

# **PSA Delivery Agreement 4:**

## **Promote world class science and innovation in the UK**

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# VISION

**1.1** World-class science and innovation in the UK are crucial to maintaining economic prosperity and responding to the challenges and opportunities of globalisation. In the global knowledge economy the UK's competitive advantage will rely on the ingenuity and capabilities of the UK population and will be dependent on the UK having an innovation system that can take advantage of the opportunities on offer.

**1.2** As well as maintaining the UK's prosperity, science and innovation play a vital part in addressing key global and domestic challenges, such as climate change and security. Science and innovation also deliver improvements in public service delivery and contribute to improvements in areas such as education, health and culture.

**1.3** The delivery of this PSA is underpinned by six priorities for achieving world-class UK science and innovation:<sup>1</sup>

- **world class research at the UK's strongest centres of excellence and sustainable and financially robust universities and research institutes across the UK.** This is essential in generating the new ideas, trained people and technologies now and for the future;
- **greater responsiveness of the publicly-funded research base to the needs of the economy and public services.** This will generate greater impact from the UK's public Research and Development (R&D) expenditure;
- **increased business investment in R&D and increased business engagement with the UK science base for ideas and talent.** The *Science and Innovation Investment Framework 2004-14*<sup>2</sup> and the preceding *Lambert Review*<sup>3</sup> and *DTI Innovation Report*<sup>4</sup> all drew attention to the importance of business engaging with the research base if it is to create value through innovation. The ten-year Science and Innovation framework set out the Government's overall ambition to raise investment in R&D to 2.5 per cent of GDP by 2014 with business investment in R&D increasing from 1.25 per cent of GDP towards a goal of 1.7 per cent. However, business engagement with the research base is just as important in non-R&D intensive sectors;
- **a strong supply of Scientists, Engineers and Technologists.** This is critical for the future sustainability of the research base as well as for giving UK businesses and public services the drive and capability to innovate;
- **confidence and increased awareness across UK society in scientific research and its innovative applications.** This is central to creating an environment where science and technology can be developed and deployed to economic and social advantage; and

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<sup>1</sup> As set out in the Government's Ten Year Science and Innovation Investment framework published in 2004 and updated in 2006. See [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) for the original documents; and <http://www.berr.gov.uk/files/file29096.pdf> for the 2006 update to the framework.

<sup>2</sup> Science and Innovation Investment Framework 2004-14 - Economic Impacts of Investment in Research & Innovation, BERR, July 2007.

<sup>3</sup> The Lambert Review of Business-University Collaboration, HMT, December 2003.

<sup>4</sup> 'Competing in the global economy: the innovation challenge', DTI, December 2003.

- **improving the use and management of science and innovation across Government.** Government departments fund some £4.2 billion of R&D outside the science budget to support their policy and delivery objectives.<sup>5</sup> It is important that the knowledge generated is used to best effect both in the policy-making process and in generating innovation more widely.

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<sup>5</sup> Estimated out-turn, 2005/06, for further information see <http://www.berr.gov.uk/science/science-funding/set-stats/index.html>.

# 2

## MEASUREMENT

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**2.1** The *Science and Innovation Investment Framework 2004-14* reflects the long-term nature of the Government's science and innovation policy objectives. The focus of this PSA however, is on the progress that will be made over the CSR07 period towards ambitions that are longer term.

**2.2** Six measures have been chosen to measure performance for this PSA:

**Indicator 1: The UK percentage share of citations in the leading scientific journals**

- This indicator measures the volume of top-quality UK scientific research and captures the scientific standing of the UK research base. The UK currently stands second behind the USA on this measure. Research Council and Higher Education funding promotes excellence by resource allocation through scientific peer review and the level of funding is a key determinant of volume.

**Indicator 2: Amount of income generated by UK Higher Education Institutions (HEIs) and Public Sector Research Establishments (PSREs) through research, consultancy and licensing of intellectual property**

- Commercial interactions between HEIs and PSREs and business are an important aspect of a wider set of business-research interactions that are central to the innovation process. Government provides specific funds to HEIs and PSREs to develop their capacity to engage with business.

