

**GLOBAL SCIENCE AND INNOVATION FORUM:**

**A STRATEGY FOR INTERNATIONAL  
ENGAGEMENT IN RESEARCH AND  
DEVELOPMENT**

**October 2006**

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The membership of the Global Science and Innovation Forum (GSIF) is drawn from the following organisations:

**Office of Science and Innovation**

[www.dti.gov.uk/science/](http://www.dti.gov.uk/science/)

**UK Trade and Investment**

[www.uktradeinvest.gov.uk](http://www.uktradeinvest.gov.uk)

**Foreign and Commonwealth Office**

[www.fco.gov.uk/science](http://www.fco.gov.uk/science)

**Department for the Environment, Food and Rural Affairs**

[www.defra.gov.uk/science/default.htm](http://www.defra.gov.uk/science/default.htm)

**Department for International Development**

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**British Council**

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**Research Councils UK**

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**Global Science and Innovation Forum**

<http://www.dti.gov.uk/science/uk-intl-engagement/gsif/index.html>

## FOREWORD

We are now – probably more than ever before – living in a global age; we can access vast quantities of information from all around the world and interact with a far greater diversity of people than has ever been possible before. Advances in science, engineering and technology have provided much of the knowledge underpinning the changes we have seen and the ability to innovate, adapt and use this knowledge has changed the way all of us live, work and communicate. Equally, world poverty and sustainable development remain serious challenges where science and technology have a critical role to play; and from global terrorism and the spread of disease to the dangers of global warming, we are increasingly facing the sorts of threats for which governments will need to turn to scientists.

Recognising the importance of science and innovation, the UK government set out its long-term vision and commitment to invest in this area in its Science and Innovation Investment Framework 2004-2014. The Global Science and Innovation Forum (GSIF) was formed as a result, recognising that science and innovation are international endeavours where the UK must be an effective and active global player. GSIF has fostered a coordinated and shared approach across key government departments and non-governmental actors, and as its Chair, I am proud to present the strategy that has resulted from this work.

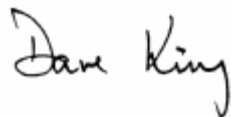
This document provides, for the first time, an overarching strategic framework through which international collaborative science and innovation activity can be coordinated and prioritised. It is based on evidence of the considerable strengths of the UK's science and innovation base, and the depth and diversity of our existing international engagements. The strategy is based on four priority areas:

- research excellence - through strengthened international collaborations and attracting the best researchers to the UK;
- excellence in innovation - through UK businesses accessing international science and by attracting international R&D investments to the UK;
- global influence - by using international science to underpin foreign policy and as a tool to promote bilateral partnerships; and
- development - using research and innovation to meet international development goals, in line with the recent UK White Paper on "Eliminating World Poverty".

Drawing on the evidence base, we set objectives in each of the priority areas, identify countries on which to focus, and offer a number of recommendations. We emphasise that researchers and businesses in the UK must be able to access and participate in leading international research, and suggest ways to strengthen this. There is also a need for the UK to develop strategic partnerships in research and innovation, and we recommend new approaches for international fellowships and for links with China and India. An underlying

theme of the strategy is the need for better coordination of the UK's international efforts, and we propose that this applies to communicating and marketing the UK's strengths as well as to promoting the use of scientific advice in international policy making.

Given that the pace of change is likely to accelerate over the next decade this strategy represents the start of an ongoing process; one which the Global Science and Innovation Forum will continue to guide and one which must be complementary to other internationally focussed government activities.

A handwritten signature in black ink that reads "David King". The signature is written in a cursive, slightly slanted style.

Sir David King ScD FRS

Chief Scientific Adviser to HM Government and  
Head of the Office of Science and Innovation

Chair of the Global Science and Innovation Forum

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Global Science and Innovation Forum:  
a strategy for international engagement in research and development:

## 1. INTRODUCTION

- 1.1 The future prosperity of the UK depends upon its success within an evolving and highly competitive global, knowledge-based economy. The UK Government views science and innovation as two cornerstones of its reaction to this globalisation challenge – recognising that, as competitors' economic activity moves rapidly up the value chain, the UK's ability to excel in globally competitive research and to rapidly exploit that research to provide competitive innovative products and services will be key to retaining its position.
- 1.2 The UK starts from a position of strength. The UK research base is the most efficient and most productive system in the world in terms of outputs. The challenge will be to maintain and build this system and to optimally harness the output of this system in meeting the globalisation challenge.
- 1.3 In July 2004, the Government published the UK Science and Innovation Investment Framework (2004-2014)<sup>1</sup> – *the ten-year framework* – a new platform for UK science and innovation policy in the decade to come which set out a challenging target for the UK: to invest 2.5% of GDP in research and development (R&D) by the end of this period.
- 1.4 The ten-year framework recognises that, although the achievement of the challenging 2014 target will depend upon increased UK public sector and matching UK private sector investments in R&D, success must also be dependent on competing globally for research investment. In parallel, the Framework also recognises that one of the key features determining the attractiveness of the UK as a research and development location, is the internationally competitive nature of its science base and those who work within it. For these reasons, the Government has set itself the aim **“that the UK should be a partner of choice for global businesses looking to locate their research and development and for foreign universities seeking collaboration with the science base or business“**.
- 1.5 It is also recognised that achieving the Millennium Development Goals<sup>2</sup> and managing global challenges requires investment in science, technological advance and innovation. Developing country governments need access to the best international expertise. With the right networks scientists in developing countries can use their skills to help the poorest and encourage effective evidence-based policymaking.

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<sup>1</sup> HMT/DTI/DfES, July 2004, *Science & innovation investment framework 2004-2014*, [http://www.hm-treasury.gov.uk/spending\\_review/spend\\_sr04/associated\\_documents/spending\\_sr04\\_science.cfm](http://www.hm-treasury.gov.uk/spending_review/spend_sr04/associated_documents/spending_sr04_science.cfm)

<sup>2</sup> <http://www.un.org/millenniumgoals/index.html>

1.6 To support the above objectives, and as one of the commitments in the ten-year framework, the Government established the Global Science and Innovation Forum (GSIF) and tasked this Forum with developing an overarching national strategy for international engagement in R&D. The establishment of GSIF brings together the main players in promotion of international R&D in the UK in order to coordinate a more evidence-based approach to international engagement, to ensure UK intervention in this area adapts to the evolving international economic and research environment and to evaluate the success of UK interventions. The Government asked GSIF<sup>3</sup> to include the following aspects in the overarching strategy:

- (i) the FCO, DTI and UKTI pro-actively promoting the UK as the partner of choice for international R&D and facilitating inward investment and outward trade;
- (ii) coordinating cross-government work on the S&T aspects of major global issues, such as climate change and S&T capacity building in developing countries;
- (iii) identifying main strategic partners for international facilities and collaboration and using networking and other programmes more strategically to make these partnerships happen;
- (iv) presenting an interface between UK activities and individual researchers and businesses that is coherent and simple to access;
- (v) identifying and prioritising EU and global large facilities which the UK will want to contribute to or host;
- (vi) using EU R&D programmes to the best advantage, particularly taking into account EU enlargement to 25 Member States.

1.7 In March 2006, the Government published Science & innovation investment framework 2004–2014: Next Steps<sup>4</sup> to the ten-year framework that set some of the detailed policies adopted or planned to meet the targets set in 2004. Next steps reaffirmed the importance of international science and innovation and set out two specific policies:

- (i) a new £9m programme to attract more business R&D to the UK and to promote innovative UK firms abroad (to be delivered by UKTI); and
- (ii) plans to promote international science and innovation links with universities and high-tech clusters (particularly in China and India).

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<sup>3</sup> Ten-year framework, pp129

<sup>4</sup> HMT/DTI/DFES/DH, March 2006, *Science & innovation investment framework 2004–2014: Next Steps*, [http://www.hm-treasury.gov.uk/budget/budget\\_06/assoc\\_docs/bud\\_bud06\\_adscience.cfm](http://www.hm-treasury.gov.uk/budget/budget_06/assoc_docs/bud_bud06_adscience.cfm)

- 1.8 GSIF was established in 2005 and is chaired by the Government's Chief Scientific Adviser. The membership of GSIF is drawn from the following organisations:
- Office of Science and Innovation (DTI/OSI)
  - UK Trade and Investment (UKTI)
  - Foreign and Commonwealth Office (FCO)
  - Department for Environment, Food and Rural Affairs (Defra)
  - Department for International Development (DfID)
  - Department for Education and Skills (DfES)
  - British Council
  - The Royal Society of London
  - Research Councils UK (RCUK)
- 1.9 Since its establishment GSIF has been developing an international strategy – commissioning and considering evidence, prioritising key objectives in focus countries and developing its first set of recommendations.
- 1.10 The clear mandate given to GSIF was to adopt an evidence-based approach to its work and in developing an international strategy<sup>5</sup>. This document therefore presents the evidence for the increasing importance of international science and innovation and thus the drivers for a strategy to promote UK engagement globally. It also examines the levers for intervening in support of UK engagement and reviews existing UK promotional activity against that of a number of competitor countries.
- 1.11 This strategy does not address points (iii) and (v) of para 1.6 at this stage. GSIF has postponed its consideration of these issues while the Government has been consulting on the creation of a Large Facilities Research Council; the policy responsibility in this area is OSI and RCUK who are jointly accountable for it. GSIF notes that there is considerable coordinated activity already in hand around Large Facilities<sup>6</sup>.

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<sup>5</sup> The detailed evidence projects that underpin this strategy can be found online at: <http://www.dti.gov.uk/science/uk-intl-engagement/gdif/index.html>

<sup>6</sup> UKTI and the newly formed Sensors KTN Special Interest Group on Research Facilities sponsored by Research Councils, UKAEA and DTI are coordinating (with RDAs, DAs, DTI, and FCO) a coordinated cross government approach to trade and inward investment aspects of large science projects including ITER (Fusion reactor) CERN (Geneva) and the European Southern Observatory (HQ Germany). There are opportunities for UK firms in all of these large-scale projects, and whether these are funded in full or part by the UK it is not unreasonable to establish a level of "juste retour".

1.12 This strategy reacts to the mandate given to GSIF in four distinct axes, that the UK should:

- (i) be excellent in **research**;
- (ii) be excellent in **innovation**;
- (iii) use research and innovation to leverage global **influence**;  
and
- (iv) use research and innovation to meet international **development** goals.

It sets clear objectives for each of the above axes and takes evidence-based decisions on the countries in which GSIF will focus when addressing each objective. The objectives and countries are those where GSIF believes it can add most value by facilitating the coordination of UK activities. GSIF notes that the unilateral activity of its members in other countries and/or to fulfill other objectives will continue outside of this strategy.

1.13 The strategy also builds upon the evidence presented to assess existing UK activity and make GSIF's first set of recommendations for changes in the way that support for international engagement in R&D should be provided in the UK.

1.14 Finally, this document sets out how this strategy will be taken forward by UK players in the context of the ten-year framework and next steps, and how GSIF will promote cross Governmental working for optimal delivery.

1.15 The strategy is part of an ongoing GSIF process, and GSIF will:

- (i) continue to improve the coordination between UK players in international science and innovation;
- (ii) monitor trends in research, in innovation and the way international businesses and competitor countries are moving; and
- (iii) review this strategy annually as part of the regular monitoring of the *Science and Innovation Investment Framework: 2004-2014*, updating and considering new areas and priorities as necessary.

## 2. THE IMPORTANCE OF A UK INTERNATIONAL SCIENCE AND INNOVATION STRATEGY

*One of the opportunities of increasing worldwide scientific activity is increased collaboration and sharing among scientists of many nations, whose work can open many doors, to broaden knowledge and create innovations for the world's benefit.*

US National Science Foundation , February 2006<sup>7</sup>

### Introduction

- 2.1. The UK has one of the most productive and efficient science systems in the world<sup>8,9</sup>. Although the UK represents only 1% of the global population, it produces 9% of the world's scientific publications, which in turn receive 12% of the scientific citations. On one measure, six of the top ten universities in Europe are to be found in the UK and both Cambridge and Oxford Universities feature in the world top ten. The strength of the UK research base is a major national asset which the Government intends to constantly nurture and exploit to improve the rate of innovation, to create a robust approach to future risks, to strengthen UK influence on key global issues and to assist developing countries.
- 2.2. From the perspective of GSIF, the important aspect of the above impressive statistics is the silent bibliometric datum – that 90% of the world's scientific output is not from the UK, but our level of activity provides direct access to this external output. In an increasingly globalised knowledge-based economy science is also becoming a more complex matter, requiring co-operation between laboratories and researchers around the world and sophisticated information processing and sharing. It is not carried out in isolation and to optimise the return on UK investments in science and innovation it will be necessary to also optimise international scientific collaboration and its exploitation.
- 2.3. This chapter briefly examines evidence for the growing internationalisation of science and innovation and therefore presents the drivers for a UK international science and innovation strategy.

<sup>7</sup> US National Science Foundation, February 2006, *Fact sheet Science and Engineering Indicators 2006: The Rapidly Changing Global R&D Landscape* [http://www.nsf.gov/news/news\\_summ.jsp?cntn\\_id=105857](http://www.nsf.gov/news/news_summ.jsp?cntn_id=105857)

<sup>8</sup> DTI, December 2005, PSA target metrics for the UK research base, <http://www.dti.gov.uk/files/file27330.pdf>

<sup>9</sup> D A King, 15 July 2004, The Scientific Impact of Nations, *Nature*, 430 (2004) 311-316

## Science is an international endeavour

- 2.4. International collaboration has always been the norm for scientific activity. The impact of significant international funding mechanisms such as the European Community (EC) Framework Programmes plus the revolution in information and communication technologies in the last two decades have fuelled a step change in cross-border collaboration.

**Table 1: Share of international co-publications in total publications (%)**

	UK	France	Germany
<b>1992</b>	20.5	27.1	25.1
<b>1995</b>	24.0	30.1	29.0
<b>1998</b>	31.3	35.8	41.7
<b>2001</b>	35.8	40.9	46.2
<b>2003</b>	39.2	43.7	43.0

- 2.5. This increase in international collaboration is supported by international journals, international (or at least pan-continental) learned societies, international conferences and the use of international peer review systems. For example Table 1 shows that, in 1992, 20.5% of UK scientific publications were internationally co-authored – by 2003, this figure had almost doubled to 39.2%<sup>10</sup>, although it is noted that co-authoring is by no means the only indicator of scientific interaction.
- 2.6. A recent survey<sup>11</sup>, undertaken for the Office of Science and Innovation, reported that 73% of UK universities expect their international engagement to increase over the next decade – a trend that is increasingly supported by pro-active international strategies on the part of universities.

