BIS Department for Business Innovation & Skills

ECONOMIC IMPACT REPORTING FRAMEWORK

Interim Report on 2010 returns

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For all general enquiries and comments

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Executive Summary

The Research Councils' Economic Impact Reports, in conjunction with the broader evidence base enable BIS to ensure value for money is being maintained through research council funding, while maintaining separation from decisions regarding the usage of funds, in compliance with the Haldane Principle. The data presented here helps, where possible, to provide a quantitative appraisal of performance.

Given their remit as funders of public research, it is unsurprising that at least 85% of **resources available** to Research Councils come directly from Government, while the second largest sources of funding are EU public funds and other UK public bodies. There is wider variation in **spending categories** resulting from the different remit of each council, whether they are responsible for large capital facilities or whether they sponsor public research institutes directly. Overall around half of all funding channelled through councils is dedicated to **responsive mode grants**. Postgraduate awards, international subscriptions and sponsored institutes receive significant proportions of the remaining half.

Inputs other than resource spend are represented by the 8,000 **researchers** funded at any one time as Principal Investigators, Research Leaders and Research Fellows, each fulfilling different roles but partially or fully funded by councils. Future generations of researchers and highly skilled workers are also supported by councils throughout their postgraduate work. Well over 12,000 **postgraduate students** receive funding directly at any one time and 85% complete their programmes successfully within 4 years. Around a half of **employed postgraduates** are deploying their skills productively outside the HE sector.

Funding excellent research is the main remit of the UK Research Councils and they follow the quality of their investments through a variety of sources, including dedicated reviews and monitoring of **refereed publication** counts, which have shown improved performance over time. Adding **published outputs** other than refereed publications, in order to ensure good coverage of all disciplines, more than doubles output levels by counting contributions from all councils, not just those that are better covered in refereed publications.

All Research Councils publish a wide range of case studies on the **impact of past research**, some of which is reflected in this report. In addition, Research Councils provide support with the aim of encouraging **knowledge transfer and exchange** activities so as to deliver the maximum economic and social impact. In trying to meet this goal, and encourage flow of information, all councils ensure user participation on boards and panels. **Spinout/patents** data gives an indication of the success of the research community in commercialising their work.

Effective communication of research is a core role of research councils, both with the government through formal reporting processes, and with the public. Research Councils are committed to raising awareness, disseminating knowledge and increasing public engagement in research. These activities have supported and continue to support the uptake by users of research funded by the Research Councils.

I.- Introduction

The Economic Impact Reporting Framework (EIRF) was implemented under the 10 Year Science and Innovation Framework as part of the monitoring system for the seven UK Research Councils[1]. This was in response to the need to demonstrate that public resources invested through Councils were being used efficiently in pursuit of excellent research that yields significant economic and social benefits.

A new streamlined monitoring system, being rolled from 2011 is intended to give a more nuanced account of the accomplishments achieved through Research Councils investments. The EIRF in its current form will be phased out, but the system of metrics that underpins the current framework will be embedded within a single report covering research performance and economic impact. The new metrics framework is attached as an Appendix.

In the interim and in order to avoid breaks in data collection, in 2010 Research Councils submitted a shorter EIRF, which served as a trial of the set of metrics which are to be reported consistently across the seven Research Councils. This report summarises the data reported under EIRF 2010 with a special focus on consistency and the use of the common metrics.

Publicly funded research plays a vital role in the UK's innovation system, complementing and sometimes leading private innovation activities that would otherwise not have taken place. Investments by Research Councils are therefore a crucial part of the UK's innovation engine and as such a fundamental contributor to innovation driven economic growth. While this role is not in dispute, due to the complexities of the innovation process and multiple relations among innovation agents, it is often difficult to pinpoint precisely the contribution of Research Councils, either collectively or individually.

The Economic Impact Reporting Framework was a first step in demonstrating this contribution. It was designed to follow the impact over time of investment in the UK Science and Research system. It is well known that because of uncertainty, long gestation periods, the variety of funding sources and difficulty of attributing potential benefits, it is impossible to follow every pound invested in the system. The presence of market failures means that if left to private initiative the resulting level of investment in R&D will be lower than socially optimal. This gives good cause to invest public resources in research activities, however it does not guarantee it will be easy to explain how these investments revert back to the public.

[1] http://www.dius.gov.uk/assets/biscore/corporate/migratedd/publications/f/file39754.doc

Research Councils demonstrate the efficiency of their resource management through a monitoring system that follows standard practice in economic impact evaluation[2]. According to this practice, assessing the impact of an intervention requires first accounting for the input mix, then following outputs in the interim and finally assessing outcomes. Research Councils collect and report quantitative and qualitative data under each of these headings, which allows some assessment of the progress, productivity and quality of the research supported.

The remainder of this report summarises data returned by Research Councils under a set of common headings as well as additional evidence that may be applicable to some but not all councils in the current year. It is important to bear in mind that this is an interim report on the use of common metrics. While the efforts of councils providing metrics under the agreed headings are to be commended, in this round it was impossible to ensure full consistency in data collection and reporting for all. Most tables therefore bear explanatory notes indicating where accounting rules differ. The Research Councils continue to work with BIS to improve consistency in data collection and reporting.