**Indicator 3: The percentage of UK business with 10 or more employees that are "innovation active"**

- This is important as a direct measure of innovation in UK businesses. Central government departments and Regional Development Agencies (RDAs) in England support business innovation through direct financial support or advice. A much wider range of policies and programmes across government affect the climate and incentives facing business.

**Indicator 4: The annual number of UK PhD completers in Science, Technology, Engineering and Mathematics (STEM) subjects**

- This indicator reflects the importance of the research and innovation system as a source of trained people, both to sustain the research base and as a source of expertise for business and the public sector. While the UK economy needs increasing numbers of highly trained people at Levels 4 and 5<sup>1</sup> in general, the focus on PhDs and STEM subjects reflects both the very significant influence that Government policy has on PhD numbers, through funding of research, and the importance of highly-trained STEM graduates in facilitating innovation.

**Indicator 5: The number of young people in England taking "A" Levels in mathematics, physics, chemistry and biological sciences**

- This indicator is important both in its contribution to developing a well-informed and scientifically literate public, and in its role as a lead indicator of the flow of future higher-level scientific skills. The Department of

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<sup>1</sup> Level 4 equates to degree level qualifications and Level 5 equates to post degree level qualifications.

Children, Schools and Families' (DCSF) policies and funding will influence the number of people who choose to take these qualifications.

**Indicator 6: Business research and development (R&D) expenditure – the average UK R&D intensity in the six most R&D intensive industries, relative to the US, Japan, France and Germany**

- Business R&D is an important pre-condition to, and lead indicator of, innovation in some technologically-intensive industries. This indicator benchmarks UK R&D in the most technologically-intensive industries against leading competitors, adjusting for the distinct structural characteristics of the UK economy that complicate comparisons based on aggregate business R&D.<sup>2</sup> Although investment decisions are made by business, the R&D Tax Credit and Department for Innovation, Universities and Skills (DIUS) and RDA programmes that part-fund R&D projects will both have an impact on R&D volumes.

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<sup>2</sup> For more information see *R&D intensive businesses in the UK*, DTI Economics Paper No.11 available at <http://www.berr.gov.uk/files/file9656.pdf>.

# 3

## DELIVERY STRATEGY

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**3.1** Science and innovation policy aims to change the UK science and innovation system in ways that promote economic, social and environmental priorities.<sup>1</sup> Businesses, the research and education sectors, and the Government at all levels have roles to play in delivering a world-class science and innovation system. The Government has some quite direct means of influencing the size and nature of parts of the system through, for example, the decisions it takes on investment in research. However, its impact on other variables, such as business innovation is less direct, with the focus of policy being to create the right ‘ecosystem’ for science and innovation to flourish.

**3.2** This strategy has been informed by key policy documents including the *Science and Innovation framework 2004-14*, the *Lambert Review of Business-University Collaboration*, the *Cooksey Review of UK Health Research Funding*,<sup>2</sup> the *Gowers Review of Intellectual Property*<sup>3</sup> and the *Sainsbury Review of Science and Innovation*.<sup>4</sup>

**3.3** This delivery strategy sets out:

- the role of key delivery partners; and
- actions that will be taken to deliver the Government’s six priorities, as set out in the Vision.

### Role of key delivery partners

**3.4** Successful delivery of this PSA is dependent on a number of delivery partners within and outside of central government. DIUS funds a number of bodies, including Research Councils, Higher Education Funding Councils and the Technology Strategy Board to deliver against these objectives. Through its role of funder of these bodies DIUS is able to set the strategic objectives of these bodies, however, operational decisions about the funding of Higher Education Institutes, individual research proposals or innovation support for businesses are taken independently from the Government to ensure that funding is, in part, driven by market demand.

