Institution: University of Southampton

Unit of Assessment: 17B Geography and Environment

a. Overview

Geography and Environment (G&E) at Southampton is one of five Academic Units (AUs) within the Faculty of Social and Human Sciences. Our submission comprises a diverse and dynamic group of 32 academics, 25.55 FTE post-doctoral research staff (PDRS) and 66 Postgraduate Research (PGR) students. Since 2008 we have:

- Published highly influential work. Of our 122 REF-submitted outputs, the 118 journal articles have (October 2013; Web of Knowledge) accrued 1264 cites, at an h-index of 20 (the h-index of the UK's leading geographical journal, *Transactions IBG*, for this same period is 21;
- Achieved a total research income of £8.99M; mean annual income of £1.80M p.a. over the REF period; £2.05M in 2012/13; and growth of annual income of more than 60% since RAE2008;
- Grown the number of our post-doctoral research staff by 46% in the same period;
- Doubled the size of our Graduate School, with the numbers of PGR students steadily increasing from 32.5 (March 2008) to 66 currently (31 July 2013).

G&E is structured into five Research Groups, each aligned with research specialisations that connect to clear funding streams and global research agendas (*see* **Section b**). Each group has a Leader who manages core staff, supports the aspirations of ECRs, and promotes group research. Our GeoData brand, which fosters applied environmental research, is fully integrated across all Research Groups. All staff, including PDRSs and PGRs, belong to at least one group; some are Associate Members of other groups to recognise cross-cutting interests:

(1) *Economy, Society and Space* (**ESS**) focuses on economic geography, with special concerns for retail geography, consumption and production networks, urban governance, and economic change. *Core members*: **Sunley** (Leader), **Clarke**, **Reimer**, **Roe**, **Tselios**, **Wrigley**, 3.0 PDRS, 13 PGRs. *Associates*: **Deverteuil**, **Boyer**.

(2) *Population, Health and Wellbeing* (**PHeW**) specialises in the spatial analysis of census and population data and in health geography. *Core members*: **Martin** (Leader), **Boyer**, **Cockings**, **Deverteuil**, **Moon**, **Power**, **Tatem**, **Wright**, **Wardrop**, 5.8 PDRS, 9 PGRs. *Associates*: **Atkinson**, **Roe**.

(3) *Global Environmental Change and Earth Observation* (**GECEO**) works on global environmental change, its impacts on ecosystem services and biodiversity, and human responses to change. *Core members*: **Atkinson** (Leader), **Dash**, **Peh**, **Petts**, **Roberts**, **Tompkins**, 6.0 PDRS, 21 PGRs. *Associates*: **Tatem**, **Wardrop**, **Wright**.

(4) *Palaeoenvironments* (**PLUS**) leads on reconstructing the dynamics of past ecological and human-ecological systems. *Core members*: **Brown** (Leader), **Dearing**, **Edwards**, **Hughes**, **Langdon**, 4.0 PDRS, 10.5 PGRs. *Associates*: **Leyland**, **Sear**

(5) *Earth Surface Dynamics* (**ESD**) focusses on fluvial geomorphology, with complementary strengths in glacial and dryland environments. *Core members*: **Darby** (Leader), **Carling**, **Hart**, **Leyland**, **Nield**, **Sear**, 6.75 PDRS, 12.5 PGRs. *Associates*: **Brown**, **Dearing**.

Management of research within G&E is led by a Director of Research and Enterprise who chairs the Research and Enterprise (R&E) Committee that coordinates the activities of the five Research Groups and Graduate School. Membership of the R&E Committee comprises the five Research Group Leaders, the GeoData Research Director, Graduate School Co-Directors (for physical and human geography), and representatives of research support services and PDRS.

b. Research strategy

Achievement of Strategic Aims (2008-2013): Our strategic vision since RAE2008 has been the pursuit of excellence. We aim to be world-leading for the quality and impact of our research. To achieve this, our strategic plan for research has focussed on (i) ***engaging with key disciplinary topics***, by building on existing research strengths and driving forward new initiatives informed by emerging research agendas and policy needs, and; (ii) ***enhancing our research culture***, by developing our graduate school and ensuring support for research excellence.
These aims built on our RAE 2008 submission where we signaled our intention to **engage with**

key disciplinary topics by:

(1) *Developing research on social and environmental aspects of global change*. With support from the EU, **Atkinson** and **Dash** have worked on vegetation phenological response to climate change, while the appointments of **Roberts** and **Peh** have extended this focus to vegetation fire mapping and forest biodiversity and structure. The appointments of **Tompkins** and **Petts** have facilitated inter-disciplinary research with GeoData that has attracted major funding (e.g. ESRC/DFID; EU) for work on the social response to global change and natural hazards.

(2) *Developing our well-established research on palaeoenvironmental records*. Supported by a continuity of large NERC and EU projects (ECOCHANGE, PReCIP, PATAGON, LAC, ~£0.85M) and 4 small NERC grants, investigations of contemporary and past socio-ecological systems including **Dearing** and **Langdon**'s work on tipping points in lake ecosystems and **Hughes**' on mire ecology. **Brown** on forensic archaeology and **Edwards** on molecular approaches to biodiversity surveys, have represented important innovations in their fields.