II.- Inputs: Investment in the research base

Each of the seven Research Councils possesses a distinct remit in terms of discipline while further differences are found in terms of size and history. Whilst all councils endeavour to fund excellent research and they collaborate in cross-council programmes[3], the particular resource mix required for each council is different. The figures provided are therefore not directly comparable between councils but give an overview of each council individually. The mix of inputs bought with their respective budgets now and in the past determines the mix of outputs and impacts obtained.

Chart 1 shows Grant-in-Aid for each Council over time. Grants-in-Aid represent the bulk of income for Councils[4] and they illustrate differences in size across Councils as well as how their relative sizes and the distribution have not changed significantly over time. The sustained income provided through Grant-in-Aid allows for stability in research management: dynamism is maintained by recycling funding as individual grants and programmes end and new ones start.

[2] Delanghe and Teirlinck (2010) "Optimising the Policy Mix by the Development of a Common Methodology for the Assessment of Socio-Economic Impacts of RTDI Public Funding" review thoroughly recent and past advances in this field. http://www.cia4opm.com/content/literature-review-final;

[3] http://www.rcuk.ac.uk/research/xrcprogrammes/Pages/home.aspx

[4] According to accounting rules, Grant-in-Aid reported in official Accounts includes all resource funding received from BIS.

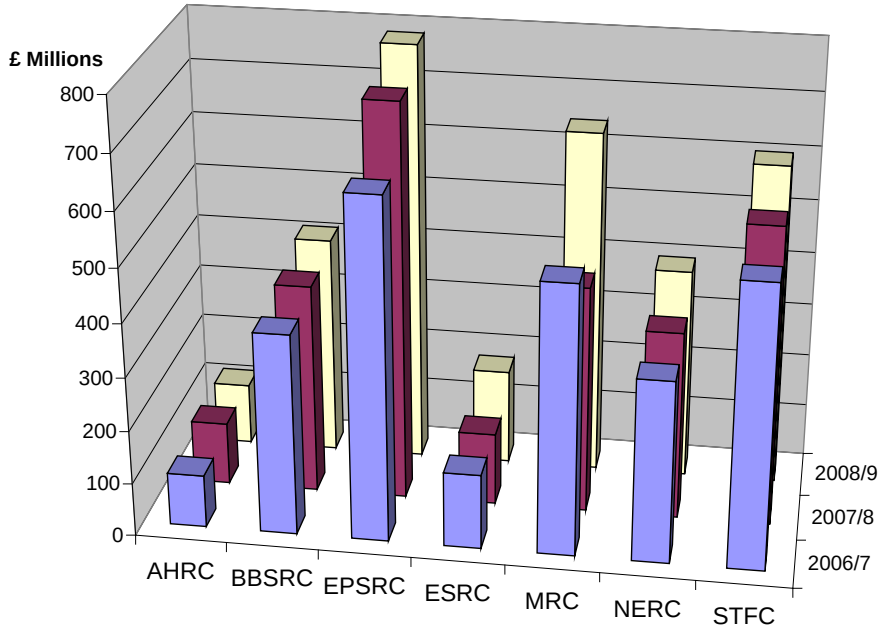


Chart 1: Grant-in-Aid per Council over three years

Sources of income to Research Councils, other than the resource provided by BIS are limited. However those councils funding research institutes and labs and managing facilities have been able to draw on funds leveraged from other sources. According to the latest available accounts online[5] Grant-in-Aid from BIS accounted for at least 85% of income for all Research Councils and all but AHRC have some income from private sources, which is up to 4% for NERC and MRC. As illustrated in Chart 2 below, the most relevant non-BIS source of income tends to be funds from other Public UK and EU bodies – excluding other Research Councils.

The councils fund research and training in various ways appropriate to their individual remits. The chart in the Appendix shows spending for all councils across three comparable[5] categories according to their latest published annual accounts. All councils spend a significant proportion of their funding on responsive mode grants. The percentages vary between 20% in STFC and 71% in EPSRC, depending on a number of factors including the Council's remit, and whether they sponsor institutes directly, or fund facilities. All councils also fund postgraduates under various schemes (described below) and this category has been either steady or increasing over the three years considered for each council.

[5] Research Councils reported on income and use of funds in their EIRF but conventions for EIRF were not harmonised, with the result that different expenses for different time periods were returned by each Council. Published accounts follow common public finance conventions and apply to the same tax-year for all so are better for comparison.