**3.5** In addition to these bodies a variety of other groups are involved in the formulation of delivery strategy and the management of delivery:

- DIUS/Research Council UK Joint Strategy Group sets the strategic direction of research council funding. Both the research community and the users of research in business, the public services and elsewhere are represented on the Research Councils themselves;
- UK Intellectual Property Office Steering Board advises on the role of Intellectual Property rights in supporting innovation;

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<sup>1</sup> In particular the challenges and opportunities for technology-based innovation in addressing climate change highlighted by the Stern Report ([http://www.hm-treasury.gov.uk/independent\\_reviews/stern\\_review\\_economics\\_climate\\_change/stern\\_review\\_report.cfm](http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm)) and the cross-cutting challenges identified for this Spending Review ([http://www.hm-treasury.gov.uk/spending\\_review/spend\\_csr07/spend\\_csr07\\_longterm.cfm](http://www.hm-treasury.gov.uk/spending_review/spend_csr07/spend_csr07_longterm.cfm)).

<sup>2</sup> *A review of UK healthcare funding*, Sir David Cooksey, December 2006.

<sup>3</sup> *The Gowers review of intellectual property*, HMT, December 2006.

<sup>4</sup> *The race to the top: A review of Government’s science and innovation policies*, HMT, October 2007.

- Technology Strategy Board, which provides a strong business focus to technology innovation programmes;
- UK Space Board and Space Advisory Council provides advice on space exploration; and
- the interface with the English RDAs on innovation is managed at a number of levels. Ministers and senior officials engage with chairs and chief executives of RDAs across the broad range of their responsibilities. In addition, an operational focus on science and innovation is maintained through the Regional, Innovation, Science and Technology (RIST) Group, which brings together central Government and innovation leads in the RDAs and devolved administrations. Each RDA in England also works closely with their Science and Industry Council, composed of business and local academic interests which develop innovation and technology plans to help deliver the regional economic strategy.

## Role of central government

**3.6** Successful delivery of this PSA is also dependent upon effective and coordinated policies and programmes across a much wider range of government departments. Government departments have significant influence over UK research and innovation outcomes in their roles as funders of R&D, as purchasers of goods and services and often through their responsibilities in regulating business or other actors in the innovation system.

**BERR 3.7** The Department for Business, Enterprise and Regulatory Reform (BERR) will work particularly closely with DIUS to create the conditions for business success and productivity, and to ensure that enterprise support schemes actively complement those tailored to innovation. DIUS will work closely with the new Business Council for Britain. BERR also has an important role in delivery through its responsibilities for enhancing the effectiveness of the English RDAs.

**FCO 3.8** The Foreign and Commonwealth Office (FCO) maintains a Science and Innovation network of attaches as a resource to promote UK science and innovation, to facilitate collaboration and the flow of both scientific knowledge and investment into the UK, and disseminate best practice in science and innovation policy. The FCO network also works with UK Trade and Investment in promoting the advantages of locating R&D investment in the UK.

## PRIORITY ACTIONS TO DELIVER THE PSA

**3.9** The following sections give further details on the specific actions that will be taken under the six priority areas, set out in the Vision, and who is responsible for delivering them.

### **Priority 1: World-class research at the UK's strongest centres of excellence and sustainable and financially robust universities and research institutes across the UK**

**Financially  
robust science  
base**

**3.10** To deliver world-class science and innovation requires a world-class and financially robust science base which rewards excellent research of all types, including user-focused and interdisciplinary research. DIUS promotes this objective by funding the UK research base through the dual funding system. It does this through the Higher Education Funding Council for England (HEFCE) and through the Research Councils. The funding of research delivered through HEFCE will over the course of this period be guided by the results of the 2008 Research Assessment Exercise, followed by new research assessment arrangements phased in from 2009/10. Research Councils will draw up annual delivery plans setting out how they will achieve their objectives as well as annual reports setting out achievement against delivery plans and delivery of outputs.

**3.11** For clinical and healthcare research, the Office for Strategic Co-ordination of Health Research will ensure cohesion between the activities of the Medical Research Council and the National Health Service R&D expenditure of the Department of Health. This will be done by creating a single funding stream for health research as recommended by the Cooksey Review.

