

## Impact template (REF3a)

<b>Institution: Keele University</b>
<b>Unit of Assessment: B7 Earth Systems and Environmental Sciences</b>
<p><b>a. Context:</b> Being very applied and multi-disciplinary in nature, research undertaken by the Earth and Environmental Sciences (E&amp;ES) Cluster at Keele has had significant impact across a wide range of national and international end-user groups and beneficiaries (as exemplified in the two impact case studies). These include, but are not limited to:</p> <p><b>Commercial &amp; industrial users</b> – e.g. BG, ICI Chemicals, Anglo-American Mining, Severn-Trent Water, Wardell Armstrong, RSK, Fugro Aperio, National Power, Rolls Royce, Reactec, Nexen, Cairn India, BNFL, Kerry Group, Zurich Insurance.</p> <p><b>Local Authorities, Councils and Agencies</b> – e.g. Staffordshire and Cheshire County Councils, Newcastle and Vale Royal Borough Council, Cheshire CC, Staffordshire Police, Advantage West Midlands.</p> <p><b>Scientific community organisations</b> – e.g. Geological Society, EUROGPR, EAGE, AGU, EEGS, IEEE, Royal Society, RICS, British Science Association.</p> <p><b>Government/EU bodies and institutions</b> – e.g. DECC, DTI/BIS, DEFRA, MOD Environment Agency, Scottish Environment Protection Agency, AEA, British Geological Survey, CEH, Nuclear Decommissioning Authority, Forest Research, Natural England, Countryside Council for Wales, CNR Italy, USGS, Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO).</p> <p><b>Public, NGO, Third sector and Charity organisations</b> – e.g. Staffordshire, Shropshire, Cheshire Wildlife Trusts, Marches Energy Agency, NUS, Carbon Trust, Royal Horticultural Society.</p> <p>The impact arises directly from the outputs of the Cluster's research programmes, and takes the form of direct interaction with user groups (e.g. advisory committee memberships, steering groups, policy/strategy placements), knowledge exchange activities (e.g. user training workshops, expert study courses, sandpit events), best practice guides, advisory articles, research highlights publications, fieldwork and equipment demonstrations, public engagement and outreach events, media appearances and press releases, and outwardly-facing social media dissemination activities (such as web sites, blogs, wikis, twitter, e.g. <a href="https://twitter.com/hypocentre">https://twitter.com/hypocentre</a>).</p>
<p><b>b. Approach to impact:</b> Our approach to impact is informed by the practical nature of our research activities. All E&amp;ES staff are actively encouraged to seek end-user collaboration and external engagement, especially with industry and government bodies and agencies, and to consider impact-related activities as a key part of their research portfolio. The Cluster facilitates and develops impact activities by strategically focusing on outcomes that have significant, sustainable socio-economic and environmental benefit for end-users. Along with the case studies, other highly notable impact activities/evidence include:</p> <p><b>Public engagement:</b> In 2011, Pringle was awarded £20k from EPSRC's Partnerships for Public Engagement programme to disseminate geophysical and forensic search research at the 2011 "Staffordshire Gold Hoard" event held at the Potteries Museum, Stoke-on-Trent in collaboration with Staffordshire CC. Over 2,000 visitors attended, including public dignitaries, schools, local businesses and charity/community groups. The event was covered nationally by the BBC and was disseminated to 2,743 national/international media contacts. Over 93% of attendees said that they had their "awareness and understanding of science improved" and the event had a 97% satisfaction score. It led to Pringle participating in (and winning) the 2011 national on-line media event, "I'm a scientist get me out of here" (funded by the Wellcome Trust) (<a href="http://imascientist.org.uk/2011/03/congratulations-to-the-winning-scientists">http://imascientist.org.uk/2011/03/congratulations-to-the-winning-scientists</a>), and gaining over £20k of follow-on dissemination, training and innovation funding awards.</p> <p><b>Industrial Fellowship:</b> In 2008, Cassidy was awarded a 4-year, £105k Royal Society Industrial Fellowship in collaboration with Fugro Aperio, Cambridge. Not only did the fellowship result in new research findings and publications (and was highlighted as a key case study by the Royal Society – <a href="http://royalsociety.org/grants/case-studies/nigel-cassidy/">http://royalsociety.org/grants/case-studies/nigel-cassidy/</a>), but it also led to a number of highly</p>