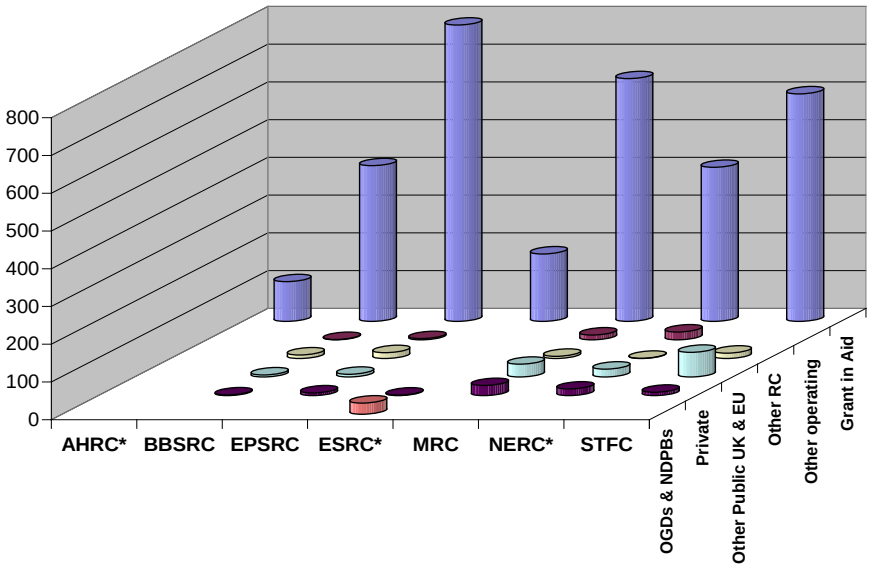


Chart 2: Sources of income. * refers to 2009/10 Annual Report and Accounts, else 2008/9

Other than grants and postgraduate awards there is no common pattern of expenditure that can be applied to all councils. Those with sponsored institutes necessarily spend a significant proportion of their resources on staff salaries due to the wide mix of specialist skills required to undertake research (e.g. medics, marine staff, animal technicians). International subscriptions make up a sizeable part of total expenses in STFC and of other expenses in NERC. Capital replacement and maintenance (such as research ship replacement, Antarctic base renewal) can occasionally make up a significant expenditure for some Councils in certain years, but generally large investments are funded through the Large Facilities Capital Fund. Some Councils account separately for a dedicated knowledge transfer budget[6] but, albeit present for all, this budget is not itemised separately within the "other" expenses category for all councils.

The variety of both sources and uses of funding makes common accounting difficult but it illustrates the benefits of managed specialisation: each Council plays an independent but complementary role within the group and makes a separate wider contribution as shown below.

Amongst the most important inputs to the UK Research Base are the researchers who receive resources from the councils to dedicate their time and skills to the pursuit of discoveries. Research Council awards are generally held by Principal Investigators (PIs), who lead research and support staff funded from the awards, Councils also fund Research Fellows who carry out their own research projects, and Councils with Institutes fund other research leaders through direct funding to those Institutes. Table 1

[6] Note that while investments by Councils on collaborative projects are inputs, the equivalent investment made by partners is regarded as an output, indicating the attractiveness of UK Research for external investors.

shows funding of PIs and/or Research Leaders in sponsored institutes/labs. Since some councils report new PIs and others exclude Research Leaders in sponsored institutes/labs, the figures are consistent only within individual Councils. Further harmonisation of this category will be sought in subsequent years.

Table 1: Principal Investigators and Research Leaders

	2007/8	2008/9	2009/10	Notes
AHRC	539	414	306	New PIs
BBSRC	1,449	1,352	1,248	Number 1st January
EPSRC	3,321	3,178	3,164	
ESRC	NA	NA	272	New PIs
MRC	1,294	1,355	1,427	PIs AND Research Leaders at 31st Dec
NERC	1,059	1,063	1,064	Number of PIs(grants only)
STFC	519	503	459	Number of PIs
Aggregate	8181	7865	7940	Annualised Growth: -1%

Within a Council, the observed fluctuations in the number of PIs from one year to another tend to occur due to changes in the turnover of grants. The number of PIs may fall because smaller or shorter grants have matured and larger or longer ones are being awarded, or vice versa. Higher concentration of research funding is consistent with a fall in the number of PIs.

Principal Investigators represent only a fraction of the total number of researchers funded by Research Council. They are often the more senior members of the research teams and are rarely dedicated to the grant exclusively. NERC for example indicates that total direct support for researchers that do not appear as Principal Investigators doubles the reported number, while AHRC reported an additional 177 co-investigators in 2009/10.

Research Fellows tend to have a larger share of their time dedicated to the funded project, with most or all of their time paid for with the grant. Some may hold more than one Fellowship.

Table 2: Research Fellows

	2007/08	2008/09	2009/10	Notes
AHRC	268	172	123	New Fellowships
BBSRC	52	56	59	Fellows at 1 January each year
EPSRC	313	310	295	Active Fellowships
ESRC	NA	NA	138	New Fellowships
MRC	327	368	362	Active Fellowships at 31 Dec each year
NERC	100	87	86	Number of Fellows
STFC	22	19	12	Number of Fellows
Aggregate	1,082	1012	1,075	Annualised Growth: -0.2%

The total number of Research Fellows also depends on the availability of fellowship schemes which may change from one year to another. AHRC for example moved from a *Research Leave* scheme where funding was tied to an output, to a *Research Fellowship* scheme where funding is granted for a specified period of time, thereby explaining the sudden fall in the number of Fellows funded between 2007/8 and 2008/09. Nevertheless, Research Councils have been providing additional sustained funding for around 1,000 Research Fellows every year.