## Science is undertaken at a scale that demands international collaboration

- 2.7. The term “big-science” has been coined for very large projects or infrastructure that are sometimes required to tackle major issues of economic, societal or global policy importance. Although some large economies can afford to fund very large projects or construct large-scale infrastructures, there is a trend toward global or regional cost-sharing of such initiatives. This trend makes economic and scientific sense – not only does it avoid duplication of effort, lower the per-

<sup>10</sup> Arthur D Little Ltd (ADL), November 2005, *Internationalisation of research and development in the UK - a review of the evidence*, <http://www.dti.gov.uk/science/uk-intl-engagement/qsif/index.html> pp45-46 – Table 11

<sup>11</sup> Technopolis Ltd, December 2005, *Drivers, barriers, benefits and government support of UK international engagement in science and innovation*, <http://www.dti.gov.uk/science/uk-intl-engagement/qsif/index.html> pp19 Exhibit 7

country investment and increase the efficiency of total research investment, but the scientific collaboration that follows increases the likelihood of success. For example:

- (i) **CERN** (the European particle physics centre) has been in operation for 50 years – allowing the countries of Europe and others to conduct groundbreaking research using facilities that would stretch the budget of any single member country. The operating budget of CERN in 2005 was around €600m<sup>12</sup>;
- (ii) the proposed International Thermonuclear Experimental Reactor (**ITER**), a collaboration between the EU, Japan, China, India, South Korea, Russia and the US on which the world’s hopes for future fusion energy production are pinned, has construction costs in the region of €5 billion over 10 years; and
- (iii) The Human Genome Project (**HGP**) was the international, collaborative research program whose goal was the complete mapping and understanding of all the genes of human beings. The HGP involved some 20 international partners and cost about €2 billion<sup>13</sup>.

### Scientists are mobile – seeking the best environment in which to excel

2.8. Higher education provision in the sciences is an international market. UK, France and Germany all have in excess of 10% overseas students in their tertiary education sector (over a quarter of a million students in each case) and for UK and France a significantly greater proportion at PhD level<sup>14</sup>.

**Table 2: International mobility of students (% of total students)**<sup>15</sup>

	UK	France	Germany	US
<b>Tertiary</b>	11.2	10.5	10.7	3.5
<b>PhD</b>	35.0	22.5	>10	~30.0

2.9. The term “brain circulation” has been coined to describe the increasing mobility of the global research workforce. For example, Figure 1 shows the relative flows in and out of the EU-15 in 2000 and indicates that the “circulation” is not random – the largest inflow of science and technology personnel into the EU was from other European countries whereas the largest outflow was clearly transatlantic. There are currently an estimated 400,000 EU science graduates in the US<sup>16</sup>.

<sup>12</sup> <http://www.pparc.ac.uk/rs/fc/cern.asp>

<sup>13</sup> \$US 1991 <http://www.genome.gov/11006943>

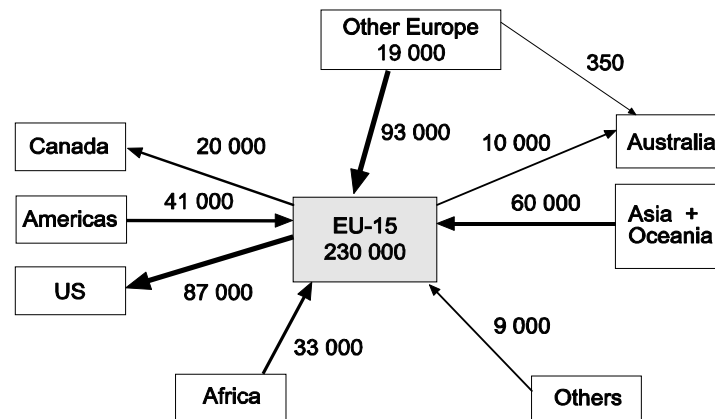
<sup>14</sup> ADL pp36-44 - table 7 and figure 10

<sup>15</sup> 2001 ADL Fig10

<sup>16</sup> European Commission, Directorate-General for Research, *Key figures 2003-2004 for science, technology and innovation*

These data could be interpreted to show that the movement of researchers is predominantly from geographic regions with weaker science systems to those with stronger science systems.

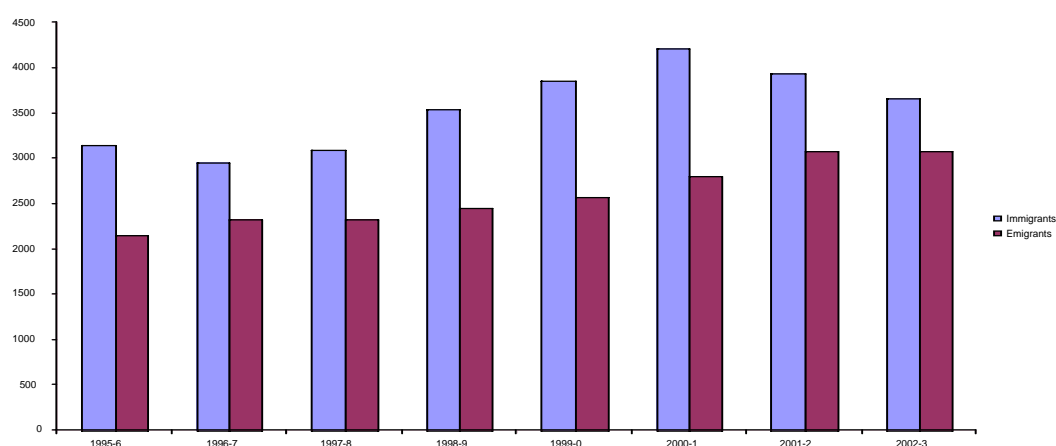
**Figure 1: Net migration between the world regions: origin of non-nationals occupied in science and technology, 2000<sup>17</sup>**



2.10. There has been a global closing of the gap between immigrant researchers and emigrants since 2001. In the US the gap has closed and there are now more emigrant than immigrant researchers. The US share of immigration actually ended the period (1994-2003) lower than it began it in absolute as well as relative terms. Figure 2 below indicates that since 2001 the UK has experienced a similar trend but still maintains a positive balance.

<sup>17</sup> ADL pp55 Fig 18

**Figure 2: Estimated immigration and emigration of researchers in the UK<sup>18</sup>**



### **Business R&D is mobile – seeking the best environment in which to prosper**

- 2.11. Businesses employ people, invest, buy and sell products and services all around the world. They also engage with and undertake R&D in a global context – creating research facilities or linking with existing capacity – to extract value for their businesses wherever the best and most innovative research is taking place.
- 2.12. Recent literature on the mobility of business R&D points to a shift in the way many businesses perceive their international R&D activity<sup>19</sup> – away from small-scale foreign R&D based on adapting home-produced innovations for overseas markets towards globally distributed research and development activity that seeks to exploit foreign science capacity and talent leading to innovation for world markets. In this context, the quality of scientific expertise and technological capacity in a specific country has a greater bearing on the attractiveness of that country as a place to invest in R&D.
- 2.13. Total R&D expenditure by affiliates of foreign companies increased by more than 50% in the OECD for the period 1991-2001<sup>20</sup>. In the UK, this expenditure (in 2001) accounted for 45% of the total R&D expenditure performed in the business sector (BERD). In cash terms expenditure in the UK above represents \$4.7 billion in 1997 and \$8.5 billion in 2001. These figures confirm the attractiveness of the UK as a location for businesses to invest in R&D, they also highlight the need for the UK to remain a highly attractive place for R&D.

<sup>18</sup> Technopolis pp24 Exhibit 10

<sup>19</sup> See literature review presented in ADL pp58

<sup>20</sup> ADL pp65

**Table 4: R&D expenditure by foreign affiliates as a % of BERD<sup>21</sup>**

	UK	France	Germany	US
1997	32	16	17	11
2001	45	19	25	14

- 2.14. At the same time as inward R&D foreign direct investment in the UK is high, the investments in R&D that UK companies make overseas are also substantial. For example, in 2004, UK companies invested around \$5 billion on R&D in the US<sup>22</sup>. These investments are important in raising innovation performance through access to foreign scientific and technological know-how.
- 2.15. Recent research shows that where the UK invests R&D resources in other countries, an ‘absorption route’ back to the UK ensues<sup>23</sup>. It is also increasingly true that multinational companies have a significant influence on where and what R&D is done and also lead in the application of research and innovation.
- 2.16. An additional trend towards internationalisation is that increasingly, many innovative start-up companies are “born global”. That is to say that their product is so specialised that their market is global from day one, a phenomenon driven by complex globalised supply chains, dominated by multinationals.

### **Major international policy challenges require scientific evidence-based approaches and innovative solutions**

- 2.17. Many of the major global policy challenges facing policy-makers and governments have a strong science dimension (e.g. climate change, energy security, epidemics, sustainability, food security and safety). The strength of the UK science base should place UK in a strong position to both influence the debate and to lead the policy response.
- 2.18. The UK has a strong tradition of supporting policy-oriented research. In addition to the underpinning evidence provided by the research supported by the Research Councils, UK Government Departments spent in excess of £1.5 billion in 2004-05 on research activity to directly support their policy objectives.
- 2.19. Implementation of policies in these areas often demands technological innovation on a large scale (e.g. environmental technologies, novel energy solutions, pharmaceuticals) which in turn can provide a market-pull on private-sector R&D investments.

<sup>21</sup> ADL page 66 Fig 23

<sup>22</sup> The United Kingdom accounted for 20 percent of 2004 foreign direct investment flows and was second to Canada (33%) but ahead of Japan with 17%

<sup>23</sup> UKTI (DTI), March 2006, *Study of the relative economic benefits of UK trade and investment support for trade and inward investment: Final synthesis report; Annex 4 Harris and Li (2005)*

## **Science and Innovation can play an important role in commonly agreed international development goals**

- 2.20. Some of the most pressing global challenges to be tackled relate to international development. One in five people in the world today, over one billion people, live in poverty on less than \$1 a day. An estimated 350m-500m cases of malaria occur annually and the number of people with HIV infection increases by an estimated 14,000 per day.
- 2.21. Achievement of the Millennium Development Goals adopted by the UN in 2000, will, in part, need to be underpinned by either advances in science or the exploitation of scientific knowledge. From reducing hunger and child mortality to combating infectious disease – these will all require an international scientific and/or innovative technological response.
- 2.22. The reports of the Commission for Africa<sup>24</sup> and the UN Millennium Project both underscored the critical importance of knowledge and innovation for development in every country, not only for reducing poverty, but also for underpinning long-term growth and strengthening both the public and the private sectors in developing countries.

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<sup>24</sup> Commission for Africa, March 2005, *Our Common Interest, Report of the Commission for Africa*



### **3. THE PROMOTION OF INTERNATIONAL SCIENCE AND INNOVATION**

#### **A REVIEW OF EXISTING UK POLICIES AND COMPARISONS WITH OTHER COUNTRIES**

##### **Introduction**

- 3.1 As described in the previous chapter, there are a number of powerful drivers all pointing towards an increasing importance of international engagement of UK research and development. Being able to address common policy challenges through joint research, exploit the complementary strengths of different national research programmes, and achieve the critical mass needed to fund large-scale projects means that it is important that the UK continues and, where possible, increases efforts to engage in collaborative research activities, using the mechanisms available to overcome any potential barriers.
- 3.2 This chapter reviews current UK activity, and where relevant compares this with similar activity in a number of international competitors, it is structured around the four axes identified in Chapter 1 (paragraph 1.12) – excellence in research, excellence in innovation, using research and innovation to leverage global influence and use research and innovation to meet international development goals. Across these four axes the information available is used to identify possible areas where the UK could improve its performance. Further information about the range of support and programmes delivered by GSIF members' organisations is provided at Annex A.

##### **Research: encouraging excellence in research through the promotion of international collaboration in science**

- 3.3 The data presented in the previous chapter paints a positive picture of increasing international collaboration in science. The vast majority of interactions involving individual UK scientists and UK research establishments are bottom-up – driven by the scientific needs for and assessments of the mutual benefits of working together. However, there is a role for government in addressing barriers to collaboration such as funding, bureaucratic complexity or structural issues and in promoting the UK science base as the “partner of choice”.
- 3.4 Some international relationships, although clearly of benefit, may require assistance (“pump-priming”) due to cultural or administrative barriers between countries or scientists. Some potential partner countries (e.g. China or India) have very centralised science systems in which (i) central government plays an important role and (ii) scientific collaborations are facilitated by government-to-government interaction. The scientists and scientific institutes (particularly where they are newly established commercial laboratories) in these potential partner countries may also be less visible to domestic scientists due to their rapidly developing science bases.

- 3.5 The **UK** government encourages scientific relationships (with China, India, Brazil, South Africa and South Korea) through bilateral networking schemes. These schemes aim to overcome the hurdles described above by providing a governmental “badge” to the individuals and groups involved and by providing some funding to cover the logistical costs of networking. The schemes are funded by OSI and administered by the Royal Society. The total annual cost of the schemes to the UK is £470,000.
- 3.6 The **UK** government also encourages scientific collaboration with India through the UK-India Education and Research Initiative (UKIERI). The initiative aims to substantially improve research and education links between India and the UK, ensuring in the longer term that we become each other's partner of choice in education and research. The UK government budget for UKIERI is £12m.
- 3.7 The **UK** FCO, through its in-country science and innovation network (SIN) helps deliver UK success by facilitating collaboration between UK universities and research laboratories and public and private counterparts abroad. Established in 2000, SIN now comprises 42 missions in 30 countries and territories across the world. FCO, through its Global Opportunities Fund (GOF), also provides dedicated funding for networking, to bring together research providers and users in key areas of strategic importance. The allocation from the GOF Economic Governance programme for science projects around the world varies from year to year according to the project bids. It stands at about £1.38m for 2006-07 and £1.48m in 2007-08.
- 3.8 The **UK** Research Councils undertake and fund a range of international activity from joint funding of research projects (bilaterally with counterpart organisations in other countries or through formal agreements such as ERA-Nets under the EC Framework Programme and international programmes such as HFSP, CERN, ESA and ESO) through to mobilising the UK research community via funding for visits, workshops and partnering activities. The following examples illustrate the depth and range of international activity attached to research councils:
- in 2004-05 41% of NERC-funded ISIS publications were published in partnership with an overseas co-author;
  - EPSRC have identified 11% of its grant portfolio as having explicit collaboration with another country;
  - BBSRC has specific schemes (annual budget £560,000) for grant holders to partner with researchers in other countries;
  - EPSRC's INTERACT scheme focuses on new collaborations with India, China and Japan;
  - CCLRC estimates that some £1.25m is spent on supporting the use of its large facilities by international users. A further

£1.5m is spent to support international collaborations under the EC Framework Programmes;

- 50% of PPARC's budget (£156m) goes on International Subscriptions, and the university grant funded programme is focused on research and technology development to enable the UK to play a leading role in these partnerships;
- MRC invests £10.7m per annum into research institutes based in Africa to undertake global health research and develop local research activity; and
- Research Councils provide the UK financial contribution to multinational projects such as genome sequencing.

