Institution: University of Hull

Unit of Assessment: C17: Geography, Environmental Studies and Archaeology

a. Context

University of Hull researchers addressing natural and human environments have a long and sustained record of impact and public engagement. Its significance ranges from legislation and governance for international and national organisations about environmental and resource issues, to sustained engagements with commercial and public sectors. Our reach stretches throughout society because we address pressing issues about our changing environments, energy and water resources. We do this from the global scale to the local. Given the breadth of our research, our user groups are myriad.

Our main non-academic users in the REF period include **supranational, national, regional and local governments** and their agencies.

- Authorities using our research to inform or shape their legislation, governance, guidelines and policies include institutions at the trans-national level such as the United Nations Food and Agriculture Organisation, the European Union and the European Commission and the European Food Safety Agency.
- National level organisations using our work include the British Parliament, the Department of the Environment, Food and Rural Affairs (DEFRA), the Environment Agency, Natural England, Natural Resources Wales, the North Sea Regional Advisory Council, English Heritage, British Waterways (now the Canals and Rivers Trust) and Scottish Natural Heritage.
- Regional users include local authorities around the UK, China, Egypt and the USA.

A key benefit of this impact is the more efficient protection, governance, regulation and legislation of the environment. Citizens benefit as a result, as do sectors including fresh and saltwater fisheries, food-industries, hydraulic engineering and sustainable transport systems.

We also work extensively with **industry and the commercial sector**.

- Users range from major industrial corporations like Tata Steel, British Gas, British Petroleum, Associated British Ports, British Nuclear and ARUP, through to utilities companies like Yorkshire Water, Thames Water, Dwr Cymru / Welsh Water, to start-up companies in emerging sectors, such as renewable energy - a field that is critically important to the UK's future and especially to Hull. Our established relations with these renewable energy companies will allow us to impact significantly in this emerging field.

Around 65% of the staff in this submission offer clear impact and engagement from their research. This engagement is encouraged and facilitated by the unit and the University.

b. Approach to impact

The focus on impact is not new at Hull. From well before the REF period we invested significantly to establish interdisciplinary centres that would facilitate research with impact for external users. As they evolved, these structures became still more oriented towards supporting effective knowledge transfer. In turn, this agenda attracted significant University and Regional Development Agency funds to develop this impact capacity further. These structures are outlined below.

- The **Environmental Technologies Centre for Industrial Collaboration** (ETCIC, from 2006, directed by Frostick). This centre was established to orientate the collaborative, interdisciplinary strengths of environmental research at Hull towards user communities – especially in the commercial sector. It employed specialist knowledge-exchange staff to do this. The rising importance of environmental agendas and this outward-facing remit saw ETCIC funded by the Yorkshire Forward Regional Development Agency.
- In 2010 ETCIC evolved into the **Centre for Adaptive Science and Sustainability** (CASS). This centre reflects developments in international environmental and sustainability agendas and it reinforces the focus on sustainability, renewable energy and low carbon economies that was emerging from environmental research at Hull. Directed by Parsons (from 2013), and with a full-time team of 3 advisors, CASS enables the exchange of ideas and expertise with business and it aims to involve external partners for all projects it sponsors: guaranteeing that academic research is connected to users from its inception. CASS also distributes Higher Education Infrastructure Funding (HEIF 5) to facilitate industry-facing initiatives on environmental and

energy issues.

- The University secured £1.96 million HEIF5 income per annum (for 2011-15) for projects with clear social and economic impact and knowledge exchange. A CASS-led project from HEIF4 (2008-11), to develop Hull's offshore renewable energy hub (with geographers and IECS), was selected as one of the 7 best examples of HEIF4-funded work. We were the only HEI in Yorkshire to see increased HEIF funding due to this successful use of previous funds.
- In collaboration with CASS and user groups, our unit of assessment are running £314,105 of projects on themes including the 'Dynamic Humber' (on how environmental change will affect the physical, social and economic state of the Humber) and 'Climate Change, Farms and Ecosystem services' (exploring how parasitoid insects can tackle pests in commercial crops).

A good example of how research finds impact via these structures is the *Pulse-Stream* Tidal Power Generator: a project that drew on strengths from across our unit and was coordinated by CASS.

- Hardisty's work on harmonic tide currents saw him involved with the initial theorisation of the generator. Modelling was then undertaken in the Total Environment Simulator, before the Institute for Estuarine and Coastal Studies (IECS**)** did the environmental assessment of the generator's effect on wildlife. A full working prototype was tested in the Humber in May 2009 and soon after the world's largest ever public grant for the product development of an ocean power technology (£8 million) was made by the European Commission. In this case our research, knowledge exchange and enabling structures contributed to genuine impact.

In addition, our two major research institutes are strong, long-established foci for research with impact (which they have undertaken since the 1980s). They are central to our impact profile: they boast international reputations for high quality academic research, while they also engage with supranational, national and regional government agencies, industry, and conservation bodies. Users include the UN Food and Agriculture Organisation, the European Commission, DEFRA, the Environment Agency, Natural England, and Scottish National Heritage.

