County Council), partnerships (e.g. Malvern Hills Area of Outstanding Natural Beauty Partnership) and community groups (e.g. Worcester Diocese). However, the undertaking of such research has not merely been income-driven. This is because the University, in its RKT Strategy, stated its mission to sustain and promote the University as a valuable part of the regional community and to be proactive in public engagement. For example, in the regional context, the Welsh Marches have been a deliberate focus for research work on the geography of agricultural change, demonstrating the value of academic research in geography to the region's society and its communities. This approach has not excluded the conduct of international research work.

In terms of the second strategic objective, new research areas have been established since RAE 2008. These have been developmental within the REF period and are beginning to show results. For example, to provide a more prominent international dimension to geographical research, as well as linking established interests in the rivers and rural sub-fields, an African wetland management researcher (Dixon) has been appointed. The post has resulted in links being forged with international NGOs, such as the Ethio-Wetlands and Natural Resources Association, Self Help Africa, and Wetlands International. Importantly, the research has had significant impact by delivering life-changing outcomes for specific communities within Ethiopia and Malawi, as well as helping to shape international wetlands policy. Similarly, an appointment in the Environmental Studies area (Westbury) has allowed development of research on agricultural policy change to link more closely to ecological implications and outcomes. Thus, research returned in this unit includes that on the use of buffer strips and seed mixes to deliver ecosystem services under agri-environmental policy. Progress has also been made in supporting Archaeology research (Lewis, Loney). Commitment is shown through investment in research infrastructure, with the establishment of a Geographical Information Systems (GIS) Mapping Suite. Two archaeology graduates have been appointed to technician posts to facilitate field and analytical work in this area. Remote sensing and GPS mapping equipment now facilitates archaeological research inquiry, as well as the purchase of specific items, such as Archeosurveyor software and LiDAR data. Significant proof of investment in archaeological research within the assessment period comes from the building of the University's award-winning new library, 'The Hive' (see section d).

(ii) Outline of research strategy over the next five years

The research strategy for the unit over the next five years will continue to follow a broadly similar path. The RAE 2008 plans are considered to be part of a long-term strategy to foster sustainable, high quality research that is impactful in regional communities in global contexts. Therefore, there are two main drivers for research over the next five years, congruent with what has gone before. First, ISE will continue to build, support and develop its two long-standing areas of research excellence in river science and rural geography (RSRG and CRR). One recent example is the appointment of a post-doctoral researcher in river science, working on national water abstraction policy, part funded by the Environment Agency. Staff will enhance their active research engagement with scholarly activity, write research bids, collaborate with other researchers in academic and non-academic institutions, present their findings at internal (e.g. the Institute Research Seminar Series) and external research meetings and conferences (e.g. Rural Geography Research Group of the Royal Geographical Society; International Society for River Science; International Symposia on Ecohydraulics), undertake innovative consultancy projects and publish in leading international academic peer-reviewed journals. The reach and significance of such work will be extended by ensuring outcomes are always highly relevant to regional communities, be they those in which the University is strongly embedded, communities in other UK regions, or those in international contexts. Second, a long-term objective is to develop strength in depth across Geography more broadly and to increase research maturity in Environmental Studies and Archaeology. A key to future growth is encouraging and supporting staff in the areas of sustainable wetlands, agro-ecology and landscape archaeology because linkages radiate out from them into the longer established areas of research excellence. This approach will ensure vibrant and innovative research in the UoA, maximising the return on investment and providing staff with a

highly supportive, mutually beneficial research environment.

Success in attaining targets will be measured externally through outputs in peer-reviewed journals and through winning research bids. Staff are supported in applications for research funding by the Research Office which has a dedicated Research Officer (funding). It is recognised that the bulk of research funding over the next five years will come from consultancy contracts and this approach will be further promoted. Staff will continue to develop collaboration with researchers in other universities and consultancies, both at home and abroad (details in section e). An example of the former includes the association established with Vision37 consultancy, alongside the University of Exeter, on agricultural policy. This has been evidenced by the commissioning of research for the Oxford Farming Conference 2013. Examples of international links include the joint research conducted between RSRG and the University of California, Davis, USA on the habitat hydraulics of the rivers draining the Sierra Nevada, and with the University of Concepción in Chile on the impact of hydropower on native fish habitat using an Unmanned Aerial System (UAS) (Maddock). In Archaeology, a research project was initiated with the University of Reading which involved the excavation of the site of the internationally significant Bronze Age metalwork Broadward hoard (Loney). Also with the University of Reading, but in Environmental Studies, there has been collaboration on the dairy cow methane project (Westbury).

