Institution: Coventry University

Unit of Assessment: 7

a. Overview

Since 2008, research in Earth Systems and Environmental Sciences at Coventry University has accelerated, with the number of staff actively researching and publishing in this area increasing to 10.4 FTEs, creating a vibrant Unit. Income has grown to £1.5M; PhD supervisions have risen to 23 with 16 PhDs completions in the census period. The Unit includes physical geographers and environmental scientists working synergistically in the important area of 'Environmental Processes and Change'.

b. Research strategy

Sonochemistry researchers were submitted to RAE2008 (UoA29 Metallurgy and Materials). Relevant UoA29 objectives have been achieved, especially the significant increase in PhD student numbers and completions. The strategy since 2008 has been to strengthen research and diversify in the Environmental Processes and Change field. This has been supported by investment to:

- grow new research areas, for example, climate change and phenology, hydrogeomorphological dynamics, earthquake prediction, urban water and hydrocarbon pollution.
- reinforce key fields through appointment of senior researchers (**Brookes**, **Dehnen-Schmutz**, **Lawler**, **Sparks**) and Early Career Researchers (**Anifowose**, **Blackett**, **Shaw-Stewart**).
- develop modelling and instrumentation infrastructure to support environmental process research, water quality research, and field and laboratory experimentation (section dii).
- increase PhD student successes with enhanced PGR recruitment and training programmes.
- initiate new international collaborations (e.g. Universities of: Cantabria; Otago; Beijing; XuZhou; Alaska Fairbanks; University College Dublin).

This strategy has achieved substantial advances in developing novel concepts, models, relationships, methodologies and datasets across many timescales, as summarised below in four areas.

Evidence of Research Achievements:

A. In **Geodynamics**, **Lawler** has enabled, for the first time, truly continuous monitoring of both erosion and deposition dynamics through the development of his innovative erosion monitoring principle of 'Thermal Consonance Timing' (TCT) (**DL1**). This substantially improves geomorphological and hydrological process specification. This methodology is now used by 30 research groups in both fluvial and coastal systems across four continents, including by Delft, Paris, Malaysia and the U.S. Geological Survey (USGS) in San Francisco Bay. **Lawler** (**DL3**) also newly identified widespread stream power peaks in mid-catchment, and hence erosion potential zones. This was achieved through the rigorous development of novel Geographic Information Systems and Digital Elevation Model (GIS-DEM) methodologies for spatial modelling of flood power distributions. Work on earthquake prediction by **Blackett** (ECR, **MB2**), through innovative analysis of the largest sets of NASA MODIS thermal data ever assembled, has questioned assertions that land surface temperature anomalies are precursors to seismic events. As a member of a major international collaborative project, **Blackett** (MB3) also developed rigorous intercomparison tests of several urban energy-balance models to identify key strengths and weaknesses in functionality and performance, and to identify future research priorities.

B. Supporting **Climate change** impact, **Jordan**'s research has led to enhanced isostatic models of Holocene shoreline changes (**JJ4**). **Lawler** has defined new linkages between atmospheric circulation, climate and river flows across northern Europe (**DL2,4**). **Sparks** has identified associated phenological changes (**TS3,4**), across different trophic levels and environments, including a warming-induced shift in European mushroom fruiting phenology. **James**' innovative research on animal physiology, hibernation and metabolic activity has improved explanations of the impact of thermal changes on species distributions and biodiversity (**RJ1-4**).

C. Within **pollution science**, **Charlesworth** (**SC3,4**), revealed the complex impacts of glyphosate-containing herbicide on pollution attenuation and biodegradation in pervious paving systems, using detailed experiments on dissolved rather than particulate-associated pollutants. Also, **Anifowose** has carried out the first in-depth study of vandalism of oil and gas infrastructure in Nigeria which

challenged accepted hypotheses, finding that pipeline attacks and pollution impacts were more common in affluent, rather than poor areas (ECR, **BA1**).

