

# Economic Development and Transport Committee

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<b>Date:</b>	6 October 2005
<b>Time:</b>	2:00 pm to 5:00 pm
<b>Venue:</b>	National Assembly for Wales, Cardiff Bay
<b>Title:</b>	EDT Science Review : Background material for EDT Committee

## Background

The purpose of this paper is to provide qualitative information on some of the key initiatives at the UK national, regional and European levels to help describe strategic context and complement the quantitative analysis of the current situation in Wales. This evidence on the current situation may also furnish a broad starting point to identify policy matters of mutual interest and impact for Wales and to indicate potential directions in the Inquiry for evaluating evidence and addressing the Terms of Reference. Common themes emerge from the various sources but no attempt at synthesis has been made at this stage.

Generally, the science policy objectives for Wales are similar to those for the rest of the UK (and many other developed nations) – to ensure a world class research base, to ensure a world class work force and to ensure a strong knowledge-based economy in those disciplines and industry sectors that Wales identifies as priorities, and taking account of specific political priorities (in particular, sustainable development).

### 1. UK Science and Innovation Investment Framework 2004 – 2014

The UK Government strategy was published in July 2004 and a review of first year progress appeared in July 2005. This strategy is noteworthy in several respects: it takes a long-term view of performance, it represents a coherent approach across Departments (Treasury, DTI, DfES) and it makes a powerful case for investment in research. In discussing Wales, this UK Government report briefly reviews WDA and HEFCW activity, describes the Nexus objectives, notes that Wales is disproportionately active in some knowledge transfer enterprises and is increasing in research quality.

The aims and remit of the EDT Committee Inquiry are consistent with the long-term strategic goals of the UK Science and Innovation Investment Framework and, if successful, will give it impetus. In turn, the UK framework may help to provide additional context and comparator information for understanding relative performance in Wales. Among the UK national level science performance indicators (part of the Public Service Agreement metrics) is measurement of business investment in R&D, which the EDT Committee has already identified as a key indicator. Some of the other UK-level measurements may provide additional information which the EDT Committee would not otherwise have collected – for example, benchmarking the research strengths of the top 10 UK universities compared to the second tier of the next 20 universities – and this may help to define "what Wales is good at".

The Science and Innovation Investment Framework is also important in underscoring the point that central Government support for science is not confined to the national objective of economic growth. Science is recognised as particularly important for the NHS and significant research funding is undertaken by many of the Whitehall Departments. In 2003 the National Audit Office reviewed efforts by central Government Departments to commission, manage and use research to support service delivery and improve policy. NAO recommendations covered clarification of Departmental strategic research aims, development of coherent systems for procuring research and sharing best practice to improve commissioning, and the need to be more proactive and innovative in the way Departments disseminate and use research and understand research users' priorities.

Although it is recognised that the primary thrust of the EDT Committee Inquiry is to focus on the "business end" to promote the economy, science policy is equally relevant to other Welsh Assembly Government functions and science should become more visible across the Assembly. Some critics assert that devolution has not delivered autonomy for Welsh researchers. Welsh researchers remain dependent on Whitehall Department strategies, which are anglo-centric and do not address the specific needs for policy development in Wales. The problem is perceived to be most acute with DEFRA. What is the solution? Possibly, the Welsh Assembly should engage more frequently with the relevant Whitehall ministries to influence their research agenda and should develop better networking in Wales - of Assembly staff, researchers and funding agencies.

## **2. UK Government technology initiatives**

The trend in UK Government support for industry technology development is embodied in three specific initiatives: (i) R&D tax credits; (ii) DTI National Technology Strategy; (iii) Provision of funding to RDAs to support technology.

These initiatives are all relatively recent so it is still too early to know if they will be successful. Indeed, it is not clear how success will be measured except at the macro level in reaching the UK Government target of total spending on R&D as 2.5% of GDP by 2014 (and this will not be attained at the current rate of progress).

