ECONOMIC DEVELOPMENT AND TRANSPORT COMMITTEE

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Welsh Assembly Government's Economic Development and Transport Committee's review of

WALES SCIENCE POLICY

October 2005

written information from the Welsh Development Agency

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CONTENTS

I	Introduction and background	Page 1
II	Current state of R&D in Wales	2
III	Ways in which research and development in the public and private sectors can be strengthened and made more effective	5
IV	Likely priorities for science awareness, skills provision, HE excellence, technology transfer and innovation	7
Annexes:-		
1.	Key Documents and Strategies	10
2.	DTI Technology Programme	11
3.	Framework Programme 7	12

4. West Wales and the Valleys Structural Funds Programme 2000-2006 and R&D Priorities	14
5. Future Technologies programme – key priorities	15
6. WDA Support for Innovation, Science, Technology and R&D	16
7. Centres of Excellence for Technology and Industrial Collaboration (CETIC)	20
8. Knowledge Exploitation Fund	21
9. Technium	22
10. Innovation Action Plan 2003 – update	23
11. Knowledge Economy Nexus Report	31
12. RAe Assessment (2001) versus HEI (3/4/5/5*) in Science Engineering and Technology	46
13. Funding of Research in Welsh Higher Education Institutes	47
14. Academic Expertise in Support of Key Sectors	48

I. Introduction and Background

If Wales is to compete globally it must transform from an economy based on traditional industries to a more knowledge driven economy. This will involve strengthening the science base, encouraging more R&D, development and adoption of new technologies and a more innovative culture across all aspects of society.

Science and Innovation depend upon people. Wales must become the region that is known for having an excitement about science and a buzz about Innovation. The Region where bright people want to live, work and do research.

Over recent years progress has been made with support from the public sector and judicious use of European funds but there is still much to be done and time will be needed to show significant progress.

Factors which have contributed to the current situation in Wales are:-

- Low business expenditure on R&D
- Lack of government funded research institutions (with the exception of IGER)
- Too few companies collaborating with academia
- Low graduate employment, especially in SMEs
- Low graduate retention in Wales
- Insufficient funding for academic research and a lack of critical mass in some areas

Science, Innovation and R&D are high on the agenda of the Welsh Assembly Government, Welsh Development Agency, UK Government and the EU and there are a number of studies, consultations, reports and strategic documents identifying the challenges and key areas for action (Annex 1).

UK/Europe

In developing a science policy and action plan for Wales it will be essential to maximise funding opportunities from outside Wales and to consider the key science and R&D priorities for the UK and Europe. UK priorities are discussed in the HM Treasury and DTI's: "The ten-year Science & Innovation Investment Framework" and which form the basis of the DTI's Technology Programme (Annex 2).

The EU has ambitious targets to increase R&D expenditure to 3% of GDP by 2010. This will be achieved partly through a new Framework Programme. Priorities and principle objectives for 2007-2013 in the latest draft of the next Framework Programme (FP7) are set out in Annex 3.

Wales

In the mid-90s Wales was one of the first regions of Europe to develop a Regional Technology Plan (RTP) following a major consultation. Building on the recommendations and following further consultation, an Innovation Action Plan was developed in 2003 and is currently being updated. The priorities identified in the original RTP and subsequently the Welsh Assembly Government's Action Plan for Innovation helped to inform the Innovation and R&D priorities for the 2000-2006 Structural Fund programme for the Objective 1 and 2 areas of Wales (Annex 4). To date, some £94m has been committed to a diverse range of Innovative R&D projects led by the public, private sector and academia across Wales.

Most recently the WDA managed the development of a Future Technologies project as part of Wales' Innovation Action Programme (Annex 5).

The Welsh Development Agency supports innovative science and R&D across Wales through a dedicated Technology and Innovation team, which is a core part of the WDA Business Support function.

The Technology and Innovation team comprises some 90 staff, the majority with experience of working in technology and R&D environments in a range of industry sectors. These staff are based at the WDA's headquarters in Cardiff and in our Regional Offices at Treforest, Swansea, St. Asaph, Newtown and Aberystwyth. The WDA activities in support of innovation, science, technology and R&D are summarised in Annex 6.

The Technology and Innovation team has taken the lead on implementing the key recommendations of the Innovation Action Plan and the Knowledge Economy Nexus report. Updates on these activities are summarised in Annexes 10 and 11.

II. Current state of R&D in Wales

Business

Recent reports from the Office of National Statistics indicate that business expenditure on R&D in Wales is still relatively low compared with some UK regions but the latest figures show that it is improving. (www.statistics.gov.uk)

Low business investment in R&D in Wales is partly due to a predominance of SMEs and low representation of companies in R&D intensive sectors. Where major international companies do have a presence in Wales these are primarily manufacturing facilities with their headquarters and R&D operations outside Wales.

There are, however, good examples of business investment in R&D in both indigenous and international companies, for example Gyrus Medical, GE Healthcare, General Dynamics, International Rectifier, EADS, Deepstream Technologies, ENFIS etc.

Nevertheless, more needs to be done to attract and embed R&D facilities of international companies, strengthen R&D in indigenous companies and encourage the start up and growth of technology based spinouts. This activity is underway through more support for indigenous business, sector specific targeted inward investment overseas missions, collaborative projects with academia, the Technium programme and an enhanced SMART scheme.

Academia

Wales' strengths in science and R&D lie predominantly in the academic base, especially in the more R&D focussed universities, ie the newly expanded Cardiff University, Swansea University and to a lesser extent Bangor and Aberystwyth Universities.

Expertise in Welsh HEIs covers a wide range of disciplines ranging from computing science, IT and advanced materials, through product design and manufacturing to environmental and biological sciences and specialist medical technologies.

The quality of research is recognised through the UK Research Assessment Exercise (RAe) and a summary of the RAe results for relevant disciplines in Welsh HEIs is shown in Annex 12. Funding of Welsh HEIs is shown in Annex 13. HEFCW has included more detailed information in their submission. As yet there is insufficient excellence in Wales to induce a step change in the attraction of significant UK and EU R&D funds and international business R&D across disciplines.

Over the last few years there has been an increase in the number of major projects supported in Wales, among them a number of successful multi-million pound bids for capital funding to take forward a number of knowledge economy projects. These include:

- **The Wales Gene Park**

The Wales Gene Park was set up in Cardiff in 2001 and is one of six genetic knowledge parks in the UK. They are part of the DTI's genetics and health strategy that aims to put Britain at the leading edge of advances in genetic technology. It brings together Welsh expertise in genetics, life sciences and clinical expertise from Cardiff, Swansea, Aberystwyth and Bangor.

Working in close collaboration with UK pharmaceutical and biotechnology industries, it provides genetic testing services and will translate research into medical practice. With the support of Techniquest, the Gene Park has a major role in stimulating public debate on genetic issues, ethics and the impact on society of genetics.

Phase 2 of the Gene Park will create in Wales a physical centre for research of national and international importance.

- Institute of Life Sciences in UW Swansea

This will co-locate a number of Swansea's life science teams and will back them up with massive computing capacity from IBM. The ILS will be a major force in research into mainstream diseases such as diabetes, cancer and cardiac ailments. Utilising the very latest in information technology, including the world's largest supercomputer dedicated to life science research, internationally acclaimed scientists will be working at the intersection of bio- and nano-technologies to extend the frontiers of international medical research.

- Institute of Advanced Telecommunications at UW Swansea

The Institute of Advanced Telecommunications (IAT) is a £30M strategic project to create a world class centre for telecommunications research in Wales. IAT is supported by a number of private sector partners and links into the modern Technium facilities at Swansea, including the £10.7M Technium Digital on the University campus and the new £4M Agilent Communications Test and Measurement Laboratory which provides extensive optical, wireless and networking test capabilities

- Micro and Nano Technology activities throughout Wales

UW Bangor (School of Informatics) has spun out the UK Laser machining Centre. The UKLMC has with Cardiff won two of the six awards made by the DTI in its recent NanoMicroTechnology facilities call. They will receive £4.3M from the DTI and £2.5M from WAG, which will reinforce Welsh research strengths in NanoMicrofluidics and will help Wales become the leading UK region for manufacture and design of nano fluidic devices, particularly for health diagnostics.

Additionally the MEC (Cardiff University – NanoMicro team) is the coordinator of two EC Networks of Excellence projects of trans-EU microtechnology.

- Collaborative laboratory for blood clot research UW Swansea & Morriston Hospital.

This is one of 25 research projects supported by the £3.1M Portfolio Partnership grant, one of only 3 of its kind awarded to Engineering in the UK, and the only one in Wales. It harnesses the expertise present in the Complex Fluids CETIC at

the School of Engineering, the Medical School and the Swansea NHS Trust. It will seek to establish new methods for studying blood clot formation and structure.

