Institution: University of Brighton

Unit of Assessment: B7 Earth Systems and Environmental Sciences

a. Context

Our mission since 2001 has been to deliver translational research with societal benefit that is firmly grounded in the two themes of our Research Environment. The main beneficiaries have been hydrocarbon geoscientists, sanitation engineers, water treatment managers, waterway guardians, legislative and regulatory bodies, disaster relief professionals, contaminated land consultants, low-income and vulnerable populations, and recreational publics. The user group includes ExxonMobil, the UK Ministry of Defence, UNICEF, the NGOs Médecins Sans Frontières and WaterAid, the Environment Agency, British Waterways and the Welsh Government. Impacts from which they have benefited include: improved public health in Haiti and Malawi; legislative change in the Welsh Government; new technologies for the management of contaminated land; improved predictions and refined thresholds that define the ecological status of aquatic systems; changed professional practices for hydrocarbon reservoir characterisation; and the creation of a public discourse on water leisure rights.

b. Approach to impact

Our approach is based on the identification of major environmental and societal challenges that demand innovative and effective responses. This we pursue through problem-to-solution partnerships between academic researchers and key user groups.

The framework for engaging with key users: Researchers develop and maximise interactions with key end users and audiences through multiple routes, including:

- *Co-working with industrial partners:* including RCUK CASE awards (eg development of new measurement technologies for suspended sediment with Aquaread Ltd); industry funded studentships (eg implementation of new exploration guidelines for bauxite with the Greek mining sector); EU Marie Curie Industry-Academia Programmes (eg producing new technologies for water clean-up with MAST Carbon International).
- *Commissioned projects and contract research:* for example, that give access to company staff and their technical/economic challenges (eg through lead of four fieldtrips for ExxonMobil geoscientists and the delivery of interactive workshops at its head office in Houston); through national public consultation projects (eg regional strategies for water-related recreation that has generated legislative change in the Welsh Government).
- *Externally funded staff secondments:* for example, to Defra for 12 months to support its Chief Scientific Advisor and Strategic Evidence and Analysis Team on science-policy issues, helping to drive improvements in the policy evidence base (Defra/NERC KE).
- *Knowledge Transfer Partnerships (KTPs):* 15 projects funded by the Technology Strategy Board (TSB), SMEs and local authorities, including the 2010 national KTP award winner for 'Most Successful Partnership Funded by the NERC' that applied a new remediation technology to nuclear legacy wastes with the Atomic Weapons Establishment PLC.
- *Development and joint commercialisation of IP:* patent licensing and technology spin-out (eg scale-up of a patented electrical remediation technology with Churngold Remediation).
- *Co-working with third-sector users:* projects with NGOs (eg improved sanitation that enabled cholera waste to be treated on site in Haiti following the 2010 earthquake, with Médecins Sans Frontières); strategic partnerships with research users (eg improved fish stock management in the Sussex coastal zone with the Inshore Fisheries Conservation Authority).
- *Hosting industry focused workshops and Continuing Professional Development (CPD) activities:* including running the Carbosorb/KTN technology showcase on emerging water and wastewater contaminants, April 2013, attended by 25 industrialists; the AquaManche Outreach Event in 2012, attended by the Environment Agency, local rivers' trusts and water supply companies.
- *Publishing in trade journals and grey literature:* reaching out to non-academic audiences (eg, 'New methods of chromium stabilisation in contaminated land' in CL:AIRE Bulletin, RB9 March 2009; 'Guidance on the future of European river basin management planning' in Water21, July 2013, the magazine of the International Water Association).

An example of our problem-to-solution approach is the new knowledge on how drinking water becomes contaminated in rural Malawi. Originally published as a report to UNICEF in 2012 by TAYLOR and EBDON, the work was picked up immediately by Pump Aid and used to guide the location of 300 new water pumps in Malawi. As a consequence, TAYLOR was invited to serve as an expert advisor on two World Health Organization (WHO) water and sanitation safety planning advisory panels. Following TAYLOR and EBDON's recommendations to the Malawian Ministry of Water Resources and Irrigation, the Malawi government established a National Water Safety Taskforce that met for the first time in 2013 to begin implementation of the report's findings. As a direct result of the Malawi study, TAYLOR was invited by WaterAid to act as an expert advisor on a faecal sludge management project in Bangladesh (REF3b [1]).

An example of how we respond and adapt to emerging opportunities is shown by ASHWORTH's research on the sedimentology of river deposits, ongoing with ExxonMobil since 2006. Work was initially commissioned on small sandy river dynamics (South Saskatchewan River, 2006–7), but in response to evolving company priorities and new target fields, moved into describing the alluvial architecture of the world's largest rivers (Rio Paraná, 2008–9), and quantifying the heterogeneity of fluvial-tidal deposits (Columbia River, 2010–14; Chehalis River, 2012–13). The fluvial-tidal partnership is a direct response to the opening of new mines in the Athabasca oil sands and is co-funded by ExxonMobil (Houston) and Imperial Oil (Calgary). Lithofacies data are shared with reservoir modellers to inform steam-assisted gravity drainage (SAGD) drilling strategies and the optimal placing of well-pad sites. Company testimonials state the collaborative projects: '*were advantageous in terms of the research they produced as well as the professional benefits to our staff who spent field seasons working with and learning from these pre-eminent fluvial sedimentologists*'.