(3) *Working on novel environmental sensing technologies*. With support from EPSRC, Leverhulme Trust, and the Royal Society, **Nield** and **Hart** have, respectively, pioneered the use of (a) Terrestrial Laser Scanning (TLS) to characterise beach and desert surfaces, and; (b) wireless subglacial probes to study processes of till formation and ice mass dynamics.

(4) *Developing our research on the links between health and poverty*. **Tatem**'s appointment brings innovative expertise in big data, health and mobility, while awards from ESRC, the British Academy, and NERC/DfID have supported **Moon**'s work on ethnicity and tobacco consumption, **Deverteuil**'s work on urban disadvantage, and **Wright**'s work on access to safe drinking water (*see* Impact Case Study [ICS]).

(5) *Continuing our work on the analysis and development of census data*. Supported by ~£1M of ESRC funding we have played key roles in the design and production of 2011 census data (*see* ICS): **Martin** led the ESRC *Census Programme* (2002-2012) and he now co-directs its successor, the *UK Data Service*.

(6) *Developing our research on economic geography*. The scope of our expertise has been broadened through the appointment of **Tselios** (political decentralisation and inequality), with awards from the British Academy and ESRC supporting major innovations including: **Sunley**'s work on resilience and evolutionary economic geography, **Clarke**'s work on ethical consumption, **Roe**'s studies of food supply chain governance, and **Reimer**'s work on innovation in the creative industries.

(7) *Developing our work on the implications of transnational retail and consumption practices and spaces*. ESRC and commercial funding of ~£1M has supported **Wrigley**'s influential work on the expansion of Transnational Corporations (TNCs) in the US, retailers and corporate social responsibility and the impact of large stores on the UK High Street (*see* ICS).

(8) *Creating an entirely new Research Group focused on geographical perspectives on population and health*: The creation of **PHeW** has brought together our methodological and substantive research strengths in this field, hosting the key journal *Health and Place,* leading the University's *Population Health* Strategic Research Group and providing a globally-significant concentration of expertise.

In addition to substantial achievements in relation to our graduate school (*see* **Section c, Research Student**), the ***research culture*** of the Unit has been strengthened and enhanced by:

(1) *A staffing strategy* that has focused on (a) strengthening expertise by *making excellent appointments* at all levels, including PDRS (PDRS numbers have risen from 17.5 in RAE2008 to 25.5 as of 31st July 2013), while (b) promoting *career development and reward* to maximise the potential of existing staff (*see* **Section c, Staffing Strategy**).

(2) Adjusting our *research group structures*, by moving from three broad research themes to five more focused Research Groups. This move enhanced alignment with external (RCUK, EU) themes and funding opportunities, as well as strong engagement with the University's new interdisciplinary Strategic Research Groups (USRGs; *see* iii). The GeoData brand was integrated into the research group structure to foster applied and policy facing research (*see* **REF 3a**) and to assist in diversifying income (*see* **Section d**).

(3) *Developing our collaborative and inter-disciplinary research ethos* by collaborating with external research partners, and by leading and participating actively in research networks, both in the UK and overseas (*see* **Section e, Collaborations**). Since 2008 an important development has been the creation of University Strategic Research Groups (USRGs) which

have provided the 'critical mass' needed to address global challenges and through which we gain synergy with other disciplines. We lead *Sustainability Science at Southampton* (**Dearing**) and *Population Health* (**Moon**), and participate actively in *Work Futures* and *Complexity Science*, as well as the *Southampton Marine and Maritime Institute* (SMMI) and *Institute for Life Sciences* (IfLS). Specific examples of how the USRGs have helped build successful consortia are provided in **Section c, Research Students** and **Section d**, **Research Income**.

(4) *Offering financial incentives* whereby all staff receive a baseline annual research budget, with a 'top up' based on measured research activity in the previous year. Staff also retain a proportion (10%) of research grant overheads which, together with any consultancy funds, can be carried over from year to year to enable reinvestment in research activities such as conference attendance or pump-priming new or risky work.

(5) *Developing the public and societal impact* of our work. **REF 3a** sets out our comprehensive strategy for impact. Major media coverage of our research includes **Sear**'s work on the excavation of Dunwich (C4 *Time Team*, February 2012), **Brown**'s work on forensic palaeoecology (BBC R4 *Material World*, May 2012), **Moon**'s research on the social impact of cadet forces (*Prime Minister's Office* website, June 2012), and **Dearing** and **Langdon**'s *Nature* paper on the early identification of eutrophication (*China Daily*, November 2012).