### 3. DTI Innovation and Lambert recommendations

The DTI remit embraces a wide range of issues, grouped into six key themes – Knowledge transfer, Innovation in procurement, Skills and workplace, Regulatory framework, Small businesses, and Regional innovation. The focus is on company support but this includes the issues for university spin-outs or other industry collaboration with the Higher Education sector, and the DTI has a lead responsibility for taking forward the UK Government response to the Lambert review (relating to business-university collaboration). The Lambert Review recommendations cover a lot of areas relevant to the EDT Committee Inquiry. For example:

- Focusing Government business R&D support on SMEs – one major vehicle for this is the Small Business Research Initiative whereby Government Departments have the target of procuring 2.5% of their R&D from SMEs. Is this feasible in Wales?
- Increasing exchange of expertise and perspectives between academia and companies, for example appointing academics as non-executive directors to Boards, seconding industry people to teach in Higher Education, and encouraging universities to capitalise on their alumni networks of graduates working in the business community. What is the experience in Wales?
- Sharing and implementing best practice in research collaborations between industry and universities and increasing the third stream funding to support knowledge transfer from academia; sharing, where appropriate, technology transfer services between institutions to optimise capacity and improve performance. The view of the WDA on how the Knowledge Exploitation Fund compares with rest of the UK, in terms of achieving targets, would be valuable. It is important to consider the opportunities for spin-out from areas other than Higher Education, in particular the NHS. It is also important to acknowledge that spin-outs are not always the best route to commercialisation of public research – collaboration and licensing with larger companies may often be preferable.
- Future round(s) of the university Research Assessment Exercise should increasingly recognise excellence in applied research, in new disciplines and across disciplinary boundaries. It would be useful to determine what universities in Wales want from Research Assessment – is it important to them to build in measures of research impact as well as publication quality (and how did they respond in the recent consultation on such measures)?
- Sector Skills Councils should have real influence over university courses and curricula. There is now a concordat involving the Sector Skills Councils, HEFCE and Universities UK. What is the situation with HEFCW? Generally, respondents to the Lambert consultation phase expressed concern that undergraduate teaching was not responsive to the needs of employers – HEFCW is probably ahead of the rest of the UK in ring-fencing part of the teaching budget for developing employability skills and providing work experience.

The DTI also takes a lead in developing closer working partnership between central Government and the RDAs and devolved administrations. While a lot has been done between the DTI and RDAs, is Wales appropriately involved in coordination at the levels below Ministerial involvement? For example, the Technology Strategy Board (a high level forum for interaction between business, Government and other stakeholders, advising on Technology Programme priorities) includes representatives from Scottish

Enterprise and some RDAs, but not Wales.

## 4. RDAs

These are now well established and all have created a Science and Industry Council, fulfilling a recommendation from the House of Lords Science and Technology Committee (in their 2003 report "Science and the RDAs). The Lords' Committee emphasised the five Cs – coherence, connectivity, coordination, communication and cooperation – as fundamental to the exploitation of science and technology at the regional level.

Should the WDA also have a Science and Industry Council to act as an influential voice and advocate for the regional science base? If the EDT Committee can take evidence from or visit a RDA, it will be helpful to understand what has been achieved so far by their Science and Industry Council, in informing the development of the regional economic strategy, the prioritisation of the UK Technology Strategy and other central Government initiatives and in helping the RDA to engage with the science base. The North West has pioneered the Science Council and Science Strategy concept, with dedicated funding for investment in "big science" facilities. The strategy emerged from objectives to build on and cluster North West business strengths in biotechnology, aerospace, chemical technologies and nuclear energy and major scientific infrastructure such as Jodrell Bank and Daresbury Laboratory – to create jobs by positioning the North West overall as a centre of excellence in science.

Apart from their Science and Industry Councils, the experience of the RDAs is relevant in many other ways to the remit of the EDT Committee Inquiry. RDAs emphasise their responsibilities to support innovation and enterprise, to maintain the supply of appropriate skills for employers, to coordinate regional transfer and use of R&D and to stimulate new R&D, variously through centres of excellence and industrial collaboration. The role of development agencies in bringing together Higher Education, Further Education, charities and the private sector to invest in science is particularly applicable in areas like NE England, Northern Ireland and Wales where, respondents to the Lambert consultation intimated, demand from the private sector for the kind of expertise that universities can offer is relatively weak. Here, public sector, the supply side, must drive innovation. One specific opportunity, noted recently by the Academy of Medical Sciences, is for development agencies to work with Research Councils and other funders to co-fund research fellowships with the aim to facilitate movement of scientists between academia and industry.

Regional Higher Education issues were also raised recently by the House of Commons Science and Technology Committee Inquiry "Strategic science provision in English universities", noting the importance of regional provision in both research and teaching to support business and retain graduates within the area. This might best be achieved by a regional "hub and spokes" model – which would have significant implications for university autonomy and was not well received by HEFCE. An analogous situation probably pertains in Wales.