## Impact template (REF3a)

successful engagement events, including exhibiting at the Royal Society's "Labs to riches" meeting in 2009, and presenting and running the GPR 'best practice workshops' at leading international conferences, (NSG 2011 (European Association of Geoscientists and Engineers) and the South African Geophysical Association Congress, 2009). These workshops have had over 100 specialist industry and end-user attendees and subsequently led to Cassidy writing the initial 'Good Practice' training guides for the EUROGPR trade/industry association (~300 industrial members worldwide).

**End-user research & training workshops/courses/seminars:** E&ES staff have developed, managed and run a number of knowledge exchange workshops/courses for end-user communities, both at Keele and internationally. Most recently, these have included: Ullah, The British Society of Soil Science Workshop on "Peatlands Restoration and Biogeochemistry" 2013 (~30 participants); Styles, the EAGE-sponsored 2012-13 International Education Tour on "Environmental Geophysics" (<http://lg.eage.org/index.php?evp=8843>), which has seen 250+ participants at five different events in France, Denmark, UAE and Australia; Pringle/Cassidy, the NERC-funded (£24k) "Geophysical Skills Development for Environmental Scientists" course planned for 2014. The Cluster has also run user awareness/engagement events with industrial and NGO collaborators, including the Science Learning Centre (West Midlands) "Sustainability Conference"; RSK's "Geophysical Ground Investigation" short course, and Schott's "Renewable Energy" awareness seminars at the Keele University Sustainability Hub.

These specific examples illustrate the wide range of impact activities that E&ES staff have led and organised, and the Cluster's breadth of engagement with the end-user community. At institutional level, Keele vigorously promotes these events through its Directorate of Marketing and Communications (MAC), which was established in 2011, and specialist PR advice provided by a dedicated Press Officer and by McCanns, which has led to a significantly increased national and international media profile for the cluster, as well as engagement with specialist focus groups and discipline specific bodies. The national media impact of Keele's environmental research is particularly evident in the current UK shale gas "fracking" debate, where E&ES staff are regularly invited to comment on their research findings and academic judgement (e.g. <http://www.bbc.co.uk/news/science-environment-17726538>; <http://www.telegraph.co.uk/earth/earthnews/10233955/The-town-where-fracking-is-already-happening.html>, BBC1 Countryfile, BBC Midlands Today (2013)). The Cluster takes full advantage of Keele's media/marketing facilities and most E&ES staff have created dedicated, outward-facing websites (e.g. <http://www.keele.ac.uk/keelehub/news/>; <http://www.esci.keele.ac.uk/merapi/>) that are supplemented by dissemination through Keele's weekly newsletter, the 'Week@Keele', (<http://www.keele.ac.uk/news/week/archive/2013/0628/index.htm>). E&ES staff also prioritise impact-related research exchange through dissemination in industrial and end-user publications (e.g. *First Break*, *Leading edge*), reviewing and editing articles (e.g. Styles is Editor-in-Chief of the Geological Society's *Geoscience* magazine), and at specialist user group meetings (e.g. Geological Society, Institute of Materials, Minerals & Mining, GeoConservation Staffordshire).

### c. Strategy and plans:

Strategic research planning at University, RI and Cluster level is strongly informed by interactions with businesses and the community, and the impact on both industry and the general public. Impact activities form part of the annual review of research, at the RI, Cluster and individual level, and are key elements of the research planning process. A University impact strategy has been established that emphasises "*social, cultural, environmental and economic impact*" fostering "*innovation and enterprise engaging with business and external partners*" and "*relationships with research users and external stakeholders to facilitate the dissemination, impact and promotion of research outcomes*". At an individual staff level impact activities (and the setting of targets) form part of the annual appraisal and research planning process and are explicit in promotion criteria, as well as being an element in calculating research time. Experience of and ability to develop impact-related activities is also a key selection criterion for appointments. ECR and newly appointed staff are mentored on how to write/develop "impact plans" and "pathways to impact statements" (for research grants particularly), and how/what activities lead to significant impact in the long-run. The Cluster's strategy mirrors this institutional approach, and Cluster/RI level events and peer-mentoring programmes help train and advise staff on how to develop impact activities, promote industry/employer engagement, and embed impact-orientated outcomes into their current and

