Institution: University of Cambridge

Unit of Assessment: C17B Department of Geography

a. Context

A central objective of our research strategy is to make a difference beyond the academy. We endeavour to achieve impact across the constituencies and sectors addressed by the full range of our research, with diverse partners and beneficiaries including:

- Policy makers, including governmental organisations at international, national and local levels;
- Charities and non-governmental organisations working in specific jurisdictions;
- Industry and commerce;
- International environmental, financial and humanitarian agencies;
- Communities, households and individuals.

Collectively, the work of all five of our thematic groups (indicated in brackets below) has reached widely and deeply into the above constituencies, with significant effects on:

- ***Environmental policy and practice***, eg biodiversity, climate, flooding, river restoration, tropical agriculture (*Natures, Cultures, Knowledges*; *Environmental Systems and Processes*);
- ***Socio-economic policy***, eg crime, food security, finance (housing, pensions), regional resilience, 'unfree labour' (*Contested Political Economies*; *Population, Health and Histories*);
- ***Public culture and knowledge***, eg Polar Museum, public forums, broadcast, written and electronic media, access to justice and education, science as diplomacy (all groups);
- ***Industrial and commercial practices***, eg Earth systems modelling, hydrocarbons exploration, Chambers of Commerce, UK growth strategy (*CPE*; *ESP*; *Glacial and Quaternary Science*);
- ***Life, health and wellbeing***, eg HIV prevention; infectious diseases; coastal, volcanic and polar-navigational risk reduction; welfare reform (CPE, PHH, ESP, GQS).

We have sought where possible to have direct impact through the mechanisms identified in b) below. But our approach is also shaped by our own research, which points to uneven and contingent relations between knowledge and action. Recognising that impact can be short or long term, direct or diffuse, intended or serendipitous, our measures are similarly wide-ranging.

b. Approach to impact

We have a long tradition of attending to the non-academic impacts of our research, often with marked effect. This increasingly explicit objective is now promoted through a strategy developed and monitored by our Research Policy Committee, which entails 1) building and sustaining relationships with non-academic users; 2) raising the profile of impact within the Department; and 3) making full use of the institutional facilities that enhance our capacity to make a difference.

1. Building and sustaining relationships with non-academic users

We have built high-level relationships with users to generate impact in a variety of ways:

Direct application through contracts, consultancies and patents of basic research leading rapidly to application, or applied research commissioned by, and/or designed for users, eg:

- Dowdeswell's consultancies with the hydrocarbons industry (eg BP, Eni) (REF3b), involving oil and gas reservoirs and informing the assessment of maritime hazards from ice;
- The Foreseer Project (BP; Richards, Co-I with Engineering), concerned with the water/ land/ energy nexus, leading to a visualisation tool for policy-making in resource management;
- Oppenheimer's basic research on volcanic gases, and his patented ultraviolet spectrometer, having significant and far-reaching impacts on the management of volcanic hazard (REF3b);
- Work for the Environment Agency (Möller, Spencer) influencing UK/EU policy and practice in relation to saltmarsh management, flood protection and nature conservation (see Section d).

***Collaborative working with partners*.** Collaboration with governments and other agencies facilitates impact by establishing lines of communication, fostering trust, developing understanding of the knowledge needs of such bodies, and allowing for direct input of findings and ideas. Examples of many departmental links with external bodies include:

- Extensive engagement, through the Cambridge Conservation Strategic Initiative (CCI) with 9 conservation organisations, integrating research, education, policy and practice to foster leadership and develop innovative solutions (Adams, Leader-Williams, Vira and others);
- Collaborations under Greencycles II Marie Curie Initial Training Network (PI Friend), training

researchers to move between academia and industry: eg modelling of Earth systems and diversity in forest ecosystems with Microsoft Research Cambridge; testing of modelled soil moisture and analysis of temperature trends globally with start-up company Estellus (Paris);
- Collaboration with law and order organisations, eg Haining's analysis of crime data, informing Cambridgeshire Constabulary's policy on 'no cold calling' zones; Jeffrey's work with the Court of Reconciliation in Bosnia to manage transition to statehood and identify due reparations;
- Research and intervention programmes, planned and implemented with NGOs and education ministries in Kenya and Uganda, promoting girls' education through mentoring schemes and school clubs (Warrington);
- Participatory research enabling communities to define questions and strategies appropriate to their needs, often resulting in community led initiatives, eg Adams & Graham in Kenya, managing human-elephant conflict (REF3b); Bayliss-Smith & Hands on sustainable agro-forestry in Honduras and 4 other countries (Section d); S. Smith on child accident prevention; and Tucker on HIV prevention, with the clinical medical sector in South Africa (REF3b).