While the RDAs are still in the process of developing their distinguishing features, it is too early to say

what are the critical success factors or examples of best practice that can easily be emulated. Nonetheless, two recent initiatives are noteworthy:

- i. The role of NE England RDA plus Newcastle University in the decision to make Newcastle a "Science City" (July 2005). It is believed that conferring Science City status will help regional science collaboration, encourage new infrastructure (and regeneration), accelerate new company start up and attract inward investment (and job creation). While it is again too early to know if the designation Science City makes a difference, it is curious that the other five such Science Cities are also in England (Manchester, York, Birmingham, Bristol, Nottingham). Perhaps there should be one in Cardiff or Swansea?
- ii. A recent report published by the South East of England RDA (SEEDA) on the impact of Higher Education in the Greater South East on innovation and knowledge transfer (July 2005). This raised issues broadly applicable to everywhere else, in particular the need for those funding initiatives in support of university-business linkages to take a longer-term approach; for development agencies to encourage stronger discourse between researchers and business in ways that encourage sharing of ideas rather than just specific collaboration; for regional databases to be produced of the knowledge exchange activities undertaken by universities and other research establishments; for a national network of advisors to raise levels of knowledge exchange activity and provide an extra-regional perspective.

## **5. Science Enterprise Centres**

One other UK Government initiative to promote enterprise nationally and further links between education and business is the formation in 2004 of a network of local Science Enterprise Centres. The Centres are expected to contribute to business creation by teaching scientists about enterprise; encouraging technology transfer by supporting academics in their dealings with industry (by mentoring and other consciousness raising); and providing support for spin-out businesses (identifying availability of financial resources).

Science Enterprise Centres are distributed across England and in Scotland and Northern Ireland – but not, currently in Wales. Of course, their functions can also be provided in other ways and some might argue that Wales already does very well in inculcating enterprise. For example, the Global Entrepreneurship Monitor study (London Business School) shows that entrepreneurial activity in Wales increased by 74% between 2002 and 2003, the second largest increase of any UK region (albeit, from one of the lowest levels in 2002). But only 10% of such new businesses in Wales use technologies in their product or service that were not available one year ago. This is considerably less than the UK average and perhaps indicative of impending weakness in the Welsh economic policy objective to develop knowledge-based innovative businesses.

## **6. CBI**

In its response to the Lambert consultation, the CBI proposed a searchable national database of areas of

research excellence across the UK as a resource for business to identify prospective partners. This might be particularly useful to facilitate knowledge transfer to SMEs, who may not have the capacity to do much individual searching (and could align with the SEEDA report proposal, described above, for regional databases of university-business linkages). Perhaps, Wales might take the lead in establishing this database, building on the analysis commissioned for "what Wales is good at"?

Other recent CBI recommendations on innovation to UK Government concentrate on R&D tax credits, noting that improvements could be made in terms of the definition of qualifying R&D, the cost categories of R&D expenditure which qualify, and the tax credit rate. Tax credits might also be better marketed to increase their uptake by business and by companies undertaking R&D related to new services and processes as well as those involved in product-related R&D. Initial judgement from the Institute for Fiscal Studies finds that R&D tax credits have uncertain impact – is there evidence for Wales?

## **7. Scotland**

The Science Strategy for Scotland provides one benchmark for what Wales might hope to achieve in its science policy. The Scottish Science Strategy covers five main goals:

- Maintain a strong science base, fully connected to UK and international activity and funding sources.
- Increase the effective exploitation of research to grow strong Scottish businesses and provide cutting edge science to meet the needs of the people of Scotland.
- Ensure that enough people study science to a standard which will enable the future needs of the country to be met.
- Promote the awareness, appreciation and understanding of science across society.
- Ensure the effective use of scientific evidence in policy formulation and resource allocation by government.

The Scottish Executive funds a wide range of research programmes contributing to these objectives and also supports various initiatives to build innovation and competitiveness. The Scottish Institute of Enterprise (embracing all 13 of Scotland's universities) is part of the Science Enterprise Centres network.