**3.12** The financial sustainability of HEIs and PSREs will be maintained by ensuring there is a clear relationship between research funding and the Full Economic Cost (FEC) of research. Research Council projects are all funded to meet 80 per cent of FEC and, in combination with continuing funding for research infrastructure, should ensure sustainability. DIUS will monitor sustainability through periodic reviews of infrastructure backlogs in HEIs and the financial sustainability of PSREs.

**3.13** Through its network of science and innovation attaches, the FCO will continue to help attract new collaborative research funding from other countries and facilitate UK researchers' access to world leading facilities and researchers. DIUS will also continue to provide support through the national contact point facility for UK researchers and businesses seeking to engage with the European Framework Programme. It will also negotiate the shape of future Framework programmes.

**Priority 2: Greater responsiveness of the publicly-funded research base to the needs of the economy and public services**

**3.14** If the impact of additional public investment in the research base on the economy is to be maximized, it is essential to ensure that the right structures are in place to deliver the benefits of this investment. For the Research Councils this translates into a greater emphasis on the economic impact of their activities, drawing on the recommendations of the Warry Report.<sup>5</sup> As a result of this Research Councils UK has set up a Knowledge Transfer and Economic Impact group to drive forward progress across the Councils and the forthcoming production of baseline impact reports for each Council provides a mechanism for each Council and DIUS to monitor progress.

**Encourage  
knowledge  
transfer**

**3.15** The Government has also established a number of mechanisms to encourage knowledge transfer from the research base and DIUS will continue to fund specialist knowledge transfer capability in HEIs and PSREs through the Higher Education Innovation Fund (managed by HEFCE) and the PSRE Fund (managed by DIUS).

<sup>5</sup> *Increasing the economic impact of Research Councils*, DIUS, July 2006.

Progress will be monitored on the basis of reports against delivery plans by the institutions concerned as well as through trends in knowledge transfer activity captured in surveys of HEIs and PSREs.

**3.16** Additionally, through the Funding Councils, DIUS will support programmes to give learners in HEIs at both undergraduate and postgraduate level a grounding in the skills that will enable them to augment their research knowledge in ways beneficial to employers.

### **Priority 3: Increased business investment in R&D and increased business engagement with the UK science base for ideas and talent**

#### **Technology Strategy Board (TSB)**

**3.17** A key determinant of the Government's success in responding to the challenges and opportunities of globalisation is investment in R&D by the private sector. DIUS supports business R&D and innovation through the Technology Strategy Board (TSB) which has recently been given greater operational independence from the Government. DIUS will set the strategic framework for the TSB, but the TSB will then decide how to best meet its objectives working closely with businesses and with Research Councils, RDAs, devolved administrations and government departments. The TSB will deliver greater business engagement with the research base and innovation through a range of programmes and activities including, collaborative R&D programmes; Knowledge Transfer Partnerships; Knowledge Transfer Networks; and Innovation Platforms, all of which involve support for business collaborations with the research base.

**3.18** In addition, a number of other government departments also support TSB-led business research programmes for example the Department for the Environment, Food and Rural Affairs supports research designed to produce more sustainable waste management and reduction technologies; and the Ministry of Defence (MoD) part funds a programme of research into materials. Activities such as Knowledge Transfer Networks and Innovation Platforms also play an important role in alerting Government to the needs and views of businesses and how Government can take action to stimulate innovation. The TSB will report regularly to DIUS on progress against its delivery plan. In addition, it will be charged with producing periodic assessments of its broader impact on the UK science and innovation system.

**3.19** The operation of the UK intellectual property (IP) system also has an influence on the innovation activities of UK businesses. The UK-Intellectual Property Office delivers policies and services that facilitate innovation; this includes modernizing the legislative framework, programmes to raise IP awareness among business and the public, the registering and granting of IP rights as well as a role in their enforcement. The UK-IPO has a Corporate Plan and Annual Report process that sets out intended actions and reports delivery against them. These are monitored both by the UK-IPO Steering Board and by DIUS Ministers. Clear benchmarks are set for the quality and timeliness of delivery of IP services.