Future Aims and Goals: Over the next five years our Research Groups will advance knowledge using research intelligence from our networks and support services and their leading positions in their areas of expertise. We envisage that:

- **ESS** will maintain its long-standing specialism in economic geography, developing work on evolutionary economic geographies, economic resilience, innovation and commodity chains. It will also enhance its commitment to socio-cultural geographies with specific reference to urban governance, mobilities and food geographies.
- **PHeW** will continue work on time-space population geographies and future population measurement systems. **Martin's** deputy directorship of the new (awarded in October 2013) £7.6M ESRC Administrative Data Research Centre for England (ADRC) will significantly enhance research on novel datasets and engagement with non-academic data providers. PHeW will also continue to grow its global leadership in population health through its international population and disease mapping projects, its work on health-related behaviours, and its focus on vulnerable and marginalised groups.
- **GECEO** will extend its research on Bayesian space-time geostatistics and agent-based models for characterising environmental systems; climate change drivers of vegetation phenology and fire and their effects on the carbon cycle, and the development, sustainability and management of ecosystem services.
- **ESD** will extend its work on the response of geomorphic systems to global climate drivers that are of international concern. It will work on water and sediments in the monsoon-affected rivers of Asia; employ TLS to develop new insights into the factors controlling dust emissions; and investigate the long-term legacy of river morphological changes induced by extreme events in terms of their effects on altered flood risk and resilience.
- **PLUS** will develop new multiproxies to investigate the sustainability of socio-ecological systems. This includes developing geo- and bioarchaeology in collaboration with Archaeology at Southampton and internationally through work on human palaeoecology, stable isotopes, molecular and genomics approaches to palaeoenvironments.

There will be extensive collaboration across all groups and we anticipate research income growing to over £2.5M p.a. (by 2015) from a diversified range of sources encompassing research councils, governmental and industrial funders. We will continue to publish leading monographs and in the most influential journals. We envisage further growth in PGR numbers (to ~75) and a PDRS complement of ≥30. Research impact will be emphasised, with each Research Group seeking to develop major societal impacts in at least two areas. We will strengthen international collaborations through the University's membership of the Worldwide Universities Network (WUN), focussing on quality partnerships underpinned by funding and/or track records, and participate in large interdisciplinary funding bids via our membership of USRGs and leadership of the ESRC ADRC.

c. People, including:

i. Staffing strategy and staff development

Staffing Strategy: Since RAE2008 we have sought and achieved measured change in staffing, alongside the development of existing staff, to ensure stability in our research direction. This policy has created a coherent and forward-looking work environment with low staff turnover. Recruitment has focussed on sustaining existing strengths and developing our new priority areas (*see* **Section b**) in *environmental change* and *health geography*:

(1) *Sustaining Existing Strengths*: **Tselios** was appointed (2012) to complement existing expertise in regional economic development. **Leyland,** (initially RCUK Fellow (2011), permanent academic post (2013)), supplements existing strengths on sensor technologies, simulation, and the response of geomorphic systems to climate change.

(2) *Developing Priority Areas*: Our commitment to *environmental change research* is evidenced by the appointments of **Dash, Peh** and **Roberts** (Dash was formerly on a fixed-term contract but moved to a permanent post in 2008), while our work on *environmental social science* has been enhanced by the appointments of **Petts** and **Tompkins** (in 2010 and 2011 respectively, the former as Dean of Faculty). Appointing **Power** (in 2011) and **Tatem** (recruited from the University of Florida in 2012) represents a similar response to our commitment to *health research*. **Wardrop** (**PHeW**) holds an MRC Population Health Scientist Fellowship and, alongside Tatem and Atkinson, expands our capability on communicable disease epidemiology.

Career Development of Established Staff: Staff development is managed through annual Personal Performance Development Reviews (PPDRs) conducted by the relevant Research Group (RG) Leader. PPDRs set agreed expectations to help plan future activity and career development, with due allowance made for special circumstances. All staff maintain individual research plans, reviewed annually in developmental one-to-one meetings with an independent Senior Colleague. Through these processes, and when appropriate, RG Leaders and Senior Colleagues encourage staff to submit cases to the Promotions Panel which meets to consider applications and to pro-actively identify staff for promotion. Since 2008 **Darby** has been promoted to Professor, **Langdon** and **Hughes** to Reader, and **Dash, Deverteuil** and **Wright** to Senior Lecturer. As discussed in **Section b** we provide financial support to staff through individual research budgets and overhead returns. We also offer research leave: staff take one semester of sabbatical in every eight, aggregating to 39 semesters of leave since 2008. Further opportunities for research leave are afforded by (i) using external funds to enable 'buy-out' from other duties (*e.g.* **Martin**, **Tatem**, **Wrigley**) and (ii) our policy of supporting applications for external fellowships (*e.g.* **Moon's** Seelye Fellowship (Auckland), **Langdon's** Erskine Fellowship (Canterbury, NZ), and **Atkinson's** Visiting Fellowship at Green Templeton College, Oxford).