III.- Outputs: Research Performance

Human Capital

Whether human resources constitute an input or an output of the national science system depends on the context of analysis. Grants and particularly fellowships intend to "buy out" time of the researcher to dedicate to the selected research, making their time and skills an input to the generation of new knowledge. On the other hand, the same time spent by the same researcher developing future generations can be seen as either an input or an output. In this report researchers funded are regarded as an input, the flow of students and learners out of the science and research system are counted as an output.

All Research Councils support postgraduate students and, as illustrated in the Appendix, all have dedicated training budgets for postgraduate study. Budgets for post-graduate training fund a wide range of programmes, over and above PhD training, including but not restricted to Masters and other specific programmes such as EPSRC e-Science and Basic Technology Programmes. Table 3 summarises EIRF-reported numbers of Doctoral students supported under various programmes.

Table 3:Students supported

	2007/08	2008/09	2009/10	Notes
AHRC	881	613	749	New Doctoral Awards
BBSRC	1,955	1,942	2,084	Doctoral students registered
EPSRC	7,388	7,201	6,940	Doctoral students registered
ESRC	743	686	719	New Studentships supported
MRC	405	412	317	Doctoral students registered
NERC	969	988	1,017	Fully funded PhD students
STFC	272	257	265	Number of fully funded PhD students
Aggregate	12,613	12,099	12,091	

For STFC, the number of students using the large UK-based facilities doubles those reported as directly supported. Table 3 shows that Research Councils were fully or partially funding over[7] 12,000 postgraduate students in 2009/10. This includes students funded in collaboration such as CASE as

[7] Some Councils reported new students only, whereas others report all (e.g. cumulative).

well as studentships linked to funded projects (ESRC) and Doctoral Training Accounts.

The total number of students funded at any point in time gives a good indication of potential highly skilled workers, but follows neither the stock (finishers) nor the flow (starters). Research Councils follow the stock of available PhDs directly or indirectly funded by recording finishing rates. Destinations of leavers of postgraduate education are also reported but they are counted among outcomes since these indicate changes in the skilled labour force rather than increases in the stock of available highly skilled people.

Table 4:Submission rates after

	2007/8	2008/9	2009/10	Notes
AHRC	79%	85%	85%	4 years
BBSRC	80%	80%	83%	4 years
EPSRC	86%	80%	79%	5 years
ESRC	84%	85%	85%	5 years
MRC		90%	87%	5 years
NERC	88%	76%	80%	4 years
STFC	86%	95%	85%	5 years

The figures in Table 4 speak for remarkable retention ability and success rates of postgraduate schemes funded by Research Councils. The minor fluctuations observed can easily be explained by changes in the cohort of students. Combining data from Table 3, where the aggregate number of students funded is quite steady with the equally steady success rates per cohort, it is evident that Research Councils contribute significantly to a stable supply of highly skilled post graduates. Taking the very approximate figure of 12,000 Doctoral students in receipt of funding each year and applying to this an 85% success rate obtains around 10,000 completed PhDs every year, directly funded by Research Councils.

Finally, a very rough approximation to the balance between human resource inputs and outputs can be made by looking at the number of students supported relative to principal investigators. Table 5 displays the figures corresponding to these ratios. The notes are clear about limitations of these figures so caution is urged in their interpretation. Councils that included Research Leaders in sponsored institutes in the PI count (MRC, NERC) will be under-estimating the ratio compared to Councils that do not fund Institutes. Fluctuations in these ratios may currently reflect counting conventions rather than meaningful changes in the balance of inputs to outputs, but councils continue to work on improving reporting consistency over time and across councils.

Table 5:Students per PI ratio

	2007/8	2008/9	2009/10	Notes
AHRC	1.6	1.5	2.4	New PIs and New Doctoral Awards
BBSRC	1.3	1.4	1.7	PIs in sponsored institutes and doctoral students registered
EPSRC	2.2	2.3	2.2	PIs funded and doctoral students registered
ESRC			2.6	PI not reported in earlier years
MRC	0.3	0.3	0.2	PI AND RL and doctoral students registered - underestimate
NERC	0.9	0.9	1.0	PI AND RL and fully funded students only - underestimate
STFC	0.5	0.5	0.6	PIs and fully funded students

Problem-Solving

As well as providing highly skilled labour, a key responsibility of funded researchers is to help address problems facing the economy and society. An important indicator of the problem-solving capacity of the research base is the new knowledge it generates - as it is the application of this knowledge that will ultimately have an impact on citizens; publications and other outputs of research are the primary repository of this new knowledge. The next subsection and the section on outputs present quantitative and qualitative evidence on the applications of this capacity.

Refereed publications are the standard for international comparisons of knowledge generating capacity of research, although they are by no means the only instrument for creating knowledge. All Research Councils monitor knowledge generation by their respective investments through publications as well as other outputs, since refereed publications do not provide appropriate coverage of codified knowledge generated in all disciplines.