D. In **soil and plant science**, **Brookes** (**PB2**) found contrasting soil pH effects on fungal and bacterial growth, suggesting functional redundancy in carbon mineralization. Mineralization of soil organic matter was also shown not to be regulated by the size, activity or composition of the soil microbial biomass (**PB1**). A study of long-term salinity tolerance in rape by **Harris** (**PH1**) revealed key cation effects. **Schmutz**'s models of soil nitrogen dynamics have substantially improved N management (**US1,2**). **Dehnen-Schmutz** has clearly demonstrated (**KDS3**) the value of a new approach to identify plant disease risk, by integrating natural and social science perspectives, especially enhanced stakeholder engagement, and, in **KDS2**, has developed a novel strategy to determine non-invasiveness in plants.

Future Strategy and Plans

The interdisciplinary nature of the research from this group will drive plans for innovative and challenging research to 2020. Reinforcing existing collaborations, and developing new, funded partnerships with leading international groups will be fundamental to our plans. Research will be expanded in three main areas to address existing research challenges for the next decade, including threats of environmental change and increased global urbanization, which will be a fundamental environmental pressure to 2020 and beyond.

- **HydroScience**, including urban hydrology, sediment and water quality interactions, dynamics and impacts of aquatic pharmaceutical concentrations, sustainable drainage and contaminant behaviour, and modelling of river flood power and pollution dynamics.
- **Environmental Process Controls**, including modelling geomorphological event dynamics, prediction of phenological and biological impacts of climate change using new generations of climate change scenarios, and developing an understanding of the relationships between suspected seismic/thermal precursors and volcanic eruptions.
- **Resilience**, an interdisciplinary Research Centre focussed on *Agroecology, Water and Resilience* will be established in January 2014, with funding from the University until at least 2017, including for six new posts and two Research Fellows. This will focus principally on innovative research for the understanding of resilient food and water systems.

Specifically, the following four objectives summarise the strategy to grow these research areas, supported by new staff, a new £60M Science Building with an environmental laboratory and data-acquisition provision (see section dii), and a new computational GIS suite:

1. Strengths in HydroScience will be enhanced by advancing new understanding of catchment-scale drivers of fluvial erosion and sediment delivery processes. We will develop and apply **Lawler** et al's (2009) conceptual-numerical CAtchment-Scale Stream Power (CASSP) model to European rivers, using a refined version of the novel CAFES methodology (**DL3**). A related collaboration has started with the new Fluid Dynamics and Statistical Physics Research Centre at Coventry University, and a first proposal has been submitted by **Lawler** and Potherat (Professor of Mathematics and Fluid Dynamics entered in UoA10). This collaboration will open up new numerical modelling directions in environmental science. New research on suspended sediment dynamics and pollution impacts with University College Dublin (funded by Ireland EPA to 2016) will be extended to Northern European systems. To advance understanding of erosion processes, **Lawler**'s novel Thermal Consonance Timing concept (**DL1**) will be applied to new contexts to automate monitoring of geodynamics. This will drive new understanding, quantification and modelling of relationships between imposed shear stresses, antecedent preparation mechanisms and erosional and depositional responses. New areas of research into the hydrological impacts of major oil and gas pipelines have been driven by recent appointments (**Lawler**: Professor; **Anifowose**: ECR, SL; **Shaw-Stewart**: ECR). Physicist **Shaw-Stewart** has now moved from a PDRA in the research field of remaining oil in carbonates, into the environmental sciences, and will focus on hydrocarbon pollution dynamics. Future research areas include novel oil spill trajectory modelling in rivers (with Potherat and **Shaw-Stewart**, in collaboration with Grenoble University, the UK Environment Agency and Niger River Basin Authority). This will address a clear research gap in understanding oil behaviour in freshwater systems. We will also develop improved systems of Environmental and Social Impact Assessment of hydrocarbon assets (**BA1**).