Career Development of ECRs: A total of 3 Early Career Lecturers, 25.55 PDRSs and 2 Research Fellows participate in the Unit's thriving ECR support group (led by **Wardrop**). The Director of Research meets the group every 6 months and all ECRs are assigned a Senior Colleague as a mentor to guide them through probation and to offer advice on research plans. Faculty support is offered via an induction programme introducing the Concordat, Vitae and relevant professional services (Finance, Research Support, HR, *etc.*). We also offer ECR lecturing staff reduced teaching and administrative loads (30% of established colleagues' loads) and encourage joint supervision of PGRs (*see* **Section c, Research Students**). Financial support for networking and/or to pump-prime research is provided via an enhanced (£800, versus £500 for established staff) annual research budget and two competitive schemes: (i) University *Adventures in Research* Grants, and; (ii) the Faculty's *Strategic Interdisciplinary Research Development Fund*. Our ECRs have, through close mentoring, enjoyed particular success in these schemes with 5 (of 6 applications) successful bids since 2011/12.

Equality and Diversity: The University's commitment is recognised by a Bronze Athena SWAN Award, held since 2006, and we have committed to developing a G&E application for Bronze status in the next two years. In the REF period, equality of opportunity has been effectively delivered through the University's Equality Plan (2010-2013) which establishes equality requirements and promotes monitoring and accountability through data collection and publication, as well as developing training programmes to improve diversity awareness. Within G&E, all staff enjoy the same privileges regarding study leave, access to resources and allocation of research support, and we play an active role in the Southampton branch of Women in Science Engineering and Technology. Half of the current members of the G&E Management Group are women.

Research Ethics: All research involving human participants has to be approved in advance by the Faculty Ethics Committee (FEC). The University (through its Research Support Office, Legal Services and Research Governance Office) ensures that members of FEC are kept up to date with all relevant legislation, Codes of Practice, *etc*., that affect ethical aspects of the research process.

ii. Research students

The Geography and Environment Graduate School (GEGS) is a large, diverse, international and multi-disciplinary community that spans the full range of our research interests, with 88% (97% when excluding ECRs) of submitted staff supervising 66 PhD-researchers-in-training. Thirty-four doctorates have been awarded in the REF period, at a rate (9 in 2011/12 and 10 in 2012/13, *cf*. 6 pa during RAE08) that has increased commensurately with growth in PGR numbers. GEGS is led by two co-directors, covering physical and human interests, respectively. They are supported by a dedicated GEGS administrator and a Graduate School committee who oversee arrangements for the recruitment, training, supervision and progress monitoring of graduate students.

Working Environment: With sustained PGR growth we were able to bid successfully for £87k of Faculty investment to create a purpose-built facility to house GEGS. Opened in 2010, the 'Hub' offers individual workstations, open plan space for Year 1 students and shared office space for Years 2+. The 'Hub' has proved a great success, with the inclusion of all students in a single space promoting collaboration and creative thinking within and across Research Groups.

Recruitment: Numbers have increased steadily from 32.5 FTE (March 2008) to 66 (October 2013), with growth achieved across all Research Groups (RGs) via four main sources of funding:

(1) *RCUK Studentships* (20% of current Year 1-4 students). GEGS actively participates in 3 of the doctoral training centres (DTCs) hosted at the University. The ESRC DTC addresses areas covered by **PHeW** and **ESS**, while two EPSRC DTCs (in *Complex Systems Simulation* and *Web Science*) cover the interests of **GECEO**, **ESD** and **PLUS**. During the submission period GEGS (*via* **Wrigley** of **ESS**) was (2008-12) lead partner of the ESRC RIBEN (Retail Industry Business Engagement Network), in which five students pursued 'CASE' projects in retail geography. Additionally, three students hold tied/quota NERC studentships (**PLUS** and **ESD**). Looking forward, we are a key partner in Southampton's successful bid ('SPITFIRE', led through the *Sustainability Science* USRG) to host a NERC DTP (2014-23).

(2) *Overseas Students* (34% of current Year 1-4 students). Following intensive networking, we have more than doubled overseas student numbers during the submission period. Overseas PGRs are largely supported by government agencies.

(3) *External Partners* (30% of current Year 1-4 students). We provide matched funding (£350k pa in 2012/13 and 2013/14) to incentivise external partners (*e.g.* Environment Agency, European Space Agency, Mekong River Commission, Natural England, Wellcome Trust) to jointly conceive, fund and, where appropriate, supervise studentships. These projects often address policy-relevant work, offering a notable contribution to our impact strategy (*see* **REF 3a**).

(4) *Institutional Schemes* (16% of current Year 1-4 students). For PGRs whose interests align with institutional priorities, competitive awards are allocated via the University's Strategic Research Groups and Interdisciplinary Institutes. Our key roles in the USRGs (*see* **Section b**) have left us well placed to target such schemes, with GEGS winning 11 competitive *University of Southampton Vice Chancellor's Studentships* since the scheme's inception in 2010.

Training and Support: All GEGS students, including non-RCUK students, receive research training support grants to fund conferences and fieldwork, *etc*. All PGRs follow an Induction Programme, while a GEGS Handbook sets out policies, procedures and training requirements. Students work with their supervisory teams (*see* below) to identify and address subject-specific training needs. All PGRs take general skills/research training courses (all of which are mapped to the RCUK sponsored *Vitae Researcher Development Framework*), accruing training credits for their personal portfolio. The University-wide Researcher Development & Graduate Centre (RDGC) coordinates generic skills training across Faculties and runs an annual research showcase event for all doctoral programmes in the University, facilitating inter-disciplinary communication and engagement. PGRs are required to attend the Unit's seminar programme, enabling them to interact with external speakers, and follow required DTC training modules. All PGRs present at the Annual GEGS Conference, which provides a vehicle for students to receive feedback on their work and gain presentation skills. GEGS students can raise issues through a termly GEGS Staff Student Liaison Committee. PGRs also have representatives on the three main Faculty advisory groups

that deal with the Graduate School, teaching, and research.