- **CuBRIC (Cardiff University)**

The Cardiff University Brain and Tissue Repair Imaging Centre has been set up with £8M DTI funding to enable research into neuroscience and advanced brain scanning techniques.

- **PET/CT Scanner**

Support for two Positron Emission Topography scanners has been announced (3rd October 2005) by the Welsh Assembly Government for the University of Wales Hospital Cardiff. One scanner will be used to treat patients, the other will be for research and, together with the cyclotron to make the short-lived isotopes that PET scanners need, they will be the nucleus of further diagnostic research and a cluster of related research based companies.

- **Structural Funds Projects**

Wales has benefited from European Structural Funds Objective I funding for a number of major projects including :-

- Knowledge Exploitation Fund approvals for seven new technology transfer centres and six new technology transfer networks;
- Accreditation of eighteen Centres of Excellence across Welsh HEIs under the WDA's CETIC programme (Annex 7).
- £5m from Priority 2 Measure 3 (Innovation and R&D) to supporting innovation, product engineering and responsive manufacture in the Manufacturing Engineering Centre in Cardiff University's School of Engineering, which is a foundation operation within the Welsh Manufacturing Advisory Service
- Over £1m to develop unique fish breeding and growth facilities at Swansea University which are being used to strengthen the acquaculture sector in Wales

- To give a snapshot of the SET activity being funded by UK government a cursory look at EPSRC's current grant portfolio in Wales reveals the following:

EPSRC Current Grant Portfolio in Wales

Organisation name	Number of grants	£ Value
Cardiff University	98	31,446,727
University of Wales Swansea	52	21,735,942
University of Wales, Bangor	19	3,382,196
University of Wales, Aberystwyth	14	2,103,093
North East Wales Inst of H E	6	477,945
University of Glamorgan	6	824,051

Total number of Grants: 195 **Total value of support £59,969,954**

Selected entries:

Cardiff University

Clinical Laboratory Science: Optical Biochips (Prof. P Smith) £ 2,271,606

Chemistry: Cardiff Centre for Physical Organic Chemistry (Prof. GJ Hutchings) £ 2,956,344

UW Swansea

School of Engineering

Portfolio Partnership in Complex Fluids and Complex Flows (Prof. PR Williams) £ 3,113,334

UW Bangor

School of Informatics £ 2,188,278

Platform: Advanced Nanoscale and Nonlinear Optoelectronics (Prof A Shore) £ 433,341

The WDA has catalogued key areas of academic expertise in science, engineering and technology in the Research Wales directory. This is currently being updated.

As part of the actions against the Knowledge Economy Nexus report, more detailed mapping of academic expertise in support of some of the key sectors has been undertaken (Annex 14).

III. Ways in which research and development in the public and private sectors can be strengthened and made more effective

Though as has already been stated there is insufficient research excellence in Wales to induce a step change in the attraction of significant UK and EU R&D funds or international R&D to Wales, progress has been made on many fronts and, if strengthened and continued, will make a cumulative, significant improvement. Development of a Science Policy for Wales that inspires, coordinates and directs would add to the process and would increase the effectiveness of funding and assist in the achievement of critical mass.

- A Science Policy for Wales must fit with the key science and R&D priorities of the UK and European Union. To attempt to be different would preclude those areas from funding by the DTI, the UK Research Councils and the European Commission. The priorities and funding mechanisms for the UK are set out in the UK Government's 10 year investment framework for Science and Innovation 2004-2014 and those of the EC in the Framework 7 programme recently announced. Additional funding and staff would enable the Wales Innovation Relay Centre (WIRC) to provide more encouragement and increased assistance to companies and researchers to develop, draft and secure UK and DTI Technology and EU Framework projects.

- The Welsh Science and Technology strategy must be built on Wales' present strengths. It should also strive to create new ones in Welsh priority sectors through systematic and continuous development of knowledge, competence, education and research and innovation both in academia and industry. The aim must be to achieve critical mass in niche areas. Ideally, there should be a degree of synergy between the niches, either via adjacent technology sectors or horizontally through the development of effective multidisciplinary ways of working on projects e.g. the Wales Energy Research Centre. This type of working may require cross-portfolio funding mechanisms (e.g. in the case of Telehealth) and cross-portfolio benefit analyses in the Welsh Assembly Government.

- Increased funding should be provided to create Research Chairs that reinforce existing academic strengths in areas that are of interest to major indigenous or incoming companies.

- The international marketing campaign recently proposed by Nexus that builds on the CETIC programme and the recent mapping exercise of all relevant research science and technology and specialist facilities within Wales should be funded and implemented on a 5-year basis with aggressive marketing across Europe, America and the Far East, where there are potential opportunities for Welsh contract research and investment.

- Convergence of technology has been recognised as being of increasing importance for successful projects in research and innovation and requires changes in working practices and the multi disciplinary organisation of projects.

- Investing in science and technologies that have multi-sector impact such as nano, optronics, new materials and non-destructive testing (Annex 6) should be encouraged.

- The priorities identified in the Futures Programme should be implemented, the Futures process should be ongoing with its outcomes and drivers continually being updated and incorporated into strategy and policy.

- **Business**
  - Existing support mechanisms for companies to carry out R&D should be enhanced. Funding should be increased, and the streamlining of application and delivery processes that has been incorporated recently in SMART Cymru should also be continued particularly with the aim of making it simpler for companies to apply. Ongoing monitoring to ensure commercialisation of R&D results also needs to be supported.
  - Additional support should be made available to indigenous businesses to carry out R&D. This should include schemes by which academics could work in industry and vice versa with company researchers having access to University equipment to carry out collaborative research projects in Universities with University staff.
  - University researchers should be encouraged to use facilities in Industry using the model of the "Open Access" facilities being set up by DTI for Nano-Micro Technology.
  - State Aids issues regarding R&D collaborative projects need to be clarified and as far as possible avoided by pre-notification and clearance with Brussels
  - R&D intensive companies should be targeted and every attempt should be made to attract and to embed inward investment opportunities into Wales via their carrying out of research in Wales, the key to this being research excellence and the availability of graduates from Welsh Universities.
  - Businesses, as well as Universities, benefit from improved access to UK and EU R&D funds and support in making proposals. This includes help in finding the best research departments in establishing ongoing links with academia and, in the case of EU projects, with overseas partners.
  - There should be more promotion of the full range of R&D funding possibilities, including R&D tax credits.

- **HE**
  - The starting point for improving the research and development carried out in Wales has to be Research excellence and this should be strengthened by cross-institutional collaboration and we welcome the efforts by HEFCWto use their reconfiguration Fund to do this.
  - For Research excellence to have economic impact it must be linked to industry and further the establishment and support of knowledge clusters capable of attaining strong sustainable positions in international markets. The targeting and encouragement of R&D intensive companies to invest in Wales mentioned above under Business is highly effective in raising the research excellence of the University with which the company collaborates.

- The WDA has developed a number of Academic/Industry link programmes and actively supports HE Third Mission commercialisation with the CETIC programme and its 18 centres and with the Knowledge Exploitation Fund's 18 Technology Transfer Centres (Annex 8). This needs to be continued.
- The recommendations of the Knowledge Economy Nexus Report should be implemented on a long term basis. The key recommendations are summarised in Annex 11.

- **Funding**
  - Steps need to be taken to increase the amount of external funding received by businesses and academia that comes to Wales from external sources such as the DTI, the EU Framework Programmes, the UK Research Councils and UK and International charities. As this funding follows research excellence, the problem is circular, but mechanisms and assistance to support the application processes should be reinforced and the means by which Welsh researchers can join programmes as partners improved.
  - Broadening eligibility and increased flexibility has recently been achieved in SMARTCymru, as has its ability to fund larger companies. This needs to be extended. Proposals to fund Proof of Concept in companies as well as in Academia (currently funded by KEF) are being developed and will need funding.
  - Funding of research Chairs in academia in areas that support existing or emerging Welsh industry should be increased. Additionally, the co-funding of Chairs so that scientists can move between academia and industry would open another avenue that could fit with the need for multidisciplinary research, convergence and rapid technology transfer between academia and industry.
  - Research as a priority needs to be built into the new Structural Funds programme 2007-2013.

- **Monitoring the Impact**

  To monitor the impact of science policy in Wales, it will be necessary to develop or to identify better indicators to measure the progress of a science driven knowledge economy in Wales, e.g. the following should be examined:
  - use of the European Innovation indicators
  - adapting and adoption of the findings of a recent DTI and Treasury report on measurement of the impact of science and innovation in the UK
  - better communication between economists and statisticians at the Welsh Assembly Government, the WDA, the DTI and the European Commission

IV. Likely priorities for science awareness, skills provision, HE excellence, technology transfer and innovation

A body needs to be nominated to be responsible for implementing the recommendations of the Science Policy, the following are thought to be relevant priorities for such a body.