2. The Unit's innovative sustainable drainage (SUDS) research will enhance understanding of

the treatment of dissolved pollutants, such as pesticides (**SC3,4**), in stormwater passing through SUDS devices. Much of this will be extended in collaboration with colleagues in Civil Engineering, including Claisse and Ganjian (submitted to UoA15). Collaborative research with the University of Valencia and Polytechnic University, Madrid will study the fate of particulate-associated contaminants in vegetated SUDS devices. Investigations of the potential pollution of urban allotments in collaboration with European Universities, including Humboldt, Berlin, will be advanced using COST grants. **Charlesworth** is an invited member of the European Innovative Partnership Water Action Group (Ecosystem Services) which will assess the monetary value of the Ecosystem Services provision of green infrastructure. Funding for this Action Group will be sought through both COST and Horizon 2020.

3. To model novel relationships between climate change and phenology, **Sparks** and **James** will develop international work e.g. with Professor Barry Sinervo (University of California, Santa Cruz) and the group of Professor Nils Chr. Stenseth (University of Oslo). This will open up new research directions for the study of species demographics and environments to enable prediction of future changes.

4. **Blackett** will focus on more reliable predictors of the relationships between thermal precursors and subsequent volcanic activity. Existing partnerships will be strengthened (e.g. University of Alaska Volcanic Observatory (Travelling Scholarship)). This relationship has led to a powerful new database of thermal Remote Sensing data for the Aleutian Islands. New collaborative partnerships will be forged between the UK, Italy (Florence), USA (Kentucky and Oregon), and China (Beijing and XuZhou).

c. People, including:

i. Staffing strategy and staff development

Staffing strategy: The main aim to 2020 is to develop further the Unit and its research groups, with significant investment in staffing from central University funds. New appointments will be made in the important areas of Environmental Processes and Change (see Recruitment and Promotion), with enhanced arrangements for sabbaticals, travelling scholarships and staff development initiatives.

***Concordat*:** Nineteen agreed measures of progress are used at the University and are overseen by the Research Concordat Sub-Committee, chaired by the University Director of Research and including key research staff and members of the University senior management team. The principles are drawn from CROS, PIRLS and HESA and underpin the Concordat in 'Support of the Career Development of Researchers'. Current priorities include the development of a new web-based researcher career development portal and the extension of the researcher progression ladder. The University achieved the European Commission's HR Excellence in Research Award in January 2013 for their work on in meeting the Concordat. Coventry is also a member of the Athena Swan Charter and has achieved the Bronze Award. Central to development reviews and staff training are skills in research management and research leadership (e.g. bidding, publishing, PhD supervision and peer review). Thus, ECRs attend relevant training courses and are included in research teams where they can be mentored in their supervision of PGRs.

Recruitment and promotion: The Unit has grown significantly over the REF period with the addition of early career researchers (**Anifowose**, **Blackett** and **Shaw-Stewart**) as well as experienced researchers (**Brookes**, **Lawler** and **Sparks**). Early career staff are mentored by an experienced researcher and promotion is secured against clearly published criteria. Applications for Professor or Reader are externally peer-reviewed. Research leadership has been strengthened by **Lawler** gaining a Chair in Hydrology, **Charlesworth** gaining a Readership, and **Blackett** and **Anifowose** achieving Senior Lectureship positions.

Protected research time and sabbaticals: The Unit manages protected research time, research project commitments and the quality of research outputs with teaching loads through annual performance reviews. Unit members are encouraged to apply for University-funded research sabbaticals: in the REF period **Charlesworth**, **Bennett** and **Jordan** have taken sabbaticals.

International Visiting Professors and Industrialists in Residence: To develop collaborations, the University funded, for example: **Harris** to host Professor Issac Aiyelaagbe, Federal University of Agriculture, Abeokuta, Nigeria; **Charlesworth** hosted Sara Perales PMEnginyeria, Ingeniera de

Caminos, Civil Engineer, Spain as Visiting Industrialist and **Mason** has hosted Professors Al-Abachi and Adda (Iraq), Yamamoto (Japan), Dükkancı (Turkey).