- 3.9 The **(UK)** British Council currently has science programmes in 70 countries with a global budget of £8m. Science activity tends to be greatest in Europe, East Asia, the technologically advanced Commonwealth countries and Latin America. Activity is prioritised on the basis of research capacity, demand, potential impact and stakeholder interests.
- 3.10 The Royal Society is the **UK** Science Academy and as such undertakes and funds a range of international activities. Over £6m per year is used to support scientific collaboration between UK scientists and their overseas partners, via short visits, joint projects, fellowships and other networking activities. The Society publishes seven international scientific journals which have a large overseas authorship and subscription base. The Society also engages in considerable networking and policy activity with its international counterparts, seeking to ensure input from the international scientific community on important global policy issues.
- 3.11 In the **US** the National Science Foundation Partnerships for International Research and Education enables institutions to establish collaborative relationships with foreign groups or institutions in order to advance specific research and education objectives and to make possible a research effort that neither side could accomplish on its own. The first grants were awarded in January 2006 and it is expected that some \$5m will be invested each year depending on the number of grants and their size and duration<sup>25</sup>.
- 3.12 **US** international programmes are nearly always coordinated with the State Department, but the larger agencies act with a considerable degree of independence in their domains of science. For example, NASA<sup>26</sup> interacts closely with international counterpart agencies on a more or less continuous basis. The National Institutes of Health Fogarty Center is devoted to international programs using scientific resources to reduce global health disparities and to prepare current

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<sup>25</sup> <http://www.nsf.gov/div/index.jsp?org=OISE>

<sup>26</sup> 2007 budget = \$16.8 billion (all programmes)

and future generations of scientists to meet global health needs. Its budget for 2006 is approximately \$50.8m<sup>27</sup>.

- 3.13 In 2006, the **German** government, the BMBF (Federal Ministry of Education and Research), has earmarked €234m for international collaboration in basic research in the physical sciences, an increase of €12m on 2005. The BMBF has also earmarked a further €24.4m for European and international science institutions in 2006, an increase of €16m on 2005.
- 3.14 The Government of **Canada** announced, in June 2005, the International Science and Technology Partnerships Program (ISTPP) to promote collaborative research and development between Canadian and foreign scientists and technologists. This five-year C\$20m program is aimed at building science and technology relationships with selected partner countries. The program will foster and support bilateral research projects between Canada and other countries and stimulate bilateral science and technology networking and matchmaking activities to further new partnerships and accelerate the commercialisation of R&D.
- 3.15 The information presented above suggests that activity undertaken by the range of organisations in the UK to promote international collaboration in science is generally comparable to the activity of some key competitors. However it is also clear that UK efforts to promote international collaboration are spread across a wide range of different organisations and institutions both governmental and non-governmental, compared to some other countries.

### **Research: encouraging excellence in research through the promotion of the international mobility of scientists**

- 3.16 The previous chapter showed that scientists are increasingly mobile and will seek out the best environments in which to drive their research forward.
- 3.17 Interaction of scientists at an international level keeps scientists in touch with the most profound developments in their field, wherever they occur; and encourages the cross-fertilisation of skills, approaches, techniques, and ideas as well as an exchange of knowledge; it provides training opportunities for early stage researchers. These links keep research at the cutting-edge, and benefit the individual researcher, the particular research projects and the institutions involved. Returning researchers build scientific capacity in their “home” institutions and countries through the application of the knowledge and skills acquired overseas.

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<sup>27</sup> <http://www.fic.nih.gov/about/plan/2006funding.pdf>

- 3.18 Furthermore, maintaining relationships established early in careers – either between individuals, departments, institutions or funders – usually continues to derive benefit and leads to collaboration in the long term. These are valuable in their own right as noted above and can also encourage a continuing cycle of exchange of younger upcoming researchers.
- 3.19 In the **UK** there is already a large amount of activity designed to promote the international mobility of scientists at all levels (see Annex A). Higher Education Institutions, OSI, FCO, Research Councils, British Council and Royal Society all operate schemes that either directly fund incoming research students<sup>28</sup> or support their stay in the UK. These international studentship and fellowship schemes assist researchers at different stages of their careers, and help UK researchers to travel abroad and foreign researchers to travel to the UK. The total UK budget is estimated to be in the region of £100m<sup>29</sup>.
- 3.20 The FCO also funds the British Chevening Scholarships scheme, which provides scholarships for young international postgraduates to study in the UK. The aim is to attract future leaders, decision-makers and opinion-formers to the UK for a period of postgraduate study at a formative stage in their careers. The scheme covers many areas including science.
- 3.21 At the international level, there are also fellowship schemes to which **UK** researchers are eligible, such as the Human Frontiers Science Program or NATO International Fellowships. The Marie Curie scheme run by the European Commission is the largest of these, although the predominant relationship is other EU nationals visiting the UK on fellowship grants, and not vice versa, with around 1,000 Marie Curie Fellows, one third of the total for the fifth Framework Programme, having come to the UK.
- 3.22 The second phase of the **UK** Prime Minister's Initiative (PMI) for International Education was launched in April 2006. The aim is to build on the success of the first phase to secure the UK's position as a leader in international education and sustain the managed growth of UK international education delivered both in the UK and overseas. The PMI will also seek to encourage universities and colleges to collaborate and to forge longer-term strategic partnerships with universities overseas. The key strands are:
- marketing and communications strategies to sustain the managed growth of UK international education delivered both in the UK and overseas;
  - ensuring the quality of the student experience;

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<sup>28</sup> In the context of this document PhD level and above

<sup>29</sup> Technopolis pps70-73

- building strategic, sustainable partnerships and alliances between UK and overseas institutions; and
- diversifying into new markets and consolidating existing markets.

The PMI is providing some £7m in 2006-07 directly to promote the objectives.

- 3.23 The **US** offers various studentships and schemes. Each year some 800 faculty and professionals from around the world receive Fulbright Scholar grants for advanced research and university lecturing in the United States. The Edmund S. Muskie Graduate Fellowship Program confers fellowships for Master's degree-level study in the US from Eurasian applicants in the fields of business administration, economics, education, environmental policy and management, as well as other fields. One hundred and forty-four fellowships have been awarded for the 2006-07 academic year.
- 3.24 **Germany** offers various studentships and schemes including those under the Alexander Von Humboldt Foundation's branding. These schemes include scholarships, research fellowships and opportunities for researchers from developing countries to undertake projects in Germany. Annually there are some 600 opportunities. The Foundation's work provides a strong brand for these fellowships, scholarships and post-doctoral schemes and active management of the alumni. In 2005 the Foundation received €48.7m in state funding. It is very highly regarded and considered by its peers. It promotes an active worldwide network of scholars and supports individual sponsorship during periods spent in Germany. Longstanding follow-up contacts have been hallmarks of the Foundation's work since 1953 since when, more than 20,000 scholars from 125 countries have been sponsored.
- 3.25 Compared to these other countries, the UK activity to encourage the international mobility of scientists is significant. However, aspects where the UK may be able to learn from others is in the branding of fellowship schemes and in pro-active alumni management.

### **Innovation: promotion of international innovation**

*Innovation is occurring more rapidly — barriers of geography and access have come down, enabling shorter cycles from invention to market saturation.*

IBM Global Innovation Outlook 2004<sup>30</sup>

- 3.26 As new markets open up in Asia and multinational corporations establish new R&D facilities across the globe, innovation has become more "open" and less dependent upon academic research. Innovation

<sup>30</sup> IBM, 2004, *Global Innovation Outlook*, [http://t1d.www-306.cacheibm.com/e-business/ondemand/us/pdf/IBM\\_GIO\\_2004.pdf](http://t1d.www-306.cacheibm.com/e-business/ondemand/us/pdf/IBM_GIO_2004.pdf)

can come from the realisation of the application of research – but is also increasingly customer driven. It also occurs between firms operating in knowledge supply chains and clusters. Governments have a role to encourage organisations to internationalise and engage with innovation-generators – those having close research links and those where customer demand, markets and entrepreneurialism are the driving force.

- 3.27 Although there are some domestic programmes in the **UK** that support business-oriented collaborative R&D projects internationally (see below), the major programmes open to UK participants in this respect are European programmes, in particular the EC Framework Programme and the Eureka initiative.
- 3.28 The **EC** Framework Programme was established in 1983 to strengthen the scientific and technological bases of industry and encourage its international competitiveness while promoting research activities in support of other European Union (EU) policies. In the current (sixth) Framework Programme the average annual budget is approximately €5 billion. The proposed seventh Framework Programme (2007-13) will introduce new aspects and an average annual budget of around €7 billion. More than 60% of the programme will support international collaborative R&D projects. A new aspect of the next Framework Programme will be a limited number of “Joint Technology Initiatives”, large-scale public-private partnerships to deliver priority research agendas essential to the competitiveness of European businesses. The Framework Programme allows collaboration with third countries that are not EU or associated countries, and in the seventh Framework Programme this activity is to be underpinned by an international strategy.
- 3.29 The UK is one of the largest participants in the Framework Programme, receiving about 15% of the available funding in the sixth Framework Programme, and evaluations point to significant benefits from this participation<sup>31</sup>.
- 3.30 Eureka is an inter-governmental initiative that exists to raise the productivity and competitiveness of European industry. The Eureka initiative was established in 1985 and has since invested €23 billion in collaborative European projects to develop technology-based innovative products, processes and services. UK investment in Eureka has traditionally been much lower than many countries, largely because it does not have a dedicated funding stream; Table 5 shows the relative scale of investments.

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<sup>31</sup> [http://www.dti.gov.uk/science/uk-intl-engagement/euro-programmes/fp7/evidence\\_projects/page17987.html](http://www.dti.gov.uk/science/uk-intl-engagement/euro-programmes/fp7/evidence_projects/page17987.html)

**Table 5: National contributions to support national participation in the Eureka initiative (€m) for the years 2003, 2004 and 2005**

	<b>UK</b>	<b>France</b>	<b>Germany</b>	<b>Italy</b>
<b>Clusters</b>	21.80	849.69	213.24	138.66
<b>Projects</b>	53.77	254.40	87.57	98.87
<b>TOTAL</b>	<b>75.57</b>	<b>1104.09</b>	<b>300.81</b>	<b>237.53</b>

- 3.31 The **UK** Global Watch Service facilitates access by UK companies to leading-edge technology wherever it occurs in the world. It does this principally through part-funding technology fact-finding missions by groups of business experts who then disseminate their findings to others in their sector; and through its network of 23 International Technology Promoters (ITPs) who work with UK firms to facilitate inward technology transfer to UK from the leading R&D investor countries of the world. They are based in the UK but spend 25% of their time overseas. Eight of the ITPs cover North America, six cover Europe and the remaining nine cover Russia, China, Japan, South Korea, Australasia and Israel.
- 3.32 In the **UK**, the Science Bridges programme with the US has been established with a budget of £6m over the period 2005-07 to strengthen joint approaches to research and innovation between the UK and the US. Four joint projects are being funded:
- (i) University of Manchester working with the University of Washington in the area of composite materials for use in aircraft design;
  - (ii) Imperial College London working with the University of Texas, Oak Ridge National Laboratory and the Georgia Institute of Technology on the treatment of cancer and energy research;
  - (iii) the University of Cambridge continuing its productive partnership with the Massachusetts Institute of Technology; and
  - (iv) a consortium of the Universities of Bath, Bristol, Southampton and Surrey working with the University of California in the areas of wireless technology, life sciences, the environment and advanced materials.
- 3.33 In the **US** the National Science Foundation Partnerships for Innovation programme strongly encourages international collaborations of a public/private nature. In 2006 up to fifteen projects will be funded with a total budget of up to \$9m.
- 3.34 In **Australia** the International Science Linkages Programme was launched in May 2004. This programme supports Australian scientists, from both the public and private sectors, to collaborate with international partners on leading edge science and technology to

increase the country's capacity to attract overseas R&D investment, promote innovation, and increase the economic and social impact of its research. A\$92.7m is being provided over a nine year period.<sup>32</sup>

- 3.35 The access of UK organisations to European programmes, means that there is not the same need for domestic programmes such as those in the US and Australia. Nevertheless it is important that UK participation in these European programmes is optimised and the activities supported reflect the needs of UK researchers and businesses.

### **Innovation: R&D intensive foreign investments**

- 3.36 As our economies become more knowledge intensive, the ability to attract inward foreign R&D investment and support UK R&D intensive business internationalisation become increasingly important goals.
- 3.37 In the **UK**, UK Trade and Investment (UKTI) is the lead government organisation supporting companies in the UK doing business internationally and overseas companies seeking to locate in the UK. UKTI includes around 2,300 personnel, with over 300 in the English Regions and some 1,300 overseas across the wider FCO Network. UKTI operates in over 100 markets overseas. It works in strong partnership with Regional Development Agencies (RDAs) and the devolved administrations. This global reach and regional network is a unique strength. Close working between regions, centre and Posts makes a vital contribution to the quality of the customers' journey. Annex A provides some further information on the activities of UKTI.
- 3.38 Science and technology are at the heart of UKTI efforts to support wealth creation with a "knowledge driven" target of 75% of Inward Investments, and trade teams increasingly focused on high technology sectors and elements within sectors. A further £9m was recently announced to implement a cross government international research and development strategy – led by UKTI – to attract more business R&D to the UK and promote the UK's innovative firms abroad<sup>33,34</sup>.
- 3.39 In terms of relationships with multinationals current **UK** activity takes place on many different levels. Where the multinational is not headquartered in the UK, UK embassies and posts overseas receive approaches or initiate and facilitate proactive contact on a regular basis.
- 3.40 **Singapore** has successfully attracted inward R&D investment from major multinational pharmaceutical companies by offering ready built shell facilities. This gives a company establishing a brand new research facility the possibility of doing so in weeks rather than the years it may take to gain permission in some other countries.