Culture

Science and Innovation depend upon people. Wales must become the region that is known for having an excitement about science and a buzz about Innovation. It must become the Region where bright people want to live, work, do research, set up companies and flourish.

Science Awareness

Public support for science ultimately depends upon public awareness and public debate. This is particularly important where the effect of the science is uncertain, complex and even ambiguous. The debate on such topics as nuclear power, genetically modified crops, nano technology, telehealth and personalised medicine is and will be carried out at national level by the Government and in the national newspapers.

Local awareness, debate and acceptance will be essential if research in these areas is to be done in Wales and if their facilities are to be built in Wales.

The local and regional Welsh campaigns will need to be coordinated with each other and with UK national campaigns.

The same coordinated approach and Welsh initiative will be needed to encourage young people at schools and universities to start careers in science and technology. This has already been started with Techniquest, competitions and awards in schools and the InnovationWorks publicity Campaign.

The creation of awareness and confidence in scientific research and its innovative applications are essential to the growth of the Knowledge Economy in Wales.

Skills Provision

- For Wales to succeed in a science based Knowledge Economy, not only will a higher proportion of the workforce be employed in SET-based endeavours but they will need a higher level of skill at Technician and Graduate level and will require continuing "life-long" learning.
- KEF has already funded training consortia in key sectors/technologies and is leading a Cardiff based proposal for a Technician training academy in nano-technology. The Academy will be networked across the whole of the UK with training modules at each of the UK MNT centres.
- Funding should be made available to up skill the workforce in new technologies.

- More specialist technical training facilities need to be established to meet the needs of key industry sectors (cf Waterton for Automotive) .

HE Excellence

The priority action areas for the improvement of HE excellence are to :-

- Build upon existing strengths to achieve critical mass and excellence in key disciplines.
- Mandate collaboration and cooperation between Welsh Institutes and encourage collaboration and partnering with other UK and international research institutes.
- Improve the links between academia and industry inside and outside Wales as being promoted by Nexus.
- Provide support and coordinated funding from various existing sources in Wales for research Chairs, equipment, university infrastructure and for collaborative research projects (DTI, EU and KEF) in research areas that are central to the expansion of indigenous and incoming companies with high growth potential.
- Encourage more investment in Welsh HEIs by major international companies and research charities including the establishment of major research facilities.

Technology Transfer

Wales is too small a country to reasonably expect to develop much of the science and technology that its economy needs. Many companies now outsource R&D and look to acquiring the technology they need through technology transfer and licensing which has been found to be quicker and more reliable. For companies technology transfer is a two way process – technology can be bought or sold. The NHS is similar but for Universities technology is predominantly created or sold.

Technology transfer requires professional competence and extensive networking. The Wales Innovation Relay Centre, part funded by the EU Innovation programme, has been carrying out transnational technology transfer across Europe for 12 years and is part of, by far, the largest technology transfer network in Europe. Their work needs reinforcing and more resources to be able to support more projects inside Wales.

KEF is developing a CPD programme to improve the skills of Technology Transfer and commercial professionals in HE, FE, innovation centres and the NHS trusts in Wales and thereby increase the commercialisation of IPR.

The NHS have a considerable body of Know How that is little known or commercialised outside the NHS and this is now receiving hands-on support from healthcare and life-science experts in the WDA and the recently established NHS IP Hub

Innovation

Research excellence is the starting point for the transfer of technology and is the dynamo for innovation. The impact of a Welsh Science Policy on Innovation in Wales could be significant, but innovation is equally as much about the spotting of a market need and the innovative application of science and technology to meet that need. Innovation per se does not need to be high-tech.

The priorities of a Welsh Science policy must include ways to develop the application of the Science to industry, how advances in Science and Technology are used and people's and industry's attitude to risk.

The innovation priorities for Wales are detailed in the Innovation Action Plan which currently is being updated. Implementation of its recommendations should be continued and supported.

Steps to improve business awareness and acceptance of this process of innovation are the main message of the ongoing InnovationWorks pan-Wales publicity programme.

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Annex 1

Key documents and strategies

Wales

- WaVE (A Winning Wales 2)
- Wales – a Better Country – the Strategic Agenda of the Welsh Assembly Government
- Wales Spatial Plan
- Innovation Action Plan for Wales
- Knowledge Economy Nexus Report
- Future Technologies : a Final Report

UK

- HM Treasury and DTI: "The ten-year Science & Innovation Investment Framework" 2004-2014
- Update to the UK Innovation Report (2003) "Competing in the Global Economy: the Innovation Challenge"
- Technology Priorities for the UK announced in November 2004 by Lord Sainsbury, Minister for Science and Innovation
- ONS – Research and experimental development (R&D) statistics 2003 – published August 2005

EU

- 6th EU Framework Programme for Research and Technological Development
- Proposals for a 7th Framework Programme for Research and Technological Development 2007-2013
- European Innovation Scoreboard
- Commission Communication 2003 – Innovation Policy updating the EU approach in the context of the Lisbon Agenda

Annex 2

DTI Technology Programme

Key priority areas include:

- Design, Simulation and Modelling
- Pervasive Computing including networks and sensors
- Micro and Nanotechnology
- Imaging Technologies
- Bio-Based Industrial Products and Processes
- Energy Technologies
- Waste Management and Minimisation
- Smart Materials and related Structures
- Optoelectronics and Disruptive Electronic Technologies

Annex 3

Framework Programme 7

The Programme will be organised in **four specific programmes**, corresponding to **four major objectives** of European research policy:-

Cooperation - support will be given to the whole range of research activities carried out in transnational cooperation, from collaborative projects and networks to the coordination of research programmes. International cooperation between the EU and third countries is an integral part of this action.
Ideas - an autonomous European Research Council will be created to support investigator driven "frontier research" carried out by individual teams competing at the European level, in all scientific and technological fields, including engineering, socioeconomic sciences and the humanities.
People - the activities supporting training and career development of researchers, referred to as "Marie Curie" actions, will be reinforced with a better focus on the key aspects of skills and career development and strengthened links with national systems.
Capacities - key aspects of European research and innovation capacities will be supported:

- research infrastructures
- research for the benefit of SMEs
- regional research driven clusters
- unlocking the full research potential in the EU's "convergence" regions
- "Science in Society" issues
- horizontal" activities of international co-operation

The **nine themes** identified for the "**Cooperation**" objectives are:

- Health
- Food, Agriculture and Biotechnology
- Information and Communication Technologies
- Nanosciences, Nanotechnologies, Materials and new Production Technologies
- Energy
- Environment (including Climate Change)
- Transport (including Aeronautics)
- Socio-economic Sciences and the Humanities
- Security and Space

Ideas
Activities will respond to the most promising and productive areas of research and the best opportunities for scientific and technological progress, within and across disciplines, including engineering and social sciences and the humanities.

The EU activities in frontier research will be implemented by a European Research Council (ERC), consisting of a scientific council, supported by a dedicated implementation structure.

The "People" objectives comprise activities under:

- Life-long training and career development
- Industry-academia pathways and partnerships
- The international dimension
- Specific actions to support the creation of a genuine European labour market for researchers by removing obstacles to mobility and enhancing the career perspectives of researchers in Europe.

The themes identified for the "Capacities" objectives are:

- Optimising the use and development of research infrastructures
- Strengthening innovative capacities of SMEs and their ability to benefit from research
- Supporting the development of regional research-driven clusters
- Research Potential
- Science in Society

Annex 4

West Wales and the Valleys Structural Funds Programme 2000-2006 and R&D Priorities

'Create an environment which supports innovation, R&D and improved Wales' competitiveness in a global market place'.

7 Strategic Objectives:

- Embed a culture of innovation throughout the region.
- Provide a comprehensive innovation and technology support infrastructure for business.
- Develop long-term R&D capacity in the region (particular industrial R&D).
- Increase competitiveness through improved linkages between the academic base and business.
- Support the development of networks and clusters of technology-based companies and allow further exploitation of research.
- Exploit business opportunities offered by specialist ICT applications.
- Support the development of content providers for the new technologies.

Annex 5

Future Technologies programme – key priorities

Future Technologies was one of four strands which made up TASK – Towards a Sustainable Knowledge-based Region funded by the EC's Innovative Actions Programme.