UW seeks to support researchers who attract matched or co-funding for research studentships from other organisations, whether another HEI, public sector organisation or private businesses to ensure that this important dimension of research activity is maintained and expanded (Loney from The University of Birmingham; Evans from Care Farming West Midlands; Westbury from Waitrose). Support is also given to researchers to attend external conferences and actively engage with learned societies, such as the Royal Geographical Society and its individual research groups such as the Rural Geography Research Group (Evans, Storey), International Geographical Union (Dixon), British Society for Geomorphology (Visser), the British Hydrological Society (Maddock), the International Society for River Science (Milner), the Theoretical Archaeology Group (Loney) and the Neolithic Studies Group (Lewis). However, these are not the only measures by which success will be judged given the importance of providing regional communities with meaningful geographical and archaeological research. Thus, methods of measuring impact attainment will include monitoring levels of public engagement with research activities. For example, the theme of the 'River Severn' has featured geographical research on flooding (Visser) in the vanguard of public-facing research events to be presented over a six month period through 'The Hive' library facility. Similarly, it is planned to use archaeological research expertise in pottery to extend public understanding of Royal Worcester porcelain. This builds on an established programme of archaeology talks to local societies in the Midlands and South West who then participate actively in UW archaeology research projects.

Vitality in the research of the submitting unit will be ensured through the supportive environment that has been firmly established. Amongst its aspirations are to encourage intellectual vigour, innovation and positive contributions to the subject areas it encompasses. Academic staff are given 20 days set aside specifically to undertake research and scholarly activity. Uptake is promoted and monitored so that every effort is made to ensure that the days are used effectively. UW also supports a system of Research and Project Leave. For reference, eight staff from the unit were successful in securing research leave for a period of up to two semesters (eight months) during the current assessment period. At least once a month, and often more frequently, the Institute Research Seminar Series provides an opportunity for researchers to present their current work to peers. The multidisciplinary fostered by the Institute means that staff from Geography, Environmental Studies and Archaeology attend regularly together, encouraging a wide range of theoretical, conceptual and methodological insights to be exchanged. Staff within ISE are supported through management structures and mentorship to conduct research with applied relevance, leading to an enhancement of both quality and quantity of research output across the Institute. Recruitment of new staff will continue to be guided by the need to enhance research strengths in the submitting unit. Academic staff will increasingly attend research development workshops established by the Research Office and Graduate Research School (GRS) to enhance research culture. The ISE Research Seminar Series will continue to be a valuable mechanism by which staff can acquaint others with their research efforts, acting also as a source of inspiration for

future work and collaboration. ISE will play its part in hosting the University's Research Focus Conference, a twice yearly event that brings together researchers, staff and students from across subject areas. Established and developmental research themes will be used to celebrate activity in those areas whilst simultaneously promoting inter- and cross-disciplinary research. For example, in 2008, the rural theme of 'landscape' formed the basis of a well-attended event, as did that of 'sustainability' in 2013 in recognition of the aim to promote research in the Environmental Studies area.