Supervision and Student Progression: PGRs have a primary supervisor leading a supervisory team approved by the Graduate School. ECRs are encouraged to co-supervise with more senior staff; ECRs and academics new to the Unit undertake University–delivered supervisor training before they can supervise. Progress is monitored against milestones set by the student in consultation with their supervisory team. Students initially register as MPhil then, in the second year of (FTE) study, undertake a transfer examination to progress to PhD. This exam takes the form of a rigorous *viva voce* conducted by an internal examiner who is not a member of the supervisory team and based on the assessment of (at least) two draft chapters and a detailed work plan. The Southampton-developed web-based 'PGR Tracker' database provides an online record of training courses attended, supervisory meetings, reports, progress reviews and study outcomes. The effectiveness of supervisory arrangements is seen in the high proportion of PGRs who submit within four years. Our PGRs also have an excellent record of progression to high-quality careers: in consultancy (29% of PGRs since 2007), government (14%) and, notably, academia (57%; destinations include the Universities of Bristol, Columbia, Exeter, Michigan, Oxford, and Twente).

d. Income, infrastructure and facilities

Research Funding: *(NB: awards/income data reported here are current at 31 July 2013, but comparative rankings are from 2011/12 HESA data, the most recent available at time of writing)*

During the REF period, we were awarded 111 grants worth £7.09M, at an overall conversion rate of 41%. Our total income of £8.99M places us firmly in the top 10 UK Geography Departments, and is on a strong rising trend: averaged over the 5 financial years 2008/9 to 2012/13, our annual income (£1.80M) has grown by over 60% since RAE2008, rising to £2.05M in 2012/13. RCUK income (£3.83M, on which we rank 13th in our UoA) comprises 43% of our total funding, with a balanced split between ESRC and NERC. For ESRC, we have leadership roles in the *Census Programme*, *UK Data Service, National Centre for Research Methods and Administrative Data Research Centre* (**Martin**) and the *Retail Industry Business Engagement Network* (**Wrigley**). Our trajectory with NERC towards the end of the REF period has been markedly upward, with 8 awards since December 2011 at a conversion rate of 47%. Success within the *Ecosystem Services for Poverty Alleviation* (ESPA) Thematic Programme (**Atkinson**, **Darby, Dearing**) exemplifies how our role within the *Sustainability Science* USRG has enabled us to lead successful bidding consortia. Since 2008 we have sought to diversify our income streams and achieved major successes in attracting Charitable, Governmental and Industrial funding (£4.59M, or 51% of our total, placing us 4th in our UoA). Peer-reviewed charitable income includes awards from the Bill and Melinda Gates Foundation (*e.g*. **Tatem**'s work on high-resolution gridded poverty surfaces), while examples of governmental funding include grants from ONS, DEFRA (*e.g*. **Sear**'s work on the ecological impacts of fine sediments in aquatic ecosystems), English Heritage and health agencies. Industrial funding has been obtained from Tesco (**Wrigley**'s work on the UK High Street) and TNS (*e.g*. **Moon**'s work on small-area synthetic estimation techniques for the analysis of health care needs). In the future we will continue to align our Research Groups' foci with RCUK priorities and we will continue efforts to diversify funding. A key focus will be to engage with the EU Horizon 2020 programme, using our successful USRGs to develop appropriately focused consortia.

Many of our grants (67% of awards) entail targeted collaboration, both within the UK (49% of awards) and overseas (14 countries), reflecting our strategic shift (*see* **Section b**) towards interdisciplinary research. With respect to larger-scale collaborations only, **Martin's** and **Wrigley**'s leadership of ESRC collaborations has involved Edinburgh, Essex, Leeds, Manchester, QUB, St Andrews, and Oxford and Leeds respectively. **Darby** and **Dearing**'s roles within the NERC/ESRC/DfID funded *ESPA Deltas* consortium involves collaboration with Dundee, Exeter, Hadley Centre, National Oceanography Centre, Oxford and the Plymouth Marine Laboratory as well as 11 institutions in Bangladesh, Jadavpur University in India and East China Normal University. **Edwards** collaborated with Copenhagen, Grenoble, Lausanne, Montpellier, Oslo, St Petersburg, Tromso and Zurich on the EU *Ecochange* project (2007-12). **Moon**'s National Institute for Health Research (NIHR) funded work has partners at Exeter, Plymouth and St Andrews. **Tompkins** collaborated (2011-13) with the University of Ghana, WWF Latin America and the Caribbean, the Government of Vietnam and LTS International in a project funded by the Climate Development and Knowledge Network (CDKN), while **Wright** collaborated with Bristol, Cape Town, Surrey, UC Berkeley and the World Health Organisation on the EU *Aquatest* project (*see*