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<sup>32</sup> <https://sciencegrants.dest.gov.au/ISL/Pages/Home.aspx>

<sup>33</sup> Next Steps pp19

<sup>34</sup> UK Trade & Investment, July 2006, *Prosperity in a Changing World*

- 3.41 Similar measures are being taken in **Hong Kong** – the key objective of the Hong Kong Science and Technology Parks Corporation is to provide high-tech facilities at lower cost and shorter set-up times for tenants establishing operations.
- 3.42 The **Indian** government has implemented a number of measures to make it easy for foreign companies to set up R&D centres. Any required regulatory approvals are easily given for wholly owned foreign subsidiaries or joint ventures. Several development centres have been established which enjoy specific concessions. For example most software development centres operate under the Software Technology Park scheme and are entitled to a plethora of concessions such as duty free imports.
- 3.43 **South Korea** merges creating clusters of research activity, financial incentives and provision of infrastructure in its system of free economic zones which is one of the most developed in the world. Companies located in the zones are fully exempted from various taxes, including income tax and corporation tax, for three years, and receive 50% reductions for the following two years.
- 3.44 **Canada** has instigated a comprehensive set of fiscal measures to attract foreign direct investment in science and innovation. At a federal level, the Scientific Research and Experimental Development (SR&ED) program is a federal incentive to encourage businesses in Canada to perform R&D. A foreign company which sets up a Canadian subsidiary or company is also eligible for the tax credit albeit at a lower level. Many of the Canadian provinces also offer tax credits/incentives to attract foreign science and technology investment. The Canadian Trade Commissioner Service has 117 officers in embassies and consulates abroad (20 of these are in the US and 30 in Europe, including 19 in the EU).
- 3.45 The **US** administration has various industry fora which involve many of the world's multinationals with resident headquarters in the US. These represent a pro-active US government-driven engagement with multinational enterprises. The **US** Commercial Service operates in 127 countries.
- 3.46 The review above shows some of the different approaches taken by various countries to promote international innovation. These tend to focus on the easing of regulatory, trade, tax, tariff and other legislative requirements, but also include proactive engagement with businesses and organisations seen to be driving innovation globally. The UK is also taking a proactive approach to the promotion of international innovation with the recently published UKTI strategy to promote UK activity and ongoing work by the Global Watch Service and through FCO overseas representation.

## **Influence: using science and technology for global influence and leadership**

- 3.47 A large number of international problems today have a scientific or technological dimension, for example sustainable development, energy policy, climate change or the spread of infectious diseases. The science base and the potential for technological innovation have key roles in informing UK policy in these areas and as tools for influencing policy at the international level.
- 3.48 However, there may be areas where international research is essential, either because an issue is fundamentally cross border or because international science consensus is a necessary prelude to a policy solution, but where we do not readily factor in potential international opportunities or where we could lever external funding in a more effective way.
- 3.49 Government Departments, Research Councils and other agencies play a central role here through their evidence and innovation programmes and also through existing UK and international collaboration and networking activities. They are heavily involved in the activities of a large number of European and international bodies, that both contribute to our understanding of global issues and are involved in the development of evidence-based policy. Bilateral arrangements with other countries also help deliver UK policy objectives through international science collaboration or capacity building. The UK's Sustainable Development Dialogues, now underway with several countries, provide another avenue for influence in this area.
- 3.50 The **UK** FCO's Science and Innovation Network (SIN) has a unique role in delivering across all the Government's strategic international priorities, in promoting the use of science and innovation for evidence based policy making to tackle new global challenges such as climate change and pandemic flu and in using science as a tool of diplomacy and influence to contribute to the wider bilateral priorities with countries, particularly with emerging economies.
- 3.51 The **UK** British Council has science programmes in 70 countries, including all countries where FCO's SIN operates. It is uniquely represented in Bulgaria, Croatia, Cuba, Egypt, Georgia, Iran, Kazakhstan, Libya, Romania, Serbia & Montenegro, Slovakia, Slovenia and Ukraine. Through this network, the British Council builds partnerships and encourages links and networking between scientists, engineers and research managers to encourage innovation. The Council promotes UK culture and creativity, and has a unique role to play in sustaining communications for and about the UK system of innovation as a whole, acting to support both wealth creation and social well being. It has two main programmes worldwide: to engage and influence scientific communities, and to spread awareness and appreciation of the UK with wider international audiences.

- 3.52 The **UK** Royal Society has links to science academies in 91 countries globally, and influential scientific institutions in more than 100 countries. Through bilateral relationships and a number of networks, it works with partner organisations to forge scientific consensus on issues of international importance and to ensure coordinated input by the scientific community into global policy debate.
- 3.53 One of the objectives of the EC Framework Programme is to fund the research required to underpin the development and implementation of EU policies (paragraph 3.28 above). The seventh Framework Programme will address research in major policy areas such as Environment (including climate change); Health; Food, Agriculture and Biotechnology; and Energy.

### **Development: science and innovation for development**

*Scientific skills and knowledge enable countries to find their own solutions to their own problems, and bring about step-changes in areas from health, water supply, sanitation and energy to the new challenges of urbanisation and climate change. And, critically, they unlock the potential of innovation and technology to accelerate economic growth and enter the global economy.*

Africa Commission Report 2005<sup>35</sup>

- 3.54 The above quote from the Commission for Africa report shows that the key role of science, technology and innovation within the international development agenda is increasingly being recognised. Capacity building is a critical part of this. Firstly to help developing countries strengthen their capacity for good governance and evidence based policymaking and develop the ability of their private sector to compete in both local and global marketplaces. Secondly, to transfer knowledge and expertise to help them address the immediate issues, e.g. in health, water and sanitation, and the future challenges that will impact on the achievement of the Millennium Development Goals.
- 3.55 The **UK** government has built on its policy on international development in its recent White Paper, 'Eliminating World Poverty: Making Governance Work for the Poor'<sup>36</sup> and the Department for International Development (DFID) will be producing a specific strategy on science and innovation in the autumn. DFID is the lead government department delivering this agenda and it does this within two main principles of good donor practice in accordance with the Paris Declaration on Aid Effectiveness:
- that development assistance is 'demand led' rather than 'supply driven', i.e. the UK will respond to demand from developing

<sup>35</sup> Commission for Africa, March 2005, *Our Common Interest, Report of the Commission for Africa*, pp138

<sup>36</sup> HMG/DFID, *Eliminating world poverty: making governance work for the poor*, July 2006, CM6876

countries rather than deciding in a top-down way what will be supplied; and

- that development assistance is delivered by those who can deliver it in the best and most efficient way, i.e. work is tendered internationally and is not 'tied' to UK institutions or businesses in any way.

- 3.56 DFID budgets for science and research are rising in line with Government commitments to increase its development budget to 0.7% of GDP by 2013 and are spent in line with the overarching policy principles outlined above. These resources are managed both centrally and through a network of DFID Country Offices.
- 3.57 The Research Councils undertake various activities addressing the broad range of research issues in relation to the international development agenda. This includes projects and programmes dedicated to issues that are uniquely important in developing countries or regions and many Councils are involved in the training of scientists and technicians from developing countries. Research Councils are working closely with DFID to develop work in this area (further information is provided in Annex A).
- 3.58 The British Council has science programmes in many developing countries and is currently developing a plan for science work in sub-Saharan Africa, to help with building national systems of innovation. This includes a pilot project in East and West Africa to build up Knowledge Transfer Partnerships between universities and small or medium sized businesses in this region of Africa and the UK.
- 3.59 The Development Partnerships in Higher Education Programme (DeLPHE) is funded by DFID working with the British Council to fund partnerships between Higher Education Institutions working on collaborative activity linked to development goals.
- 3.60 The Royal Society has been working with partner organisations in Africa since 1994 to strengthen and support the local science base. More recently, with partners from around the world, the Society is engaged in programmes to assist local scientific communities to participate more constructively in policy discussions and the provision of expert advice to own governments on issues surrounding science and technology for national development goals.



## 4. A STRATEGY FOR THE PROMOTION OF INTERNATIONAL SCIENCE AND INNOVATION

### Introduction

- 4.1 The previous two chapters have examined evidence supporting the promotion of international science and innovation and have reviewed current UK activity in this area against that of some international competitors. In the light of the evidence presented this chapter details a number of areas where GSIF has **set objectives**, the countries in which GSIF has decided to **focus its attention** to achieve these objectives and a number of concrete **recommendations for the future** to achieve these objectives.
- 4.2 Within each of the four distinct axes of this strategy (research, innovation, influence and development) GSIF has selected a limited number of countries on which to focus its efforts initially. In these cases GSIF considers it will add value by facilitating the coordination and identifying synergies between existing and new activities to promote UK collaborations with the countries. GSIF notes that its member organisations may also focus on other countries in line with their priorities and mandates.
- 4.3 The identification of focus countries is based on an assessment by GSIF of current strengths, future trends and where coordination can add most value, and has taken account of the evidence commissioned for the strategy as well as other available metrics (see Annex B). Consideration has been given to where multiple and overlapping interests can work together most effectively to add maximum value and where spheres of regional access or influence may be usefully employed. The focus countries for the strategy will be kept under review and will be updated as necessary.

### Research

- 4.4 GSIF has adopted two **research** objectives:
- (i) to maintain excellence in the UK research base by ensuring that UK researchers have access to the best science globally and that the UK science base retains its excellent reputation overseas; and
  - (ii) to ensure that UK researchers have access to the best science of the future by building strategic links with those countries with the fastest growing science bases.
- 4.5 To support the objectives above, GSIF has decided to focus its attention on (i) those countries with most productive and excellent science base as determined by bibliometric evidence on the total number of scientific citations and the share of scientific papers in most

prestigious journals and (ii) those major emerging economies which are rapidly expanding their science base to further fuel economic growth for instance consideration student numbers overseas and absolute spend on R&D<sup>37</sup>. Furthermore, although a number of EU countries would score highly against the above criteria, GSIF has decided to focus on the EU as a block – recognising the increasing importance and prominence of European Community instruments in this area. **GSIF has therefore decided to focus its attention on Australia, Canada, China, the EU, India, Japan, South Africa, Switzerland and the US.**

- 4.6 As the evidence presented in Chapter One paints a generally healthy picture of increasing international **research collaboration** and as the evidence presented in Chapter Two would suggest that the support for international collaboration provided by the UK (networking schemes and other “introductory” programmes) is comparable with that of its competitors, GSIF has no recommendations at this stage for substantial new programmes in this area.
- 4.7 However, some barriers were identified in the survey evidence commissioned for this study<sup>38</sup> – financial constraints associated with long-distance collaborations (especially for public sector researchers) and the bureaucracy associated with some schemes (not necessarily UK schemes) designed to overcome such financial constraints. It is also clear that there is a danger of over-proliferation of schemes and confusion among potential recipients about the different support offered by different organisations.
- 4.8 GSIF therefore finds that, in the broadest sense, UK support in this area is having a positive impact and should be continued at a level of funding that can ameliorate the financial constraints identified. To ensure optimal take-up of this support (and to ensure that the very best UK scientists are encouraged to make use of all the support mechanisms available), GSIF would like to see some further consideration on how the research base might best engage with priority countries and considers that the primary responsibility here lies with the Research Councils.

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<sup>37</sup> See Annex B for the range of evidence taken into account

<sup>38</sup> Technopolis - Section 6 pp53-67

### Recommendation 1:

GSIF recommends that the UK build upon the success of existing schemes that aim to establish or improve the collaboration of UK researchers with those from GSIF focus countries. In particular, GSIF recommends that the interface between these publicly funded schemes and the user community be simplified and streamlined. A single point of access for these schemes could be established for the research community and consideration given to greater presence of Research Councils UK (RCUK) internationally (e.g. establishing overseas offices, use of the RCUK brand).

- 4.9 GSIF notes the movement in European research policy towards the use of European funds for basic research and the proposed establishment of a European Research Council. GSIF also notes the increasing activity of pan-European research networking schemes such as COST and the activity of the European Science Foundation. The implementation of the above recommendation would need to take account of (i) the activities of non-UK providers and (ii) integration with existing helpdesks and advice lines.
- 4.10 The evidence presented in Chapter Two paints a generally healthy picture for the UK with regard to the international **mobility** of students and researchers. The UK is a popular destination for students and has a relatively high proportion of overseas researchers in its science workforce that is increasing due to the effects of “brain-gain”.
- 4.11 The evidence in Chapter Three suggests that the support for international mobility provided by the UK is comparable with that of its competitors. In the broadest sense, UK support in this area is having a positive impact and should be continued at a level of funding that will maintain this impact in the light of increasing global opportunities, recognising also the value of such schemes in supporting achievement of the Millennium Development Goals. In addition, GSIF considers that the branding and alumni management activities of the Alexander von Humboldt scheme in Germany is a valuable illustration of best practice in this area and lessons could be drawn for the UK. Whilst there should continue to be a range of fellowships it would be desirable to encourage and promote an alumni network of researchers who have been working in the UK to ensure that in the longer term potentially valuable collaborative relationships are not lost.

### Recommendation 2:

GSIF invites the Royal Society to establish a new fellowship scheme to attract the very best researchers to the UK from overseas and to manage the alumni of that scheme. At the same time, GSIF invites the Royal Society to consider including within this alumni scheme other excellent researchers from other UK funding schemes.

- 4.12 The market for international researchers is becoming increasingly global and likely to become increasingly competitive in the future. Researchers are attracted to work overseas for a variety of reasons – quality of the faculty and facilities, available prestigious schemes are of course important – but often other factors such as culture, visas, banking, induction all come into play. The UK must remain vigilant to these factors to keep attracting the best foreign researchers.
- 4.13 GSIF notes the increasing importance of the European “Marie Curie” mobility programme. In implementing recommendation two, the position of UK Marie Curie scholars and fellows would need consideration.

