Environment template (REF5):

Institution: University of Leicester

Unit of assessment: 17B Geography, Environmental Studies and Archaeology: Geography

a. Overview

Geography at Leicester is a small but growing department which punches significantly above its weight, undertaking and leading research that is internationally excellent with world-leading quality in our chosen areas of specialisation. The Department's activities cover all 3 core strands in the discipline - Human Geography, Physical Geography, GIS and Remote Sensing – and these form the architecture for our Research Groups. Our research is structured into ten dynamic Themes operating within and across these groups, with the success of the structure evidenced by collaborative cross- and multi-disciplinary research awards, publications and impacts. Our Research Themes drive forward scholarship in the discipline and reflect our theoretically innovative and issue-oriented research. **Human Geography** Research Group themes are *Geographies of Emotions and Feelings, Spatial Politics of Change, Geographies of Communities and the Everyday,* and *Environmental Geographies*. **Physical Geography** themes are *Ecosystem-Climate Interactions, Palaeoenvironmental Change* and *Catchment Dynamics,* while those of the **GIS** Research Group are *Earth Observation, Applied Geo-computation* and *Spatial Literacy and Digital Geographies*. Our research activities are nested within the Strategic Plan of the College of Science and Engineering and staff play an active role in two inter-disciplinary College research themes: *Landscapes and Communities* (led by **Phillips**) and *Environment, Energy and Climate Change* (**Smith** was appointed to support this theme). The Department houses a new inter-disciplinary **Centre for Landscape and Climate Research** (CLCR) set up under the University's "Investing in Research Excellence" initiative. CLCR undertakes fundamental research addressing global challenges by focusing on: interactions between the water cycle and ecosystems; exploring potential effects of climate and land use change on ecosystem services; and analysing spatial and temporal patterns and processes in evolving landscapes.

b. Research strategy

The Unit contributes to the mission of the University for 'international excellence through the creation of world changing research'. We are especially committed to producing elite research in a non-elitist and supportive research environment. Prior to RAE2008 the University injected new blood into the Department, i.e. appointments to replace retirees, which allowed us to develop areas of research strength and produce significant growth in the quality and quantity of our outputs; research income; publications; postdoctoral staff and RAs; research students and awarded degrees; and research infrastructure. The result is a Unit that is making rapid progress in terms of its standing in the discipline. In short, there has been a substantial step change in the quantity, quality and significance of our research activities, driven by an ambitious research strategy and supported by a collegial yet research-intensive management structure. Our cohort of researchers has flourished since 2008 and a significant number have built solid international reputations.

Our research strategy has the following objectives:

- Advancement of the discipline of Geography and related subjects through (i) the pursuit of original (basic and applied) research at an international level and (ii) delivery of research excellence with socio-economic and environmental impact based on the production of knowledge in close interaction with stakeholders and end users;
- Recruitment, development and retention of internationally outstanding researchers;
- Attracting research grant income to support our research programmes and contract income and consultancies via an explicit strategy for end user engagement and impact;
- Investment in research infrastructure, including frontline equipment and laboratories for research in Physical Geography, Human Geography and GIS;
- Development of links with other departments at the University, in the UK and internationally;
- Attracting national and international visiting fellows to work in the Unit and facilitating staff secondments to other institutions worldwide;
- Attracting and supporting high quality research students and postdoctoral research staff to train the next generation of internationally-excellent researchers;

- Encouraging conference organisation, participation and publication by all researchers;
- Increasing representation of staff in funding organisations, editorial boards, learned societies and government agencies;
- Leading and participating in College of Science and Engineering research themes.

The evidence provided in this submission is testament to the successful implementation of this strategy. For example, in the 7 years of the RAE2008 census period research income was £256,000 per year (total £1.8 million), while in the 5 years of the REF2014 it has more than doubled to £660,000 per year (total £3.3 million). The number of PhD students in the Unit has substantially increased; in RAE2008 our average was 3.3 FTEs per year, in REF2014 the equivalent figure is 6.3 FTEs. Many staff are now recognised as leaders in their particular fields, evidenced over the census period by increasing research grant successes, invitations to give keynote presentations at international fora, and merit awards (e.g. **Balzter**, Royal Society Wolfson Merit Award; **Page**, recipient of the RGS (with IBG) 2013 Busk medal; **Lees**, appointed Academician, Academy of Social Sciences). In addition, the CLCR Research Centre was launched in 2012 under the direction of **Balzter** (awarded a University Research Chair).