Table 6 displays the quantity of refereed publications reported by each council in the relevant year's EIRF. Each council would have collected this information at different points in time and because of this figures cannot be compared across them. It is also the case that within a single Council publications data reported was not collected at the same date in every year, though Councils are encouraged to maintain a certain consistency in their own EIRF report. With these caveats in mind, Table 6 shows a stable or increasing trend over time. Non-increasing trends have been noted and explained by the respective Councils. EPSRC had a large number of maturing grants in 2008/9 and therefore the small drop in the number of publications comes as a result of the timing of data collection. BBSRC transferred two of its sponsored institutes into the HEI sector in 2008, so figures for 2008-09 and 2009-10 are from two fewer institutes.

Considering only publications in refereed journals ensures a certain standard of quality in publication counts. It is however common knowledge that non-refereed publications and non paper outputs like exhibitions, databases or electronic outputs are important vehicles of knowledge

generation and transfer for all disciplines, only these other outputs are more difficult to capture and aggregate systematically for comparison over time and across countries.

Table 6: Refereed Publications

	2007/8	2008/9	2009/10	Notes
AHRC	1,910	2,237	2,276	
BBSRC	1,059	895	821	Sponsored Institutes only
EPSRC	6,426	11,639	9,475	
ESRC	272	1,066	1,772	
MRC	3,786	4,510	5,111	
NERC	3,893	4,090	4,336	
STFC	4,161	4,281	4,438	
Aggregate	21,507	28,718	28,229	Annualised Growth: 9%

It is common practice to calculate research output productivity by considering publications per researcher or per pound spent. Without correction for size of the unit assessed larger units will inevitably produce more output than smaller units. It is common knowledge for example that the UK is a small spender compared to other countries but the national research base is the most productive among the large economies[8]. This large-unit effect is evident in Table 6 where Councils with more resources obtain more publications, regardless. With consistent data collection within a council over time, such an indicator (output relative to size) could be calculated and the performance of Research Councils could be assessed in relation with the national research base.

Table 7 illustrates the need to account for differences in publication practices. Total publications including non-refereed articles, conference papers, book chapters can more than double refereed publications, notably for EPSRC and ESRC. The large-unit effect is also noticeable here.

Table 7: All publications

	2007/08	2008/09	2009/10	Notes
AHRC	2,186	2,551	2,598	
BBSRC	1,059	1,276	1,106	Sponsored Institutes only
EPSRC	19,652	34,649	23,041	
ESRC	5,810	4,856	4,088	
NERC	6,764	6,895	7,046	
Aggregate	35,471	50,227	37,879	Annualised Growth: 2%

Knowledge Transfer and Exchange

Publications indicate knowledge generation and problem solving ability whether they currently have direct application or not. Research Councils

[8] BIS Report on the international comparative performance of the UK Research Base. http://www.bis.gov.uk/assets/biscore/corporate/migratedd/publications/i/icpruk09v1_4.pdf

directly fund a number of activities where research funded is making a difference in economic and social terms. An input-output cycle can be followed in Research Council KTE as evidenced by the wealth of examples provided in EIRF returns. The collection of hard data in a consistent way for all seven Councils remains a challenge due diversity of inputs and frequency and variety of outputs, several of which are sector specific.

For inputs the difficulty lies in establishing a common definition of KTE budgets as these activities are very different across Councils. Some initiatives like Knowledge Transfer Partnerships (KTPs) are funded by all Councils, but these represent only a fraction of total input to KTE. In order to maximise the impact of these activities, all Councils strive to innovate constantly on ways to encourage KTE so even within Councils comparability is compromised. Because of this continued innovation in the area of knowledge exchange, programmes funded under this heading change over time within Councils as well as across them.

All Research Councils reported variable spend in KTPs and collaborative funding of doctoral awards, reflecting clear differences in the sectors they operate within and the ways in which their research outputs generate benefits (for example Collaborative Awards in Science and Engineering – CASE Awards are the single most important component of NERC's KTE spend). Beyond these, commonalities are reduced to subsets of Councils according to their needs and plans. Some invest in Knowledge Transfer Fellowships and Catalysts (found to be very successful by AHRC), while others offer a Young Enterprise Scheme and a different subset of councils invest in a Follow-on Fund. Fluctuations in funding from one year to another are due to changes in the composition of initiatives or calls for KTE.

In the absence of a set of generally accepted definitions and common practice in terms of recording within and across Councils, KTE expenditure is not reliably comparable and therefore of limited use as an indicator of progress in this area.

The participation of external users in management is an aspect shared by all Councils and it conforms to good practice for facilitating the flow of knowledge and information at management level. The percentage of user representation in Boards in 2009/10 was 16% on average across the councils. It is worth noting however that this figure will conceal differences in the internal organisation of each Council, where user representation is higher in some boards (e.g. Council board) than in others (Research or Strategy Boards) and the size of the board also matters. As with other indicators, some harmonisation is needed from Councils reports in future rounds of data collection, and steps have been put in place to facilitate this.

Some outputs of KTE activities are well understood and can be systematically assessed, notably those that count instances of IP. These

however represent only a fraction of actual KTE and because of that they fluctuate from one year to the next independently of resources invested in KTE. Table 8 shows patents filed for those Councils that reported on them in this year's return. The fluctuations are noticeable, EPSRC for example reported a large number of grants maturing in the previous year and thus this year's figure may be lower also because of the time the data was collected.