### Innovation

- 4.14 GSIF has adopted two **innovation** objectives:
- (i) to increase the innovative nature of UK business by ensuring that companies have both the capacity to internationalise and optimal access to the very best science, engineering and technology opportunities worldwide; and
  - (ii) to increase the research intensity of the UK by encouraging R&D investment in the UK by innovative multinational enterprises .
- 4.15 To support the objectives above, GSIF has decided to focus its attention on a limited number of countries. Much of the evidence used to inform the selection of countries under the research objective was also relevant here, along with of measures of business spend on R&D, numbers of patents and venture capital spend<sup>39</sup>. **GSIF has therefore decided to focus its attention on Canada, China, the EU, India, Japan, South Korea, Switzerland and the US.**
- 4.16 The evidence in Chapter Two concluded that national schemes offering funding to international relationships in the application of research and in development and innovation are rare (although in the UK there are initiatives to facilitate, but not fund, partnerships e.g. the Global Watch Service’s technology partnering programme). Clearly there is some overlap with those schemes discussed in the above section that seek

<sup>39</sup> See Annex B for the range of evidence taken into account

to promote scientific collaboration: often research-intensive or research-demanding businesses will be involved in those schemes. The most significant support mechanisms in this area are European initiatives.

- 4.17 The objective of the EC Framework Programme is clearly related to innovation in an international context (“to foster European industrial competitiveness”), the budgets for the seventh Framework Programme are due to significantly increase, and the UK has a strong track record of success in the Framework Programmes. As well as supporting participation, the UK can influence the ongoing priorities and implementation of the Framework Programme through the Programme Management Committees.
- 4.18 The inter-governmental Eureka initiative provides good opportunities for international collaboration, but the evidence presented in Chapter Three is that UK participation is low, largely due to the need for funding from national sources. The seventh Framework Programme may provide greater links with Eureka, for example in the proposed Eurostar initiative to support innovative small and medium sized businesses.
- 4.19 GSIF therefore finds that European or inter-governmental mechanisms are predominant in the promotion of business-oriented and innovation-supporting research and development and that optimal UK engagement with these mechanisms is therefore essential. This includes recognising the value of facilitating effective North-South collaboration in all aspects of the seventh Framework Programme.

**Recommendation 3:**

GSIF recommends that the UK put in place advisory and support services to promote and support optimal engagement, especially by business organisations, in the forthcoming European Community Seventh Framework Programme as well as ensuring UK priorities and needs are properly reflecting in the implementation of the Programme.

GSIF recommends that the UK reinvigorate the engagement of UK businesses in the Eureka Initiative – building on a possible new European Community support for SME engagement.

- 4.20 As part of the third round of the Government's Higher Education Innovation Fund, universities were invited to submit competitive bids for innovative projects aimed at strengthening university - business interaction and knowledge transfer. The competition encouraged different aspects of knowledge transfer, including through international collaboration. The winners of the competition were announced in May 2006 and 11 projects totalling over £52m will be funded starting September 2006 onwards. Over half of the funded projects involve

overseas collaboration including "Creative Capital - World City" led by University of the Arts London including links with Chinese Universities and Indian Institutes and "Innovation China UK" led by Queen Mary University London, which brings together five UK Higher Education Institutes and 20 Chinese Higher Education Institutes. GSIF recognises the value of such funding schemes and the importance of encouraging aspects of international collaboration.

**Recommendation 4:**

GSIF recommends that the UK build upon the model established in 2005 to link UK and US universities by extending this model to China and India. Departments of world class UK universities and research institutes should be invited to bid for funding to support collaborative research and development projects relevant to specific business innovation drivers on both sides of the partnership.

- 4.21 GSIF notes that the Research Councils are considering ways to strengthen the links between world-class university researchers and their world-class counterparts abroad, for example to facilitate travel and workshops and to provide seed corn funds to assist the successful transformation of good research into business practice.
- 4.22 The evidence presented in Chapter Two paints a picture of an increasingly global marketplace for research and development – in which multi-national companies seek out the most excellent and most innovative locations to undertake their research and development and in which businesses no longer look at overseas R&D capacity simply as a means to adapt existing technologies to new markets.
- 4.23 The evidence presented in Chapter Three shows that countries adopt a range of policies and programmes to attract foreign direct investment in R&D – from proactive marketing of the science and technological infrastructure and skills base, to wider economic framework conditions such as fiscal regimes and employment law. Conditions in the UK are positive – a world-class science system underpinned by high and sustainable public investment, a favourable fiscal environment for R&D and a flexible labour market. The UK needs to capitalise on this position.
- 4.24 In addition, DTI's Global Watch Service facilitates access by British businesses to innovative technologies and practices from overseas. It does so by identifying and raising awareness of overseas technology developments through its technology fact-finding missions and the work of its International Technology Promoters. The Global Watch Service and UK Trade & Investment are working ever more closely with DTI's Knowledge Transfer Networks (KTNs), both to strengthen KTN understanding and engagement with technology sources overseas, and as a conduit for two-way international commercial engagement.

- 4.25 Collaborative R&D projects supported through the DTI led Technology Programme bring together universities and businesses to work together on R&D projects from which successful new products, processes and services can emerge. It also primes the flow of the latest knowledge and thinking in key technology areas from the UK's science, engineering and technology base to business. Through the collaborative R&D projects supported, universities and business partners (including foreign owned multi-nationals located in the UK) bring an understanding of the international context for their work and bring this to bear on the collaboration for the benefit of all the partners as well as spill over benefits for the wider University and business communities.
- 4.26 The UK is one of many players in the global marketplace for R&D and should continue with efforts to discover and work with multinationals' global strategies to mutual benefit. Inward investment by R&D-intensive multinationals increases R&D intensity in the UK, strengthening the science and innovation base. Overseas engagement by UK-based companies also improves the UK's innovation excellence.
- 4.27 GSIF recognises the importance of multinationals and considers that there is a need for high-level and long-term relationships with these organisations if the UK is to gain a greater understanding of their future R&D investment plans and activities and be in a position to influence their decision-making.

#### **Recommendation 5:**

GSIF members recognise that multinationals drive global R&D, and will work to improve the level of representation and targeted propositions to multinationals by supporting UKTI in its cross-government coordinating role, and by helping UKTI to identify and effectively market UK excellence in science and innovation.

#### **Influence**

- 4.28 GSIF has adopted two **influence** objectives:
- (i) to ensure optimal deployment of the international scientific evidence base to support UK foreign policy goals; and
  - (ii) to promote the use of science and innovation as a tool for influence and to forge bilateral partnerships.
- 4.29 To support the objectives above, GSIF has decided to focus its attention on a limited number of countries which are key to current UK foreign policy goals – either as a result of their weight in international fora generally or their importance to specific policy issues of a bilateral nature (or both). China and India are included specifically as countries

in which the top-down management of their science system make them a priority for the second objective. **GSIF has therefore decided to focus its attention on the G8 and EU countries plus Brazil, China and India.**

- 4.30 The emphasis on quality, evidence-based policymaking is not unique to the UK. Other countries and international organisations also look to the evidence base (including the scientific evidence and the technological implications or opportunities of that evidence base) when developing or negotiating policy. This presents the UK with a number of opportunities:
- the strength of the UK science base and the reputation of UK scientists can be used to influence policymaking on a wide range of issues;
  - the maturity of the UK system (the history and role of the Chief Scientific Adviser, of OSI, the Guidelines etc) for the use of scientific evidence and scientific advice can be used to improve the use of the science base and scientists internationally in policy making; and
  - innovative UK businesses can be ready to step in when technological innovation is required to implement policy (e.g. environmental technologies).
- 4.31 Capitalising on these opportunities requires a more coordinated approach to be taken and more high-quality intelligence, foresight and horizon scanning in the UK and overseas. GSIF is ideally placed to encourage a cross-government dialogue on international engagement in science and innovation and will consider appropriate action to supplement the material gathered.
- 4.32 The UK operates a number of in-country networks around the world – it is important that that the science and innovation aspects of that activity (which may well not be the core activity of the network) is well coordinated and intelligence shared appropriately.

**Recommendation 6:**

GSIF recommends a strategic, coordinated approach to the optimal deployment of the scientific evidence base in support of policy-making and wider opinion forming on the international stage. GSIF will encourage cross-Government input of information and guidance on priorities to help the FCO Science and Innovation Network and other in-country representatives; and to provide a steer and appropriate input to overseas visits of Ministers and senior officials.

- 4.33 GSIF has already developed and piloted a methodology for agreeing country-specific priorities between those in-country and the wide range of government stakeholders in the UK. Country templates were created to:

- generate an ‘at a glance’ summary of country focus against GSIF strategic priorities;
- provide attachés and others in-post with GSIF strategic priorities;
- encourage responses which would inform GSIF to what degree countries are active in areas covered by the four axes of the Strategy; and
- gather further comments and intelligence on more detailed subsequent pages of the template.

This process was an agreed interim means to communicate country-specific science and innovation targets in advance of an overarching strategy. It is likely that this or some similar interaction with in-country networks will be required in order to provide near-term and easily assimilated material for GSIF, with the intention of providing feedback to ensure an effective dialogue.

## Development

4.34 GSIF has adopted the following key **development** objective:

- (i) to ensure optimal cross-Whitehall science and innovation support for UK international development policy as set out in the recent government White Paper – “Eliminating World Poverty: Making Governance Work for the Poor”.

4.35 In support of this objective, GSIF will focus its attention on a sub-set of those countries where DFID is concentrating its overall development effort. In particular, GSIF will focus on **Africa**, as part of cross-government effort to follow up on the G8 African Development agenda, and in particular on the AU/NEPAD Consolidated Plan of Action for Science and Technology.

4.36 DFID has overall responsibility for the delivery of international development policy. It has a research budget of some £137m with a commitment to increase research funding by 2010. Science and innovation support the UK’s international development goals and the Millennium Development Goals across a wide range of issues: natural resource management, water, agricultural productivity, healthcare etc.

4.37 Although this research spend is untied and open to international competition, recent analysis shows that the UK has a broad and diverse development sciences research base which is in a good position to compete globally and also has a good track record of collaborative effort with institutions and organisations in developing countries.

4.38 Within the UK DFID already works closely with a number of government departments and Research Councils unilaterally and multilaterally. Overseas, DFID maintains a network of ‘country offices’ to deliver its policy objectives by working closely with governments and

other stakeholders on the ground. The UK also funds a range of other initiatives and networks in the focus countries through other government departments and organisations, including DfES, FCO, UKTI, OSI, Defra, the Royal Society, the British Council and the Research Councils.

- 4.39 In order to avoid duplication of effort and to minimise the risk of conflicting messages being communicated GSIF considers that it has an important role to play in providing a forum for members to exchange information and intelligence and seek to agree a more co-ordinated approach across Whitehall and in-country. GSIF has already set up a sub-group to do this work for Africa.
- 4.40 Clearly the UK research base for the development sciences has a role to play in this area. The House of Commons Science and Technology Select Committee reported on this aspect of the research base in October 2004<sup>40</sup> and a Development Sciences Working Group was convened under the chairmanship of Sir David King<sup>41</sup>. Whilst this group is primarily concerned with the UK research base for development sciences its work will provide useful input to the development axis of the GSIF remit and links will be maintained as appropriate. The Development Sciences Working Group is expected to report in the autumn.

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<sup>40</sup> House of Commons Science and Technology Committee, Thirteenth Report of Session 2003-04, HC133, published 26 October 2004

<sup>41</sup> House of Commons Science and Technology Committee, Government Response to the Committee's Thirteenth Report of Session 2003-04, HC235 Published 24 January 2005

## **5. WORKING TOGETHER: COORDINATION OF THE DELIVERY OF THE STRATEGY FOR THE PROMOTION OF INTERNATIONAL SCIENCE AND INNOVATION**

- 5.1 This chapter considers how the strategy will be taken forward and makes proposals for the better coordination of that activity to deliver the GSIF International Strategy.
- 5.2 Across the range of GSIF organisations there is a varying level of activity that can be identified as directly related to or contributing specifically to the UK's international science, technology and innovation collaborative effort. This is set out in Annex A. There is clear activity across OSI, FCO, UKTI, Royal Society, British Council and DTI that has, as its central purpose, increasing international collaborative science or innovation efforts. The primary role of the Research Councils is to ensure scientific excellence in the UK. However there is a clear acceptance that UK science can benefit from international collaboration and this is reflected in the scale of the international interactions and programmes the Research Councils identified. Similarly other government departments spend significant amounts on research activity in the UK and overseas to fulfil their particular departmental objectives rather than to increase the amount of or visibility of international scientific collaboration.
- 5.3 Members of GSIF each have their specific core aims and objectives and the remit of member organisations is not uniquely international or necessarily focussed on science, technology or innovation. The evidence presented in Annex A provides a snapshot of the level of current activity in support of international science and innovation that is aimed at sometimes different policy goals and delivered by a range of actors each with their own target community. Whilst noting this plurality, GSIF recognises that it is sometimes difficult to see an overarching strategic direction guiding this activity and that there are clearly some areas of overlap.
- 5.4 These are a complex set of issues and it is important that the UK's strengths and aspirations are recognised and clearly signalled both in the UK and overseas. The emphasis on marketing in UKTI's new strategy provides a significant step in this direction. However, this could be complemented by a broader "umbrella" communication which sets out the UK scientific landscape and its strengths, as well as how and with who to engage with in the UK for international collaboration in research, development and innovation. Such a communication should be developed professionally.

### **Recommendation 7:**

GSIF recommends that a communications tool is developed to provide a concise overview of the UK strengths and approach to international collaboration in science and innovation. This should draw from and support the communication activities of individual GSIF members.

- 5.5 In most countries, considerable progress has been made to improve coordination between the different organisations involved in the UK's international science, technology and innovation relationships, by means of regular meetings, sharing information and ensuring science and innovation opportunities are identified and taken. In some cases, teams are putting together joint business plans for the activities, which they will undertake together. GSIF suggests this best practice is promulgated throughout the overseas networks.