***International collaboration and networking**:* University-funded travelling scholarships support international collaborations, e.g. University of Alaska Fairbanks (**Blackett**); University of Cantabria, Spain (**Charlesworth**); Frostburg State University, USA (**Jordan**); Agricultural Research Council, the Eastern Cape Department of Agriculture and Rhodes University (**Bennett**).

Equality and diversity: All staff receive mandatory equality and diversity training. The Unit itself comprises a mix of men and women, is multicultural and includes early-career, experienced and senior staff. Monitored through regular Equal Pay Audits, the most recent Audit (2010) showed that the Academic Staff Gender Pay Gap at Coventry was 2.81% compared with 13.5% for the wider Higher Education Sector (ECU 2010). To support this, the University offers a range of schemes: Flexible Working; Career Break; Maternity, Paternity and Adoption Scheme; Child Care Vouchers; On-Site Nursery; Breastfeeding Facilities; Job Share; Sabbatical Arrangements. Coventry University is a Stonewall Diversity Champion.

ii. Post Graduate Research students (PGR)

The Unit has a long and successful track record in supervising PGR students. In the REF period, UoA7 had 16 PhD completions and has 23 PhDs in progress. Most are externally funded and, in addition, there are currently three PhD students based at Birmingham University, jointly supervised by **Lawler**. Funding includes: EUFP7 (1); Carbon Trust (1); Coventry City Council (1); Governments of Libya (4), Iraqi (1), and Thailand (2); Unit funded (6); and self-funded (3).

Integrated research culture: PGR students are co-located in a dedicated Research Centre, which has been recently refurbished with infrastructural investment of £5 million to provide fully networked accommodation for Research Centre staff, PhD students, visiting researchers, and space for video conferencing. The University sponsors PGRs to give presentations at national and international conferences, including Novatech 2013 (Lyons, France); International SUDsnet conference 2012; European Sonochemical Society Conference ESS11 (Montpelier, France 2008); ESS12 Lviv (Ukraine 2012); XXVII Congress of the International Society for the Advancement of Cytometry, Leipzig, Germany, (funded by EU FP7 SONO project). PhD students are also encouraged to submit international peer reviewed journal articles with over 65 of these joint publications, including both the research student and their supervisor, in the REF census period.

***Supervisory structure, training and monitoring**:* A comprehensive PhD support framework was introduced across the University in 2008, including 40 taught credits in project management, research methodology, science writing and conference presentation. An internal Progress Review Panel (PRP) is held annually with independent subject-specific experts where the students present their progress, before a short viva to simulate the PhD examination. The PRP process agrees a schedule of deliverables for the project which enables the monitoring of student progress to assist in timely completion of theses. Students are furnished with office accommodation, personal computer, storage, research group membership, lab space, field equipment, printing and financial support to enable conference attendance.

***Seminars, symposia and competitions**:* These include an annual field trip to a strategic SUDS site and an internal symposium. There are annual PGR and staff symposia and PGRs compete in the Vitae-organised Regional Research Student Poster Competition. An Environmental Seminar Series helps PhD students and staff to develop and question ideas, arguments and datasets, and network with other scientists.

Career, leadership and entrepreneurial support: PGR students attend relevant workshops in the Graduate Centre either course-related, such as Preparing for your Viva, Effective Time Management, or career progression (Career Support Teams). Supervisors carry out Training Needs Analyses to ensure students are suitably equipped for their studies. SIGMA, set up with a £3.5 million grant from HEFCE in collaboration with Loughborough University, offers key support in statistical and advanced numerical analysis, for which it has established an international reputation. The Centre for Academic Writing (CAW) trains students in relevant scientific writing skills and hosts writing retreats to prepare international journal articles or thesis chapters. If appropriate, students are encouraged to commercialise the outputs of their PhDs. For example, a

SUDS decision support tool for Local Authorities is now being developed from a PhD study.

d. Income, infrastructure and facilities

i. Income

The Unit's income has grown to more than £1.5M. Examples of the variety of income sources include: Research Councils (EPSRC **Harris**: £47,128; **Mason**: £73,600), Ireland Environmental Protection Agency (**Lawler**: £45,000 as part of a Euro 0.5M joint grant with University College Dublin), EU (**Harris**: £113,590 and £217,019; **Mason**: £672,052), consultancy (**Charlesworth**: Tarmac £42,684) and non-government agencies (**Charlesworth**: Waste & Resources Action Programme, £41,699; **Harris**: The British Council, £29,997).