**3.20** The maintenance of common levels of standards and measurement practice are a key part of the necessary infrastructure in which innovation can foster. DIUS will support business innovation through its funding of the National Measurement System, principally through programmes of business-relevant research into metrology at the National Physical Laboratory. Priorities for the National Measurement System are set explicitly taking account of business needs, and targets are set for business engagement and co-funding. DIUS will promote the development of standards through its support

for the British Standards Institute (BSI). DIUS funds development of standards where these might not occur otherwise or influences them in ways favourable to the UK. BSI reports annually to DIUS on the activities delivered in return for funding.

**3.21** DIUS also promotes the use of design in business and the public services and its use as a tool for innovation through its provision of core and project funding and sponsorship of the Design Council (jointly with the Department for Culture, Media and Sport). The Design Council is a Non-Departmental Public Body with a stated mission to “improve prosperity and well being in the UK by inspiring and enabling the best use of design”. It has an annual corporate planning and reporting process to account for its activities.

**3.22** DIUS supports the development of innovative enterprises through programmes funded by the National Endowment for Science, Technology and the Arts (NESTA). NESTA funds its programmes from its endowment and the return on its investment income. DIUS ministers are responsible for appointments to the board of trustees, for setting strategic direction and for ensuring that NESTA delivers value for money.

**3.23** Through British National Space Centre (BNSC), DIUS funds technology development programmes for civil space. This is primarily through contributions to programmes run by the European Space Agency.

**3.24** Development of a portfolio of future energy technologies will be delivered through the Energy Technologies Institute, a public-private partnership combining public funds and significant investment by the private sector.

## **Priority 4: A strong supply of Scientists, Engineers and Technologists**

**3.25** To support the UK’s ambition to move to a higher level of research and development intensity it is crucial to ensure that the UK has the right stock and flow of skilled scientists, technologists, engineers and mathematicians (STEM). The ten-year science and innovation investment framework set out the Government’s approach towards achieving a step change in the level of science skills in the economy. Building on the original framework the Government set new ambitions for STEM skills in 2006 including, to achieve year on year increases in the number of young people taking A levels in physics, chemistry and mathematics and also to continually improve the number of pupils achieving A\*-B and A\*-C grades in two science GCSEs.

**STEMNET 3.26** To meet these ambitions DCSF runs a number of initiatives in England that encourage young people to study STEM subjects. For example, making GCSEs in the individual sciences of physics, chemistry and biology (triple science) more accessible to pupils who would benefit, and piloting 250 science clubs for pupils at key stage 3 with an interest and aptitude for science. DIUS funds STEMNET, a national network for the delivery of STEM support especially enhancement and enrichment activities in schools and colleges. STEMNET runs the Science and Engineering Ambassadors scheme inspiring children about science across the UK. These initiatives aim to promote the relevance of STEM subjects and ensure that young people and those they seek advice from are well-informed, and are managed by a DCSF project board and overseen by a joint DCSF/DIUS high level strategy group.

## **Priority 5: Confidence and increased awareness across UK society in scientific research and its innovative applications**

**3.27** Investment in science and innovation is opening up an array of new opportunities and ways of addressing societal challenges. However, there is sometimes unease about the direction of R&D and regulation of technology. The Government's goal is for the UK public to be confident about the governance, regulation and use of science and technology by both government and business and to be positively engaged with science activity. To achieve these aims DIUS will continue to manage programmes and initiatives like Sciencewise, which provide opportunities for the general public to have their views taken into account by policy-makers on emerging areas of science & technology. Building on the success of Sciencewise, DIUS is developing an Expert Resource Centre for Public Dialogue on Science and Innovation (ERC) to build capacity across Government and integrate public engagement/dialogue into policy-making, capturing and disseminating best practice from the UK's science & society community. DIUS also works with partners such as the national academies, science based businesses and learned societies on flagship national events, including National Science and Engineering Week.