The Department is part of College strategic planning which assists with prioritisation of research-related objectives, identification of new investment opportunities and progress monitoring. Annual targets are agreed for research income and PhD recruitment. In line with our research strategy, the Unit has, over the REF period, obtained resources to increase academic and research staff, the latter substantially as a result of research grant success. We have coherent structures for monitoring recruitment, financial targets, staff promotions and career development via the Department's Research and Postgraduate Committees and supported by the University's Integrated Research Information System. In accordance with our research strategy we seek out new opportunities to develop cooperation and collaboration. For example, the Human Geography Research Group benefits from a fund provided by grant income overheads to host meetings and support new initiatives: **Pickerill** held a successful national meeting on Eco-housing; the RGS-IBG Limited Life Working Group on Energy Geographies was born at a meeting hosted by **Bradshaw** and supported by the fund; and **Pickerill** and **Brown** organized an event on protest camps that led to an ESRC seminar series application. This funding model has now been extended to all 3 Research Groups. The Unit supports external visits to cement inter-national collaborations: **Comber** has held two JSPS Fellowships and **Page, Phillips** and **Comber** have hosted in-coming JSPS Fellows, facilitating fruitful collaborations with universities in Kyoto and Tokyo. **Page** has active links with and has hosted researchers from Indonesian universities, while **Balzter** collaborates with Soran University, Kurdistan. At University level, the Unit is an active partner in G-STEP (Global Monitoring for Environment & Security Partnership with Businesses), created in 2009 to promote the use of Earth Observation data to improve regional economic competitiveness. At international level, research leadership is evidenced by **Balzter's** direction of GIONET (European Centre of Excellence for Earth Observation Research Training for Early Stage Researchers), a €3.5 million EU FP7 project investigating methods for natural resource monitoring and land cover change, geohazards and climate adaptation. In addition, from 2005-2010, **Tate**/**Jarvis** (in collaboration with UCL and Nottingham) led the HEFCE-funded £4.1 million SPLINT CETL that delivered a world-class infrastructure for GIS teaching and research.

Our aim for the next 5 to 10 years is to continue to undertake transformative, highest calibre research, guided by our research strategy and building on key strengths, including: improved understanding of land/climate interactions through land surface/climate modelling; reconstructing past environments – particularly in low latitudes; the dynamics of pollutants and sediment; remote sensing and field studies; development of cutting edge theory in urban, rural and cultural geographies - from local communities to global environmental challenges; developing the next generation of geographic information science, geospatial analysis methods and remote sensing applications from forthcoming space missions. To achieve this, we will maintain policies and practices that engender a supportive and well-resourced working environment, thereby maximising academic staff time for research, their opportunities to exploit new funding streams and their capacity for research leadership at national and international levels in their chosen fields.

c. People, including:

i. Staffing strategy and staff development: To support our internationally excellent research we recruit staff with the potential to perform at the highest level. In order to retain and reward them for their success our staffing and staff development strategy has 3 central components—recruitment, reward and retention. Over the past 5 years our high staff retention rate, promotion achievements and individual awards demonstrate the success of this strategy. A period of relative stability in terms of staffing has been brought about by, and created, a vibrant, ambitious research culture, enabling staff to realise their potential as excellent teachers and researchers, and providing the bedrock of an energised and forward-looking Unit. We have invested in significant appointments: 2 new Chairs (**Lees**, **Oechel**), a Reader (**Whelan**), and 5 Lecturers (**Barrett, Coles, Dickinson, Ogutu, Smith**), while our career structure has evolved through a series of promotions. In 2013, we have 42% of staff at Chair/Reader, 29% at Senior Lecturer and 29% at Lecturer level. This uplift is largely the result of internal promotions made in response to staff achievements over the census period. The University's promotions process is rigorous and includes extensive external peer assessment. The change in our career profile is therefore solid evidence of the research standing of our staff, the supportive nature of our research environment and the effectiveness of our staff development strategy, all of which enable career development. A further strength is our international staff profile: we employ academics from, Germany, Kenya, the Netherlands, USA and Colombia.