Income generation is supported by a dedicated Business Development Support Office (BDSO) funded initially by HEIF. BDSO staff have research and bid-writing experience to provide support for grant applications and project management. Development workshops are held to support researchers, for example to assist with bids to European funding calls. The BDSO also has expertise in knowledge transfer, Intellectual Property Rights and the commercial exploitation of research.

Regarding future funding plans, the Unit will continue to grow its funding portfolio by:

- Targeting EU Horizon 2020 sources, and collaborative, inter-disciplinary research, especially in the Environmental Processes area.
- Increasing grant applications to NERC and EPSRC, given the influx of new staff especially in areas A-D above. NERC has several relevant Theme Action Plans including Earth System Science and Environmental Pollution and Human Health; Soil Security; Valuing Nature. Additionally, EPSRC runs themes such as Living with Environmental Change, in particular Built Environment, and Coastal and Waterway Engineering.
- Developing new international contacts, in areas such as tropical SUDS, oil spill remediation, improved Environmental and Social Impact Assessment systems for hydrocarbon development, climate-hydrology links, and soil and plant science.
- Developing new collaborations with industry for joint applications of proof-of-concept and feasibility studies, collaborative research and development and demonstration projects with funding from sources such as TSB, NERC and EPSRC.
- Continuing to develop innovative commercial products and services and engaging in knowledge transfer activities, e.g. the development of innovative geotextile materials, and the transfer of expertise in the field testing of new generations of drainage devices.

ii. Infrastructure and facilities

Support by Coventry University will be expanded over the next census period with the building of a new, world-class £60M Science Building which will open in 2016 and underpins a further major expansion in environmental research. Plans for the building are well advanced, funding has been secured and planning permission has been obtained. This building will house dedicated laboratories for process simulations, and the testing, monitoring and analysis of waters, earth and biological materials. It will also include space and facilities to develop and 'road-test' advanced and innovative field monitoring systems in hydrology, geomorphology and water quality, prior to deployment at field sites. It will receive telemetry from the automated interrogation of environmental sensors and will have full technical support. This facility is integral to the Unit achieving its stated goals for the future, to develop and maintain high quality research. In the interim, new equipment and facilities are already in place to substantially strengthen the Unit's capability for laboratory and field work. This will enable the Unit to explore new areas of research, such as fluvial pharmaceutical dynamics and impacts, and sustainable drainage and water quality processes.

The new laboratory amenities are complemented by extensive High Performance Computing facilities, enabling the numerical modelling of complex environmental processes. These facilities have been recently extended by further investments of over £1.8M in hardware thus ensuring they remain sufficiently powerful to handle large, complex data sets and advanced modelling.

The Unit has access to laboratory facilities which open up new research fields. For example, test model rig structures for hydrological research were funded by Lafarge Tarmac and Marshall (£42,684 and £20,000 respectively). The Unit also has access to equipment including ICP-OES, AA, Laser Granulometry, Mass Spectrometry, and microwave digestion. The dedicated microbiology laboratory is ISO9001 (Management Quality) accredited, enabling the use of category 2 microbes including *E. Coli*, MRSA, *Salmonella, Pseudomonas* and *Aspergillus.* External funding (EUFP7/Carbon Trust) has enabled the purchase of a range of analytical equipment including large scale ultrasonic apparatus, a particle size analyser, agar plate pourers, two incubators, a colony counter, an additional ELS detector for the HPLC, freezers and a plant growth room with temperature and light control. The University has funded the purchase of UV and fluorescence spectrophotometers and HPLC with diode array detectors housed in dedicated research laboratories. The Unit has access to Scanning Electron Microscopy, and Flow Cytometry at Coventry University in order to assess the development of bioflms on geotextile (**Charlesworth**) and cell counting (**Mason**). Formal arrangements with Garden Organic Research Centre (formerly Henry Doubleday Research Association) provide access to field trials sites, field laboratories and research library (**Harris**). **Charlesworth** has access to novel experimental car parks in Spain: a 46-bay mixed pervious-paving facility (University of Cantabria, Santander), and a 76-bay research car park (Gijon, Asturias), to support SUDS research. **Blackett** has access to extensive databases of volcanic thermal remote imagery held by the University of Alaska Fairbanks.