ICS). The recently awarded £7.6M ESRC Administrative Data Research Centre (**Martin** and **Moon**) involves collaboration with UCL, the London School of Hygiene and Tropical Medicine, the Institute for Fiscal Studies and the University of London's Institute of Education.
To increase the quality of applications, in 2009 we introduced a system of pre-submission internal peer review. Success rates have since accelerated to an outstanding 45% (based on 25 bids to ESRC and NERC between January 2012 and July 2013), despite increased sector competition. Internal peer review is informed by seminars from funders and by increased membership of Peer Review Colleges (*see* **Section e**), and has proved especially helpful to ECRs.

Research Infrastructure:
Our strategic shift to larger, interdisciplinary, bids (*see* **Section b**) has been supported by the University's Research and Innovation Services (RIS) experts, providing support for impact and external collaborations. RIS Research Support Officers also support large funding bids (*e.g.* **Martin**, ADRC, NCRM), access to secure data (*e.g.* **Moon, Martin, Cockings**), and provide ethics and contractual support (all staff). Collaboration Managers broker partnerships and support commercialisation of intellectual property, including support for enterprise activities, spin outs and licencing. We also benefit from RIS support for: EU Bids and Contracting, Major Contract Management, Knowledge Transfer support and IP management (*e.g*. IPR agreements for **Moon**'s work with TNS and **Wrigley**'s work with Tesco). RIS also plays a key role in implementing multi-disciplinary research through a team of Research Coordinators supporting the University Strategic Research Groups. Separate dedicated financial support for research costing and financial planning is provided within Geography and Environment, and GeoData's networks are used to facilitate applied research, for example **Carling**, **Darby** and **Sear**'s UN FAO sponsored work on the 2010 Indus River floods.

Research Facilities:
During the REF period, we have invested >£0.6M in significantly upgrading our facilities, while also reconfiguring our associated technical support, now 3.5 FTE new laboratory-based posts plus 3 FTE cartographic and GIS specialists:

(1) *Palaeo-Environmental and Earth Surface Process Laboratories* (**ESD** and **PLUS** RGs). In 2011-12 the University invested £237k in refurbishing the *Earth Surface Processes (ESP) Laboratory* and creating a tephra processing suite to extend the *Palaeo-Environmental Laboratory*. Alongside this, our unit invested £204k in equipping the laboratories with an Analytik Jena HT3100 TOC/N analyser, Saturn II laser grain-size system and a Jeol Neoscape 6000 Environmental Scanning Electron Microscope (ESEM). The Saturn II and ESEM are both state of the art and amongst the first of their type to be commissioned by UK Geography Departments. Technical support has been shaped accordingly and now comprises a 1.0 FTE technician for the *Palaeo-Environmental Laboratory*, a 1.0 FTE Technician to support the *ESP* and *Chilworth Laboratories* (*see* below), and a Chief Technician.

(2) *Chilworth Hydraulics Laboratory*. In 2012 the 60m outdoor flume at Chilworth Science Park was redeveloped in a collaboration between **Carling, Leyland** and Kleinhans (Utrecht, Current Visiting Professor, *see* **Section e**). Through the use of Terrestrial Laser Scanning (*see* below) and a network of Sontek ADV probes, the flume now supports **ESD**'s research on flow through natural vegetation (forested floodplains) and porous media (debris dams). Chilworth also houses a refurbished fish egg research facility that will support extensions to **Sear**'s work on the ecological impacts of excess fine sediment on salmonids (cf **Sear et al**., 2012).

(3) *Environmental Sensing Facility*. Our field spectroscopy laboratory sustains equipment to support **GECEO's** field experiments in Earth observation, including the vicarious calibration of aircraft and satellite sensors. From 2008 we began a programme of strategic investment in novel ground-based environmental sensing technologies, with an initial £60k investment in a Leica Scanstation Terrestrial Laser Scanner (TLS), enabling **ESD** to pioneer the use of TLS to elucidate controls on sediment transport in aeolian environments (*e.g.* papers by **Nield**, 2011; **Nield et al**., 2011) and we now support TLS applications across the University (*e.g.* in Archaeology, Ship Science, *etc*.). A further £200k was invested in 2012/13 to acquire Leica C10 and P20 TLS systems, a Quest S200 UAV (for low-level aerial photography), and Pulse Ekko 100 GPR and SyQwest Bathy-2010PC CHIRP dual frequency sub-bottom profiler (to image sediment sequences in terrestrial and aquatic environments). The equipment pool is supported by a 0.5 FTE electronics technician, while data post-processing, image and terrain

analysis, and modelling tasks are conducted on a dedicated Geo-computation cluster (and University HPC facilities, *see* below), with support from a 1.0 FTE Geo-Computation Officer.