Empowering and rewarding staff to deliver impact: Staff are encouraged to maximise the impact associated with their research through a series of investment schemes and formal recognition through internal enterprise awards and staff promotion. All research and academic staff may apply for a business-oriented sabbatical (worth £20k) with recent awards to develop bacteriophage-related tools for control of waterborne disease within the water treatment industry (EBDON) and to develop environment-specific water-quality guidelines for suspended particulate matter for regulatory bodies and the Environment Agency (BILOTTA). Staff who deliver outstanding research with impact may apply for a University Innovation Award (won jointly in 2008 by B7 staff HOPKINSON for work on 'green' industrial mineral synthesis and WHITBY and CUNDY for novel nanomaterials from CO_2 feedstocks). TAYLOR and EBDON also won the Innovative Research with Impact Award in 2010 for a scheme that assists microbiologists in developing countries to produce low-cost water quality detection methods. Impact engagement and delivery is part of the professorial promotion criteria from July 2013, where professors must demonstrate that their research has 'substantial impact beyond the university'.

An example of our approach to support and encourage staff to achieve impact from their research includes our work on novel nano-structured materials for water treatment, which has been ongoing since 2007. Early work in this area was supported by a University of Brighton business sabbatical award to CUNDY to identify market opportunities, and SEEDA proof of concept investment (2007–2009) co-ordinated by the Economic and Social Engagement (EASE) Department. Business Development Manager (BDM) (see below)-led discussions with water companies allowed targeting of the research onto critical engineering issues and key markets. Subsequent collaboration with SME MAST Carbon under two EU Marie-Curie projects (2009–2013, 2011–2013) developed a patented nanoporous carbon based water treatment method that removes metaldehyde and other EU-priority contaminants. The technology is now being applied by a water industry consortium for large-scale on-site application.

Institutional resources to support impact delivery: A network of science-focused BDMs work closely with staff to identify and monitor impact and develop the necessary networks and partnerships to exploit IP and economic benefit. For example, the Environment BDM has coordinated the development of a regional Green Growth platform (see section c), and has supported extensive KTP activity. The University of Brighton funded Community University Partnership Programme (CUPP) develops partnerships with the local community (for example, CHURCH'S work with Hastings Knowledge Exchange on access to water resources) and was the

2008 winner of the UK Times HE award for outstanding contribution to our local community and 2011 winner of the US MacJannet Prize for Global Citizenship.

c. Strategy and plans

The university has recognised the need to engage with the wider impact agenda and is therefore investing in strengthening its support infrastructure, incorporating impact monitoring and targets into research planning, and training of researchers to recognise and pursue impact opportunities.

Strengthening the infrastructure: Impact activities and the benefits accrued are captured and are monitored by the university's EASE Department. In 2011, EASE, with its 51 support staff, joined with the Research Office to become a single department responsible for bringing fundamental research to market and exploiting business opportunities. A BDM in the school is responsible for initiating and monitoring engagement with end users. The university will appoint an Impact Policy Officer in 2014 to support the collection of evidence for REF2019 and guide decisions on impact initiatives. A new Intellectual Property Policy was introduced in 2013 to support enterprise growth and creation, which will stimulate the commercialisation of ideas and facilitate the licensing of work to other parties as a route to gaining both income and impact.

Embedding impact into institutional planning: EASE financial targets, including collaborative R&D programmes and intellectual property income, are now included alongside research income targets and are monitored by the Faculty Dean. EASE impact activities and metrics are reported bi-monthly to the University of Brighton Business and Community Committee and on to the University Board of Governors.

Training of researchers: From 2013, the university has ensured that postgraduates and ECRs receive training on early identification of impact, types of knowledge exchange and dissemination both through its formal PGR training programme and in modules offered at *The Future's Bright* annual conference for ECRs (REF5). Staff now provide an impact plan for internal research investment schemes such as Rising-Stars and Innovation Awards.

Future ambitions: Over the next three years we will direct resources and effort to:

- Disseminate and publicise the impact of our research through: (i) offering further training courses to B7 staff by the new Impact Policy Officer, on how to stimulate, document and develop impact; and (ii) launch of a new university research website in 2014 that will provide B7 examples of research impact from both RAE2008 and REF2014.
- Increase engagement and generate links with new partners, including via the University of Brighton's CUPP, and especially its new Green Growth Platform (2013–2018, £2.98m). This HEFCE Catalyst funded programme links the knowledge assets of the university (particularly in waste and water research) with 1,000 high-growth-potential SMEs and private, public and third-sector partners, with the aims of supporting innovation, addressing skills shortages and stimulating economic growth. To support these interactions, we will appoint an 'impact champion' from existing B7 staff to work with the BDM to co-ordinate joint working and knowledge exchange, and enable impact via this platform.
- Work with the university to develop robust and measurable KPIs of impact activity that become part of the local annual budget centre planning cycle and then the development and monitoring of the new University of Brighton Strategic Plan from 2015.
- Support staff to engage with KTP schemes, industrial secondments and RCUK Knowledge Exchange Programmes. The current ECR secondment to Defra, funded under the NERC KE scheme, will be used as a springboard for interaction with impact policy at government level.

d. Relationship to case studies

REF3b [1] exemplifies how we work with end users to define and frame a problem and then offer practical and affordable solutions. The framework for impact delivery enabled a snowballing of end users, research uptake and benefits to vulnerable members of society. ECRs were rewarded for their innovative research and outreach through appointment, awards and promotion.

REF3b [2] uses commissioned research projects to harness public opinion and translate it into an effective voice that influences government policy. It is an example of start-to-finish partnership with voluntary and regulatory bodies that has delivered obvious and measurable benefits.