With regard to emerging initiatives, recent investment has been made in staff appointments and supporting research in subjects related to the established and developing areas of activity. Some are beginning to return performance at international level and are worth noting for future performance indicators. These include remote sensing, ecohydraulics, ecosystem service delivery and cultural geography. For example, since the appointment of a remote sensing specialist and the purchase of an UAS, we have developed research specialism in low altitude high resolution remote sensing of river habitats. This has been advanced through joint research with the University of Concepción, Chile and the appointment of a funded research student. As a result, the first one day Remote Sensing and Photogrammetry Society (RSPSoc) workshop on remote sensing from small UASs was held in 2013 and attended by an international audience.

c. People, including:

i. Staffing strategy and staff development

Staffing Strategy

The staffing strategy for the period 2008-2013 has been to achieve a significant increase in full-time and fractional staff contributing to the unit. Achievement of this goal is evidenced by the 220% increase in staff returned, compared with RAE 2008. All are Category A staff on permanent contracts. Recruitment has been positive with six permanent staff appointed and no departures. Applicants have been required to demonstrate potential for research excellence during the recruitment process. One appointment was made directly to support and evolve the established area of geographical research in river science and she has since been awarded the Dick Chorley Medal for her postgraduate research (Milner). The remainder demonstrate commitment to developing research according to the second strand of research strategy discussed in the preceding section. Hence, there have been appointments made in the areas of material cultures (Loney), agro-ecology (Dutton), African wetland management (Dixon), cultural geography (Stepney) and ecosystem services (Westbury). A particularly positive development has been the appointment of ECRs to four of these posts, demonstrating a determination to invest in the future of research. A sign of growing maturation has been the appointment of the first Chair in the unit in 2010 (Evans). This was made in the sub-field of rural geography, in accordance with the overall research strategy. The Chair sits on the University's Professoriate and acts as a conduit for the flow of research ideas and initiatives between ISE, other institutes and central University services. The appointment also contributes to the strategy of supporting ECRs through mentoring.

Staff Development Strategy

All academic staff construct a four-year research plan which is reviewed and updated on an annual basis through the appraisal process as part of the University's Staff Development Framework. In developing this plan, staff are encouraged to identify their development needs, as well as outlining research plans for future projects, funding bids, dissemination and publication. These are reviewed by the Head of Institute (ISE) in relation to the research strategy previously outlined. UW has a full programme of research training and development workshops for its academic staff. There are four main themes: research funding; dissemination, engagement and impact; research governance; and research supervision. There has been a concentration within this programme on developing staff knowledge and competencies in relation to ethics and research integrity and to enhancing public engagement with research, reflecting the University's commitment to the *Concordat to Support Research Integrity* and the *Concordat for Engaging the Public with Research*.

UW has implemented the Concordat to Support the Career Development of Researchers and

developed an action plan based on its recommendations. Key aspects of this plan have been the development of a bespoke training programme for its research staff, the establishment of a research staff forum, and the development of training for principal investigators around the commitments of the Concordat.

ii. Research students

There were 14 research students in the unit (9 full time and 5 part time) as of 31/7/13 (out of a university cohort of approximately 100): 6 in Geography, 6 in Archaeology and 2 in Environmental Studies. These numbers reflect the success of the unit in bidding for funded PhD studentships - 12 in total (3 match-funded by external organisations) over the period. Three new Masters in Research pathways in Archaeology, Ecology and River Science have recently been validated and will in time feed into a growth in research student numbers. There have been 3 doctoral completions over the period. This number will rise rapidly in the next 12-18 months as a number of funded students are about to submit for examination.

The University's Graduate Research School (GRS) is responsible for the management of all Research Degree Programmes (RDPs) from recruitment to examination, for monitoring student progression, for the coordination of the research student training programme, for training and supporting supervisors, and for the day-to-day support of Worcester's research students. ISE works closely with the GRS through a dedicated Research Degree Coordinator to ensure that only excellent students are accepted on to RDPs and that all supervisory teams have the requisite expertise and experience. Teams consist, as a minimum, of a lead supervisor (Director of Studies), who is normally the expert in the field and a second internal supervisor, who, where the lead supervisor has little or no experience of supervision, will be an experienced supervisor who can act as a mentor for his/her colleague. Many teams also draw on external supervisors when particular expertise is required. The GRS maintains a register of approved supervisors which identifies the expertise and experience of supervisors. This register is reviewed annually to ensure that its supervisors are research active and up-to-date with training – the GRS offers a range of supervisor training workshops. The number of approved supervisors in the submitting unit is 13, a significant growth over the REF period.