Staff recruitment is guided by our research themes and recent appointments complement and extend our research specialisms. At a senior level we have appointed staff to provide Research Group leadership in and around particular themes. **Lees** was appointed to a Chair in Human Geography to provide leadership and strengthen the research group's standing and impact, and contribute to the *Geographies of Communities and the Everyday* theme; **Oechel** was appointed to a Chair in Climate Change Science to support the CLCR and the Physical Geography group (*Ecosystem-Climate Interactions* theme); **Whelan** was appointed to a Readership to lead the Physical Geography group and contribute to the *Catchment Dynamics* theme.

To assist in the development of research excellence the Unit employs a series of methods for monitoring research activity and supporting staff. Early-career staff are allocated a mentor, who is usually someone from the same Research Group. Research Group Directors, together with the HoD, play a major role in monitoring overall research activity and career development. Annual research reviews for staff (including fixed-term research staff) look back at activity over the previous year (publishing, grant applications, PhD supervision, impact activities) and agree future plans. They are also an opportunity to discuss any issues affecting performance. Outcomes are reported to the HoD, highlighting individual or generic issues requiring attention while ensuring that departmental policy and practice maximise performance.

Within the university, there is strong commitment to the Concordat to Support the Career Development of Researchers and a comprehensive programme for research training and support. The Unit provides a supportive and positive working environment for researchers at all career stages. As well as a mentoring scheme, there are informal processes of mutual support (e.g. reading/reviewing work) for engaging PhD students and early career staff in a motivational working environment. Generous and supportive financial arrangements within the University allow overheads from FEC grants to be shared between the Department and PIs, facilitating further research investment, teaching buy-outs, dissemination activities, PhD co-sponsorship, workshops and equipment procurement. The CLCR created state-of-the-art facilities for academic and research staff and students, has a visiting fellowship scheme (incoming/outgoing) aimed at early career researchers, holds an annual conference and a regular research methods seminar series.

The Unit accommodates staff needs relating to maternity leave, welfare issues, long-term illness and disability. The HoD works closely with Human Resources and Occupational Health to ensure that equality of opportunity is properly considered and addressed. Several staff are on fractional appointments and measures are in place to ensure that any special needs arising from being part-

time are met. The University operates a study leave system, which the Unit implements to ensure staff receive 1 semester in every 7 of leave. All established staff have had the opportunity for at least one period of study leave in the REF census period. Three substantial outputs (publications, research grant applications, fieldwork or data collection) are expected from a leave period. Extended periods of research leave have resulted from buy-outs and external fellowships: **Bradshaw's** Leverhulme Major Research Fellowship (2008-11) paid for a replacement lecturer (**Dickinson**), while **Phillips'** award of an AHRC Fellowship (2012-13) led to a teaching fellow appointment. More generally, overheads on FEC grants in Human Geography have been used to finance teaching fellows to free up staff time to deliver funded research, while in Physical Geography they have been used for additional technical support.

i. Research students are an intrinsic part of our vibrant research community. Since RAE2008, PhD numbers have almost doubled due to the receipt of studentships from competitive sources including research councils (e.g., ESRC, NERC, including CASE awards), the academy (e.g., HEA), international organisations (e.g., Commonwealth Scholarship/British Council; Canadian Social Sciences and Humanities Research Council; CONACyT, Mexico), bilateral agreements (e.g. with Soran University, Kurdistan) and overseas governments (e.g. Libya, Nigeria, Brunei, Saudi Arabia, Ecuador). The award, in 2011, of an EU FP7 Marie Curie Initial Training Network 'GIONET' funded 14 PhDs (10 in the Department), while the University and College awarded us 10 internally funded PhDs over the census period. The Unit also benefits from ERDF IRSA awards which currently co-fund 2 PhD students working with a regional small company and an NGO. Future sustainability of studentships will be facilitated by the Unit's inclusion in two Doctoral Training Partnerships: (i) the Midlands 3 Cities AHRC DTP funds 205 PhDs across the consortium, with institutions matching on a one-to-one basis, thereby delivering 410 arts and humanities studentships; (ii) the NERC-funded CENTA DTP consortium will receive 240 studentships over 5 years, all with institutional match-funding, to deliver training in environmental research. We also participate in the College of Social Science's Leicester DTC and are planning an application for the next round of ESRC DTCs.

