**Institution: Kingston University**

**Unit of Assessment: 17, Geography, environmental Studies and Archaeology**

## a. Context

Research undertaken by the Unit spans the geographical, earth and environmental sciences and is located within more than eleven countries worldwide, as well as engaging with global organisations. The main impacts achieved by the Unit are:

**Economic benefit to industry** through collaborative projects, consultancies and the development of scientific instrumentation and methods. The major beneficiaries are the minerals and oil exploration industries.

**Social and environmental benefits** through engaging with governments, NGOs and other public bodies to achieve policy change. Beneficiaries include the United Nations, the World Health Organization, and UK policymaking bodies.

## b. Approach to impact

The majority of the Unit's impact has been achieved through collaborative projects with partners in industry and government, but the Unit has also been proactive in reaching out to potential beneficiaries where research has resulted in a potential impact, achieving substantial results. The reputation of the Unit has also led companies and public bodies to draw on its expertise.

### Engagement with industry

The Unit has cultivated long-term, sustainable relationships with industrial partners (e.g. Linkam Scientific Instruments, Randgold Resources and Renishaw) who benefit economically from research undertaken within the Unit. Collaborative research undertaken with industry (e.g. Statoil and Randgold Resources), including that carried out by industry-funded research students, has benefitted their minerals and hydrocarbons exploration activities.

Knowledge exchange and training

A major part of the Unit's collaborative research is with petroleum companies, which benefit commercially from the stratigraphic expertise of the Unit's researchers. Industry-funded PhDs are a prominent feature of these collaborations, and the three such students who have so far completed are all now working in industry: Lignum (2009, Statoil), de Cabrera and Espin Gil (both 2010, Petroleos de Venezuela Sociedad Anónima (PDVSA)). There are currently three PhD students supported by Statoil.

The Unit has organised CPD courses for Gemmologists (10-15 trainees on four courses held at Kingston University) to disseminate advances in analytical methodologies, and has run professional training courses for PDVSA (2011, 2012 and 2013) in Mexico.

Research with Maersk Oil (2011-12; 2012-13) has applied a chemo-stratigraphic framework developed in the Unit to the North Sea Chalk and provided training for company staff members.

Development and commercialisation of scientific instrumentation and methods

The Unit has developed methods and instrumentation for fluid inclusion analysis using a heating and freezing stage in close collaboration with Linkam Scientific Instruments, and the company markets fluid inclusion standards produced at Kingston.

A collaborative project with Renishaw plc developed high-resolution laser Raman analysis of inclusions. This has assisted the company in breaking into the gemstone market.

Research on a new 3D imaging method using reflectance confocal microscopy for radon measurement was spotted by Olympus Europa and the National Physical Laboratory. This resulted in NPL offering access to its LEXT OLS4000 series scanning confocal microscope to evaluate the new software. The results led the Olympus Corporation to commercialise the software.

In 2008, the Unit carried out a collaborative research project with Palynological Laboratory Services Ltd, an SME in Wales. This led to improved sample processing methodologies for

dinoflagellate cyst analysis, which the company adopted for commercial use.

**Engagement with government and NGOs**

Radon regulation and training

Following an invitation from the Health Protection Agency, the Unit has participated in radon policy fora and advised on the development of the radon testing ISO standard New Work Item Proposal ISO/TC85 N936, which became ISO 11665-4 in 2012.

The World Health Organization (WHO) referred to the Unit's work on radon in the *WHO Handbook on Indoor Radon: A Public Health Perspective* (2009), which led to revised UK guidance on indoor radon with a new Target Level (July 2010).

The Unit has organised Radon Council workshops (with the Health and Safety Executive and the Royal Society for Public Health) to educate builders, engineering companies, lawyers, environmental health and building control officers on radon issues (http://www.radoncouncil.org/TRAINING.pdf).

National and local government

The Office for National Statistics approached the Unit to obtain the digital census boundary data sets for 1971 and 1981 censuses created in ESRC-funded research, which were of assistance in planning census geography for the 2011 Population Census.

The Unit delivered advanced spatial statistics courses (2009-10; 2010-11) for civil servants in the Department of Communities and Local Government in conjunction with the GeoInformation Group.

The Unit carried out the Older People's Use of Unfamiliar Space (OPUS) project in partnership with Colchester Borough Council. The Council then used the findings of this project as part of the evidence base when developing its *Better Town Centre* plan (Colchester Borough Council, 2012).