All students on RDPs are required to undertake an associated training programme. The student completes an initial training needs analysis (utilising Vitae's *Researcher Development Framework* and associated Planner) and agrees a programme of development in consultation with the supervisory team. The GRS runs a full training programme including a series of generic research training modules ('Processes & Skills, Management & Methods', 'Publication, Dissemination, Engagement & Impact', 'Supporting Student Learning in HE') and workshops (such as 'Preparing for the Viva', 'Time Management', 'Drafting Your Thesis', 'Writing a Journal Article', 'Data Management', 'CV Clinic', 'Research Ethics'). ISE offers subject-specific training modules (drawn from its newly validated MRes programmes), workshops and mentor support. Much of the material on these programmes is available online. These programmes are constantly being developed in direct response to individual student needs identified through the training needs analysis process and through student evaluation of workshops.

ISE works with the GRS to nurture a strong, interdisciplinary and cross-disciplinary research culture among its research student body. This is achieved through the full training programme but also through student-led conferences and seminar series. GRS facilitates both an Annual Research Student Conference and a Postgraduate Work-in-Progress seminar series which are both student-led. ISE expects its research students to attend and present at Institute seminars and conferences as well as at external seminars/conferences. They are encouraged to publish their work in progress (and to upload this work to the university repository). There is research student representation on ISE Research & KT Committee (as well as GRS committees and University-level research committees) which ensures the student voice is fed into not only the development of RDPs but also the development of research strategy at Institute and University level.

d. Income, infrastructure and facilities***Income***

Income for the unit over the reporting period has been small (£92K) but 2012/13 has seen a significant growth over previous years (£64K) and this is viewed as reflective of the unit's trajectory. Significant grants have been won in 2012/13 from the Environment Agency to support a postdoctoral researcher (£39K) and from Waitrose and Fruition PO to support a PhD studentship looking at ways of enhancing apple production (£40K).

In order to grow income further, various initiatives have been introduced at university and unit level. For example, the university's research office runs workshops, seminars and information-providing sessions on bidding for grants and provides assistance with searching for funding opportunities. Furthermore, both the research office and colleagues from a specially designated peer-review panel support all grant bids. The aim of this panel is to work with the applicant in order to refine and develop the proposal submitted in order to maximise chances of success.

Infrastructure and facilities

Investment in research infrastructure has improved facilities in all disciplines in the unit since 2008. Most notably, a new GIS mapping suite has been created serviced by two technicians. This has greatly enhanced digital cartographic capability across all three disciplines. The suite also houses a printed map archive with a specialist emphasis on 'the region'. Investment has been made in a Draganflyer X6 UAS plus cameras (£29k) and Helikite to undertake remotely sensed research on river channels and vegetation within the RSRG and to augment capability in land use (rural geography) and archaeological research. Surveying equipment has been enhanced through the acquisition of a survey grade Trimble R8 with Nomad GPS equipment (£17k), updated Total Station units, multiple Trimble GeoExplorer and Juno hand-held units (>£19k) and a single axis magnetic field gradiometer system. For river science research, the unit has acquired a 2D Acoustic Doppler Velocimeter (Flowtracker) and an Acoustic Doppler Current Profiler (Teledyne StreamPro) specifically for discharge measurement and hydraulic data collection. One existing hydrological monitoring station has been upgraded to provide telemetry access to data and a new second site with identical continuous flow and water quality monitoring capability was funded by Worcestershire Wildlife Trust (~£20k) and subsequently donated to the University for its river science research. In the case of human geography, UW funds for field research have been consistently available.

UW has invested substantially in its overarching research infrastructure in the period 2008-2013. It has established a Research Office, led by a Director of Research Development and supported by a Research Support Officer (funding). The role of this office is to support staff in their research primarily in the process of bidding for research funding and post award management. It is also responsible for coordinating the development and implementation of research governance systems to ensure the quality and integrity of the University's research. It has established a clear set of policies and guidelines around ethics and research integrity that meet with the commitments of the Concordat for Supporting Research Integrity and comply with relevant professional and ethical frameworks and codes of practice. UW has continued to invest in its long established GRS which manages its research degree programmes, and supports its research students and supervisors, both in terms of its staffing and its physical resources.