All PhD students have office space and use of state-of-the-art laboratory and high performance computing facilities. Each student has at least two supervisors and supervision proceeds in line with the University Postgraduate Code of Practice, supported by a dedicated progress committee. Inexperienced supervisors attend University Staff Development courses (e.g. on Supervising Doctoral Candidates) and are twinned with more experienced staff. Individual PhD training programmes are composites of complementary Departmental, College and University courses, supplemented by training activities run with Midlands Universities. PhD students deliver an assessed research report and seminar to the Department at the end of Year 1 and take part in a local student-led conference in Year 2. They also participate in Departmental research seminars and Research Group meetings, which offer further opportunities to discuss and share ideas. We encourage international conference presentations and external collaborations, as well as publication and impact-related activities, as appropriate. Recent successes include: awards in 2008 (Hadfield-Hill), 2009 (Moore) and 2013 (Palmer, Burwell) at the University Festival of Postgraduate Research; President's Cup for best paper at RSPSoc 2009 (Ghent); Rufford Grant for Nature Conservation 2009 (Graham); Frank Knox Fellowship at Harvard University 2012 (Morrison); publications in top journals (e.g. Barker in *Antipode*; Alexander in *Journal of Photogrammetry and Remote Sensing*; Ghent in *Journal of Geophysical Research–Atmospheres*); and journal guest editorship (Palmer for *Remote Sensing of Environment;* Barker for *Antipode*).

d. Income, infrastructure and facilities

Income: In line with our research strategy, we generate a high level of research income despite the relatively small size of our Unit. Due to the interdisciplinary character of our research we have a wide portfolio of income sources, including the European Commission, European Regional Development Fund, NERC, ESRC, AHRC, EPSRC, Royal Society, British Academy, Leverhulme Trust, DEFRA, National Trust, Darwin Initiative, industry and charitable sources. The annual value of research awards has grown steadily over the past 4 years and in the last 2 years has exceeded targets set within the University that are benchmarked to other Geography departments in the Russell and (former) 1994 Groups. This success reflects the progressing career structure in the

Unit as mid-career and senior staff tend to attract greater funding, although several junior staff have also had significant success (e.g., **Carr**, **Brown** and **Upton** have won Leverhulme awards). This success is also a reflection of dynamic collaborations, internally and externally; effective leadership by and support from Research Group Directors; and sympathetic management of staff workloads to prioritise research time and grant writing activities.

Major competitive research awards to staff as Principal Investigators over the census period include GIONET, EU (**Balzter**); Greenhouse gas fluxes from UK lowland fens, NERC (**Balzter**); Development of structure in coarse-grained river bed sediments, NERC (**Powell**); Novel biomolecular indicators of dryland landscapes, Leverhulme (**Carr**); Global gas security, UKERC (**Bradshaw**); Spatial characterisation of wind impacts in urban environments, EPSRC (**Smith**); Leverhulme Major Research Fellowship: Global energy security (**Bradshaw**); Adaptations to rural communities living with climate change, RELU (**Phillips**); AHRC Fellowship: Gentrification of rural communities across the 20th century (**Phillips**); Non-stop apartheid, Leverhulme (**Brown**); Values and valuation: new approaches to conservation in Mongolia, Darwin Initiative (**Upton**).