To flourish in the world of the future, Wales needs to develop the ability to spot and realise specific opportunities where the Welsh economy and businesses can capture the most value. For benefits across all sectors, Wales needs to embrace convergence and within a Futures strategy to:

- Establish a Wales-wide Futures network that captures and disseminates leading edge knowledge among technologists, scientific researchers and business people.
- Create cross-sectoral partnerships that will encourage the development and use of convergent technologies.
- Assist the establishment of a Wales micro- and nano-technology centre.
- Ensure Wales has world class access to information and communication technologies, networks and infrastructure.
- Develop a workforce that is flexible, up-to-date and multi-skilled.

In specific sectors, Wales needs to build upon existing strengths in academia and industry to develop and reinforce support mechanisms in the light of future change, especially in:

- Bioscience and healthcare
- New materials, advanced design and manufacturing
- Power electronics and opto-electronics
- Renewable energy and environmental technology
- Sustainable technologies.

The "bottom up" consultation process produced a number of specific "technology" opportunities. These were based on the opinions of business leaders and academics who were consulted on suggestions of potential applications, based on current and anticipated developments in market and global trends.

The opportunities identified in Technology Clinics and Workshops can be grouped in these main areas:

- Combined/convergent technologies
- Biosciences
- Electronics (including opto-electronics)
- Information and Communication Technology
- Materials
- Nano- and Micro-Technology

Annex 6

WDA Support for Innovation, Science, technology and R&D

Dedicated Technology & Innovation Team

The WDA's support for Science, Engineering & Technology is provided primarily through the Technology & Innovation team, which is a core part of its Business Support Division. The Technology & Innovation team comprises some 90 staff based at our central headquarters in Cardiff and in our Regional offices in Treforest, Swansea, Aberystwyth, Newtown and St Asaph. The team includes a number of technology specialists and locally based Innovation & Technology Counsellors. In addition, there is a dedicated member of staff in each of the Regional teams who works at the interface between business and the academic institutions (Know How Wales).

Partnerships

The WDA adopts a "Team Wales" approach to supporting technology, science and R&D companies in Wales and potential new inward investors. Partners in "Team Wales" include academic institutions, ELWa (Education & Learning Wales), HEFCW, local authorities, private sector providers as well as the Welsh Assembly Government. The WDA does not have an official remit for education but supports projects led by third party organisations in order to encourage young people to be enthused and consider careers in science, engineering and technology. This includes Techniquest, WJEC, Engineering Education Scheme etc.

Budget for Technology & Innovation Activities

The revenue budget for 2005-2006 is approximately £40m to cover support for centrally and locally run programmes. This includes income from EU programmes and ring-fenced Welsh Assembly Government monies, for example for Knowledge Exploitation Fund. This budget does not cover capital costs for roll out of Technium projects or other specialist infrastructure provision.

Use of EU and other External Funds

Wherever possible the WDA maximises the use of EU and other (e.g. DTI funds) to support the delivery of its Technology and Innovation programmes. In particular, it has secured funding from European Structural Funds, both Objective 1 and Objective 2, and was successful in bidding for funding to support Environmental Goods and Services, CETIC, Technology Exploitation Programme, SMART and the Technium programme.

Monitoring & Outputs

Programmes are delivered against a detailed business plan, targets agreed with the Welsh Assembly Government and monitored on a monthly basis. During 2004/5 the programmes assisted 3,350 businesses and 1,636 industry/academia collaborations with Innovation, Technology and R&D support

from the WDA. Other indicators monitored on a regular basis are new products / processes under development, private sector investment in technology, R&D and innovation and patents filed.

Clients

Our client range includes:

- Individuals
- Businesses in Wales (majority are SMEs)
- Inward Investment Companies
- Universities and Colleges
- Academic Institutions

Range of WDA Support

Specialist support for Science, Technology, Innovation & Engineering to these clients includes:

- Grants and Access to Funding
- Collaborations with Universities and College
- Technology Transfer, IPR and Commercialisation
- Provision of Specialist Infrastructure including, Facilities, ICT / Broadband
- Sectoral Support and Networking
- Awareness and Promotion of SET and Innovation
- Futures and Foresight Programmes

Grants & Access to Funding

The WDA manages the SMARTCymru scheme, which offers support to individuals and companies of all sizes for R&D, product development and technology implementation. Grants are available between £1.5k and £200k to cover various stages of development, whilst exceptional development projects may attract a grant of up to £500k. The total budget for 2005/06 is £8m, with £500k coming from EU structural funds.

Access to EU Framework and other External Funding

The WDA hosts the Wales Innovation Relay Centre (WIRC). Its specialist Case Officers help companies and academic institutions to access R&TD funding from the EU Framework programmes and also from DTI (e.g. Technology Programme) schemes. Since April 2002 the WIRC has handled 2746 technical enquiries and has assisted in preparing 28 proposals to the European Commission R&D Framework programme and other national and regional programmes to the value of over £47m. 23 proposals have been successful, securing £3.93m from the EC's Framework Programme and £8.57m from other sources.

Since April 2002 WIRC has produced 23 signed Technology/Knowhow/Commercial agreements.

WIRC assists in the preparation of bids and the identification of transnational partners and also introduces new technology transfer opportunities to Welsh business.

Collaboration with Universities & Colleges

The WDA works closely with the academic institutions in Wales to encourage collaborative R&D, product development and technical problem solving for businesses in Wales and also in support of new inward investment projects.

Particular activities include:

- Centres of Excellence Programme
- Knowledge Exploitation Fund
- Provision of Specialist Facilities
- Involvement of Academic Experts in Overseas Missions
- Partnerships to roll out Technium
- Grants for SMEs to Access Academic Expertise
- Research Wales Directory of Expertise
- Support for International Conferences
- Support for Professorships to Support Key Sectors e.g. Power Electronics at Swansea and Optronics in North Wales

Centres of Excellence

The Centres of Excellence for Technology & Industrial Collaboration (CETIC) are specialist groups within higher education and are recognised both for the excellence of their research and their proven track record of working with industry. The 18 Centres of Excellence cover a wide range of technology areas (Annex 7). This is a £4.2m project over 3 years supported by Objective 1 funding, the Welsh Assembly Government, WDA and the Knowledge Exploitation Fund and provides support for a commercial manager at each Centre. The Commercial Manager acts as the interface with business. The Centres play a key role in our efforts to attract new knowledge based inward investment to Wales.

Knowledge Exploitation Fund

The Knowledge Exploitation Fund (KEF), which supports 3rd Mission activities in HE and FE institutions, has been transferred to the WDA and integrated with other relevant support mechanisms and programmes. In tandem with and consequent to the integration process, KEF has continued to make excellent progress across a wide range of activities (Annex 8) in support of innovation, entrepreneurship, knowledge transfer and exploitation.

Provision of Specialist Facilities & Infrastructure

A key part of our strategy is to provide specialist facilities and infrastructure to support science, technology and knowledge based businesses:

Technium

The Wales for Innovation Action Plan has proceeded apace, the most high-profile consequence being the network of Technium centres (Annex 9), which are now both helping to host and develop indigenous new high technology companies, and acting as a magnet for the activities for multi-national corporations. Many of the Technium projects are sector specific.

Each Technium is developed in partnership and can provide specialist advice e.g. IPR, access to academic expertise, legal etc to its tenants. Tenants are strictly vetted and are expected to move onto the next stage of their development within 2 years.

Sector Specific Facilities

A number of Technium projects include state of the art equipment and laboratories. These include Objective 1 supported OPTIC (optoelectronics), CAST (Centre for Advanced Software Technologies) in North Wales, Technium Digital (Swansea) and Technium Sustainable Energy (Baglan)

In order to regenerate our more traditional industries the WDA purchased the Corus Technology Centre in Port Talbot following the closure of the Corus R&D centre. This facility is now fitted out with industrial scale facilities which are available for companies and researchers to use. Building on materials expertise in the universities, the centre has been developed into an Engineering Centre for Manufacturing and Materials: ECM². The facility is the location for a growing number of strategically important initiatives, including:

- The non-destructive testing (NDT) network – this network and the capital investment in the NDT validation centre run by TWI has contributed to the development of a major new resource for Welsh industry.
- The Wales Energy Research Centre (WERC)

Culture & Awareness

A lot of effort is being put into developing a more innovative culture and raising awareness and changing the international perception of Wales. We do this through a range of science, technology & innovation awards (for example, for undergraduates students), conferences, exhibitions, overseas missions and a range of publications including specialist directories and Advances, a magazine promoting science, engineering and technology from Wales.

Futures

The WDA managed the Future Technologies project as part of an EC funded Wales wide Innovation Actions Programme. The findings of this project will influence investment in future technologies, skills and facilities, which will have an impact on both traditional and merging industries.

Technology Transfer, IPR & Commercialisation

There are few major companies carrying out R&D in Wales so technology transfer, protection and commercialisation of IPR are important, especially to SMEs.