***Expert advice*:** Staff are engaged in high-level advisory roles for governmental and non-governmental organisations, serving by virtue of their expertise and drawing extensively upon their research. We see such engagement as an important mechanism through which knowledge comes into contact with policy and practice. Committee memberships since 2008 include: Board of the Institute of Small Business and Entrepreneurship (Bennett); Cabinet Office Expert Advisory Group on Resilience to Volcanic Eruptions (Oppenheimer); Expert Panel on Science Priorities for the Canadian Arctic (Bravo); Foresight Panel on the Future of Cities (Ron Martin); Council of Fauna and Flora International (Leader-Williams, Vice-Chair); Hazardous Substances Advisory Committee and Royal Commission on Environmental Pollution (Owens); UK National Ecosystem Assessment (Vira, Chair & Lead Author, Responses Working Group – see Section d). Individual advisory roles include Amin's work with OECD on reconciling cohesion and competitiveness in urban futures, and with *OpenDemocracy* magazine on xenophobia and race in Europe; Bennett's advice to the Heseltine Review, *No Stone Unturned* (2012), on stimulating growth; Herzog as technical expert on volcanic aviation hazards, WMO; Mawdsley presenting on 'rising powers as development actors' at strategy meetings of Norwegian and Polish Govts. and her confidential report for the Norwegian Foreign Minister on tri-lateral development co-operation; Spencer as Review Editor for ch. 29 (*Small Islands*), IPCC 5th Assessment Report.

We also *seek expert advice*, ensuring that user groups are well represented on project advisory teams and more formally constituted advisory committees. The Advisory Committee for the Scott Polar Research Institute (SPRI), for example, includes representatives of the Canadian High Commission, the FCO, the hydrocarbons industry, and the UK Hydrographic Office. Members helped facilitate SPRI research into Arctic Ocean sea-floor topography and sediments (REF3b).

***Wider engagements*.** We encourage and support outreach activities, especially those with transformative impact. Examples include:
- *High profile events* at King's Place, London: *i)* Public Forums on issues of gender inequality, *Centre for Gender Studies* with *The Guardian*, involving capacity audiences and extensive media coverage (2010); and ii) debates on Global Food Security (Cambridge Strategic Initiative), co-organised by Nally and Vira, who contributed articles to *The Guardian* and *Al Jazeera* (2013).
- Science diplomacy: Oppenheimer's research on Mt Paektu with North Korean collaborators, contributing to basic science, hazard reduction, and international relations; generating considerable interest, eg *BBC News* website 6.9.13; *Financial Times*, 14.9.13; *Science* 6.9.13;
- Bravo's collaboration on artistic representations of the Arctic with London-based *Arts Catalyst* (promoting critical engagements between art and science) and Slovenian artist, Marko Peljhan; outcomes included a major exhibition, *Arctic Perspective* (Dortmund 2010), offering insights into the Arctic as a living environment and critical marker of global change;
- Spencer's contributions to the Twelfth Venice Architecture Biennale (catalogue and installations) based on his research on the Venice Lagoon; and presentations of their research by Browne, Bravo and Jeffrey at the Hay Festival of Literature and the Arts.
- Extending reach through film and television, eg i) Oppenheimer's contributions to Werner Herzog's Oscar-nominated (2009) documentary on the Antarctic, *Encounters at the End of the World; Raging Planet: Volcano* (Discovery Channel, 2009); *Earth's Deadliest Eruption* (History Channel, 2010); *Frozen Planet (BBC1, 2011)* and others (REF3b); ii) Adam Wakeford's award-

winning film, *Going up in Smoke*, about the work of the Inga Foundation arising from Bayliss-Smith's and Hands' research on sustainable tropical agriculture; iii) Dowdeswell's marine and glaciological research featured in *The Iceberg that Sank the Titanic* (BBC *Natural World*, 7/12);