Table 8:	**Patents filed**			**Spinouts/New Businesses**		
	2007/08	2008/09	2009/10	2007/08	2008/09	2009/10
AHRC	0	2	4	5	0	0
BBSRC*	10*	27*	15*	5	0	0
EPSRC	125	276	175	26	49	25
ESRC				1	0	2
MRC	21	20	25	1	0	2
NERC	10	7	11	1	6	1
STFC	2	5	4	1	6	1
Aggregate	158	312	219	38	55	28

*BBSRC figures are for Institutes only and patent figures are for patents granted not filed

There are very effective means for knowledge transfer that are specific to each Research Council and therefore difficult to aggregate; these are best reflected in individual returns under EIRF, EI Baselines and Annual Reports. Most Councils fund training in addition to or as part of all of the above, sometimes in the form of seminars and workshops with Industry or Government. Sometimes it is in response to local needs, like Commercial Awareness Workshops funded by BBSRC. The MRC has a well managed programme of Translational Research to ensure efficient development of new treatments. EPSRC set up an Innovation and Knowledge Centre for Secure Information Technologies (CSIT) aimed at accelerating and promoting business exploitation. STFC is making facilities and services therein available to businesses through their Science and Innovation Campuses in Daresbury and Harwell, thereby supporting local and international industries across a range of sectors while at the same time fostering cross-sectoral collaboration. NERC's British Geological Survey's Open Geoscience website provides high quality maps, data and images free of charge over the Internet for use in a range of applications by specialists and the wider public. Some Councils also make research materials available to others so as to maximise the productivity of these materials in complementary areas of research. ESRC reports regularly on datasets delivered for general use and the number of active registered users in their Research Resources facility. All of these examples illustrate the quality of goods and services offered by Research Councils.

IV.- Outcomes

Despite well known difficulties with the systematic assessment of impacts Research Councils seek to maximise and demonstrate the beneficial effects their investments through continuous and effective assessment and communication.

The outcomes of human capital investment are monitored in terms of the sectoral mobility of PhD students funded. Although this is by no means the only outcome it is one that can be collected systematically and it captures direct impact in terms of labour market outcomes.

Table 9: Percentage PhDs funded with destination NOT a HEI

	2007/08	2008/09	2009/10	Notes
AHRC	43%	43%	41%	
BBSRC	63%	56%	59%	
EPSRC	57%	53%	56%	
ESRC	49%	37%	38%	
MRC	30%	37%	48%	
NERC	72%	58%	51%	
STFC	58%	50%	48%	
Average (unweighted)	53%	48%	49%	

Table 9 shows the percentage of funded PhDs in each Council that make a transition away from the HE sector three years after graduation as per responses to the Longitudinal DLHE survey (HESA). This includes those who find employment in the Private sector, the Public sector and the Third sector as well as the small percentages of unemployed in some but not all instances. Research Councils are working to have a more granular view of destinations but even without granularity it is remarkable that roughly one half (based on unweighted averages) of funded PhDs on average transfer away from HE in any year, bringing with them knowledge and skills acquired during post-graduate study.

Other outcomes through the application of problem solving ability in industry are achieved through placements of Research Council funded fellows in user organisations. These schemes are present in several Councils in various forms and have proven themselves as successful and effective vehicles for impact. ESRC for example reports increasing the number of successful placements over the 3 years to 2009/10. BBSRC and NERC both report on schemes to exchange researchers with industry including placements and secondments where the experience has been found to be of value for both the researcher and the user organisation.

Instances of policy influence are an informative and representative indicator of the value of research for society as a whole. Examples of this include NERC's advice on Climate Change, ESRC's work on the Education Maintenance Allowance and a great deal of research undertaken by MRC regarding the treatment of disease. Research Councils are working together on ways to report on these instances for impact, if not to qualify the size of the impact, to account for their presence and prevalence over time.

Case study evidence reveals that a significant amount of activity funded by Research Councils has found its way into areas of everyday living. In healthcare MRC's research played a key role in the development of 10% of the monoclonal antibody drugs currently approved for use. The first therapy to reach blockbuster status was Humira, being used in 80 countries for the treatment of 370,000 patients in 2009, and estimated to be the world's top earning pharmaceutical product, with sales predicted to reach $10bn by 2016. The benefits of research funded by other councils also spill on to healthcare: a new core technology originally developed by EPSRC funded Dr. Mark Grubb, is being used to monitor the heartbeats of newborn babies who need resuscitation – with an expected annual commercial EU and US market for the device of around £18 million. BBSRC-funded researchers continue to work with the pharmaceutical industries in leading research on Streptomyces for the development of new antibiotics. The advancement of particle physics technology, financed by STFC, pioneered early developments in superconducting magnets, which are nowadays the basis for MRI scanners. The MRI technology has revolutionised healthcare world-wide, contributing significantly to the successful diagnosis and treatment of millions of cancer patients. MRI industry supported around 4,000 jobs in 2007 with an added value contribution to UK-GDP of £195 million.