- The **Institute for Estuarine and Coastal Studies (IECS)** was founded in 1983 and has an integrated, interdisciplinary approach to research in coastal and estuarine zones. Directed by Elliott and with 22 staff, its expertise spans biological and physical environments, coastal planning, environmental quality, marine law and environmental impact assessment. IECS has worked globally and advised governments and local authorities at all scales of governance. It maintains strong relations with its users and its income is around £1 million per annum.
- The **Hull International Fisheries Institute (HIFI)** was established in 1989. It is directed by Cowx and has six full time staff. HIFI specialises in applied research in the sustainable development, management and commercial development of freshwater fisheries, in conservation and aquatic-resource management and in natural resource production. It has long-standing links with key organisations. In the case of the European Commission, the strong relations between the two are evidenced by the EC's use of HIFI as researcher of first choice for many research contracts: EU research income totals €3.5 million in the REF period (averaging €583,434 per annum). HIFI's relationship with the Environment Agency is also fruitful: income totals £915,000 since 2008 (averaging £152,500 per annum).

Our unit enables impact by allowing staff time and flexibility to pursue impact opportunities when they arise. An example of our swift and agile response to impact opportunities is a NERC emergency award held by Mayes (November 2010–June 2011).

- The impact was enabled by Mayes' quick response and by a flexible teaching programme that released him to assess the aftermath of the Ajka red mud impoundment failure near Kolontár, Hungary, in October 2010. Mayes assessed the highly-toxic, hyper-alkaline contaminant and its dispersal in the catchment and the downstream river system. He shaped the medium- and longer-term management of this crisis. He also influenced policies for the management of this waste through advice to the Hungarian Minister of Rural Development. Subsequent NERC funded research, which drew on this earlier grant, also works in partnership with major corporations, including Tata Steel and Tarmac, to improve management approaches to alkaline wastes through combined resource recovery and waste stabilisation (NERC 2013).

We also encourage staff to conceptualise impact in their work from the start of the project design:

- The *Digital Economy : Food Trust* project (EPSRC 2013-15), run by Holloway and Eden, is one example. This project uses smartphone apps to connect consumers with food producers, but

the beneficiaries (consumers, farmers, the retail sector) were written into the project from the start: the objectives include impacting on these groups and changing their behaviour.

Finally, some of our research projects are designed explicitly to connect users and researchers:

- On behalf of the European Union Integrated Infrastructure Initiative we are the academic lead in the *Hydralab* III (2005-09) and IV (2010-14) networks - which are otherwise composed of commercial partners. *Hydralab* coordinates Europe's best research infrastructure (including our TES) to produce best-practice guidelines in hydraulic engineering for the commercial research and engineering sectors. This research is also directed at user-impact from the start.

c. Strategy and plans

Our impact strategy is to derive impact from excellent research, whenever possible, and to design projects with impact, where appropriate. We aim to sustain and augment our impact profile through the next REF period. The following are measures that are already in place.

- A preferential rate for consultancy and other services whereby overheads are reduced to 20% strategically as an incentive to encourage research with impact potential.
- Rewarding impact activities through the Work Load model (with teaching remission).
- Rescheduling teaching and administrative duties to let research with clear impact develop. For example, Parson's research on the Mekong Dam proposal (November 2013) has been supported with replacement teaching so that this impactful, but time-sensitive, research can develop to its maximum potential.
- Applications for internal research support funds require a statement of users and potential impact. Faculty PhD studentship applications also ask for the involvement of external users.
- Research with potential impact has also been identified through the regular, individual REF preparation meetings where staff are helped to identify and develop their impact profile. We ask them to be agile, imaginative, collaborative and interdisciplinary in conceptualising their options.
- Postgraduates and postdoctoral researchers are prompted to consider the impact of their projects - so that possible impact and user groups are considered throughout this research.
- 'Impact' sections have been designed for our websites.

The Faculty of Science and Engineering and the University also offer structures to facilitate impact:

- If commercialisation of research is feasible, staff are supported by 'The Enterprise Centre' (and its dedicated staff), which works with academics and external partners to enable this outcome.
- The Faculty holds an annual industry-facing research showcase to demonstrate our work and its applications to potential partners (with a particular focus on early career researchers).
- Research reporting in the Faculty has included 'outreach' and 'impact' as core categories since the early 2000s.
- The Faculty has developed an Enterprise Register which operates during and after research projects to identify and protect impactful outputs prior to exploitation.

d. Relationship to case studies

Our first three case studies demonstrate that an excellent reputation in a research field, plus a quick and proactive response to opportunities, can generate research with impact. They also show how experience of public sector institutions helps to translate research into these contexts. Finally, they reveal how avowedly interdisciplinary approaches equip us to tackle environmental issues better.

- The 'Fisheries Legislation' case study (1) came about due to HIFI's reputation and their record of working with national and transnational institutions, especially in European contexts.
- The 'Humber Infraction' case study (2) likewise illustrates how a sustained record of engagement with international agencies attracts further opportunities for impact.
- The 'Hull Floods' case study (3) shows how the unit responded to a call from a key local partner, and how other duties were re-arranged to respond to an urgent environmental crisis.
- Our fourth case study, on 'Conker Tree Science' (4), demonstrates a proactive, imaginative and community-facing response to a growing environmental problem.

These case studies are about better protection and understanding of, and better legislating for, our changing environments. They informed our impact strategy by emphasising the importance of interdisciplinary research that addresses all facets of environmental problems. They also made us think about how to best generate research with impact, and wider impact capacity, for the future.