One initiative of particular interest encompasses three Intermediary Technology Institutes (ITIs), created to stimulate entrepreneurial dynamism in the key areas of Life sciences, Energy and Techmedia. The well-resourced ITIs function across universities and business sectors to identify emerging markets and develop technologies to exploit the new markets – by commissioning pre-competitive research, managing intellectual assets and catalysing information exchange between members. The Life sciences ITI will also be a central part of the new Scottish Life Sciences Strategy coordinated by the Scottish Life Sciences Industry Advisory Group. This recent strategy lists key objectives (and indicators for measuring success) that, when generalised, are also highly relevant to the EDT Committee Inquiry: (a) Increasing contribution by companies to the economy; (b) Being a more attractive place for graduates

and managers to work; (c) Increasing level of investment in science; (d) Attracting added value foreign investment; (e) Promoting and enhancing academic success; (f) Demonstrating improved connectivity and collaboration among stakeholders.

The output from the current Inquiry by the Enterprise and Culture Committee of the Scottish Parliament ("Business Growth") may also be relevant to the EDT Committee – in particular regarding its analysis of international comparator regions, its focus on growing R&D investment and its analysis of the best means to stimulating innovation and commercialisation of discoveries. Interim findings are to be reported to the Scottish Parliament in September 2005. In its evidence to this Scottish Inquiry, the Royal Society of Chemistry emphasised points from the recent report "Chemical science spin-outs from UK universities", for example, the need to do better in sharing best practice between Technology Transfer Offices (a recurrent theme), the possibility that costs of patent filing could be included under the R&D tax credit scheme and the desirability of building chemistry laboratories in science park/incubator facilities.

## **8. Northern Ireland**

The NI Department of Enterprise, Trade and Investment's Research and Evaluation Agenda covers issues for competitiveness; R&D and innovation; enterprise, skills and labour market; infrastructure and investment, that are also relevant to the EDT Committee. The programme of evaluation scheduled for 2005-2006 will include analysis of the type and amount of R&D undertaken in the Higher Education sector and within NI Government Departments with a view to identifying policy needs to support R&D and encourage commercial spin-outs.

Recent analysis of the situation in NI by the UK Campaign for Science and Engineering emphasised the relative under-funding of the science base (similar to Wales) by comparison to England and Scotland – one contributory factor in both NI and Wales may be the lack of Research Council Institutes. The solution proposed for NI (and perhaps also applicable to Wales), to capitalise on what research excellence it has and build business R&D is composed of three elements: (i) attract inward investment from existing larger science-based companies; (ii) grow the endogenous SMEs who recognise the importance of innovation; (iii) convince those companies who do not yet conduct research to start. Underpinning this tripartite vision is the need to do more to share perspectives across the sectors by promoting secondments between Government, academia and industry.

## **9. Eire**

The 2004 Report "Building Ireland's Knowledge Economy – The Irish Action Plan for Promoting Investment in R&D to 2010" is a detailed account of the current R&D performance, the vision for 2010 and an action plan to achieve agreed goals. In May 2005, the Minister for Enterprise, Trade and Employment announced the appointment of a Science Advisory Council, as part of the desired coordination and governance of science and technology and innovation. This new Council, which includes representatives from industry, academia and the state sector has roles to act as primary interface

between stakeholders and policy makers, contributing to development and delivery of coherent and effective national strategy and to provide advice to Government on policy.

One other key initiative has been the launch of Science Foundation Ireland to enable Irish universities to work together rather than, as in the past, competing with each other for funding and linkage with foreign universities. Three new centres for science, engineering and technology are conceived (in Human Proteomics, Alimentary Pharmabiotics and Digital enterprise) together with other interdisciplinary clustering of industry and academic researchers. This may hold lessons for Wales.

Eire is also notable for its strategic effort to invest EU Structural Funds in support of R&D.

## **10. EU-level initiatives**

The European Commission is an important source of comparative statistics on national and regional performance in R&D and innovation, and supports a range of analytical projects to identify best practice. The principal instrument for Commission funding of R&D has been the Framework Programmes designed to stimulate, organise and exploit all forms of cooperation in research. While specific objectives of such research have been ostensibly to achieve socio-economic impact or support EU policy, in reality most of the focus has been to attempt to build research quality in Europe. Concern has been expressed that Welsh universities are not receiving a fair proportion of EU research money (or, indeed, other public research money), possibly because of their relative lack of critical mass. A solution would be for Welsh universities to collaborate (with each other and with English universities) to attract investment. A recent study by the business support group, Intellectual Property Wales, makes a related point – Welsh universities are losing out in the technology transfer market because they are not working with each other and with industry to patent inventions jointly.