NERC leads contributions in the sphere of environmental advances, for example, continuing to provide essential advice regarding experimental Carbon Capture and Storage in relation to the UK's energy security. Their Flood Forecasting Centre established in partnership with the Environmental Agency and the Met office provides information to decision makers and emergency responders, while to help mitigate risks in parts of Oxford, NERC's British Geological Survey models have been used by the Environmental Agency for the safeguard of properties worth an estimated £46 million, with potential additional impacts on reduced insurance claims and premiums. Moreover in collaboration BBSRC NERC, Defra, the Scottish Government and the Wellcome Trust are investigating the decline in pollinators in the UK: the loss of pollinators could cost up to £440M, 13% of farming income.

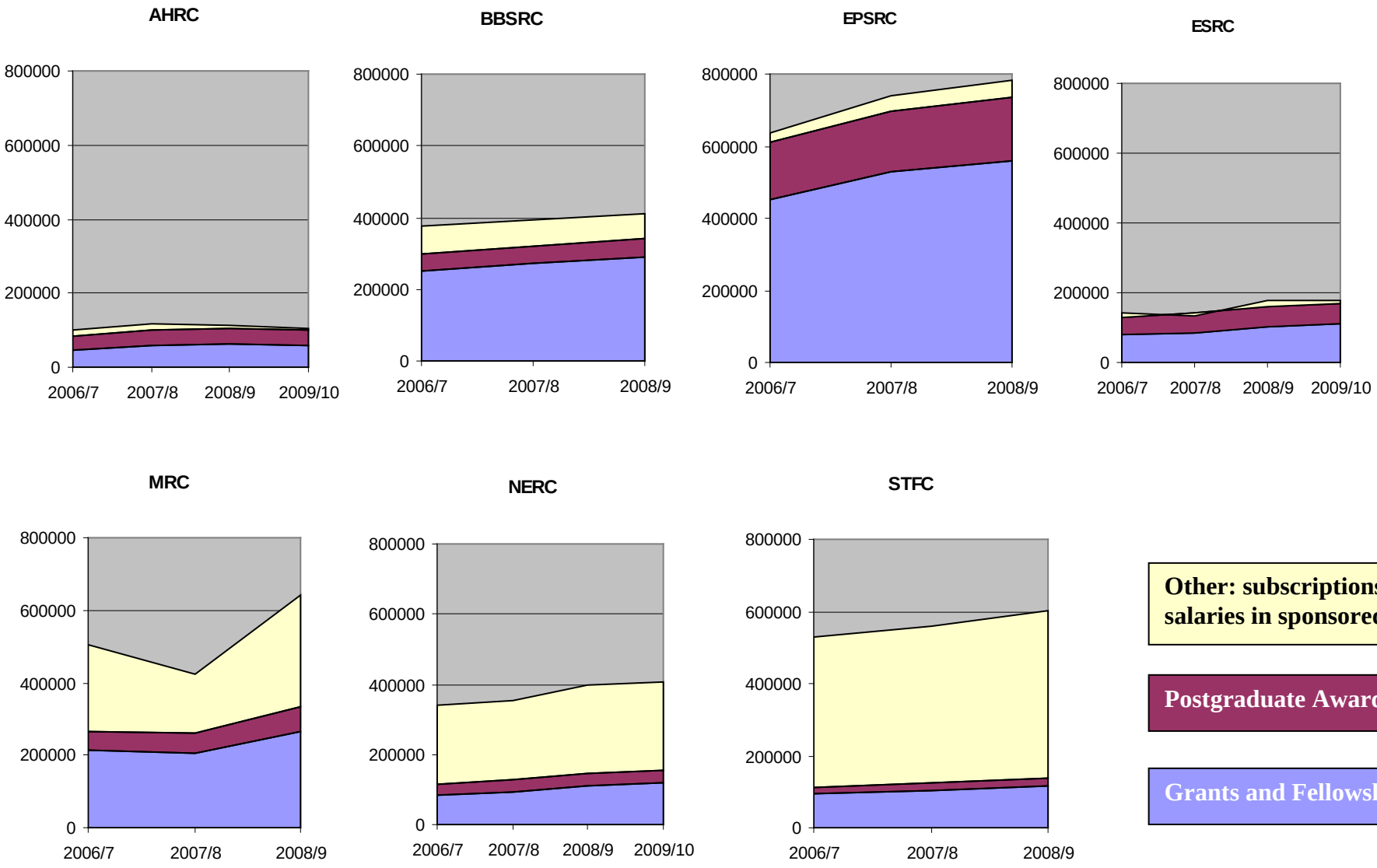
AHRC's research has impacts of historical and cultural benefits, for example, by improving our knowledge of non-British communities in the UK through its work on migration and displaced communities. Educational

resources implemented as a result of funded research help communities understand and accept cultural differences and build safer living environments. In addition AHRC contributes to a better understanding of diversity through the funding of exhibitions, not only attracting visitors, but also enhancing our knowledge of foreign communities and supporting international relations through the deepening of cultural relations.

