

Engineering and development roundtable – background paper

Roundtable Objectives

To bring leading UK engineering researchers together to

1. Map the size and shape of the UK engineering research community relevant to international development.
2. Ascertain whether UK engineering research could be playing more of a role in enhancing UK international development efforts?
3. Identify from key academics what issues a group of funders could address to enhance the impact of UK engineering research in development.

Introduction

Engineering is crucial for sustainable development, and underpins a significant part of UK aid¹, whether it is building new primary schools in Pakistan, providing sanitation in Ethiopia, or generating renewable energy in Nepal. Academic research can provide new knowledge to improve the way we do all of these things. This can enhance the UK contribution to sustainable development, and the knowledge can also be used by others, from rural farmers to the World Bank or Shell, to improve how they tackle shared challenges.

The influential 2011 Institution of Civil Engineers, Oxfam and WaterAid report on community based water management² highlights the thought leadership the UK engineering research base can contribute to international development. As does the Institution of Mechanical Engineers' report "Global Food: Waste Not, Want Not"³ which hit headlines last month with the striking finding that as much as 50% of global food produced never reaches a human stomach.

DFID are likely to spend £110-120m on engineering research over the next seven years to enhance the UK's poverty alleviation efforts.⁴ However, a number of signals indicate that engineering research may not be filling its role of improving UK aid as much as it could:

- Engineering for development research funders are not as joined up as other fields, increasing the chance of duplication or gaps in research.⁵

¹ In 2009-10, DFID channelled more than £900 million to infrastructure activities, out of a total budget of £6.6 billion.

² The Institution of Civil Engineers, Oxfam GB, WaterAid (2011) Managing water locally. An essential dimension of community water development.

³ Institution of Mechanical Engineers (2013) Global Food: Waste Not, Want Not

⁴ DFID, Personal Comm.

⁵ Evidence from C Whitty, House of Commons Science and Technology Select Committee inquiry into science and international development, 2012.

- Some development-related research currently funded would be strengthened by the inclusion of an engineering component.⁶
- UK engineering research capacity relevant to international development is thought to have declined, with late-career research leaders and few mid-career researchers.⁷ For example, road research capacity has declined significantly, and agricultural engineering ‘fell between’ two Research Councils, with an accompanied lack in resources.

UKCDS is well placed to bring together the key players to explore these issues, as the only organisation working across all disciplines to join up leaders and funders to advance UK science for international development. In October 2012 it convened a cross-Government group to discuss the state of play. This discussion was wide ranging, covering the research base, skills for today’s global engineering companies and the changing nature of global development and aid. One key action emanating from this meeting was for UKCDS to work with the Royal Academy of Engineering (RA Eng) to better understand the shape and nature of the UK development-relevant engineering research base.

Existing data

While there are lots of data on the UK engineering research base (inputs, human capital, outputs) there are very little data on how much research is international development focused. This is not surprising: it is both very difficult to decide what should be included and excluded as ‘development focused’, and since data is often not categorised in this way at the point of collection, there are few datasets that exist.

To try and find what data is available, UKCDS has spoken to a number of organisations (Engineers Without Borders, Engineers Against Poverty, the Engineering Council, the Women’s Engineering Society, Association of Commonwealth Universities and Evidence, Thomson Reuters). These organisations have confirmed that there is no existing data mapping the UK engineering for development research base.

Qualitative mapping

In the absence of quantitative data, UKCDS and the RA Eng have convened this roundtable of leading academics to gain expert insight into the scale and nature of the engineering for development research base. We hope to start answering these questions:

- How big is the engineering for development research base? How many researchers would consider themselves to be working on engineering research for development?
- Which research areas are strongest and weakest? Is the UK world-leading in any areas?
- Where are these researchers getting their funding from? And who are they collaborating with internationally?
- Is there an engineering for development ‘community’ (a critical mass who see themselves as doing the same, or similar things)? How has this community changed over time? Have particular fields grown?

⁶ An expert Grant Panel discussing research proposals to the ESRC/NERC Increasing Resilience to Natural Hazards scheme in 2012

⁷ UKCDS-convened roundtable discussion in October 2012.

The UK clearly has some relevant capacity: in a current DFID-DECC-EPSRC call on Energy and International Development, there were 90 Expressions of Interest from UK academics. It might not be immediately obvious where the best researchers are based: of 40 engineers who applied, five came from non-engineering departments, including a business school.⁸

Similarly, how do we reconcile the fact that there are only a handful of departments of agriculture in the UK, but 40 universities, 31% of the UK university sector, applied to the BBSRC/DFID Sustainable Agriculture Research for International Development (SARID) programme.⁹

Issues for discussion

1. Joined-up funding

Funders who communicate effectively and are joined-up can have more impact by not duplicating each other, spotting gaps, pooling resources to fund expensive equipment or experiments, and creating a critical mass where that is necessary for progress.

The UK health for international development funders are well joined-up, with established formal and informal channels for sharing information and brokering partnerships. Is the engineering community less joined up, as per the introduction? Does that just reflect the nature of engineering (see below), and most importantly, does it matter for international development?

Engineering as a process rather than a subject-defined field

Many fields of academic research are defined by what the knowledge is 'about' rather than how the knowledge was generated (e.g. neuroscience is fundamentally to do with the brain whether the information comes from fMRI scanning, or behavioural studies of patients with lesions).

Engineering, without getting into the exact definitions, is concerned with the application of scientific methods to practical problems. These practical problems vary from those that would classically be considered engineering e.g. developing earthquake resistant buildings, to those not so obvious e.g. developing drought resistant crops. In this way, engineering could be conceived as a process, rather than domain specific knowledge.

Engineering as a 'brand'

DFID label much of their engineering research under "Infrastructure". The Global Food Security Programme chooses not to use the phrase "agricultural engineering", instead using "engineering solutions for agriculture". In addition, as engineering is embedded across different research themes (see the text box above), it may have less of a profile, or 'brand' than other fields of research.

For example, in the post 2015 discussions taking place at the moment, the health community are very vocal, with events at the Department of Health, in Parliament, position papers and a vibrant discussion. The engineering community are not so visible, at least not labelled as 'engineering'.¹⁰

⁸ UKCDS analysis by Alex Green. 'Engineers' defined by a PhD in engineering. Data from EPSRC. Jan 2013.

⁹ Carter, A, and Waage, J. Understanding the UK agricultural research contribution to international development and food security: Historical perspectives and future opportunities (2011).

¹⁰ Googling "post 2015 health" and "post 2015 engineering" really highlights the difference.

Does, or will, this have negative implications for the UK contribution to international development? Are there examples from other sectors where a *lack of branding* has led to lower resource allocation (and therefore lower development outcomes)? NB. This is related, but not to be confused with sectors dropping out of fashion for non-branding reasons e.g. tertiary education under the MDGs.

2. How could engineering funders' help UK researchers better fulfil their potential in advancing sustainable development?

Given the points raised during the discussion, we would like to ask how engineering research funders, such as UKCDS members and the RA Eng, could improve the role that engineering research plays in development. Are there practical measures that could overcome or mitigate some of the challenges that have been raised?

Ian Thornton, UKCDS, and Holly Wright, Royal Academy of Engineering, February 2013