Examples of collaborative research include investigation of: millennial-scale peatland carbon dynamics, NERC (**Page,** led by Charman, Exeter) and tropical wetland methane fluxes, NERC (**Page**, led by Gauci, Open; **Berrio/Page**, led by Teh, Aberdeen); greenhouse gas emissions from UK lowland peatlands, DEFRA (**Balzter/Kaduk/Page**, led by Evans, CEH); greenhouse gas emission patterns and controls in Arctic tundra (**Oechel**, led by Zona, Sheffield); Geoland II project, EU (**Balzter/Tansey**, led by Astrium, Germany); fire mapping, ESA (**Tansey**, led by Alcala Univ., Spain); development and demonstration of a web-based, renewable energy rating platform, EU [**Tate,** EAGLE consortium]; the ESRC new urbanisms/new citizens project (**Kraftl/Jarvis**, led by Warwick); two AHRC Connected Communities co-design projects (**Phillips**, led by Brunel and Keele); an EPSRC/Dept. for Science & Technology India 'Bridging the urban and rural divide' renewable energy project (**Phillips,** led by Nottingham and IISc Bangalore).

The Departmental strategy for generating grant income provides staff with the necessary time, resources, academic and administrative support to produce high quality, innovative research applications that address contemporary RCUK and EC agendas. Research groups discuss research funding strategies 1 to 2 years in advance and raise any workload issues with the HoD. The Departmental workload model includes time allocation for grant writing, scaled to the size of the bid. The Unit also operates an internal peer review procedure within Research Groups to ensure that bids are thoroughly evaluated prior to submission, in line with University guidelines and increasingly important given RCUK demand management policies.

Research infrastructure and facilities: Geography is housed in a large, substantially refurbished building containing high-quality infrastructure adjacent to research facilities in other College departments. Ten technical, computing and administrative staff support our research activities. Core facilities are monitored and upgraded on a rolling basis. During the census period, investment from a HEFCE CETL, University Research Infrastructure Funds (RIF), the College and grant income has transformed our research infrastructure. In addition, the university has invested substantially in the CLCR. Over the REF census period, investment in our research infrastructure and laboratory and field equipment amounts to **more than £2 Million**. This has included:

- A £350K (2012) Optically Stimulated Luminescence (OSL) dating laboratory with Risø equipment to develop chronological frameworks for Quaternary palaeo-environmental research and studies of long-term landscape evolution. The lab is supported by field equipment including gamma spectrometer and specialised dormer coring equipment (RIF funding).
- A £130K (2012) palaeo-environmental laboratory and microscope suite (RIF funding).
- A £180K (2012) thin section laboratory with automated sectioning and polishing equipment. (RIF and College funding).
- An £88K (2009) Leica HDS 3000 Terrestrial Laser Scanner and Faro Laser Scan Arm with Cyclone and Polyworks Software (2011). (College funding).
- A £37K (2013) AQ2 discrete chemical analyser (SEAL Analytical) with total nutrient digestion block for analysis of soil and water samples (College funding).
- An £18K (2011) ASD Fieldspec HandHeld 2 portable advanced near-infrared field spectro-radiometer to derive precision reflectance, radiance and irradiance spectra. (College funding).

- £650K investment in the CLCR, including a 30-seat laboratory housing PhD students and post-doctoral staff, a seminar room, meeting space and staff offices. (University funding).
- A state-of-the-art Human Geography qualitative methods laboratory with equipment for production and analysis of visual and oral data, small library and meeting space (Dept. funding).
- Two field stations in the Fens (£300K; funded by the College, RIF and NERC), each including full eddy covariance flux tower systems to measure trace gas (CO_2, CH_4), water and energy fluxes between land surface and atmosphere, including 3-dimensional sonic anemometers; LI-COR open path CO_2/H_2O and CH_4 analyzers; net radiometers; krypton hygrometers; self-calibrating soil heat flux plates and multiplexing LI-COR soil respiration chambers. We also manage a third flux tower in the Fens on behalf of NERC-CEH.