**3.28** The climate of public attitudes to science and technology and public engagement is measured every three years by a large scale survey, the latest being conducted with Research Councils UK and will report in early 2008.<sup>6</sup>

**3.29** DIUS is also continuing to promote the adoption of a Universal Ethical Code for Scientists to build public trust in the governance and use of science.

## **Priority 6: Improving the use and management of science and innovation across Government**

**3.30** Science and innovation not only generate economic prosperity but also underpin evidence-based policy development and improved service delivery. The Government believes that policy and operational decisions should be evidence-based and this involves the effective use of scientific evidence and analysis.

**3.31** Whilst this is primarily the responsibility of individual departments DIUS supports Departments through the activities of the Government Chief Scientific Adviser (GCSA) and GO-Science. The GCSA chairs the Chief Scientific Advisers' Committee, which brings together Departmental Chief Scientists and is a means both of monitoring progress towards the ten-year framework goals and of sharing experiences and best practice across Departments.

**3.32** GO-Science also works to raise standards of science across Government and its use in the policy-making process by setting guidelines and protocols. Key documents such as the '*Guidelines on Scientific Analysis in Policy Making*' and the '*Code of Practice for Scientific Advisory Committees*'<sup>7</sup> were put out to public consultation.

**3.33** All Departments will continue to produce Science and Innovation Strategies, and these will be quality assured by GO-Science with periodic reports to the Prime

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<sup>6</sup> The results of the last survey can be found at <http://www.ipsos-mori.com/polls/2004/pdf/ost.pdf>.

<sup>7</sup> *Guidelines on Scientific Analysis in Policy Making*, DTI, October 2005 and *Code of Practice for Scientific Advisory Committees*, Office of Science and Technology, December 2001.

Minister. Quality Assurance of Departments' scientific capacity will continue to be assessed independently through the rolling programme of Science Reviews.

**3.34** Horizon-scanning of current science and technology opportunities and threats in the future is essential to the effective governance and direction of Government policy and DIUS will continue to provide support to forward policy making across Government through its Foresight and Horizon Scanning programmes.

**3.35** DIUS will also co-ordinate the international efforts of departments on science and innovation through the activities of the Global Science and Innovation Forum (GSIF), which brings together key departments and other delivery partners and stakeholders. DIUS will help departments implement the GSIF strategy and monitor progress.<sup>8</sup>

## CONSULTATION

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**3.36** Government has extensively consulted with key stakeholders – including the scientific community, businesses, charities, individuals and regional and devolved bodies throughout the policy development process. A comprehensive consultation was carried out in advance of the ten-year science and innovation investment framework and similar processes have been followed for previous and subsequent reviews, such as the 2003 DTI Innovation Report and the 2006 Gowers Review of Intellectual Property. Individual policy proposals put forward updating the 10 Year Framework have again been subject to consultation.

## ACCOUNTABILITY AND GOVERNANCE

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**3.37** The Secretary of State for DIUS is the lead minister for this PSA. The relevant Cabinet Committee/s will drive performance by regularly monitoring progress, holding Departments and programmes to account and resolving inter-departmental disputes where they arise.

**3.38** The Senior Responsible Officer within Government for the PSA will be the Director General of Science and Innovation, working closely with the Government Chief Scientific Adviser who will chair a Senior Official PSA Delivery Board, comprising all lead and supporting departments. The Board will also monitor progress and review delivery regularly and report to the relevant Cabinet Committee/s.

## DEVOLVED ADMINISTRATIONS

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**3.39** This PSA covers the UK. However, significant aspects of delivery in Scotland, Wales and Northern Ireland are the responsibility of the devolved administrations rather than DIUS. Similarly, in England, promotion of innovation is one of the key priorities for the RDAs.

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<sup>8</sup> The GSIF strategy document can be found at <http://www.berr.gov.uk/files/file34726.pdf>.