With regard to the specific objective to win more Framework Programme funding, Wales might also consider doing more (i) to clarify strategic opportunities (emulating what is being attempted, for example, in NE England RDA) by seeking partnership with EU new Member States to strengthen the collective application for funding; and (ii) building university-SME local partnership to bid for funding.

Discussion of the proposed Framework Programme 7 (due to start in 2007) is complicated by the EU budget controversy but the new Programme may introduce two additional funding vehicles:

- i. European Research Council – essentially to support fundamental research of the highest quality, without the criterion of EU collaboration;
- ii. Technology Platforms (TPs) – essentially led by industry and potentially able to draw on additional funding from Member States under Article 171 of the Treaty. Selected TPs will be eligible for additional strategic support on evolution into Joint European Technology Initiatives (JETIs). TPs/JETIs are, potentially, of great interest for Wales and cover a wide range of key industry sectors, for example Energy (Hydrogen and fuel cells), Agriculture (Plant genomics and biotechnology, Animal health), Health care (Innovative medicine, Nanomedicine), Transport

(Aeronautics, Road, Rail, Maritime), Other manufacturing (Sustainable chemistry, Nanoelectronics).

It is now quite likely that the next round of EU budget decisions (2007 onwards) will also see more Commission support for the use of Structural Funds for research and innovation.

In addition to its direct funding of research, the Commission has been active in identifying issues for raising private sector R&D investment as part of the EU Lisbon and Barcelona goals to reach the R&D investment level of 3% of GDP by 2010. The publication "Investing in research: an action plan for Europe" (2003) (and its supporting volumes on the range of measures available to stimulate industry R&D) provides comprehensive analysis of supply-side and demand-side policies, with particular emphasis on SME needs, not all of which are currently implemented at UK level. Public procurement of R&D and its innovative products is one particular growth area.

## **11. Recent initiatives in Wales:**

### **11a. Welsh Assembly Government "A Winning Wales"**

The national economic development strategy (and its update in 2003 indicating progress on achieving targets) does not make much mention of science but covers highly relevant areas for improving enterprise and innovation and for raising skill levels and learning performance. What is now needed is a detailed progress report as to whether key objectives are being met – in particular, regarding business R&D expenditure and the inception of the Knowledge Bank.

### **11b. WDA**

Much of the activity is well regarded from outside Wales, for example the activity of the Innovation Relay Centre and Knowledge Exploitation Fund, use of EU Structural Funds (albeit relatively little in direct support of R&D), the principles underlying establishment of Techniums and the culture of forward looking enshrined in the Future Technologies project and the Knowledge Economy Nexus (see below). The identification of key strategic issues by WDA is also apposite – the importance of growing industry R&D investment, of developing work force skills at all levels, of understanding how to measure success and considering Wales in the wider context of the UK and EU. What is now needed is analysis of some of the early lessons learned – for example, has a consistent standard been reached in constituting and populating all of the Techniums?

### **11c. Future technologies project**

This report is very helpful both in identifying specific areas of promise in technology in Wales and those science-business support mechanisms required to capitalise on the specific strengths. The Action Plan merits more prioritisation. The possible next steps – establishing a Wales-wide Futures network, cross-sectoral partnerships, new centres of excellence (particularly in micro-nanotechnology) and the generic

support mechanisms – are all important. But what is actually now being done in consequence of this project and how can the EDT Committee Inquiry help to re-affirm priorities for key business sectors?

### **11d. Knowledge Economy Nexus**

This report is also very informative in addressing the themes for the economic development role of Higher Education, including the issues for academia-business interaction, research assessment and trained graduate output. Before the EDT Committee invests time in covering some of the same ground, it would be useful to know what has happened in response to the Nexus recommendations.

### **11e. Education and Lifelong Learning Committee Policy Review of Higher Education (2003)**

This report also covers some issues highly relevant to the EDT Committee Inquiry – the importance of developing an all-Wales strategy for research that will produce a world class research base, will facilitate development of new research units, develop centres of excellence and recognise and reward the contribution of applied research in supporting academia-industry interactions. These specific objectives for research are conceived within the context of broader strategic goals for Higher Education such that resource allocation could become at least equivalent to that in England, and Wales would move to a cluster model of provision in order to optimise efficiency. Again, it would aid the EDT Committee Inquiry to know how these ELL Committee recommendations were received, what was found to be controversial, what has happened in consequence and what the ELL Committee judges is still to be done.

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