The WDA supports lone innovators who need advice on all aspects of new product / process development and IPR protection through the Wales Innovators Network which runs local meetings involving professional experts and has over 800 members. The WDA also supports the IP Wales project.

Support for business is tailor made to meet individual needs either through technology review, search or identification and introduction of new technology.

Wherever practical the WDA also supports the commercialisation of research from academic institutions, mainly through KEF.

WDA is liaising with the NHS regarding the Intellectual Property and Innovation Advisory Service, which has been set up to advise NHS bodies on how they can best manage, share and capitalise on innovations that are developed within the NHS in Wales.

Sectoral & Networking Activities

The WDA has helped to establish and support a number of industry and technology fora bringing together businesses, academia and support organisations. These fora have industrial-led Steering Groups and cover the materials, electronics, medical, automotive, aerospace, printing & coating and mechatronics sectors.

Specific programmes are in place to support the growth of sectors of strategic importance to Wales. For example, this includes support for the Optoelectronics sector in North East Wales.

Following a major review the WDA is seeking to strengthen the Bioscience sector and to build on the existing Wales Gene Park project and Bioscience expertise in our universities. Discussions are underway on an exciting new development in Cardiff Bay.

Annex 7

Centres of Excellence for Technology and Industrial Collaboration (CETIC)

This programme is a key initiative that supports "third-mission" type activities from the Welsh Higher Education Institutions (HEIs), science engineering and technology (SET) base. 18 Centres are accredited to the CETIC programme. These are:-

Aberystwyth Bio Centre	IGER / Aberystwyth
Centre for Advanced Software& Intelligent Systems (CASIS)	Aberystwyth
Centre for Applied Marine Science (CAMS)	Bangor
Centre for Communications & Software Technologies (CAST)	Bangor
Centre for Complex Fluids Processing	Swansea
Centre for Electronic Product Engineering (CEPE)	Glamorgan
Centre for Engineering Research & Environmental Application	Glamorgan
Centre for Enterprise Planning, Organisation and Computational Systems	Newport
Centre for Research in Built Environment (CRiBE)	Cardiff
Centre for Research in Energy Waste & Environment (CREWE)	Cardiff
Institute of Bioelectronic and Molecular Microsystems and Industrial and Commercial Optoelectronics (IBMM-ICON)	Bangor
Manufacturing Engineering Centre (MEC)	Cardiff
Materials Centre of Excellence	Swansea
National Centre for Product Design & Development (PDR)	UWIC
The Centre for Advanced & Renewable Materials (CARM)	NEWI/Bangor
The Civil & Computational Engineering Centre (C2EC)	Swansea
Wolfson Centre for Magnetic Technology	Cardiff
Wound Research Healing Unit	Cardiff

The CETIC programme has shown significant impact in Objective 1 areas of Wales by encouraging and supporting the growth and increased competitiveness of businesses throughout the Objective 1 regions of Wales through their technology and knowledge transfer activities with Centres

The programme is partly funded by European Structural Funds and, as such, the programme provides support for a dedicated Commercial Manager who can help with the identification, acquisition and exploitation of Centres key R&D activities, facilities and technologies, enabling significant wealth generation and increase in commercial R&D activities within Wales.

Over the first three years of operation (April 2001 - March 2004), the CETIC programme yielded the following:-

1533 Companies Assisted in Wales Total Value of Contracts £4.6M

2005 Non Welsh (UK, Multinational) Assisted Total Value of Contracts £12.3M

106 Jobs Created / Safeguarded at CETICs

- 310 Jobs Created at Collaborating companies
- 660 Jobs safeguarded at collaborating companies
- 647 Research Contracts won at a total value of £99.0M

Annex 8

Knowledge Exploitation Fund

Update on KEF Innovation projects and allocations 2005/6

Project Activity	Number of projects	Total allocation to date
Innovation strategies in institutions	32	£3,620,550
Consortia for industrial training	8	£1,985,336
E-training networks (al institutions in Wales involved)	3	£1,430,174
Patent and Proof of Concept	46	£2,317,357
Collaborative Industrial Research Projects	16	£2,997,716
Technology Transfer Networks	10	£677,333
New Technology Transfer Centres and incubator centres established	8	£3,148,522
New Technology Transfer Centres and incubator centres supported with a contribution to revenue costs	13	£1,381,074
TOTAL	136	£17,558,062

Project highlights and other key initiatives

- Non destructive testing (NDT) network and the capital investment in the NDT validation Centre, based at ECM², have contributed to the development of a major new resource for Welsh industry.
- The Sustainable Energy Technologies (SET) network has laid the foundations for the establishment of the Wales Energy Research Centre launched at ECM² on 23rd September 2005.
- Micro and Nano technology (MNT) academy looking to roll out the project to the UK using support from DTI and DfES
- High Performance Engineering consortia supporting the Wales Motor Sport initiative
- Of the first phase of PPoC projects, there have been five commercial opportunities involving either spinout company formation of licensing of technology

- 77 new companies helped to become established in KEF-supported incubators
- The KEF Technology Transfer Centres have helped to establish 10 new companies and have assisted 925 SMEs with advice on Innovation and R&D
- CIRP projects will lever in £3.5m private sector investment into industrial R&D in Wales
- KEF training consortia accessing UK funding (from DTI, DEFRA, DfES) for MNT Academy, Waste Management Consortia and eSkills Academy
- Master classes in advanced licensing have been provided, including the M.I.T. story
- KEF proposes to establish a Welsh CPD programme for Knowledge Transfer Professionals in partnership with Auril.

Annex 9

Technium

Aim

To provide a network of world class innovation facilities with strong links to academic expertise support and providing specialist support to encourage the establishment and growth of technology based businesses.

The Technium programme is a £150m investment over 3 years and has been substantially supported by EU Structural Funds.

Current situation

The first Technium was established in partnership with Swansea University, the local authority, Welsh Assembly Government, the Welsh Development Agency and the private sector in 2001, and is the flagship for the Swansea SA1 Development.

Technium projects established to date are:

Current

Technium 1	Swansea
Technium 2	Swansea
Technium Digital	Swansea University
Technium Digital@Sony	Pencoed
Technium Aberystwyth	
Technium OpTIC	St Asaph
Technium CAST	Bangor

Under Development

Technium Sustainable Technologies	Baglan
Technium Performance Engineering	Carmarthenshire
Technium Energy	Pembroke

Projected

Technium Bioscience	Roath Basin

Technium Challenge

A business Plan competition now in its 3rd year. Winners are provided a space in Technium and professional support to help establish and grow the business

Global Innovation Network (GIN)

In partnership with Scottish Enterprise GIN is a web-based system enabling Technium clients to liaise with companies in other innovation centres, including the Pacific coast of the USA.

Technium Associate programme

For prospective Technium companies, both indigenous and international, which are potentially next generation tenants of the Technium network.

The WDA is working with the Welsh Assembly Government and its partners to establish a private sector led all-Wales Advisory Committee to oversee ongoing and future Technium developments.

Annex 10

Welsh Assembly Government's Innovation Action Plan 2003

Key Actions for WDA

PROGRESS REPORT 2004/2005

SUMMARY

During 2004/5 WDA Technology and Innovation Programmes have assisted 3350 businesses, 331 individuals, safeguarded and created 3568 jobs. The Programmes have secured £12.25m funding for R&D and new product development, levering in approx £31.5m PSI. Over 4800 technical enquires have been handled. 2543 new product processes & services are under development.

ACTION AREA 1

No.	Ref to IAP Item	Lead Agency	Activity	Current Status
1	**Communicating what can be achieved through more innovation**			
1.1	A communications campaign including mobile road shows and exhibitions, conferences, an annual innovation week, innovation awards, one-to-one advice and seminars	WDA	Communications Campaign	The InnovationWorks campaign includes direct mail, advertising, pr - including 10 week feature with Western Mail, development of an InnovationWorks Guide and Interactive Guide, development of website, e-newsletter, events diary innovation/creativity sessions, events including 'Celebration of Innovation', DTI Living Innovation – Minister for economic Development introduced the video .
1.1.1	International promotion of innovation strengths of Wales			Ongoing & includes: Publications e.g. Advances Attendance at major international conferences & exhibitions with WTI.