e. Collaboration or contribution to the discipline or research base

i. Collaborative activities:

Examples of international collaborations: Travelling scholarships support staff to spend up to three months abroad each year. For example, **Blackett** visited the University of Alaska, Fairbanks, to collaborate on research to remotely sense Pacific volcanic activity. Support is also provided for Visiting Professors and Industrialists (see section ci).

Lawler is co-investigator on the interdisciplinary River Sediment Flux project with University College Dublin, funded by the Environmental Protection Agency, Ireland, until 2016. **Lawler** also led the Geomorphology section of the NERC Hyporheic zone project, and jointly-published results with the University of Texas, Austin.

Harris has had an EU Africa, Caribbean and Pacific (ACP) funded project with partners in Sierra Leone, Benin, Nigeria, Ghana, for research and training into organic agriculture. EPSRC funded **Harris**'s research on 'Enhanced biomass production and energy conversion for use in water-scarce areas of India' (2007-11) with the Indian Institute of Technology Delhi, GB Pant University and Haryana Agricultural University.

Charlesworth has collaborated with the Polytechnic University Madrid and the University of Oviedo for 15 years leading to joint contributions at conferences (5), journal articles (8) and book chapters (2). Collaborations with the Universidade Tecnologica Federal Do Parana, Toledo, Brazil have resulted in one journal article, one edited book (Wiley) and two book chapters to date.

Anifowose has worked with the Niger Basin Authority, Nigeria to better formulate management strategies in protecting oil pipelines. A University pump-priming grant (July 2013) has enabled **Anifowose** and **Lawler** to undertake a collaborative proof-of-concept study of Niger River flows and climate change impacts. Such research has now led to an important professional network between the University and the Society of Petroleum Engineers, resulting in a lively hydrocarbon seminar series, and considerable future joint research potential.

Bennett has published collaboratively with the Agricultural Research Council, Eastern Cape Department of Agriculture and Rhodes University to assess land access, control and management on communal rangelands.

Examples of collaboration with international Universities and other organisations: The Unit has numerous collaborations with other groups in the UK and internationally. These include **Sparks**' work on climate change and its impacts on phenology and ecology with Universities of: Cambridge; Trinity College, Dublin; Poznan Life Sciences, Poland; Turku, Finland; and Bern, Switzerland. **Mason**'s work on the High Intensity Focussed Ultrasound treatment of cancer was recognised with the award of Honorary Professorships at both Chongqing Medical University, P.R.China (1999) and Lviv Polytechnic University, Ukraine (2012). **Brookes** is Honorary Professor

at five Chinese Universities and in 2012 was awarded the title of State Specially Recruited Expert at Zhejiang University, Hangzhao, China. He also collaborates with the University of Western Australia on soil phosphorus dynamics in flooded ecosystems. **Jordan**'s work with academics at Oxford, Brunel and Exeter has resulted in high profile outputs including (for example **JJ1-4**). Other organisations include: NERC, CEH (**Lawler**); Kenya Forestry Research Institute (**Harris**); Chinese Academy of Forestry and State Forestry Administration; Rothamsted Research (**Brookes**).

ii. Examples of leadership in the academic community:

Examples of EU and UK Government Committee membership: **Mason** has been co-opted onto a UK Government Foresight project: "The Future of Manufacturing" to assist policymakers address future challenges associated with food processing/ manufacturing, nanoparticles and surface treatments. **Charlesworth** and **Schmutz** have been invited onto EU EIP Action Groups (AG) in Ecosystem Services and Organic Farming respectively. Members of AGs will be called on to be consulted as key reference bodies for policy and technical advice to the EU. **Harris** is a member of the External Program and Management Review of The World Vegetable Centre in Taiwan.