### **Taking the strategy forward**

- 5.6 This strategy provides an overarching strategy into which current activity can be moulded and new policies and programmes developed. In coordinating the framework that implements this strategy and in playing its important role in guiding the delivery of Government policy in international science and innovation, part of GSIF's future role will be ensure that such delivery is not only strategic and coordinated, but also efficient and consistent.
- 5.7 This document sets out GSIF's first recommendations in respect of the adopted four axes of the strategy. It is clear from the analysis set out here and in Annex A that there is already a significant investment in activity to ensure the UK is well-placed to respond to the globalisation challenge – to excel in globally competitive research and rapidly exploit that research to provide competitive innovative products and services. In addition and intertwined with the strategy are the UK's ability to use science and technology for global influence and in delivery of sustainable capacity building in developing countries.
- 5.8 The recommendations set out in this strategy will be taken forward by the individual members of GSIF where they have responsibility and with support from other GSIF members (see Table 6 below). The implementation of the recommendations will be included in the annual reports on the ten-year framework.
- 5.9 To take forward the work on the focus countries identified in this strategy, GSIF will facilitate the coordination of UK policies, programmes and activities in order to promote and optimise bilateral collaboration and exchanges. Under the objectives set out in this document GSIF will monitor the success of policies and the output of programmes and assess the effectiveness of UK intervention against

other countries and on the basis of this assessment may suggest appropriate changes in policies or programmes where necessary. GSIF will review biennially this strategy, updating it as necessary and reporting on its further work and recommendations.

**Table 6: Delivery of recommendations**

Recommendation	Lead	Support from
<p><b>Recommendation 1:</b> GSIF recommends that the UK build upon the success of existing schemes that aim to establish or improve the collaboration of UK researchers with those from GSIF focus countries. In particular, GSIF recommends that the interface between these publicly funded schemes and the user community be simplified and streamlined. A single point of access for these schemes could be established for the research community and consideration given to greater presence of Research Councils UK (RCUK) internationally (e.g. establishing overseas offices, use of the RCUK brand).</p>	Research Councils	OSI FCO British Council Royal Society
<p><b>Recommendation 2:</b> GSIF invites the Royal Society to establish a new fellowship scheme to attract the very best researchers to the UK from overseas and to manage the alumni of that scheme. At the same time, GSIF invites the Royal Society to consider including within this alumni scheme other excellent researchers from other UK funding schemes.</p>	Royal Society	OSI Research Councils FCO British Council UKTI
<p><b>Recommendation 3:</b> GSIF recommends that the UK put in place advisory and support services to promote and support optimal engagement, especially by business organisations, in the forthcoming European Community Seventh Framework Programme as well as ensuring UK priorities and needs are properly reflecting in the implementation of the Programme. GSIF recommends that the UK reinvigorate the engagement of UK businesses in the Eureka Initiative – building on a possible new European Community support for SME engagement.</p>	OSI	All GSIF members
<p><b>Recommendation 4:</b> GSIF recommends that the UK build upon the model established in 2005 to link UK and US universities by extending this model to China and India. Departments of world class UK universities and research institutes should be invited to bid for funding to support collaborative research and development projects relevant to specific business innovation drivers on both sides of the partnership.</p>	OSI	All GSIF members
<p><b>Recommendation 5:</b> GSIF members recognise that multinationals drive global R&amp;D, and will work to improve the level of representation and targeted propositions to multinationals by supporting UKTI in its cross-government coordinating role, and by helping UKTI to identify and effectively market UK excellence in science and innovation.</p>	UKTI	All GSIF members

<p><b>Recommendation 6:</b> GSIF recommends a strategic, coordinated approach to the optimal deployment of the scientific evidence base in support of policy-making and wider opinion forming on the international stage. GSIF will encourage cross-Government input of information and guidance on priorities to help the FCO Science and Innovation Network and other in-country representatives; and to provide a steer and appropriate input to overseas visits of Ministers and senior officials.</p>	<p>FCO</p>	<p>All GSIF members</p>
<p><b>Recommendation 7:</b> GSIF recommends that a communications tool is developed to provide a concise overview of the UK strengths and approach to international collaboration in science and innovation. This should draw from and support the communication activities of individual GSIF members.</p>	<p>GSIF Secretariat</p>	<p>All GSIF members</p>

## ANNEX A: Promoting international engagement in research and development

The table below provides a snapshot as of summer 2006 of government funded schemes and projects which broadly encourage international collaboration of UK science and innovation. It is intended to provide an indication of the scale of the activity of GSIF members undertake it is not an exhaustive audit of all government activity related to international R&D. The funding levels indicated are approximate and in some cases include administrative costs. Information is consolidated in schemes/ programmes and is not generally provided on individual projects.

The eight **Research Councils** are Non Departmental Public Bodies established by Royal Charter. They are the main public investors in fundamental research in the UK with a commitment to maximising the investment of the Science Budget in world-class research, training and knowledge transfer. The Research Councils have a long history of facilitating and taking advantage of opportunities for international partnership. The Research Councils undertake and fund an extensive range of international activity from joint funding of research projects – bilaterally with counterpart organisations in other countries, through formal agreements or multilaterally through international programmes – through to mobilising the UK research community via funding for visits, workshops, networking and partnering activities. The UK Research Office (UKRO) is UK's leading information and advice service on European Union funding for research and higher education. Established in Brussels in 1984, UKRO's mission is to promote effective UK participation in EU-funded research programmes, higher education programmes, and other related activities by providing early insight and briefing on developments in European programmes and policies; disseminating timely and targeted information on EU funding opportunities; providing high quality advice, guidance and training on applying for and managing EU projects; and exchanging information between the UK research and higher education community, the Institutions of the European Union, and other countries participating in EU programmes.

Scheme/ programme	Description/objective	Approx annual funding
Research Council responsive mode grants	All Research Councils consider the UK costs of any joint research project with other country partners as part of their normal responsive mode grant funding <sup>42</sup> .	Not quantifiable [See footnote 1]
Research Council involvement in ERA-NET schemes	The Research Councils are involved in a wide range of ERA-NET activities and projects with partners in the <b>EU and other associated countries</b> The objective of the ERA-NET scheme is to step up the cooperation and coordination of research activities carried out at national or regional level in the EU Member States and other associated States through: <ul style="list-style-type: none"> <li>the networking of research activities conducted at national or regional level, and</li> <li>the mutual opening of national and regional research programmes.</li> </ul> The scheme aims to improve the coherence and coordination across Europe of such research programmes and enables national systems to take on tasks collectively that they would not have been able to tackle independently. Both networking and mutual opening require a progressive approach.	£8.1m
EUROCORES	The Research Councils are involved in a wide range of European Science Foundation EUROCORES activities and projects with partners in the <b>EU</b> . The scheme provides a mechanism for multinational collaboration within Europe in basic research bringing together national funding agencies, national research organisations and their analogues to overcome some of the disadvantages of scale in a distributed science policy system to provide a critical mass of both expertise and resources	£3.14m
European Science Foundation (ESF)	Range of networking schemes, conferences etc for researchers across <b>Europe</b> . Delivered by AHRC, BBSRC, EPSRC, ESRC, MRC, NERC, PPARC	£680k
EuroHORCs Money Follows Researcher Scheme	Allows Research Council grant holders in the UK who are moving to an institution in another <b>European</b> country to apply to take the remainder of their grant with them.	variable

<sup>42</sup> Many RCs do not operate specific mechanisms for collaboration, but instead much of their activity is delivered through generic mechanisms. A sizeable proportion of 'Responsive Mode' funding is performed in collaboration with organisations or academic institutions overseas and these data do not fit comfortably within the suggested framework. Specifically EPSRC records that it does not fund its International activities through specific schemes and the data presented does not include contributions to international facilities, specific programme activities or training/studentship allocations. Many PPARC grants support university researchers participating in the construction of equipment and analysis of data for international partnerships.

Agreements with international partner agencies	RCs have cooperation agreements with a range of agencies, largely in the far East, to sponsor N+N meetings to encourage information exchange between researchers and the planning of future collaborations.	Variable (about £100k)
BBSRC International Scientific Interchange Scheme	To allow BBSRC-grant holders and researchers at BBSRC-sponsored institutes to initiate and develop international activity through visits, workshops and bringing world-leading researchers to the UK. This scheme has <b>global</b> coverage	£260k
BBSRC Partnering Awards	To allow BBSRC-grant holders and researchers at BBSRC-sponsored institutes to initiate and develop long-term collaborative activity over 4 years covering exchanges workshops and visits with <b>Japan, China, India</b>	£300k
ESRC bilateral agreements	Facilitate linked responsive mode proposals by applicant in UK and one other country – global coverage. Nine signed in 2005, with 12 more being negotiated.	No allocation yet
ESRC 'matchmaking' schemes	Stimulate contact between UK and overseas researchers in topics of importance to both countries, aimed at developing bilateral research proposals. Initially <b>UK-France</b> ; model being developed for wide application incl. <b>China, South Korea, S Africa</b> .	No allocation yet
ESRC visits programme	Enable international exchange visits to/from ESRC centres, programmes etc to stimulate future research agendas. <b>Global</b> coverage	No allocation yet
ESRC review of International data sources	Aims to improve compatibility of and access to socio-economic datasets in different countries, to benefit comparative research collaborations. <b>Global</b> coverage	No allocation yet
ESRC-AHRC-HEFCE Language-based Area Studies initiative	Aims to boost UK capacity to do social research in Far Eastern, Middle Eastern and E European languages. Includes extensive <b>global</b> scope for international collaborations	No allocation yet
EPSRC INTERACT	To initiate and develop collaborations through workshops, visits etc. in <b>China, India or Japan</b> .	£312k
EPSRC Visiting Fellows and Visiting Researchers	To bring expertise into the UK for the purpose of research collaboration and sharing of knowledge. Delivered by EPSRC with a <b>global</b> coverage	£750k
EPSRC Overseas Travel Grants	To permit travel by UK researchers to overseas research institutes for gaining insight into current research programmes. Delivered by EPSRC with a <b>global</b> coverage	£472k
EPSRC Networks	To allow multi centre interactions, both in the UK and overseas, for the purposes of developing research programmes and networking Delivered by EPSRC for the UK with <b>European</b> coverage	Variable
Access to three UK major facilities	CCLRC's facilities are available to international users subject to successful peer review. The facilities also offer EC Transnational Access funded opportunities, also subject to successful peer review. <b>Global</b> coverage funded by CCLRC	~£1.5m (variable)
PPARC research fellowships	All awards are open to international applicants who wish to take up their fellowships at UK institutions. Coverage is <b>global</b> .	£2m
EU FP6 Design Studies programme	Councils like PPARC are providing matching funding to UK groups to enable them to benefit from FP6 awards to European consortia to enable to participate in design studies for future research facilities such as the linear collider, extremely large optical infrared telescope and square kilometre array for radio astronomy.	£3m
<b>The following activities are in the form of subscriptions made by the Research Councils to international facilities/ programmes</b>		
Human Frontier Science Program (HFSP)	Funded by MRC and BBSRC for the UK, HFSP awards collaborative research projects and fellowships ( <a href="http://www.hfsp.org">www.hfsp.org</a> ) covering <b>Australia, Canada, EU member states, Japan, South Korea, New Zealand, Switzerland, USA</b>	£985k
European Molecular Biology Organisation	Funded by MRC and BBSRC for the UK, EMBO awards a range of research fellowships within <b>Europe</b> .	£1.4m
International Agency for Research on Cancer (IARC)	Funded by MRC for the UK, IARC awards a range of research fellowships.	£768k

UK subscription to Institut Laue-Langevin (ILL)	To provide access for UK researchers to the facility (principally) and to support collaborative working between them and the other users of ILL. Covers <b>France, Germany, Spain, Switzerland, Italy, Russia, Austria, Czech Republic, Sweden, Hungary</b> Subscription funded by CCLRC.	£13.7m
UK subscription to European Synchrotron Radiation Facility (ESRF).	To provide access for UK researchers to the facility (principally) and to support collaborative working between them and the other users of ESRF. Covers <b>France, Germany, Spain, Switzerland, Italy, Austria, Czech Republic, Sweden, Hungary, Poland, Israel, Portugal, Denmark, Finland, Norway Belgium, The Netherlands.</b> Subscription funded by CCLRC	£7.2m
UK subscription to CERN, paid by PPARC	To enable UK researchers to participate in the programmes of CERN. Covers the majority of science active countries of the world, since while formal membership is European, CERN projects are <b>global</b> and include financial and in-kind contributions from non-members including USA and Japan.	£78.6m
UK subscription to ESA, paid by PPARC	To enable UK researchers to participate in the programmes of ESA. Covers <b>Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden and Switzerland.</b> Canada, Hungary and the Czech Republic also participate in some projects under cooperation agreements and there are opportunities for cooperation with other partner countries such as USA, Japan and China.	£59.7m
UK subscription to ESO, paid by PPARC	To enable UK researchers to participate in the programmes of ESO, including the construction of new facilities in Chile. Covers <b>Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Portugal, Sweden and Switzerland.</b>	£23.1m
PPARC contributions to other international partnerships	To enable UK scientists to gain access to, and participate in, projects in astronomy, solar terrestrial physics, particle physics and particle astrophysics such as GEMINI, AAO, JCMT, ING, EISCAT, ATLAS, CMS, SNO, AUGER and GEO600 with a wide variety of international partners.	£12.5m
<b>TOTAL FOR RESEARCH COUNCILS (Not including responsive mode grants. Some jointly funded activities are recorded separately below)</b>		<b>£219m</b>

<p><b>UK Trade &amp; Investment (UKTI)</b> has lead responsibility within government for marketing the UK economy internationally and for trade and investment services, it brings together the work of the FCO and the DTI in supporting both companies in the UK trading internationally and overseas enterprises seeking to locate in the UK. UKTI undertakes a significant amount of work in attracting R&amp;D investment to the UK and supporting the outward international activities of UK high technology businesses.</p>		
Scheme/ programme	Description/objective	Approx annual funding <sup>43</sup>
R&D Programme	<ul style="list-style-type: none"> <li>Convince multinationals or overseas global companies of the benefits of investing their R&amp;D activities in the UK.</li> <li>Enable multinationals or overseas companies to collaborate with UK companies and/or researchers.</li> <li>Enable R&amp;D intensive UK companies to penetrate overseas markets &amp; multinational supply chains.</li> <li>Support the sustainable internationalisation of new R&amp;D intensive UK companies.</li> </ul>	£4.8 <sup>44</sup> m
Inward Investment	To target and deliver potential <b>global</b> investors who intend to establish R&D capability within the UK, and also provides after care services to current investors in the UK. Effort is focused on knowledge driven opportunities, and targets potential investors who intend to establish R&D capability within the UK, and also provides after care services to current investors in the UK. Tailored client account management includes information provision from across the UK network – UKTI, DTI, RDAs and Devolved Administrations	£29.5m
Global Partnership	To broker two-way international technology partnerships and joint ventures with <b>global</b> coverage	£350k
<p>UKTI services are focused on the broad business internationalisation agenda, of which technology and science led companies form an important component – technology expenditure has not been disaggregated below but these areas of investment include coverage of technology and science-led activity.</p>		
Trade Development – capacity building	To deliver capacity building programmes to enable UK businesses to successfully internationalise their business. <b>Global</b> coverage. International Trade Teams around the English regions, working closely with the RDAs, deliver capacity building programmes to enable SMEs to internationalise their business. A key programme is called Passport to Export and is aimed at New Exporters. These companies are often “high tech”. For example ~41% of the 7000 SMEs participating in Passport are from the ICT sector. This support does not stop at the regional level, but via the UKTI vertical network is delivered both from national sector teams and overseas from the Posts.	£40m
Sector Development	To coordinate a coherent UK offer to global overseas buyers in that sector. This includes: <ul style="list-style-type: none"> <li>Arranging/supporting overseas trade shows, missions and seminars</li> <li>Bringing key overseas decision makers to meet suppliers</li> <li>Disseminating information on UK sectoral capabilities</li> <li>Gathering and disseminating information on overseas opportunities in specific sectors</li> <li>Political support and lobbying</li> <li>Providing access to overseas supply chains</li> </ul>	£20m
Emerging Markets	To help experienced exporters make early inroads in emerging <b>Asian</b> markets, with a new experimental programme designed to help experienced exporters expand into and within the high growth Asian markets	£1.5m (in first year)
Global Entrepreneurs Scheme	To target and support entrepreneur relocation into the UK bringing in <b>global</b> talent to drive the UK economy	£1.2m
<p><b>TOTAL FOR UKTI (not including non-research and innovation specific activities)</b></p>		<p><b>£34.7 m</b></p>

<sup>43</sup> Figures are indicative only and cover main areas of spend, service delivery direct from UKTI overseas posts is not included.