				Conferences include Cebit Hanover, ITU Telecoms Geneva, TEAM Birmingham, London Biopartnering Presentations to visiting overseas trade delegations Recommendations of the Nexus Report are being taken forward which includes greater promotion of the academic strengths of Wales to overseas companies and intermediary organisations. Working closer with Wales Trade International and HEFCW. Consultants have been appointed to consider the development of alumni relations across all HEIs.
1.1.2	Expansion of the Commitment to Innovation programme	WDA	Commitment to Innovation	The Commitment to Innovation programme has been reviewed. Recommendations are under consideration.
1.1.3	Innovation awareness events for young people		Awards, Competitions & Communication Campaign	Nearly 3000 young people attended events across Wales in 2004/5 Every primary & secondary school in Wales received material that highlights the importance of innovation Events included: Engineering Education Scheme Wales – Welsh National Convention of Excellence in Engineering & technology WDA technology Prize Competition Welsh Final of Young Engineers for Britain Presentation of Awards at the 3M primary awards competition Inventors Competition at the National Eisteddfod of Wales WDA/WJEC 6th form Innovation Awards exhibition Presentation of Awards at the Wales Student Innovation Awards Final Student projects showcased at Future Wales event
1.2	Creation of Innovation Network Partnership Wales with four sub-regional groups, providing an all Wales platform for innovation: a forum for educational and economic development professionals to engage in strategic development and provide regional input	WDA	Innovation Network Partnerships	Partnerships now well established and continue to attract a wide cross section of public and academic support organisations. To date 2 joint all Wales meetings of INpart members have been held.
1.2.	Development of a network of		Link to CTI	Commitment to Innovation companies have been highlighted as 'good

1	innovation champions			practice' as part of the InnovationWorks campaign. Role of the Innovation Champions to be taken forward and developed as part of InnovationWorks.

ACTION AREA 2

No.	Ref to IAP Item	Lead Agency	Activity	Current Status
2	**Developing more high growth potential businesses**	WDA, HEFCW, ELWa National Council, AG		During 2004/5 WDA Technology and Innovation Programmes have assisted 3350 businesses, 331 individuals, safeguarded and created 3568 jobs. The Programmes have secured £12.25m funding for R&D and new product development, levering in approx £31.5m PSI. Over 4800 technical enquires have been handled. 2543 new product processes & services are under development.
2.1	A stronger technology and R&D drive will be implemented. It will include increasing R & D in indigenous businesses and targeting key technology intensive sectors and overseas companies		Relay Advances SMART Cymru	Ongoing collaboration between Business Support & International Divisions in the attraction of new R&D intensive inwards investment projects. R&D indigenous companies supported through SMART & RELAY & technology transfer & sector activities e.g. April 2004 was the start of a new 4 year contract for Relay. Relay co-ordinated the management & submission of 2 DTI Micro & Nano proposals which were successful securing a total of £4.3m and PSI of £4.3m. Relay also co-ordinated a Welsh led Integrated Project under the EU 6th Framework Programme. Also helped secure £700k DTI funding for the Wales e-Science Centre with equal match in PSI. Successful BioWales 2005 with a brokerage event organised by Relay – 61 companies submitted 91 profiles resulting in 137 one-to-one meetings. Relay also supported further 8 international brokerage events (Hanover Fair, Farnborough Air Show, EPPS 2004, Medica 2004, Pollutec 2004, Medical Devices, Cebit 2005 and incoming Austrian Mission – 338 one to one meetings held.
2.1.1	Increased assistance for companies with assessing market potential and technical evaluations, linked to the		ITCs SMART TEP	Part of new SMART Cymru programme. Individuals can also be assisted by the Wales Innovators Network – see below

	revised innovation grant			
2.2	Develop and implement a plan to increase business investment in R&D in both SMEs and in larger companies	WDA AG	RELAY SMART Cymru Core Activity	Ongoing – see 2.1.1 In addition since the start of the new SMART Cymru programme until April 2005 86 businesses have accepted SMART Cymru funding worth £6.7m. Total applications received in 2004/5 were 78.
2.2.1	Enhance and harmonise existing IP initiatives so that support is available on an all Wales basis		IP Wales WIN SMART Cymru	IP strategy grants now being financed via WDA Innovation Credits. Elements of IP Wales being integrated into WDA.
2.2.2	Enhanced support for establishment of international technology links and greater opportunities for international benchmarking		Relay International Division	Ongoing – trans European links created as a core function of Relay. Working with Universities to link to major international centres of excellence e.g. MIT Activities to support the delivery of NEXUS and increased international promotion of Wales' academic strengths include some benchmarking/market research.
2.2.3	A campaign to raise awareness of and take up of R&D tax allowances	WDA AG		Guidelines being developed on R&D tax credits to be used at Awareness events.
2.2.4	Implementation of outcomes from the Task Futures technology programme		Future Technology Foresight	Final report of the Future Technologies Project published. Recommendations of the report now being implemented. Focusing on encouraging businesses to actively consider future technical developments in a variety of sectors. Providing an all Wales overview of technical developments.
2.2.5	Establishment of , and support for, new specialist technology and R&D centres – including ECM²		ECM²	New manager appointed – Adrian Jickells. The total number of jobs in ECM (154) has exceeded the 3 year target set by the CORUS regeneration fund. As at 04.05 ECM houses 17 companies. TWI non destructive testing centre now well established. Quinetiq secured KEF & WEFO funding for the relocation and development of a gas turbine test facility.
2.2.6	Implementation of Wales Bioscience Programme		Core activity	Ongoing work to support growth of indigenous companies and to target new inward investors. Successful BioWales 2005 with 234 delegates. Successful brokerage event organised by Relay see 2.2.1. Continued input into proposals for BioTechnium and BioScience focus at Roath Basin. Liaising with WAG re diagnostics sector.

				15 companies represented at Medica resulting in 147 one to one meetings
2.2.7	Full integration with enhanced 'academia-company' links and sector/technology for a networking activities		Fora	Ongoing – Review of individual fora undertaken as part of Agency wide activity. Some for a activities now supported by KEF. KEF also supports sector training consortia and Technology Transfer Networks.
2.2.8	Development of new financial products to assist companies in incubator/innovation centres		Finance Wales	New IP fund for creative industries.
2.3	The roll-out of "hub" Technium centres and sector specific "satellite" Technium centres across Wales	WDA	WDA	To date £90m has been deployed. Further £40m and additional Technium under consideration **Technium 2** – now complete **Technium Optic** now complete and open for business **CAST** – complete **Technium Digital** is filling up with tenants – including 2 American inward investors. **Techium Aberystwyth** now open and filling up **Technium Sustainable Technologies** –now complete **Technium Bio** – WDA continuing to resolve issues **Technium Performance Engineering** – project started **Technium@Sony** – complete Feasibility studies commissioned for Technium Centres at **Nantgarw** and **Roath Basin** **Technium Energy** at Cleddau Bridge – discussions at advanced stage Strategy & Legacy documents produced. All Wales Steering Group to be established All Wales Technium activities include Technium Challenge, VPN and Global Incubator Network and new Technium Associate Membership
2.3.1	Support for other incubator centres		KEF/Regions	Ongoing and includes those supported by KEF
2.4	Launch of the "Technology Commercialisation Centre" to acquire and exploit strategic world-beating technologies for	WDA AG	Technology Commercialisation Centre	Dr Allan Syms appointed to lead TCC project. Initial investments made and advice provided by Finance Wales

	the benefit of the Welsh economy			
2.4.1	Carry out a study into the feasibility of establishing a Proof of Concept Fund		KEF	No funding available at this stage for business – this being considered. Proof of Concept fund for academic projects is available from KEF and to date has allocated £2.9m for 46 projects. Second call for proposals in October 2006.

ACTION AREA 3

3	**Better Equipping People to Innovate**			
3.1.1	Establishing an "innovation accreditation" scheme for junior staff	WMC ELWa		No Further work done
3.2	Sectoral extranets – pilot the concept with the Welsh Automotive Forum. If evaluated as successful roll-out to other identified sectors, in tandem with the 'Broadband Wales Action Plan' proposals	WDA AG		No further work done
3.2.1	Continued support for sectoral fora		Fora	Support currently provided to automotive, electronics, aerospace, medical, materials, opto electronics, mechatronics and the printing and coating sectors. Review of all fora undertaken. New contracts and more formalised agreements are now in place.