## Impact template (REF3a)

future research plans. E&ES PGR students undergo training in IP/commercialisation, identifying how to write and publish impact-related articles and publications as part of their 1<sup>st</sup> and 2<sup>nd</sup> year training (e.g. the pilot training day 'Vitae Researcher Futures: Making Your Mark' – <http://www.vitae.ac.uk/policy-practice/916-637061/Vitae-Researcher-Futures--Making-Your-Mark-Pilot--Keele-University.html>). All staff are given 'workload allocation' credit for impact activities and industrial/public engagement, with access to RI/institutional funding to facilitate this. For example, E&ES Cluster Staff have been supported to attend RCUK Knowledge Exchange and policy events (e.g. NERC Portfolio Analysis Workshop, 2013), run IP/commercialisation workshops (e.g. BBSRC's IP maze event held at Keele in 2009), attend public engagement workshops (e.g. British Science Association events, with which we have extensive engagement as presenters (Robinson) and as recorders (Waller) for various sections). Staff have also been awarded competitive funding from the University (HEIF 'innovation Keele' funding, as well as HEFCE Research Capital funding) to explore the translation of research outcomes into commercially viable technologies (e.g. Cassidy, for developing new thermal tracer technologies; Styles, for vertical-axis wind turbine vibrational studies). These Cluster/RI based activities are supplemented by Keele's own institutional training and support structures, including dedicated support for technology transfer, IP/commercialisation, employer and business engagement and European funding from staff within the University's Research and Enterprise Services (RES). This also includes the use of external consultants to offer specialist advice on how to target grant applications to areas most likely to attract impact-related funding, especially for very large EU schemes (e.g. £4M 'TANGO' Framework 7 project, led by Heckl, studying combustion instabilities, with relevance to reducing carbon emissions by optimising the efficiency of gas engines (see UoA B10 Impact Case Study)).

To expand the significance, reach and profile of the Cluster's impact agenda in the future, a number of activities and initiatives are planned for the next REF cycle. These include;

- ❑ Increased support (ring-fenced funding, time allocation, buy-out) for impact-related staff activities and employer and business engagement (in collaboration with RES).
- ❑ Media training for staff (PGR and ECR staff particularly), including social media, TV/Radio and writing/developing web sites, blogs, etc.
- ❑ Developing industry and end-user focused events, particularly using Keele's Sustainability Hub, to attract wider commercial collaboration (e.g. industry days, business breakfasts ('Ready for Business', Keele, Sept. 2013), research networking) as well as embedding industrial placement opportunities into all of our PGR studentship programmes.
- ❑ Encouraging and supporting end-user involvement in the practical, commercial and knowledge exchange development programmes for MSc students, PGRs and PDRAs.
- ❑ Creating an 'impact champion' role within the Cluster with appropriate funding and time provision to allow this person to strategically develop the role.
- ❑ Raising the profile and visibility of the Cluster's impact-related research with an emphasis on supporting industry-funded PhDs (with elevated levels of matched RI 'Acorn' funding), supporting staff to apply for policy and media placement roles (e.g. the NERC policy placements, BSA media fellowships) and encouraging staff to sit on the committees of end-user organisations (e.g. EAGE, AAPG, IFA).
- ❑ Applying for external KE funding to support end-user engagement and research collaboration at the Cluster level (e.g. CASE studentships, RCUK KE fellowships, EU networks).

### **d. Relationship to case studies:**

The underpinning approach and wide-ranging impact of the Cluster's research is exemplified in the two case studies. The first, 'Microseismic Monitoring for Environmental Applications', illustrates how the historical development of key E&ES Cluster research at Keele has not only led to significant international socio-economic and political impact but continues to be at the cutting edge of the renewables vs hydrocarbons energy debate. The second case study 'Environmental Outreach to Business and the Community' case study highlights the recent and broad-ranging industrial and community-related impact of Keele's Environmental Sustainability and Green Technology research. In particular, it illustrates how the multi-disciplinary expertise of E&ES staff has been strategically combined to focus on important end-user engagement and benefit.