ESRC leads on initiatives with social impact, the evaluation of Pathways to Work found indirect contribution of 24% from ESRC funded researchers into the 2002 Green Paper that set out the Pathways to Work proposals. ESRC investment is also pivotal in the development and analysis of the Millenium Cohort Study. Recent research investigates links between socio-economic status and learning achievements in early years, finding significant differences in favour of more affluent environments. The results of this research are crucial for a good understanding and potentially policy making in the area of social mobility and life aspirations.

The year 2009/10 saw the most recent example of the worth of maintaining a national capability in research to deal with unforeseen circumstances that may have catastrophic impacts. During the eruption of the Icelandic volcano, Eyjafajallajokull, NERC provided vital evidence to the MET Office to ascertain thresholds for safe-flying, contributing to the change in industry standards.

While funding research is a core part of the work of Research Councils, effective communication about the research, including its benefits is an important component of impact strategies. In addition, each Council has a carefully developed agenda for public engagement, although their scope and nature vary widely as they are tailored to the respective council's needs. Examples of communication activities and public engagement initiatives funded by the Councils include, but are not limited to, holding science festivals, presenting lectures, holding public open days running public consultations and public dialogue events, publishing reports of the organisation's work, publishing historical information/interviews with staff on websites and lab demonstrations. All these initiatives contribute to increasing awareness of science, identifying and addressing concerns and fostering public dialogue; they are also of great value for researchers and a worthy means for inspiring and attracting young people.



Appendix: Broad expenditures by Council as per Annual Accounts. Same scale for all measured in £Millions

NEW METRICS FRAMEWORK FOR 2011/12 –PROPOSAL FOR RESEARCH PERFORMANCE REPORT
R Fernandez – BIS

Proposed 25 metrics that are common or quasi common to all Councils. Each Research Council to provide up to 5 additional metrics. Separating one metric/indicator by discipline or by facility does NOT count as more than one metric (see metrics 2 and 3 where several indicators belong to one metric). Additional metrics can be quantitative or qualitative at the discretion of the Research Council. The list of metrics to be revised annually.

INPUTS	**OUTPUTS**	**OUTCOMES**
Structure of Income and Expenditure Broad trends in resources received and spent. Suffices to reproduce last year's annul accounts.		
	Knowledge Generation Bibliometrics Other publication outputs Co-authorship with industry and abroad	
Human Capital (Input) PIs, Fellows, Researchers supported as per JeS or Outputs Databases.	**Human Capital (Stock)** Students supported Finishing Rates	**Human Capital (Flow)** Destinations of leavers Placements/people exchanges in/with user organisations
Collaboration Moved to part of structure of income for simplicity. Consider for subsequent years	**Knowledge Transfer and Exchange** KTE level (count and scheme description) IP Activity, patents and spinouts. User Engagement	**Public Policy** Account for influence in policy, count instances of short description
		Public Engagement Trend counts and levels Public Attitudes Survey - biannual

METRICS			
	CATEGORY METRIC	UNITS	NOTES
INPUTS			
1	Budget allocation	**£Mill**	Budget Allocation from BIS – from last year's annual accounts
2	Leverage		Other income as % of Total Income from annual accounts
	Private	**%**	
	Other Research Councils	**%**	
	Other largest component	**%**	Please specify which component (EU, ODGs, Charities…)
3	Expenditure		Expenditure as per last year's annual accounts
	Responsive Mode Grant	**%**	
	Postgraduate Awards	**%**	
	Other largest component	**%**	Please specify which component (subscriptions, sponsored institutes, museums…)
	Human Capital		
4	Principal Investigators	**#**	PIs as per JeS and comparable other regardless of "title" in supported labs and research institutes – if possible separate PIs from Sponsored Institutes staff
5	Research/Other Fellows	**#**	NON overlapping with above. Specify which.
OUTPUTS			
	Knowledge Generation		
5	Number of Grants assessed for reporting	**#**	Relevant to account for fluctuations in outputs within Council
6	Refereed Publications	**#**	Non-refereed and non-paper outputs optional
7	Co-authorship International and/or with Industry	**%**	% of refereed publications as in metric 5
	Human Capital		
8	Number of Students Supported	**#**	In all programmes - please specify where relevant
9	Finishing Rates	**%**	Finishing in relevant cohort
10	Student funding/training schemes		Qualitative – count trends or describe

	Knowledge Transfer and Exchange		
11	KE Spend	**£Mill**	
12	External Representation in Council	**%**	
13	External representation in other bodies	**%**	If applicable and found relevant – specify which body
	IP Activity (discretionary)		Not all applicable to all Research Councils in every year.
14	Patents licensed	**#**	Best GRANTED but if not then patent application count
15	Spinouts/new businesses created		
16	Income from IP activity		Possibly only available for Councils with Sponsored Institutes
17	KTE SCHEMES		Qualitative – trend count or short description
OUTCOMES			
	Human Capital		
18	Destinations of leavers	**%**	
19	Placements in user organisations	**#**	Quantitative (discretionary)
20	Placements in user organisations		Qualitative – give examples (discretionary)
	Public Policy (discretionary)		
21	Instances of influence		Quantitative
22	Value/changes induced		Qualitative
	Public Engagement		
23	PE schemes		Quantitative: trend counts or levels
24	PE Schemes		Qualitative – short description
25	Results from PAS		Quantitative biannual