ACTION AREA 4

No.	Ref to IAP Item	Lead Agency	Activity	Current Status
4	**Simpler, more flexible innovation support & funding**			
4.1.1	Innovation and Technology Counsellors (ITCs) network to be expanded to include specialist advisors		ITCs	ITC activity ongoing with increased involvement in developing projects with businesses. During 2004/5 ITC network carried out 672 projects with businesses, handled 2669 technical enquiries and helped to secure £5.8m of grant funding which levered in £8.2 m of PSI. ITCs are instrumental in helping to deliver a number of projects including the Technology Exploitation Fund. ITCs are also involved in delivering events and workshops.
4.1.3	Implementation of Wales Manufacturing Advisory Service (MAS)		MAS	New tender let
4.1.4	An Investors Forum, linked with Finance Wales, will help innovative projects secure private sector finance		Finance Wales SMART Cymru	Ongoing collaborations between Finance Wales and other WDA Programmes e.g. SMART & WIN
4.1.5	Embed and build upon Wales Innovators' Network		WIN	Over 800 individuals registered as members of WIN. Events organised throughout Wales. New procedures in place and structural development plans are there to help take ideas forward. Several members have successfully commercialised new products. WIN members have had another successful year at the International Exhibition in Geneva and the British Invention Show winning in total 2 platinum, 2 gold, 8 silver and 4 bronze medals. Ann Sudder won a gold award for 'Support for Product Development' at the Female inventor and Innovator of the Year Awards 2005.
4.2	Single enhanced innovation grant scheme, incorporating most of the existing portfolio of funding, such as SMART/SPUR/RIN; the	WDA	SMART Cymru TEP	SMART – Since the start of the new SMART Cymru programme until April 2005, 86 businesses have accepted SMART Cymru funding worth £6.7m. Total applications received 2004/5 were 78. Streamlined application process developed and new lead regeneration exercise is underway. Successful Objective 1 application to WEFO.

	Technology Exploitation Programme (TEP), and the newer, small Innovation Credits			TEP – has exceeded targets or job creation, jobs safeguarded and PSI. 420 projects approved in 2004/5. WEFO increased grant percentage rate. 299 Innovation credits were approved with £262k funding TEP & Innovation Credits to be integrated with SMARTCymru for future streamlined delivery.
4.2.2	A proactive campaign and hands-on service to ensure more businesses access the funding available from the fullest range of available financial assistance and support.		Core activity SMART Cymru Finance Wales	Ongoing. Series of workshops highlighting a range of financial assistance available have taken place around Wales.

ACTION AREA 5

No.	Ref to IAP Item	Lead Agency	Activity	Current Status
5	**Maximisation of economic development impact of our universities and colleges**			
5.1	Integrated 'company-academia' link support activities	WDA AG HEFCW	Know How Wales KEF Centres of Excellence TEP	Following transfer of KEF to WDA in 2004, review completed and principal recommendations implemented. Innovation elements of KEF (Collaborative Industrial Research projects, Patent and Proof of Concept Fund, Technology Transfer Centres and Technology Transfer Networks, Innovation development programmes and sector training consortia) being more closely integrated with other industry-academic support activities including CETIC and Know How Wales. Know How Wales review undertaken. Implementation of the Review ongoing. KHW secured > £1m funding through Knowledge Transfer Programme and GO Wales. KHW continues to be instrumental in initiating industry academia projects and supporting events.
5.1.1	Mainstreaming of CETICs network		CETIC	Phase 2 of CETIC underway. 18 new CETICs accredited. £1.69 Objective 1 funding secured as part of and all Wales programme of approximately £6.7m.

				New marketing materials developed and series of open days of CETICS held. CETICs represented at a number of major international conferences.
5.1.2	Greater overseas promotion of Welsh academic excellence		Marketing & Promotion of Industry / Academia Links	Ongoing publications and events. As part of the implementation of the Knowledge Economy Nexus Report increased promotion of academic strengths of Wales being undertaken. Mapping of expertise completed & preparation of marketing materials in support of healthcare, automotive & aerospace sectors underway.
5.2.1	Build international links with HEIs to share best practice and create benchmarking opportunities	WDA HEFCW HEIs		Ongoing including Centres of Excellence activities and Relay participation in collaborative projects. WDA working with HEFCW

ACTION AREA 6

No.	Ref to IAP Item	Lead Agency	Activity	Current Status
6	**Support Actions – Measurement and Monitoring**			
6.1	The WDA's website wales4innovation.com will be well marketed and provide an effective portal for: access to innovation funding and support; best practice examples, and matching technology needs and opportunities, with links to other innovation-relevant sites	WDA AG	Communications Campaign	Wales4Innovation is being replaced by InnovationWorks website and information on WDA website.
6.2	A set of innovation indicators will be developed, and Wales will be benchmarked against	WDA AG		Ongoing activity in WAG & WEFO

	other regions (UK & international)			
6.2.1	Establishing benchmark statistics			Ongoing
6.3	Involvement of expert private-sector and academic representatives in monitoring progress	WDA AG		

Annex 11

KNOWLEDGE ECONOMY NEXUS

IMPLEMENTATION ACTION PLAN UPDATE (October 2005)

PRIORITY 1: *NEXUS* RECOMMENDATION 4				
To ensure that all parts of our national innovation system are intimately involved in its future, holistic development *and* help to assess major collaborative opportunities.				
Ref.	**Sub-section**	**Lead Org.**	**Agreed actions**	**Current status**
4	To ensure the collaboration message is fully to the fore both in respect of the *Reaching Higher* and *Wales for Innovation* strategic agendas.	WDA HEFCW	Rationalising of existing support initiatives. Academia to make better use of UK funding streams, ensuring more coherent application and greater impact – competing bids should cease to be the norm. Development of Micro-Nano Technology fabrication	WDA internal working group established to develop plan for more integrated industry/academia support programme – ongoing (but is being influenced by the merger). Main lead by Wales Relay Centre regarding DTI and EU Framework funding. Workshop on new DTI Technology Programme. WRC inputting to FP7 KEF training consortia accessing UK funding (from DTI, DEFRA, DfES) for MNT Academy, Waste Management Consortia and eSkills Academy The UK Laser Machining Centre at Bangor and the Cardiff University Microbridge focussed Ion beam facility have both

			facilities in Wales	negotiated and received their contracts from the DTi. The WDA /WGA parallel contracts are in the last stages of being finalised and are expected to be signed by the end of September.
			Development of a networked UK Nano-Micro training academy based in Cardiff	The proposal has been resubmitted to the DTi and is being developed to meet their latest trans-UK requirements.
			Horizon scanning	Futures report printed. Series of cross-disciplinary workshops e.g. telehealth. Marlize Palmer has been replaced by Rachel Stephens as Future Technologies Programme Manager, HEFCW continues to progress reconfiguration agenda. Current proposals under consideration by the Reconfiguration Panel include collaborative activity in Cognitive Neuroscience and a proposed Cancer Institute. HEFCW currently funding collaborative HE projects in aerospace and the creative industries' Skillset endorsed Wales Film Screen Academy, a trailblazer for the Dragon Studios. In May 2005, HEFCW launched its new Strategic Development Fund (approx £3m

				pa) to promote smaller scale collaborative projects. Current projects relate to the appointment of a facilitator in the new Wales European unit in Brussels (WHEB) to help HE sector maximise opportunities in Europe, and a joint proposal with the WMC to bolster Welsh business schools co-operating more. Major discussions continuing in SE Wales on HE Provision there, following publication of the Cook and Bull report in May 2005. . Reconfiguration agenda features in report being prepared for ELL Minister in response to HEFCW's current letter that asks for advice on further steps to strengthen the role of HE in economic development. To be submitted in October 2005. Reconfiguration agenda also underlined in Phil Gummett letter to ELL Minister (16 September) on *Strategic Uses of Reaching Higher Funding*

PRIORITY 2: *NEXUS* RECOMMENDATION 2				
To ensure that collaborative opportunities, which will enhance the excellence of our research base and that are in line with market-place drivers, are identified, developed and seized.				
Ref.	**Sub-section**	**Lead Org.**	**Agreed actions**	**Current status**

2(a) /(b)	Identify industry-academia research project opportunities, and also major inter-university collaborative opportunities, that could be supported by catalytic funding.	WAG WDA	Bid to Assembly Capital Fund as part of BPR2004.	Several cross-portfolio capital bids were approved during BPR2004 to help drive forward the knowledge economy agenda. These include: ▪ Institute of Life Science Objective 1 application for ERDF funding approved. ▪ Commercialising world-class HE micro-nanotechnology research through Welsh and UK elements of the UK Micro-Nano Technology (MNT) Network. ▪ A Fast track proposal to set up a centre of Nano excellence node in Cardiff has been approved by the DTi and is being subjected to due diligence. The bids respond fully to the need for stronger academic collaboration in Wales. For example, through KEF there are 7 new TTCs, an example being the Centre for Health and Environmental Research (CHER) based at Aberystwyth and jointly managed by University of Aberystwyth and College of Medicine In June 2004 KEF invited expressions of interest from HEIs for collaborative research projects, now 16 in number, £3M of projects. OST has announced a third round of the Science Research Investment Fund (SRIF3)

				for 2006-07 and 2007-08 to enable HEI investment in state of the art equipment and facilities for research. HEFCW is combining its capital funding with SRIF funds for those years to create a single consolidated fund of £46.5m. An Outline Business Case for a research/clinical PET/CT Scanner, with a small-bore research scanner and a cyclotron to produce the very short-lived isotopes needed for research, has been given tri-Ministerial funding approval (Andrew Davies/ Brian Gibbons/ Sue Essex). The facility will be built at the Heath Hospital site in Cardiff with an all Wales research remit. It will exploit synergies with the Brain-imaging Centre, the Wales Gene Park and other centres of excellence in the area. A group, led by Cardiff University, is now proceeding to Full Business case.
2(c)	Provide universities with access to professional knowledge transfer specialists, funded jointly on a long-term basis by the institutions and HEFCW.	HEFCW WDA WAG	Infrastructure/financial support should be delivered via 3M fund – as part of a dual funding system.	HEFCW's Third Mission Fund is to double in size from £3.1m to £6.1m by 2007/08. HEIs requested to demonstrate how additional allocations will be used strategically alongside other sources of funding to deliver their 3M aims and objectives. HEFCW and WDA continuing to review