These new investments supplement existing but upgraded facilities, including: a SRIF-funded, laboratory dedicated to environmental stable isotope research using organic compound specific biomarker ($\delta^{13}C$ & δD) analyses, determination of $\delta^{13}C$, $\delta^{15}N$, $\delta^{18}O$ and δD on bulk organic samples, and isotopic composition of carbonates, water and air, with a quadrupole GC/MS for biomarker analysis in complex organic matrices; (ii) a sediment laboratory (for sieving, core extrusion etc.) equipped with atomic absorption spectrophotometer, laser particle size analyser, walk-in cold store and a range of equipment for measuring soil chemistry, magnetic susceptibility and physical properties; (iii) a rainfall simulation laboratory and hydraulics flume. As a result of CETL investment, the Unit has an updated 3D stereo Virtual Reality Theatre supporting geo-visualisation in areas of GIS, remote sensing and surveying. We also support innovative GIS research by maintaining a geospatial equipment pool of: field computers, GPS/differential GPS, GPS-enabled smartphones/tablet computers, GPS-enabled digital cameras, SLR/video cameras, data loggers, temperature and soil moisture sensors. For environmental modeling, staff have access to a £2 M University High Performance Computing Facility (ALICE), while the Unit runs servers for data storage and archive purposes. Staff and PhD students have access to College facilities: mechanical workshops, advanced microscopy facilities and other analytical equipment as required. The Unit retains a Cartographic Unit, providing high quality mapping and design services for staff research publications, and maintaining our departmental webpages and multimedia tools (e.g. Twitter and Facebook) used to promote our research.

e. Collaboration and contribution to the discipline or research base

The majority of the research within the Unit is collaborative, working within or across our Research Themes and Groups, or as part of larger cross- and multi-disciplinary teams within the University or with other UK and international researchers. Examples that demonstrate the breadth and reach of our research collaboration and its contribution to the discipline are highlighted here.

In Physical Geography (*Catchment Dynamics*), **Powell** and **Tate** are collaborating with Reid and Rice at Loughborough and Wood at City on a NERC-funded project to better understand the implications of bed-surface structuring in coarse-grained alluvial rivers for near-bed flows and bedload flux. This is generating improved understanding of bed surface adjustments to changing water and sediment supply regimes. Newly appointed **Whelan** offers a unique combination of modelling and experimental expertise in active, complementary external collaborations on the environmental fate and transport of pollutants with Engineering at Warwick (Guymer), Geography and Geology at Durham (Burt, Worrall), Engineering at Bristol (Howden) and Cranfield (Corstanje, Holman, Villa) in the UK, with the University of Milan (Gandolfi) in Italy and the Norwegian Institute of Air Research in Oslo and Tromso (Breivik, Warner; with funding from the Norwegian Research Council). The *Climate-Ecosystem Interactions* theme involves research collaborations that span the globe. For example, **Page** led the Carbopeat Project (EU) that investigated carbon-human interactions in tropical peatlands involving 7 institutions in Europe and SE Asia, and resulting in high impact publications that raised awareness of the scale of greenhouse gas emissions from drained tropical peatlands. **Balzter** was involved in the CARBOAFRICA consortium (EU-FP6) which led to improved estimates of greenhouse gas emissions in Sub-Saharan Africa, and in the GEOLAND-2 consortium (EU-FP7) that developed the Copernicus/GMES Land Monitoring Core Service. **Kaduk** and **Balzter** were involved in a NERC-funded project (with Wooster, Kings) which enabled characterisation of the spatio-temporal dynamics of boreal forest fires and improved knowledge of their impact on carbon fluxes. Recent advances by the CLCR team, led by **Balzter,** include measurement of coloured dissolved organic matter and chlorophyll content in lakes using ship-mounted ultraviolet fluorescence LiDAR; a

method for terrain-corrected savanna tree canopy height retrieval using ICESAT-GLAS LiDAR and a remote sensing technique to estimate spatial-temporal patterns of urban anthropogenic heat discharge.