International policy

Research within the Unit on stateless people came to the attention of policymakers through a number of dissemination channels including commissioned reports for international organisations (including UNICEF, UNDP and Council for Europe), invited contributions to seminars/conferences and expert witness testimony (e.g. Report for Russell-Cooke LLP on the *Matter of Extradition Proceedings Between The Government of Croatia v. Mirko Zdinjak*, 18 March 2011). The research led to a change in United Nations policy in this area.

**Approaches to opportunity**

Political, economic and societal changes in the external environment beyond the Unit's control mean that the opportunities to plan for or to achieve impact from academic research are often time-limited and the windows of opportunity open and close unpredictably. The Unit's researchers respond to this volatility by positioning themselves so that they are alert to trends in the environment, economy and society and by undertaking targeted research on emergent topics. The Unit is committed to building long-term, integrated partnerships with industry and partners in other sectors in order to maximise the opportunity for a degree of stability in collaborations, as exemplified by links with Linkam Scientific Instruments, Randgold Resources and Statoil. Engagement with new academic and non-academic networks has resulted in multidisciplinary research impacting on designing better town centres (OPUS).

**Support for impact**

The University's Research and Enterprise Support Departments help researchers to prepare non-academic impact plans when writing research funding applications and to develop or establish new relationships with potential beneficiaries at the outset of the research process.

The Unit has benefitted from University support during the period 2008-13 through the development of the KUeggs consultancy website (http://KUeggs.co.uk). This aims at securing Proof of Concept funding for enterprise activities arising from completed funded projects and providing knowledge transfer and training services with industrial partners. The training courses for Gemmologists and for PDVSA (mentioned above), and the collaboration with Linkam Scientific

Instruments, were undertaken as a result of KUeggs.

The University also provides direct funding for collaborative projects with business. This enabled the Unit to use data and expertise from Kingston University to help Wessex Archaeology resolve problems they had encountered in interpreting data from the Olympics site.

**c. Strategy and plans**

Based on the Unit's past approach, three objectives underlie its future strategy:

> **develop existing and initiate new** personal and professional links with industry and other user groups by continuing the successful strategy of engagement via collaborative research, consultancy and knowledge transfer;
>
> **increase the visibility of research** in the Unit by contributing to public discussion and debate, to encourage further opportunities for the Unit to inform policy and decision-making;
>
> **embed new researchers** in collaborations to ensure links with industry, policy-making and third sector organisations are sustainable and enduring.

The Unit has identified actions and ongoing research that will ensure its work continues to have impact beyond academia:

Embedding new researchers in the geodynamics and crustal processes area into existing collaborations with industry partners will maximise the opportunity for further sponsored research studentships and will extend work on methane-carbon dioxide fluid inclusions.

Current research on radon will be developed in new directions, notably in relation to the issues associated with the fracking of shale for gas, by building on links initiated in 2008-13 with the Olympus Corporation, the National Physical Laboratory and Ground Gas Solutions Ltd. that have resulted in access to data from a site used for fracking gas from shale. Future impact is expected to relate to the potential problem of radon gas being transported along pipelines in conjunction with gas being used for domestic purposes.

A research and development project in Cretaceous bio- and chemo-stratigraphy with Statoil including a funded PhD student (2011-2014) and is expected to produce commercial benefits for Statoil as the project continues.

The NERC Knowledge Exchange grant (NE/J006491/1) awarded to the Unit under the auspices of the British Society for Geomorphology with partners in engineering consultancies (Mouchel, Halcrow), the Environment Agency and Natural England has developed an innovative web map database giving access to and illustrating spatial coverage of published data on UK geomorphology. The immediate impact of this will be the benefit to the engineering firms involved in the collaboration. However, as the trial study area includes part of the HS2 high speed rail route, this will also provide a high-profile opportunity to engender further impact through demonstrating the utility of the approach to government, local interest groups and the general public.

**d. Relationship to case studies**

The selected case studies exemplify research in the Unit that has produced economic and policy impact at an international scale. Taken together the case studies demonstrate the benefits of long-term industrial collaborations and dissemination of research findings to high level policymakers and officials that typify the Unit's approach to impact.

**Case study 1: Economic benefit and improved practices in the mineral exploration industry** demonstrates impact on a specific commercial sector: the minerals exploration industry. This case study illustrates how impact has arisen from the Unit's long term commitment to collaboration with industrial partners.

**Case study 2: Policy change by United Nations regarding stateless women and children** evidences impact realised through influencing international policy and practice of the United Nations. It shows the Unit's flexibility in responding to emerging issues and seeking out actors in organisations with the potential to deliver impact on the ultimate beneficiaries of its research.