<sup>44</sup> Building to £9m in 2007/8

<b>Office of Science and Innovation (OSI)</b>		
<p>The <b>OSI has a trans-departmental function</b> to ensure that UK researchers, businesses and government gain optimal benefit from international partnerships and programmes in science and technology. The Office of Science and Innovation is accountable to the Government's Chief Scientific Adviser (CSA), to the Parliamentary Under Secretary of State for Science and Innovation and to the Secretary of State for Trade and Industry. OSI lead on HMG overseas relationships where there is a clear trans-departmental agenda and supports the overseas work of the CSA and Ministers. OSI has a small budget to promote international S&amp;T (e.g. to support the networking schemes run by the Royal Society). OSI also leads on EU activity such as the Framework Programme.</p>		
<b>Scheme/ programme</b>	<b>Description/objective</b>	<b>Approx annual funding</b>
Partners in science	To build bilateral links and agreements between UK and partner scientific funding agencies and research institutes in <b>China</b> and <b>Brazil</b> . To encourage collaborative links.	£325k
Focal points	Selected priority research areas for collaboration with <b>South Korea</b> and <b>China</b> (the latter building on Partners in Science initiative)	£125k
Networking schemes	Facilitate collaboration between UK and partner country researchers. Networking schemes currently operate with <b>China, India, Brazil, S Africa and South Korea</b> . They are jointly funded by the UK and the partner country	£470k
Joint Commissions	Ministerial bilateral meetings to raise profile science and innovation collaboration at and provide a platform for launching/endorsing new bilateral initiatives. Joint Commissions currently operate with <b>India, South Korea, China, Japan and Russia</b>	£24k
University Links	To build science and innovation bridges with world-class universities and high-tech businesses in the <b>US</b> to increase industrial competitiveness and knowledge transfer. £6m over two years announced November 2005	£3m
EU Framework Programme	National Contact Point (NCP) support for UK organisations wanting to access the mobility aspect of <b>EU</b> Framework Programme	£50k
FP6UK service	Provides support (via a website, expert advice on bid preparation, seminars, e-mail alerts etc) to UK organisations bidding into many other elements of the <b>EU</b> Framework Programme. Includes Central Information point.	£1.45m
<b>SUB TOTAL OSI (Tran departmental) (Some jointly funded activities are recorded separately below)</b>		<b>£5.4m</b>
<p>The <b>Global Watch Service sits within the science and innovation group of OSI</b> and reports to the Director General of Science and Innovation. It facilitates access by UK companies to leading-edge technology wherever it occurs in the world its activities are focused on businesses and technology, rather than science and academics. It works principally through funding technology fact-finding missions by groups of business experts who then disseminate their findings to others in their sector; and through its network of International Technology Promoters (ITPs) who work with UK firms to facilitate inward technology transfer to UK from the leading R&amp;D investor countries of the world. There are 23 ITPs who are based in the UK but spend one quarter of their time overseas.</p>		
<b>Scheme/ Programme</b>	<b>Description/objective</b>	<b>Approx annual funding</b>
Technology Partnering	Help UK businesses to identify and access leading-edge technology from overseas in particular <b>Europe, North America and Asia-Pacific</b>	£4m
International Secondments <sup>45</sup>	Help UK SMEs acquire advanced technological skills or knowledge not readily available in the UK by sending employees abroad or receive key people from another country – this is a <b>global</b> scheme	£1m
Missions	Enable teams of UK businesspeople to make short trips overseas to investigate technological developments there and disseminate findings to their industry sector on return. Missions may also effect high-level introductions with the potential to grow into profitable partnerships.	£2m
Global Watch Information Service	Raise awareness of overseas technology developments and stimulate business innovation	£1.3m
Britech Fund	Encourage industrial R&D collaborations between entities in Israel and SMEs in UK.	No new funding.
<b>SUB TOTAL OSI (science and innovation group)</b>		<b>£8.3m</b>
<b>TOTAL FOR OSI</b>		<b>£13.7m</b>

<sup>45</sup> Suspended from 1 April 2006, but budget for 2006-07, to fund secondments approved in financial year 2005-06 shown

<p>The <b>FCO Science and Innovation Network (SIN)</b> The rationale behind the establishment of SIN was that the UK Science and Innovation base needs country-specific intelligence on what is being funded, why and how countries prioritise their spending, and how best to tap into the best S&amp;I. SIN adds value by being a network of in-country experts familiar with both the UK customer base and host country networks. The work of the S&amp;I Network is aimed at promoting access to and sharing of scientific expertise, resources and facilities through international scientific collaboration and exchange; strengthening the UK's innovation capacity through international R&amp;D investment, R&amp;D partnerships and technology transfer; informing effective domestic and international policymaking and leadership based on the best available science; and using science and innovation as a tool for influence in an increasingly globalised world and to forge strategic alliances. SIN, through its in-country network of science experts has a key role in helping shape opinions and attitudes towards the UK and promoting the UK as the R&amp;D partner of choice, which attracts young people, brings in know-how, access to facilities and expertise, R&amp;D investment and helps high-tech trade. SIN is also key to ensure science is used to underpin international policy negotiations and as a wider tool of diplomacy. SIN, now comprises over 100 people (81FTE) in 42 missions in 30 countries and territories across the world. SIN is coordinated through the Science and Innovation Group in FCO in London, in collaboration with OSI and the Chief Scientific Adviser.</p>		
<b>Scheme/ programme</b>	<b>Description/objective</b>	<b>Approx annual funding</b>
Science & Innovation Network	Global network of Science Officers coordinated by Science & Innovation Group in London, in collaboration with the DTI's Office of Science & Innovation.	£10.6m
Global Opportunities Fund	The Global Opportunities Fund (GOF) promotes action on global issues in areas of strategic importance to the UK. It funds projects around the world relating to the FCO's international policy priorities. The projects contribute to the FCO objective to "promote science and innovation collaboration with developed and emerging markets for the benefit of the UK's knowledge economy and to build S&I capacity to strengthen the global economy". Projects are currently running in <b>China, France, Germany, India, Israel, Italy, Japan, Korea, Mexico, Russia, Singapore, South Africa and Switzerland</b> , with funding approved for a project in Brazil due to start in 2007.	£1.4m
<b>TOTAL FOR FCO</b>		<b>£12m</b>

The <b>Department for Education and Skills (DfES)</b> higher education budget for 2005/06 includes some £1,410 million to support research carried out in universities in England. There are currently (2004/05) some 229,000 international students studying at British universities of whom some 124,000 are post-graduate students. One of the objectives of the Department's international strategy is to maximise the contribution of our education and training sector and university research to overseas trade and inward investment.		
Scheme/ programme	Description/objective	Approx annual funding
PMI	<p>The first phase of PMI saw the UK meet its target of attracting an extra 50,000 international students into HE two years ahead of plans, and offered an extra 1,000 funded post-graduate research places via the Chevening Scholarship Scheme. PMI 2 is building on this to encourage:</p> <ul style="list-style-type: none"> <li>• student mobility both to and from the UK,</li> <li>• Marketing and communications strategies to sustain the managed growth of UK international education delivered both in the UK and overseas;</li> <li>• Ensuring the quality of the student experience;</li> <li>• Building strategic, sustainable partnerships and alliances between UK and overseas institutions;</li> <li>• Diversifying into new markets and consolidating existing markets.</li> </ul> <p>As part of the PMI, the UK has developed an Education UK brand. It supports the promotional activity of UK universities by raising the profile of UK education overseas.</p> <p>A further strand enables overseas students to stay and work in the UK for a year after completing their degree. An entitlement from Summer 2004 means that international students completing science, technology, engineering and mathematics subjects are allowed to work in the UK for one year after graduating from a UK institution, without the need for a Work Permit. This is being expanded following an announcement by the Chancellor in the Pre-Budget Report in December 2005. From May 2006 postgraduate students of any subject will be able to work in the UK for a year after completing their qualification without the need for a Work Permit.</p>	<p>Chevening £400k annually</p> <p>PMI: £7m in 2006/07</p>
DfES	New fund to support institutional links between English and African HEIs for educational capacity building covering <b>South Africa and sub-Saharan Africa</b> . Two-year programme with total investment for S Africa is £1m and for sub-Saharan Africa is £2m	£1.5m
China Scholarships for Excellence	This scheme provided 20 scholarships for <b>Chinese</b> post-doctoral and PhD students to study in UK universities in the fields of science and technology in 2005/06 academic year. The aim is to have 50 such scholars in the 2006/07 academic year. The scheme also makes provision for UK post-doctoral students to study in China. The scheme hopes to create long-term sustainable links between UK and Chinese institutions.	£840k
DfES co-operation with Russia	Seedcorn funding for research co-operation to 2008 - build partnerships with Russian institutions to develop long term research links in Science & Technology with <b>Russia</b> .	£250k
DfES BRIDGE project with Russia	Current partnerships include 3 at Masters level: MSc in Biophotonics & Biotechnologies between Cranfield and Saratov State University; MSc in Computer & Information Engineering between City University and St Petersburg State; MA in Creativity & Innovation in High Technology Industries between De Montfort and Moscow Bauman. <a href="http://www.bridgeproject.ru">www.bridgeproject.ru</a> . Partnerships with <b>Russia</b> that run over 3 years)	£20k pa per partnership
Future BRIDGE projects	Intention to extend BRIDGE HE Partnerships with a particular focus on Science and Technology.	£200k
<b>TOTAL FOR DfES</b>		<b>£10.2 m</b>

**Department for Environment Food and Rural Affairs (Defra)** is the government department responsible for sustainable development in the UK and internationally. It is a major funder of science spending over £300m annually, including around £155m on research and development and £145m on monitoring and surveillance. Defra draws on a wide science base to underpin its policy agenda and in particular the priorities set out in its Five Year Strategy “Delivering the Essentials of Life”. Defra plays an important role globally and uses science internationally to help promote policy interests and to build shared understanding and influence with other governments and international organisations, such as the EU, UN fora, OECD, FAO and IPCC in framing and negotiating international agreements. Research around issues such as climate change, protection of natural resources, sustainable consumption and production, and sustainable farming and food all have significant international aspects and involvement.

<b>Scheme/ programme</b>	<b>Description/objective</b>	<b>Approx annual funding</b>
EU Framework Programme	“Match-funding” of projects in the Food and Environment thematic areas of the EU’s RTD Framework Programme that have the potential to provide evidence to underpin Defra policies, and where there is most added value to <b>EU</b> collaboration. >£5m over FP6	>£1.25m
EU Framework Programme	Funding of an external National Contact Point to promote and encourage UK science collaboration with EU researchers in the Food and Environment thematic areas of the <b>EU’s</b> RTD Framework Programme.	£100k
EU Framework Programme – ERA-Net schemes	Defra is involved in a number of ERA-Net activities with <b>EU and other European countries</b> , including co-ordination of projects on flood risk management, marine fisheries and phytosanitary (statutory plant health) research. It also participates in projects on accidental marine pollution, biodiversity, and organic food and farming.	N/A
Defra’s collaborative research activities	“Pump-priming” of joint research activities with other European countries, including ERA-Nets under the EU Framework Programme, that encourage increased collaborative research at the <b>EU</b> level.	£200k
EU Standing Committee on Agricultural Research (SCAR)	Defra co-ordination of SCAR Collaborative Working Group on Animal Health. Overarching objective to increase co-ordination of national research programmes. Defra also participates in the SCAR Collaborative Working Groups on Agriculture and Sustainable Development, Renewable Raw Materials and their Application in Non-Food Industries and Sustainable Livestock Production and Grassland. <b>EU</b> coverage	N/A
OECD Co-operative Research Programme	Postdoctoral fellowship programme on Biological Resources in Agriculture. Offers scientists the opportunity to undertake co-operative research in other OECD countries. Led by Defra for the UK. Covers <b>OECD</b> countries	£40k
Darwin Initiative	Defra small grants programme funding collaborative projects and fellowships between UK institutions and developing country bodies to promote biodiversity conservation and sustainable use of resources around the world. <b>Global</b> coverage	£7m
UK–Japan Partnership on Endocrine Disruptors	To build collaborative links and facilitate exchange of scientific information and development of joint research on endocrine disruptors in aquatic environments with <b>Japan</b> . Defra and NERC are official sponsors. Defra contract £325k over 5 years	£65k
India-UK Programme on Impacts of Climate Change	Scientific collaboration led by Defra looking at impacts of climate change in <b>India</b>	Project (Phase II) figures n/a
UK-China collaboration on Climate Change	Scientific collaboration between <b>China</b> and the UK to undertake a detailed assessment of potential impacts of climate change on Chinese agriculture. Defra funding of Phase II of project is £810k over 2005-08.	£270k
UK-China Agreement on near Zero Emissions Coal project	<b>EU-China</b> Partnership on Climate Change. Collaborative series of activities aiming to obtain near to zero carbon emissions from coal-fired energy in China. UK (joint Defra/DTI) funding first phase. 2006-09 (Defra £3m, DTI £0.5m)	£1m
<b>TOTAL FOR Defra</b>		<b>&gt;£9.9m</b>