In addition to our in-house facilities we work closely with other laboratories in the University: (i) we are major users of Itrax core-scanning (*e.g.* paper by **Langdon et al**., 2011), inductively coupled plasma mass spectrometry (ICP-MS) and flux-gate magnetometer facilities at NOCS; (ii) we employ the University's £3M µVis system (computed tomography), for example to support **Sear** and **Dearing**'s NERC research on reconstructing flood records using fossils in lake sediments and **Carling's** NERC funded work on tracing sediment pathways on large rivers using fossilised wood, and; (iii) Southampton's High Performance Computing facilities comprise two world-leading supercomputer clusters (Iridis 3 and 4). The £3.2M Iridis 4 became operational in 2013 and is the most powerful supercomputer in England (within the top 30 academic facilities globally). Freely available to all our staff and PGRs, Iridis is used to support our computational work (*e.g.* papers by **Leyland** & **Darby**, 2009; **Nield**, 2011; **Nield et al**., 2011).

e. Collaboration or contribution to the discipline or research base

Collaborations: (*NB*: *Collaborations via funded projects are discussed in* **Section d**)

We collaborate extensively with leading groups in other institutions in the UK and overseas. 71% of our submitted papers are with co-authors at other institutions, aggregating to 122 external academic partnerships, of which 45 are in the UK and 77 overseas (34 countries). These partnerships include 22 of the top 50 Geography Departments in the 2012/13 *QS World University Rankings*, other academic disciplines (*e.g.* earth sciences, economics, management, social policy, public health, epidemiology, archaeology and statistics), as well as major organisations/laboratories such as the NERC Centres, Chinese Academy of Sciences, CNRS, Natural History Museum, Smithsonian, Russian Academy of Sciences, UNESCO, and the US Geological Survey. We encourage leaders in the discipline to visit, hosting 31 long-term visiting academics (from 17 countries) during the REF period, as well as the annual Gregory Lecture for leading geographers (Tucker, NASA, 2008; Batterbee, UCL, 2009; Livingstone, QUB, 2010; Philo, Glasgow, 2011; Clark, Sheffield, 2012; Martin, Cambridge, 2013). We support Visiting Professorships: **Adrian Collins** (ADAS) and **Maarten Kleinhans** (Utrecht) actively work with **ESD** on fine sediment dynamics and vegetative flow, respectively, while **Vanessa Lawrence** (Ordnance Survey) and **Paul Curran** (City University) contribute to the work of **GECEO**.

Our academic partnerships are supplemented by participation in leading research networks that relate strategically to our research interests and expertise (*e.g.* **Moon** and **Atkinson**'s membership of the ESRC *National Centre for Research Methods* network on small area synthetic estimation and **Dearing**'s leadership of *IGBP-PAGES*). We participate fully in World Universities Network (WUN) groups on *Climate Change* (**Dearing** and **Tompkins**), *Global Public Health* (**Atkinson** and **Moon**) and *Global Health Literacy* (**Moon**) and *Earth Surface Sedimentary Flows* (**Carling** and **Darby**). Industrial and Governmental partnerships include close linkages with Tesco (**Wrigley**), ONS (**Martin** and **Cockings**), DEFRA (**Sear**), the Environment Agency (**Sear** and **Darby**), farm animal welfare and food production regulatory bodies (**Roe**), and TNS (**Moon**).

Support for interdisciplinary and collaborative research is provided in a number of ways. RIS (*see* **Section d**) provide contract management services. As noted previously, we lead two and actively participate in four more of the University's Strategic Research Groups/Interdisciplinary Institutes. The USRGs provide a vehicle for multi-disciplinary networking, supervision of joint studentships, research intelligence and bid development. Southampton is an active member of the Worldwide Universities Network (WUN) and our staff have had success with WUN's various seed-corn funding schemes to support international collaboration in research.

Contributions to the Discipline: (*NB: all contributions are current (October 2013) unless stated*)

- **Agenda-Setting Roles**: Home Office Forensic Sciences Advisory Group (**Brown**); Chair, International Geosphere-Biosphere Programme (IGBP), Past Global Changes (PAGES) Project, Focus 4 (**Dearing**); ESRC Census Programme Director (2002-12), now UK Data Service Co-Director (**Martin**); Member, UK Census Design & Methodology Committee (**Martin**); Member, National Statistics Population Theme Advisory Board (**Martin**); Member, ONS 2011 Census High Level Quality Assurance Panel (**Martin**); Chair, DEFRA/DECC Social Science Expert Panel (**Petts**); Member, DEFRA Science Advisory Council (**Petts**); Co-Chair,, BIS Sciencewise Expert Resource Centre Steering Group (**Petts**); Member, Royal Commission on

Environmental Pollution (**Petts**, 2005-11); Advisor, Environment Agency WFD Hydromorphology Group (**Sear**, 2011-12); Advisor, World Health Organisation Malaria Elimination Scenario Planning (**Tatem**); Secondment (0.6 FTE) to DfID Climate & Environment Research Group (**Tompkins**, 2009-11); Lead Author, IPCC AR5 Chapter 29: *Small Islands* (**Tompkins**); Contributing Author, IPCC *Special Report on Climate Extremes and Disasters* (**Tompkins**, 2011-12); Sole Academic Member on the Department for Communities and Local Government *Future High Street Forum* (**Wrigley**).