Examples of conference organisation: High profile events include the three day SUDSnet International Conference, 2012 (**Charlesworth**); International Prosopis conference, 2012 (**Harris**). **Mason** organises a number of major international conferences e.g. ICU, ESS, JSS and ICA. Unit members are routinely invited to present at meetings and conferences e.g. University of Kwa-Zulu Natal, South Africa (Rangeland Policy workshop) **Bennett**; China Mining Conference, **Blackett**. Keynotes include: National Organic Agriculture Conferences, Organic Agriculture Project for Tertiary Institutions in Nigeria; COST Action FA0901: Putting Halophytes to Work - From Genes to Ecosystems, Naples, Italy, 2012, (**Harris**); Molecular Environmental Soil Sciences at the Interfaces of the Earth's Critical Zone, Hangzhao, China, ASA-CSSA-SSSA meeting, 2009, Pittsburgh (**Brookes**); British Ecological Society conference, 2012 (**Sparks**).

Examples of reviewing activities: **Charlesworth**: current member NERC Peer Review College, reviewer EPSRC; **Lawler**: NERC Peer Review College (2009-12), invited Deputy Chair for two NERC Proposal Assessment Panels, Invited Member NERC Freshwater Sciences Committee to select new members of Peer Review College for 2012-15; **Mason**: reviewer EU FP7 programmes. **Harris**: International Foundation for Science, Stockholm, Sweden; **James**: BBSRC, National Science Foundation, USA, Agence Nationale Recherch, France, Netherlands Organisation for Scientific Research, Flanders Research Foundation, Belgium.

Examples of journal editorships: *Biological Agriculture and Horticulture* (**Harris**); *African Journal of Range and Forage Science* (**Bennett**); Associate Editor*: Journal of Environmental Quality* (**Lawler**); Editorial Board: *Resources* (**Lawler**); Ultrasonics Sonochemistry (**Mason**); *Climate Research*; Statistical Editor: *Annals of Applied Biology* (**Sparks**); Two Special Issues were co-edited by **Lawler** in *Earth Surface Processes and Landforms* and in *Hydrological Processes*, arising from a Chaired British Society for Geomorphology Conference and EGU sessions respectively. Two Special Editions were edited by **Charlesworth** in *Journal of Water Supply: Research and Technology* - AQUA and CLEAN – Air, Soil, Water for SUDSnet International Conference and Water Efficiency Network respectively. Members of the Unit continually review papers for Editors of Environmental journals.

Examples of external PhD examinations for Universities include: Imperial College (**Sparks**), Reading (**Charlesworth**), Southampton (**Lawler**), UEA (**Bennett**), and overseas at: Charles Darwin University (Australia); Madrid and Cantabria (Spain) (**Charlesworth**); Fort Hare (South Africa) (**Bennett**); Copenhagen, Technische Universität München and University of Riga (Latvia) (**Sparks**); and the following Universities in Pakistan: Agriculture, Faisalabad, Punjab, Lahore and Quaid-i-Azam, Islamabad (**Harris**).

Examples of fellowships/ memberships of learned societies and board memberships: Royal Geographical Society (**Charlesworth**; **Lawler**); Royal Society of Chemistry (**Mason**). Memberships: Irish EPA Phenology Steering Group, Defra Environmental Statistics Advisory Group, Institute of Biology Environment Committee (**Sparks**). President of European Sonochemical Society and on International Congress Ultrasonics (**Mason**); European Geosciences Union Catchment Hydrology Committee (**Lawler**); Continuing Committee International Rangelands Congress, European representative (**Bennett**).