Much of our geoarchaeological and palaeoenvironmental research involves national and international interdisciplinary collaboration. **McLaren** is working with Archaeology at Cambridge on the Niah Cave project in SE Asia and with Archaeology at Leicester on the Fezzan in Libya (along with Reading, Lancaster and Benghazi universities) to provide unique insights into Quaternary environmental change in low latitudes. **Carr** and **Boom** have long-standing collaborations in South Africa (Cape Town and Free State Universities; S. African Council for Geoscience) to establish, for the first time, links between climate and stable isotope fractionation in soil and plant materials and hyrax faecal pellets as an empirical basis for semi-arid environmental reconstruction (ERC funding). **Carr, Boom** and **Berrio** are working together with Armitage (Royal Holloway) and Bilbao (Caracas) on a project examining the dynamics of fossil sand dunes in the Orinoco to elucidate the Quaternary history of that region (National Geographic funding).

Within the GIS group, one of the largest in the UK with 9 staff, **Tate** and **Jarvis** lead the way in the area of pedagogic research on Spatial Literacy through the SPLINT-CETL. Both are Co-I's on an ESRC-funded project 'Quanting' and, with RGS funding, research into quantitative methods teaching in geography to address critical skills shortages (Harris, Bristol). **Tansey** has secured funding at European level with ESA and the EC to develop global burned area maps. He sits on a UN advisory panel for terrestrial climate variables and an interspace agency panel on calibration and validation of satellite products. **Comber,** with **Jarvis** and **Kraftl**, led research into methods for assessing community resilience and social cohesion (Boeck, De Montfort; Green, Leicester) resulting in strategies for local community engagement. **Comber** with **Fisher** has led JNCC/Defra funded research into monitoring landscape change using fuzzy sets, shifting policy perceptions of how landscape is conceived. **Comber** (with Carver, Leeds) has developed methods for CNPA, LLTNPA and Scottish Natural Heritage to quantify the value of wild landscapes that are now incorporated into local planning processes. **Comber** is also part of an EU COST consortium on 'Mapping and the citizen sensor' (Foody, Notttingham) and is developing research, for the National Trust, into coastal land use processes that drive variations in land use changes.

In the Human Geography Group, **Kraftl** has been involved in several AHRC/EPSRC/ESRC funded projects working with architects, ergonomists and sociologists. These projects have pioneered new conceptual and methodological approaches for studying young people's use of and participation in architectural spaces (e.g. focusing on everyday practices and emotions). These approaches have been well-cited and adopted by academics in several disciplines, and led to many international invited presentations and PhD training seminars (e.g. in Finland, Australia, New Zealand, Lithuania, Brazil, Portugal). **Lees** is PI and working with the London Tenants Federation and others on a Antipode Activist Scholar Award on developing alternatives to the state-led gentrification of council estates in London. They are in the process of publishing 'An Anti-Gentrification Toolkit for London', which has already attracted international attention from the City of Vancouver's Planning Department. **Bradshaw** is PI on a NERC/UKERC funded project examining the 'Geopolitical Economy of Global Gas Security and Governance: Implications for the UK' that also involves Bridge (Durham), Bouzarovski (Manchester), Watson (SPRU-Sussex) and the Oxford Institute for Energy Studies. The project has helped to establish a space for energy geographies research that is now formalised in the RGS-IBG Energy Geographies working group.

Bennett is working with colleagues at the Open University on an ESRC-funded project 'Living with Multiculture: the new geographies of ethnicity and the changing formation of multiculture in England.' The project repositions debates on multiculture away from segregation and withdrawal through a focus on informal multiculture, testing and developing theoretical concepts such as conviviality, encounter and community that pioneers methods at the psychotherapeutic-geographical interface. **Phillips** has been involved in research projects within the AHRC Connected Communities programme, working amongst others with artists (Speed, Edinburgh), a computer scientist (Higgett, De Montfort), designers (Baurley and Lam, Brunel), management studies (Keleman, Keele; Lim, Leicester), historians (Gunn, Leicester) and sociologists