- Interventions by Christoffersen and others at SPRI in the *Times Atlas* Greenland Ice Sheet controversy – 'a lesson in how scientists should mobilise' (*Guardian* 21.9.11) – attracting considerable media attention and resulting in production of a corrected edition of the Atlas;
- Sustained contributions to flagship BBC Radio 4 programmes on topics of long-term significance, eg: S. Smith on radical economics, *Analysis*, 2/11; Dowdeswell on Antarctica, (6/10), Amin on Utopia (12/10), *In Our Time*; S. Smith on second homes, 12/11 and 'Home at RIBA', 3/12; Strauss on gang labour, 3/13; all on *Thinking Allowed.*
- Extensive coverage of Möller's and Spencer's research on coastal protection (ITV Anglia; BBC Radio 4 & Radio Essex, 1/13); particular interest around 60th anniversary of 1953 floods (interview, BBC1 6pm and 10pm News, 31.1.13; material provided for BBC News website).

2. Supporting impact through departmental practice

Through Research Policy Committee (RPC), the Department seeks to create a culture in which impact is routinely considered, supported, generated and sustained. Mechanisms include:

- Encouragement of and facilitation for staff to engage in activities with the potential to enhance impact, eg by ensuring that time is made available for policy advisory roles and collaboration;
- Enhancing reporting systems within RPC to monitor and maximise impact;
- Bringing user groups directly into the Department eg: i) hosting non-academic visitors such as Moscariello from Shell E&P (Gibbard) ii) exposing early-career professionals to departmental research through the MPhil in Conservation Leadership, so that they 'bring to bear their newly-acquired experience in a variety of conservation contexts' (*Fauna and Flora* 17, 2013, p 33);
- Enabling strategic secondments eg Doubleday (see 3 below) as an ESRC Placement Fellow to Govt. Office for Science (2009-10), to develop an Action Plan in response to the 2008 Council for Science and Technology Report on how government and academia can work together;
- Raising consciousness, eg by dedicating a series of departmental seminars to ways of maximising the impact of academic research, including speakers from industry and public policy. Piloted successfully in 2010-11, this exercise will be regularly repeated.

3. Using institutional resources to enhance impact

The effectiveness of departmental strategy is maximised through proactive engagement with institutions within the University that facilitate knowledge transfer and research impact, eg:

Cambridge Enterprise, a wholly-owned subsidiary of the University, offers assistance/advice on many aspects of external engagement, such as consultancy, serving on advisory boards, and patenting and commercialising the products of research. Geography has directly benefited in many ways, including contract negotiation (eg with hydrocarbons industry), liability insurance, arrangement of Preferred Contractor status (Coastal Research Unit), and upgrading of technical facilities used for consultancy (eg Malvern Mastersizer 2000, Perkin-Elmer ICP-OES analyser).

The Centre for Science and Policy**,** promotes engagement between policy professionals and academics. With outstanding links to government, industry and third sector organisations, CSaP has created c. 100 Policy Fellows, including senior leaders, who visit Cambridge for intensive interaction with researchers. Its Executive Director (Doubleday) was formerly a PDRA in the Department, and the Department engages fully with the Centre's activities: 22 staff met 36 Policy Fellows in 2011-12 & 2012-13, establishing connections with 10 Downing Street, EU institutions, statutory agencies, and 7 Government Departments. The meetings are much appreciated: in feedback for CSaP one Fellow wrote: 'the range of skills and the very thoughtful processes I was exposed to were wonderful'; they are also productive, leading, eg, to Owens' membership of the Hazardous Substances Advisory Committee. Under the auspices of CSaP, Bravo, Owens and Richards led an innovative, collaborative process through which c. 50 academics, policy-makers and practitioners identified key questions on science/policy relations. The process culminated in a paper in *PLoS One* 9.3.12 (>17,000 views), preceded by a *Guardian* 'Science Weekly' podcast (2/12). In feedback, one science policy advisor described it as 'a terrific example of how much can be achieved by bringing a diverse group of researchers and policy professionals together'.