- **Research Councils**: Our staff have made significant (*i.e*., advisory roles, Panel memberships, *etc*., not merely reviewing) contributions to funding bodies: *AHRC* Strategic Reviewers' Group Member, Large Programmes Advisor, Committee C Panel (all **Brown**); *EPSRC*: Societal Issues Panel (**Petts**, to 2010), Strategic Advisory Network (**Petts**, 2010-13), Adaptation & Resilience to a Changing Climate Panel (**Tompkins**, 2008); *ESRC*: Council Member (**Martin**), ESRC Centres & Large Grants Panel (**Moon**, 2012), Wellbeing Programme Commissioning Panel (**Moon**, 2010-11), ESRC/RGS International Benchmarking Review of Human Geography (**Martin, Moon**), Peer Review College (**Cockings**, **Moon**); *European Research Council*: Panel SH3 Environment & Society (**Dearing**); *European Science Foundation:* Peer Review Panel (**Petts, Sunley**); *Japanese Society for Promotion of Science*: Grants & Fellowships Panel (**Brown**); *Leverhulme Trust*: Philip Leverhulme Geography Prize Panel (**Dearing**, 2011, 2013); *NERC*: Antarctic Survey Advisory Committee (**Hughes**), Arctic Programme Advisory Group (**Edwards**, 2010-11), Services Review Group (**Langdon**, 2012), Technology Steering Group (**Hart**, 2011), Peer Review College (**Atkinson**, **Darby**, **Langdon**, **Sear**); *Research Council of Norway*: Geosciences Panel (**Atkinson**); *Swiss National Science Foundation*: External Advisor (**Brown**).
- **Journal Editorships**: 59% of our staff serve(d) as Editors, Associate Editors, Special Issue Editors, or on the Editorial Boards (7 staff, 17 journals; not listed here), of 31 major journals: Editors-in-Chief: *Health and Place* (**Moon**), *J. Economic Geography* (**Wrigley**), *J. Wetland Archaeology* (**Brown**), *Sedimentology* (**Carling**, 2003-10); Associate Editors: *Advances in Space Research* (**Dash**), *Computers & Geosciences* (**Atkinson**), *Earth Surface Processes & Landforms* (**Darby**, 2003-09), *Int. J. Applied Earth Observation & Geoinformation* (**Atkinson**), *Int. J. Remote Sensing Letters* (**Atkinson**), *J. Glaciology* (**Hart**), *PLoS Neglected Tropical Diseases* (**Tatem**), *Quaternary Research* (**Langdon**); Special Issue Editors: *Geomorphology* (**Atkinson**, vol. 183, 2012), *Health and Place* (**Power**, vol. 17(1) and **Boyer** vol. 17(2), both 2011), *Quaternary International* (**Langdon, Hughes** and **Brown**, vol. 268, 2012).
- **Professional Associations**: *Association of American Geographers* (**Moon**, Jacques May Thesis Prize); *British Society for Geomorphology* (**Brown**, Chair Anthropocene Working Group; **Darby**, Vice-Chair (Research); **Leyland**, Publications Committee; **Nield**, Publications Committee, 2008-11); *Quaternary Research Association* (**Hughes**, Co-Coordinator, PALPEAT Initiative); **Langdon**, Honorary Secretary); *Remote Sensing and Photogrammetric Society* (**Atkinson** and **Dash**, both Council Members); *RGS-IBG* (**Boyer**, Social & Cultural Geography RG and Women & Geography Study Group Committees, both 2008-12; **Moon**, Vice-Chair Geography of Health Research Group (2009-11); **Deverteuil**, Urban Geography and Geography of Health RG Committees; **Power**, Geography of Health RG Committee; **Roe**, Social & Cultural Geography RG Committee, 2005-12, Coordinator Social & Cultural Geography UG Dissertation Prize, 2009-12; **Wrigley**, Council Member, 2009); *Royal Statistical Society* (**Martin**, Chair, Census Study Group).
- **Conferences**: Since 2008 our staff have delivered >150 invited lectures and convened 27 special sessions at major meetings (*e.g.* AAG, AGU, EGU, IAG, RGS-IBG) in 25 countries. **Wrigley** was Chair of the 2010 RGS-IBG Conference and we have hosted 16 other meetings including, most recently, the PAGES sponsored *12th International Chironomid Workshop* (June 2013), and *Beyond 2011* on the future of the census (April 2013).
- **Academic Recognition**: Major honours bestowed on our staff include **Wrigley**'s election as *FBA* for his research on economic and retail geography; the election of 5 staff (**Martin**, **Moon**, **Petts**, **Sunley** and **Wrigley**) to the *Academy of Social Sciences*; **Moon**'s election as *Honorary Member of the Faculty of Public Health Medicine*; the awards of the *RGS Murchison Medal* to **Wrigley** and the *Zeldovich Medal of the Committee on Space Research and the Russian Academy of Science* to **Dash**, and a *CBE* to **Petts** for services to scientific research.