# A

## MEASUREMENT ANNEX

Indicator I	Percentage UK share of citations in leading scientific journals
Data provider	DIUS although the analysis involved is prepared by an independent contractor.
Date set used, including coverage	Thomson Scientific database <sup>1</sup> of journal outputs and their citations.
Baseline	Data on citations in 2006, the latest available data in 2008/09.
Frequency of Reporting	Annual.
95 per cent confidence interval	Not relevant. There is no sampling error.
Minimum movement required for performance assessment	<p>UK to maintain its relative share of citations and subsequent world ranking in the face of rapidly growing shares from emerging economies.</p> <p>Closer investigation will be carried out if a decrease in the UK's share of citations leads to a sustained change in the UK's world rankings. Decreases in the UK's share of the most highly cited publications (which in the short-term will be less affected by emerging economies) would also prompt further investigation.</p>
Data Quality Officer	Resources and Policy Directorate, DIUS.

### DEFINITION OF KEY TERMS

- UK:*

Data is collected in aggregate form for England, Scotland, Wales and Northern Ireland covering all disciplines in the database.
- Leading scientific journals:*

Those journals included in Thomson Scientific's database. Thomson Scientific is the world's premier source of information on journal outputs and their citations, and indexes over 8 000 journals in 35 languages, which is agreed to represent most or all of the material likely to be recognised as having significant value to others for most science fields, though it is less rich in coverage in Social Sciences and the Arts and Humanities.

**A.1** This indicator will aggregate all disciplines covered in the database.

<sup>1</sup> See <http://www.dti.gov.uk/files/file38817.pdf> page 101 and 106 for more detail on Thomson Scientific.

Indicator 2	Amount of income generated by UK HEIs and PSREs through research, consultancy and licensing of intellectual property
Data provider	HESA collect data from HEIs. An independent contractor is engaged to administer the survey of PSREs.
Date set used, including coverage	Annual return from HEIs (formerly HEBCI survey). Annual survey of PSREs.
Baseline	£437m. Baseline is calculated as the average of the last three years of data (2003-4 to 2005-06). An average is used, given past experience showing some of the items in the data are very volatile from year to year.
Frequency of Reporting	Annual.
95 per cent confidence interval	These are not sample surveys so in principle there is no sampling error. Response rates are high (94 per cent for the latest PSRE survey). Where there is non-response, imputation may be more feasible than computing standard errors.
Minimum movement required for performance assessment	To increase or at least maintain current levels in the face of increased international competition.  Closer investigation will be carried out if a decrease of 10 per cent occurs in this indicator, including examining trends in other supporting knowledge transfer indicators that are collected.
Data Quality Officer	Exploitation Directorate, DIUS.

## DEFINITION OF KEY TERMS

- *HEI*: Higher Education Institution
- *PSRE*: Public Sector Research Establishment
- *HEBCI*: Higher Education-Business and Community Interaction Survey
- *HESA*: Higher Education Statistics Agency

**A.2** This indicator is comprised of the sum of two separate data items, aggregated for HEIs and for PSREs:

1. Income from business (research and consultancy).
2. Income from licensing intellectual property.

Indicator 3	Percentage of UK businesses with 10+ employees that are “innovation active”
Data provider	Office for National Statistics on behalf of DIUS.
Date set used, including coverage	UK Innovation Survey. <sup>2</sup>
Baseline	Baseline uses data for 2004 based on the 2005 survey, which shows 57 per cent of businesses are innovation active with a confidence interval of $\pm 1$ per cent.
Frequency of Reporting	Biannual.
95 per cent confidence interval	Based upon the 2005 survey, 1 percentage point.
Minimum movement required for performance assessment	Maintain the UK position relative to the EU15. Cyclical variation will need to be taken into account in the UK and other countries’ data, though insufficient data points are available to enable a precise cyclical adjustment.
Data Quality Officer	Science and Innovation analysis, DIUS.