<p>The <b>Royal Society</b> is a learned society and the UK national academy of science. It is dedicated to promoting excellence in UK and international science, and in ensuring that UK scientists engage with the best scientists worldwide so that they remain at the forefront of world-class science. To this end it works closely with leading scientific organisations worldwide, on funding, collaboration and science policy issues. Funding schemes provided by the Society, at postdoctoral level, include incoming and outgoing short visits, joint projects and incoming Fellowships from priority countries. The Society also administers the Office of Science and Innovation's international networking programme.</p>		
<b>Scheme/ programme</b>	<b>Description/objective</b>	<b>Approx annual funding</b>
Conference grants	Provide assistance to UK scientists attending conferences in any overseas country. <b>Global</b> coverage	£6.4m
Short visits grants	Available for scientists to undertake visits (either by UK scientists overseas, or by overseas scientists to the UK) for periods of between one week and three months; these are intended to assist in initiating one-to-one collaboration and exploring opportunities. Funding is for travel and subsistence, and in some instances costs are shared with partner organisations 'in-country'. <b>Global</b> coverage	
Joint projects	Provide mobility grants for bi-lateral research projects between a UK research group. Funds available cover the costs of a series of visits between the two groups over a period of two to three years. Covers <b>Europe, CIS, South America, South East Asia, China, India and parts of Africa and Latin America</b>	
Incoming Fellowships for postdoctoral scientists	The Society also offers incoming fellowships for postdoctoral scientists undertaking a research project with a named host in a UK research organisation. Covers <b>India, China, and South East Asia</b> for 6-12 months and <b>US</b> and <b>Canada</b> for 12 to 36 months	
ERA COREACH ERANET on European research collaboration with China	This network is intended to create coherence and synergy in Europe's S&T relations with China. Covers <b>Netherlands, France, Germany, Poland, Austria, Norway, Finland, Ireland, Hungary</b> . Delivered by RS (and British Academy) on behalf of UK. £250k over five years	£50k
International Science and Science Policy Organisations	Collaboration with the international scientific community through support of the International Council for Science (ICSU), InterAcademy Panel and Council (IAP/IAC), International Scientific Unions, the International Seismological Centre, European Academies Science Advisory Council (EASAC), European Science Exchange Programme (ESEP) and Academia Europaea. <b>Global</b> coverage delivered by RS for UK	£750k
<b>TOTAL FOR ROYAL SOCIETY</b>		<b>£7.2m</b>

The **Department for International Development (DFID)** DFID, the Department for International Development: leading the British government's fight against world poverty. One in five people in the world today, over 1 billion people, live in poverty on less than one dollar a day. In an increasingly inter-dependent world, many problems - like conflict, crime, pollution, and diseases such as HIV and AIDS - are caused or made worse by poverty. DFID supports long-term programmes to help tackle the underlying causes of poverty. DFID also responds to emergencies, both natural and man-made. DFID's work forms part of a global promise to: halve the number of people living in extreme poverty and hunger; ensure that all children receive primary education; promote sexual equality and give women a stronger voice ; reduce child death rates; improve the health of mothers; combat HIV & AIDS, malaria and other diseases; and make sure the environment is protected; build a global partnership for those working in development. Together, these form the United Nations eight "Millennium Development Goals", with a 2015 deadline. Each of these Goals has its own, measurable, targets. DFID works in partnership with governments, civil society, the private sector and others. It also works with multilateral institutions, including the World Bank, United Nations agencies, and the European Commission. New science, technologies and ideas are crucial for the achievement of the Millennium Development Goals, but global research investments are insufficient to match needs and do not focus on the priorities of the poor. Many technological and policy innovations require an international scale of research effort. DFID's Central Research Department (CRD) commissions research to help fill this gap, aiming to ensure tangible outcomes on the livelihoods of the poor. CRD seeks to influence the international and UK research agendas, putting poverty reduction and the needs of the poor at the forefront of global research efforts. CRD manages long-term research initiatives that cut across individual countries or regions, and only funds activities if there are clear opportunities and mechanisms for the research to have a significant impact on poverty. CRD works closely with DFID's Chief Scientific Adviser to maintain external links, particularly with UK Science, Whitehall and political stakeholders, to promote DFID's agenda

Scheme/ programme	Description/objective	Approx annual funding
Development Partnerships in Higher Education Programme (DeIPHE)	Funded by DFID to fund partnerships between Higher Education Institutions (HEIs) working on collaborative activity linked to development goals. <b>Global</b> coverage but activity linked to development goals	£3m
<b>TOTAL FOF DFID (Some jointly funded activities are recorded separately below)</b>		<b>£3m</b>

The **British Council** is a Non Departmental Public Body sponsored by the FCO. It operates a worldwide science network building partnerships and encouraging links and networking between scientists, engineers and research managers to encourage innovation. It networks young scientists to foster sustainable relationships encourage scientific collaboration. It also raises international awareness of the UK's role in scientific creativity, and collective debate about the impacts on science on people's lives including major science-based campaigns such as ZeroCarbonCity and mechanisms such as café scientifique and a web magazine. The British Council currently has science programmes and representation in 70 countries

Scheme/ programme	Description/objective	Approx annual funding
International Networking for Young Scientists (INYS)	Bilateral and multilateral N+N seminars and workshops for the exchange of information, knowledge and ideas between early stage researchers and formation of collaborative links. <b>Global</b> coverage delivered by BC with matched funding from national partners	£250k
Partnership programme (Academic Research Collaboration)	Bilateral, co-financed programmes promoting links and contacts between higher education research institutions and laboratories in the UK and <b>Austria France Germany Italy Netherlands Portugal Poland Turkey Cuba Greece India Slovenia</b> . Delivered by BC with matched funding from national governments	£517k
Researcher Exchange Programme (RXP)	Individual awards providing money for travel, subsistence and recurrents to enable early stage researchers to spend 2 week – 3 month periods in foreign laboratories (inward to and outward from UK) in order to make international connections. <b>Global</b> coverage.	£500k

Network UK (part of ERA-MORE)	Personal assistance and advice provided to <b>EU/Global</b> researchers planning to move to the UK for a period of work. It comprises a mobility portal and helpdesk at the national level ( <a href="http://www.britishcouncil.org/eumobility">www.britishcouncil.org/eumobility</a> ) supported by 12 mobility centres located around the UK, aimed at removing the barriers to mobility. Co-financed by EC (under FP6) and OSI, and delivered by BC	£91k
<b>TOTAL FOR BRITISH COUNCIL</b>		<b>£1.4m<sup>46</sup></b>

#### Some examples of jointly funded activity

Scheme/ Programme	Description/objective	Approx annual funding
UK-India Education and Research Initiative (UKIERI)	is a joint cross-government (DfES, HMT, FCO, British Council, OSI) initiative about developing long term sustainable links between UK and Indian institutions The main focus of activity is about encouraging more active research partnerships with India in science and social sciences, and will include student and faculty exchanges, increased opportunities for scholarships and research collaboration. Mix of networking, small grants, large grants, institutional links, scholarships and industrial fellowships – collaboration and mobility with <b>India</b> . This is a five-year programme with government investment totalling £12m. <a href="http://www.globalgateway.org.uk/Default.aspx?page=2728">http://www.globalgateway.org.uk/Default.aspx?page=2728</a>	£12m
MRC – DFID concordat	MRC has a concordat with DFID to co-ordinate policies for research into the health of developing societies, and to help share resources. Total MRC/DFID portfolio amounts to approximately £30m per annum, to which DFID contributes approximately £4m; £10.7m per annum of this investment is focussed on research institutes based in <b>Africa</b> to undertake global health research and develop local research capacity.	£30m
ESRC-DfID 'poverty' initiative	Stimulate and support collaborations between UK and overseas researchers on substantive research topics on poverty alleviation. Covers <b>developing countries</b>	No allocation yet
BBSRC-DFID joint research	BBSRC/DFID call for research proposals (First joint call in Sustainable Agriculture for Development). Directed at research of benefit to <b>sub-Saharan Africa and South Asia</b> but other developing country participants possible. This joint £6m programme is funded by BBSRC (£2m) and DFID (£4m)	£6m
Dorothy Hodgkin post-graduate awards	Attracting outstanding students from <b>developing countries</b> to study for PhDs in top-rated UK research environments. Promotion of international mobility of scientists. This scheme is jointly funded by OSI – business and delivered by EPSRC. £4.5m annual funding from Research Councils and £132k from OSI.	£4.6m
<b>TOTAL FOR SELECTION OF JOINTLY FUNDED SCHEMES</b>		<b>£42.6m</b>

#### **TOTAL<sup>47</sup>**

**Note: this figure is approximate and does not represent total UK expenditure. In particular it does not include significant amounts of Research Council expenditure where the elements relating to international collaboration are not identified, neither does it include expenditure of government departments and other bodies that are not members of GSIF.**

**£354m**

<sup>46</sup> The total budget for British Council science programmes around the world is £8m

<sup>47</sup> Figures shown are (where possible) for 2006 and the total is rounded to the nearest £1m



## ANNEX B: Selection of GSIF coordination focus countries

Country selection has been guided by available evidence recognising that some desirable metrics are not available; this is especially the case for the axes of the strategy addressing influence and development. Nevertheless, for the research and innovation axes, various quantitative measures are available, and give a reasonably consistent picture – those considered by GSIF are detailed below.

This information provided guidance to GSIF members in deliberations leading to the selection of the initial coordination focus for the strategy. This information was used in conjunction with knowledge of existing and forthcoming activities and an understanding of where multiple overlapping interests and activities of GSIF members may work together most effectively to add maximum value in achieving the diverse aims of the strategy.

In addition it was necessary to take into account that these historic metrics do not reflect the current performance of certain countries, especially China but perhaps also India and Korea. More generally, metrics tend to indicate ability/capacity; they are less good at identifying future threats or opportunities.

### Citations (applicable to the research objective)

- (a) Rank (1998-2002 total citations) based on bibliometric work by Evidence Ltd<sup>48</sup> and subsequently update by Sir David King<sup>49</sup>.
- (b) Share of papers in most prestigious journals based on OECD data.
- (c) Proportion of papers in most prestigious journals which are highly cited (OECD) a measure of *relative* quality, not absolute impact.

(a) Total citations	(b) Share of papers in prestigious journals	(c) Prestigious papers which are highly cited
1. USA	1. USA	1. Canada
2. UK	2. UK	2. Finland
3. Germany	3. Germany	3. Israel
4. Japan	4. Japan	4. Italy
5. France	5. France	5. Switzerland
6. Canada	6. Canada	6. USA
7. Italy	7. Italy	7. France
8. Netherlands <sup>50</sup>	8. Switzerland	8. Netherlands
9. Australia	9. Netherlands	9. Sweden
10. Switzerland	10. Australia	10. UK

<sup>48</sup> DTI, December 2005, PSA target metrics for the UK research base, <http://www.dti.gov.uk/files/file27330.pdf>

<sup>49</sup> D A King, 15 July 2004, The Scientific Impact of Nations, Nature, 430 (2004) 311-316

<sup>50</sup> The 'Nature' data went up to 2001, when the last three in the top ten were in the order: Switzerland, Netherlands, Australia.

### Students (applicable to the research objective)

- (a) Proportion of foreign students in the tertiary education system (all subjects, not just Science Engineering and Technology; data for OECD countries plus 10 others, but not whole world).
- (b) Proportion of country's students who are studying abroad.
- (c) Countries with many students studying in UK (HESA, enrolled numbers for 2003-04).

<b>(a) foreign students there</b>	<b>(b) domestic students abroad</b>	<b>(c) many students in UK</b>
1. Switzerland 2. Australia 3. Austria 4. UK 5. Belgium 6. Germany 7. France 8. Sweden 9. Denmark 10. New Zealand	1. Luxembourg 2. Iceland 3. Greece 4. Ireland 5. Norway 6. Slovakia 7. Malaysia 8. Switzerland 9. Austria 10. Sweden	1. China 2. Greece 3. Irish Republic 4. India 5. USA 6. Germany 7. Malaysia 8. France 9. Hong Kong 10. Japan

### Expenditure (applicable to both the research and the innovation objectives)

- (a) Rank by absolute spend on R&D (GERD - General expenditure on R&D) (China at R&D intensity of 1.3% of GDP, with GERD approx \$15.5 billion. The OECD accounts for about 75% of global R&D.)
- (b) Proportion of GDP spent on R&D ("R&D intensity")

<b>(a) Absolute spend (GERD)</b>	<b>(b) GERD as % of GDP</b>
1. USA 2. Japan 3. Germany 4. France 5. UK 6. Korea 7. Canada 8. China (approx position) 9. Italy 10. Sweden	1. Sweden 2. Israel 3. Finland 4. Japan 5. Iceland 6. Korea 7. USA 8. Switzerland 9. Germany 10. France

**Business measures (applicable to the innovation objective)**

- (a) BERD (Business Expenditure on R&D – absolute)
- (b) Number of patents (numbers included to indicate how fast they reduce)
- (c) Venture capital as a proportion of GDP (a relative measure)

<b>(a) BERD (absolute)</b>	<b>(b) Patents (numbers)</b>	<b>(c) Venture capital % of GDP</b>
1. USA	1. USA (15,000)	1. USA
2. Japan	2. Japan (12,000)	2. Iceland
3. China	3. Germany (6,000)	3. Canada
4. Germany	4. France (2,000)	4. Netherlands
5. France	5. UK (1,800)	5. UK
6. UK	6. Netherlands (900)	6. Sweden
7. Korea	7. Sweden (800)	7. Korea
8. Russia	8. Italy (800)	8. Belgium
9. Canada	9. Switzerland (700)	9. Finland
10. Sweden	10. Canada (500)	10. Germany