(Walkerdine, Cardiff). These projects have demonstrated a series of new iterative methods of community engagement that have attracted interest from community groups and policy makers as well as being highlighted in AHRC Showcase events. **Upton** is involved in a series of projects examining different aspects of environmental sustainability in Central Asia, Mongolia and East Africa. A Darwin-Initiative project on 'Values and Valuation: New Approaches to Conservation in Mongolia' involves UK and in-country ecologists, environmental economists, social scientists and agricultural scientists, as well as Mongolian policy makers and leading NGOs and environmental activists. **Upton** also works with Harper in Biology at Leicester on a series of projects in the Lake Naivasha area, Kenya and is a participant in a major international and multidisciplinary research project the East African Great Lakes Observatory (EAGLO) (DFIC/ESRC/NERC). These projects contribute to critical disciplinary and inter-disciplinary debates over socio-ecological and culturally appropriate approaches to environmental governance and sustainability.

Cross-disciplinary research within the Unit is illustrated by the RELU project (ESRC/ NERC/BBSRC) on 'Adapting to Climate Change' which involved staff from all research groups— **Jarvis, Phillips, Kaduk, Comber, Pickerill** and **Page**, as does the 'Bridging the Urban Rural Fringe' (BURD) project. These two projects are developing important new understandings of the potential for and challenges associated with a transition to low carbon rural societies and of the role anticipatory activities play in everyday lives.

Members of the Unit also actively engage in consultancy work with industry and other non-academic organisations. For example, **Bradshaw** participated in Scenarios Planning for Shell and wrote UK Gas Security report for Friends of the Earth. **Lees** was an invited expert witness to the GLA's new Regeneration Committee where she presented on what regeneration is and should be in the context of London. **Balzter** has worked with the European Space Agency on forest biomass mapping and Sentinel convoy mission concepts. **Page** has undertaken research consultancy for Deltares on management of tropical peatlands and on greenhouse gas emissions from plantations on peat for the International Council for Clean Transportation. **Whelan** has worked with regulators (e.g. the Environment Agency, Chemicals Regulation Directive, Drinking Water Inspectorate) and industry (e.g. Unilever, European Silicone Centre, Severn Trent Water) on a range of applied projects, primarily to understand the environmental behaviour of organic pollutants. As well as engaging with the impact agenda, many of these applied projects have generated international journal papers and formed the basis for research funding applications.

In terms of contributions to funding councils, professional associations and learned societies, several staff have served on research council peer review colleges (**Kaduk, Balzter**, **Powell** for NERC; **Kraftl, Phillips, Lees, Brown** for ESRC); **Balzter** is a member of the Steering Committee of the NERC Airborne Remote Sensing Facility; **Bradshaw** is a member of ESRC's Research Committee; **Madge** is a member of ESRC's NCRM Restore Advisory Board for Sustaining Online Resources. **Bradshaw** was a Council member of the Royal Geographical Society from 2009-10 and from 2010-13 its Vice-President for Research and Higher Education. In 2012, **Bradshaw** was also a member of the Steering Committee for ESRC's International Benchmarking Review of Human Geography, while **Lees** made input specifically into the Urban Geography review and **Phillips** to the Social and Cultural review. **Page** has held a Visiting Professor appointment at the National University of Singapore and is a Lead Author, along with **Tansey** (Contributing Author), for IPCC guidance on greenhouse gas emissions from drained organic soils. **Bradshaw** is a Senior Research Fellow at the Centre for Russian and East European Studies at Birmingham University and a Visiting Research Fellow at the Oxford Institute of Energy Studies. The Unit is home to a number of journal editors: **Bradshaw** is editor-in-chief for *Geography Compass* and co-editor of *European Urban and Regional Studies*; **Kraftl** is co-editor of *Children's Geographies;* **Pickerill** is co-editor of *Antipode* and *Social Movement Studies*. Those on editorial boards include **Balzter** (*Remote Sensing*), **Berrio** (*Frontiers in Ecology and Evolution*), **Fisher** and **Comber** (*International Journal of Geographical Information Science*), **Tansey** (*International Journal of Remote Sensing)* and **Upton** (*Society and Natural Resources*).

In summary, since RAE2008 the strategic development of our research environment has delivered real success across the board and our future strategies aim to build on this achievement to make us one of the best Geography Departments in the country and indeed internationally.