The Office of External Affairs and Communications has a broad remit for engaging wider publics, and runs the annual Festivals of *Ideas* (>14,000 visitors in 2012) and *Science* (c. 30,000 visitors in 2012). Bravo, Browne, Nally, Oppenheimer, Rees and Willis have actively participated.

c. Strategy and plans

The evidence above, and in REF3b, demonstrates that our research impacts have been significant and far-reaching over an extended period. In important respects, our approach to developing impact has been the same as our strategy for producing world-class research, in that our aim to address challenging intellectual questions in critical areas of environment, economy, and society incorporates that of shaping policy debate and informing lived experience. The development of an explicit *strategy* for impact is, however, relatively recent, and one that we intend to reinforce, over the next 3-5 years, through departmental measures that include:

- Intensification of mechanisms outlined above – building relationships, adapting departmental practice, and using institutional facilities – which have to date been demonstrably successful;
- Development of the Department's profile, and our potential to make a difference, through targeted departmental and inter-departmental seminars and workshops on research impact, drawing on the experience and expertise of Cambridge Enterprise, CSaP and alumni from government, NGOs and industry, and engaging with the RAND Europe office in Cambridge;
- Incentivising individuals and thematic groups to consider, develop and sustain impact, by requiring regular reports to RPC on impact-related activities and achievements, and providing information on, and access to, relevant opportunities, such as media training;
- Liaising with a reorganised University Development Office, building on our notable successes with Gender Studies and Conservation Leadership, to explore further opportunities for aligning our strategic research agenda with the interests of potential benefactors, especially in areas where research is likely to have significant effect outside the academy;
- Continuing to develop and participate in the work of the Centre for Science and Policy, aligning with our recognised expertise in this area and enhancing our impacts in multiple contexts;
- Intensification of strategies for public engagement, taking account of plans by the University's Joint Museums Committee to develop inter-museum collaboration, potentially including a virtual or physical central hub & access schemes to encourage further and wider engagement.

d. Relationship to case studies

The 6 case studies in REF3b have been selected to demonstrate the diversity, significance and reach of our research impacts. Two cases – one on SPRI's polar marine research used by hydrocarbon companies and the UK Hydrographic Office, and the other involving collaboration with volcanic observatories in life-saving applications of a new technique for monitoring volcanic plumes – are illustrative of engagement with industry and public agencies, and, in the SPRI case, of commercialisation facilitated by Cambridge Enterprise. A third, exemplifying the effects of involving beneficiaries, shows how pioneering research on the geographies of health led directly to an innovative programme for HIV protection in South African Townships, which has recently found wider application. A fourth case, concerned with river restoration under the European Water Framework Directive, also involved the joint efforts of academics and users, further exemplifying our considerable influence on environmental policy and practice. In this sector, too, but in a very different context, a case study on human-elephant conflict in Kenya highlights the complexity of conservation conflicts and the importance of engaging local communities to develop mutually beneficial solutions. Finally, we offer a case in which, through the innovative work of the Polar Museum, the natural and social scientific research of SPRI is brought alive to a wider public, fostering engagement across all age groups with critical issues such as that of climate change.

Excellent research had significant impact in the REF period in three further potential cases. Original work by Bayliss-Smith and Hands on alley cropping with *Inga Edulis*, as an alternative to slash and burn agriculture, led, via establishment of the Inga Foundation, to adoption by 60 families in Honduras (with 200 more being trained) and to serious interest in 4 other countries. Research by Spencer and Möller on the role of saltmarsh ecosystems in flood protection influenced practice (via guidelines and the *Living with the Sea* Project) and UK/EU policies, via the Lawton Report, *Making Space for Nature* (2010) and DG Envt.'s review of management of *Natura 2000* habitats (DGEnvB2, 2008). Finally, Vira, through leading on Response Options in the *UK National Ecosystem Assessment* (2011), brought his research on ecosystem services to bear on the 2012 *Natural Environment White Paper*, an important policy framework document.