## DEFINITION OF KEY TERMS

- *Innovation active:*

International guidelines to define are set out in an OECD publication, the Oslo manual (OECD, 2005).

### A.3 The survey covers all sectors with the following exceptions:

*Agriculture, hunting and forestry*

*Fishing*

*Public administration and defence; compulsory social security*

*Education*

*Health and social work*

*Other community, social and personal service activities*

*Private households with persons employed*

*Extra territorial organisations and bodies*

<sup>2</sup> Data are collected from enterprises with 10+ employees.

Indicator 4	The number of students who qualify with PhDs in Science, Technology, Engineering and Mathematics (STEM) at UK Higher Education Institutes (HEIs)
Data provider	The Higher Education Statistics Agency (HESA).
Date set used, including coverage	The HESA Student Record records details of enrolments on higher education courses including PhD courses at UK Higher Education Institutions (HEIs). It records qualifiers by subject and country of domicile each year. STEM subjects are as defined by HESA.
Baseline	2007- 08. The figure for 2007- 08 will be available in January 2009. The latest available figure, for 2005-06, is 11,340.
Frequency of Reporting	Annual.
95 per cent confidence interval	Not applicable as the indicator is based on administrative data.
Minimum movement required for performance assessment	UK to maintain the number of students qualifying in Science PhDs.
Data Quality Officer	Higher Education Analysis, DIUS.

**A.4** Changes in the numbers of Science PhDs will depend on trends in 1) funding levels for science research and research students, 2) the economy, particularly the graduate labour market, and 3) demographic trends.

Indicator 5	Number of young people in England taking A levels in mathematics, physics, chemistry and biological sciences
Data provider	DCSF.
Date set used, including coverage	A Level entries by young people aged 16-18 in England.
Baseline	2005 entry figures:  Chemistry: 33,164;  Physics: 24,094;  Maths: 46,034;  Biology: 47,925.
Frequency of Reporting	Annual.
95 per cent confidence interval	Not applicable – administrative data.
Minimum movement required for performance assessment	UK to maintain year on year increase in take up levels in each of the subject’s mathematics, physics and chemistry in order to meet 2014 ambitions. Any decrease in numbers taking up biological sciences not explained by demographics or other factors will prompt further investigation.
Data Quality Officer	Schools data unit, DCSF

## DEFINITION OF KEY TERMS

**A.5** This indicator covers the following subject categories recorded in the statistics:

*Mathematics*

*Physics*

*Chemistry*

*Biological sciences*

*Other sciences*

**A.6** Long-term ambitions were set for increases in A Level entries for mathematics, physics and chemistry by 2014 as part of Budget 2006. The ambitions set are:

*Mathematics 56,000*

*Physics 35,000*

*Chemistry 37,000*

Indicator 6	UK R&D intensity in the 6 most R&D intensive industries, relative to other G7 economies
Data provider	ONS/OECD.
Date set used, including coverage	ONS business enterprise R&D (BERD) survey for UK, OECD for the rest of G7.
Baseline	Baseline for UK Direction of movement is 2005 data. For the relativity to G7, baseline data is 2003.
Frequency of Reporting	Annual.
95 per cent confidence interval	The ONS BERD survey (and similar surveys in other countries, on which the international comparisons are based) is sample surveys. ONS publish revisions data and test for significance.
Minimum movement required for performance assessment	Positive movement or at least maintain UK position relative to the G7 economies. Cyclical variation will need to be taken into account in the UK and other countries' data.  A fall in the absolute or relative position in the indicator or its components would initiate investigation at a disaggregated level.
Data Quality Officer	Science and Innovation analysis, DIUS.

## DEFINITION OF KEY TERMS

- *Six internationally comparable industries:*

Aerospace, Electronics, Office machinery and computers, Pharmaceutical, Instruments and Services.

**A.7** BERD is Business Enterprise Research and Development, which measures expenditure on R&D performed in UK businesses. This is estimated using a standardised survey methodology based on international guidelines published by the OECD in the Frascati manual.