Central university provision of IT remains generous for the unit's subjects, enhanced by specific purchases of Tough Book laptops to support field research. Library provision has been transformed by the building of the Hive, opened in summer 2012, the first joint University and public library in the UK and is an example of the strategic institutional emphasis on public engagement. However, the activities of the unit have prominence within it because The Hive is home to the newly designed Worcestershire Archive and Archaeology Service research collections and records centre.

e. Collaboration and contribution to the discipline or research base

UW has made strides in contributing to the wider research base since the last submission in 2008 through a range of initiatives. The growth of a strategic partnership with the University of Birmingham has facilitated the establishment of a number of research collaborations, resulting in joint bids, cross-fertilization within the ISE seminar series and match-funded studentships. UW has also run 'Joint Innovation Days' with Coventry University, the University of Gloucestershire and Buckinghamshire New University in which unit staff have participated. The purpose is to identify opportunities for collaboration in research and knowledge transfer.

Researchers in the RSRG have conducted work for the European Union with academics in the Institute of Water for the Republic of Slovenia (Maddock), success being directly indicated by an on-going series of staff exchanges; in Belgium on remote sensing (Visser); with the University of Concepción (Chile) and University of California, Davis (Maddock). National collaboration is evident from the Environment Agency part-funded post-doctoral research post and work with University of Huddersfield (NGO research joint consultancy - Milner). Research with the University of Exeter on the social contribution of agriculture was introduced by HRH Prince of Wales and presented to the Minister (Defra) at the 2013 Oxford Farming Conference (Evans). Joint research bids have been made in Environmental Studies with the Universities of Bristol, Reading and Leeds (Westbury). Regionally, a joint research studentship in Archaeology examining pottery (FT-ICR metabolomics and ancient wine analysis - Loney) and one in River Science on hydrogeomorphic complexity (Maddock) provide specific examples of the University of Birmingham partnership in action. The relationship with Coventry University was instrumental in the creation of a PhD studentship competition jointly funded by UW, resulting in a match-funded project on the resilience of wetland institutions in Africa (Dixon). Links with industry and commerce are demonstrated by the research studentship in Environmental Studies with a consortium of growers, a large UK supermarket and the University of Reading on ways of enhancing pollination services through the introduction of in-orchard wild flowers (Westbury). There is also interdisciplinary collaboration with researchers outside the submitted unit, as exemplified by a current research project on care farming joint with the University of Worcester's Institute of Health and Social Care plus an external charitable organisation. Collectively, these have served greatly to enrich the research environment through inwards flows of ideas, practice and understanding external clients' requirements from academic endeavour. In archaeology, there has been collaborative work undertaken in partnership with the National Trust at Croome Court (Lewis). Research projects are based on park features that either pre-date or are contemporary with Capability Brown's design, as with the excavation of the remains of the site of the destroyed Chinese bridge. The National Trust subsequently ran a successful funding campaign to reconstruct it using information resulting from the research.

Staff in the unit are active in refereeing for all highly-regarded peer-reviewed international journals, including Transactions (Evans), Progress in Human Geography (Evans), River Research and Applications (Maddock), Journal of Applied Ecology (Westbury), the Proceedings of the Prehistoric Society (Lewis). International and UK Research Council bids have also been assessed (Evans). Three members of staff act on journal editorial boards (Dixon, Westbury, Loney). Beyond publications, staff make an active contribution to the activities of learned societies, such as the Rural Geography Research Group of the RGS (Evans, Storey) and RSPSoc (Visser, Maddock). Archaeology staff work closely with long-established learned societies, such as the Cumberland and Westmorland Antiquarian and Archaeological Society (Loney) and the Somerset Archaeology and Natural History Society (Lewis). They have also made significant contributions to the English Heritage funded South West Archaeological Research Framework and North West Archaeological Research Framework. One staff member sits on the conference organising committee of the Association of Applied Biologists (Westbury). Active research contributions have been made to international conferences in Europe, Canada and the USA.