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Dear Alan,

Thank you for your letter of 15 April on strategically important and vulnerable subjects (SIVS). I am distressed that it has taken so long to get back to you, the fault rests entirely with my office, and I hope you will accept my apologies for not responding sooner.

On receiving your letter I sought input from departmental Chief Scientists Advisers and other key stakeholders on subjects which they considered to be strategically important and vulnerable. I summarise their views below.

Impact on the work of HM Government

Several departments emphasised the interdisciplinary nature of the skills required by the majority of government analysts. Modern policy making needs to take account of ever more complex systems, a process to which polymaths add considerable value. Consideration should be given to how postgraduate courses might reflect this.

Nuclear science and engineering

Nuclear science and engineering and related subjects were the most commonly cited areas of concern. They were mentioned specifically by the Foreign and Commonwealth Office, the Department for Energy and Climate Change, the Health and Safety Executive, the Food Standards Agency, and the Ministry of Defence. In particular, it was noted that there appears to be a shortage of postgraduates coming through with expertise in nuclear power (including safety and inspection), counter

proliferation, and radiological detection and protection. This could significantly impact on the Government's ability to deliver on its policies.

Security

The UK's national security infrastructure relies heavily on STEM research. Although in general UK maths is strong, colleagues identified two areas of concern; algorithmics and statistics.

Algorithmics is at the interface between mathematics and computer science and is highly relevant to activities in the security sector as well as in the financial world. It is therefore critical that the UK develops and maintains strengths in this discipline.

In the area of statistics, the particular concern raised related to the analysis of challenging datasets (very large, very fast data-mining and stream-mining). This is of enormous importance across government, commerce and industry, and it is expected that challenging data will form an increasing part of the business of security, particularly in cyber security. Indeed, cybersecurity itself was identified as not being taught well in universities with teaching tending to focus on the theoretical side.

Safety

The Health and Safety Executive (HSE) identified a number of SIVS relevant not only to its work, but also to economic sectors important to UK infrastructure, and to emerging industries where hazards and risks are not yet understood. These included: mechanical engineering, for example in relation to the gas industry and pipelines more generally; electrical engineering, particularly control and instrumentation work; process safety and integrity; occupational health and hygiene; and chemicals regulation (particularly in agriculture). At a very specific level, it also noted a shortage of chemical spray application specialists and of toxicologists and ecotoxicologists for the regulation of chemicals, including nanomaterials.

Looking to the future, the HSE highlighted the need to ensure a pool of graduates equipped with the necessary skills to support emerging priorities, for example to address the health challenges of: microbiology, biological agents and synthetic biology; novel manufacturing methods; and new materials.

Food security, biotechnology and environment

Colleagues raised three issues of concern in this area.

First, that student interest is declining in core disciplines at a time when the agricultural and food sectors need access to highly-skilled individuals. These disciplines include crop genetics and breeding, soil and weed science, applied animal nutrition, production systems, nematology, agronomy.

Within the Agricultural Economics (AgEcon) field, the issue is not with the percentage of those enlisting on relevant degrees, but with the limited number of programmes being offered. Just fifteen academic institutions offer AgEcon or similar undergraduate courses.

Second, while the industrial biotechnologies sector is a key growth area for the UK, graduate and postgraduate numbers are low in subjects relevant to bioenergy, biological agents and synthetic biology, and novel new materials and manufacturing methods. This has the potential to make vulnerable UK growth in this sector.

Third, taxonomy continues to be crucial to understanding changes in biodiversity as a response to climate change. However, low student interest has led to a loss of expert teaching staff with retiring experts being replaced by staff working in more popular disciplines.

If you would like further detail on the issues and risks for specific areas then please do not hesitate to contact me. I can guarantee a more prompt response.



Sir John Beddington