			WDA/HEFCW to consider ILO training needs/processes.	options for better co-ordinated funding via a task & finish group reporting jointly to HEFCW's 3M Committee & the Joint Operations Group. Report due December 2005). Master classes in advanced licensing have been provided, including the M.I.T. story Working with ILOs to develop model for all-Wales licensing programme. Ongoing - WILO's conference taking place Oct05, an opportunity for WDA for continuing discussion. A meeting taking place in October 2005 to agree a model for the licensing programmes. The evaluation of KEF support for innovation strategies in HEIs is now under way. BIC Innovation is the consultant.
2(d)	Appropriate promotion, appraisal and career development opportunities for knowledge transfer specialists within academia.	WAG HEFCW	Develop HR strategies with Welsh HEIs.	Ongoing work covering all HE staff: Consultancy commissioned by HEFCW to support HEIs in development of appropriate HR strategies by April 2005 (ECU involved, to ensure equal opportunities covered), ongoing to October with report to Council December 2005 on outcomes KEF looking to establish a Welsh CPD

				programme for Knowledge Transfer Professionals in partnership with Auril. The first meeting will be 10th October 2005.
2(e)	Improve joint working between WDA and HEFCW.	WAG WDA HEFCW	Stronger WDA/HEFCW joint working and dual funding issues to be driven by partnerships, ensuring the avoidance of double funding.	WDA/HEFCW/ELWa strategies and operational groups have developed joint action plan for just this purpose. Gretel Leeb in discussion with WAG reviewing the future of these groups post-merge HEFCW 3M committee also delivering improved partnership working. HEFCW represented on all WDA's KEF evaluation panels and vice versa. New calls for proposals coming out on 27th September 2005 for PPoC, CIRP and TTCs (capital). A meeting on 19th September taking place for WDA/ELWa/WAG/HEFCW to agree on joint overseeing of the development of KEF funded consortia for industrial training Recommendations for joint working post-ASPB merger process will also be put forward in HEFCW's October 2005 remit letter report referred to at 4 above.
2(f)	Each university to appoint a Pro Vice Chancellor responsible for the innovation activities of their institution	HEFCW	HEFCW to progress, possibly through next strategy letter to Vice Chancellors.	HEFCW 3M strategy request sought nomination of a member of staff at Pro Vice Chancellor level to be responsible for 3M matters. Incorporation of innovation

				responsibility under this PVC recommended at 3M seminar on 6 July. **Done** Clarification being sought from HEIs that have submitted 3M strategies without the senior manager endorsement sought in the request circular prior to release of the full 3M funding allocations. **Done**
2(g)	WDA to consider the appointment of high level account managers for each university, keeping regional, national and international collaborative opportunities in view.	WDA	WDA to consider appointing dedicated HEI account managers to identify all collaborative opportunities. Acknowledged that account management is active in some institutions but need to formalise to reflect both regional and national issues.	WDA will utilise T&I staff in the regions and centrally including KHW and RELAY officers. These personnel will be located regionally in the Business Foundations element of the new merged organisation. T&I staff in regions continue to work closely with HEI. Final outcome will be influenced by the implementation of the findings of the KEF and KHW reviews.
2(h)	Techniums	WDA		The Technium Sustainable Technologies building has been completed and is currently being fitted out ready for relevant tenants. This project is led by the council but managed by the University at Swansea The performance engineering Technium is now underway. Significant collaboration with IBM in supplying PLM software to partners in the project. Advanced discussions with several Automotive companies are underway in conjunction with WDA international

				colleagues. Technium at Sony has been opened and has housed its first tenants. CAST Technium has recently opened and is currently negotiating with its first tenant (winner of the Technium Challenge) Technium Challenge goes from strength to strength with number and quality of applications improving. A Technium Associate programme is about to be launched. This will be available to both indigenous and international companies who are potentially next generation tenants of the Technium network Technium Optic has developed its technology centre and has attracted some prestigious academic groups to locate there. Incubation facility has many relevant tenants occupying the facility.

PRIORITY 3: NEXUS *RECOMMENDATION 1*				
To raise significantly the awareness in high value-added companies throughout the world of Welsh research excellence – whether in universities, companies or institutions like IGER.				
Ref.	**Sub-section**	**Lead**	**Agreed actions**	**Current status**

		Org.		
1(a)	Develop a much stronger strategic and more integrated marketing team to better promote our world class R&D strengths, working closely with universities and business intermediaries.	WDA HEFCW WIC HEW	WDA and HEFCW officials to pull together what is already going on from a marketing perspective, with transition identification from where we are to where we should be.	Ongoing activities in this area include: R&D missions with WTI; Advances journal; CETICs; international technology symposia with Invest UK; RELAY centre activities led by the WDA. WDA taking the lead on the global promotion/marketing of world-class S&T strengths from academia in Wales. A working group, involving key stakeholders WDA, HEW, HEFCW, WAG, British Council and WIC has been set up and are piloting the promotion of healthcare, automotive and aerospace industries. WDA undertook a mapping exercise of all relevant research, science and technology and specialist facilities in Welsh academia for promotion overseas as identified by WAG. This mapping exercise was ratified by Vice Chancellors offices of Welsh HEIs A marketing plan which encompasses this promotion of Welsh HEIs has been produced. Centres of Excellence for Technology and Industrial Collaboration (CETICs) have showcased near-market technologies and excellence at CEBIT 2005, Hanover Fair 2005, Paris Airshow, IFAT, Dusseldorf and

				Bio in Philadelphia. As a result of these events a number of major international companies are in discussion with Welsh institutions regarding collaborations. Further collaborative opportunities are being discussed with UKTI and WTI for involvement of leading Welsh academic groups in proposed future overseas missions. The WDA has also organised a number of high level visits to academic institutions in Wales by overseas companies.
1(b)	European Developments	HEFCW		Work currently in hand to utilise Business Eye as a vehicle for bringing HE related-services to attention of more businesses in Wales. GO Wales now embarked on Phase II (with ESF funding) with renewed emphasis on bringing HE offerings to the attention of the business community. GO Wales invited to have a promotional stand at Manchester EU presidency event in November. Following success of HEFCW 1 March Brussels event, HEFCW hosting November meeting of UK High Level Policy Forum in Cardiff. WEFO invited to contribute to Regional issues paper.

				Joint HEW/HEFCW proposal to improve Welsh HE presence in Brussels to be first SDF proposal agreed by Council panel on 23 September. Next step taking it forward with HEW
1(c)	Knowledge Bank for Business (KB4B) pathfinding activities should take account of Nexus recommendations.	WDA	Ensure KEF contractors and KB4B team are fully aware of Nexus recommendations.	KEF review report received. KB4B was launched on a pathfinder basis on 27 September. Over fifty high growth client companies have been identified and the KB4B team will work closely with them over coming months to agree a programme of support that will help them achieve more rapid rates of growth. This will include brokering deals with academia where appropriate. The KB4B team will fix up a meeting with HEFCW over coming weeks to discuss KB4B links with academia
1(d)	Wales Science Strategy	WAG/ WDA/ HEFCW		Ministerial meeting held Mar05 to discuss draft science strategy paper prepared by Dr Ron Loveland. Initial proposal that science strategy should focus on 3 key areas: • Low Carbon • Health • Sustainable Development A widespread discussion on the 3rd topic was held on 8th July and included representatives from WAG, WDA, HEFCW and academia. Nigel Graddon has been seconded from WDA

				to office of Chief Technology Officer to assist with development of science policy (health strand in particular) and Nexus reporting WDA providing written evidence to WAG appointed Science Policy advisor. HEFCW preparing evidence to EDT Committee review on science policy in September 2005
1(e)	Wales Spatial Plan			Knowledge Economy and role of academia are key to themes in Spatial Plan. HEFCW joined (19 September) ELWA task and finish skills group on LNG developments at Milford Haven to ensure HE interests taken into account. HEFCW represented on WAG Spatial Plan Internal Officers Group, pressing HE interests

PRIORITY 4: *NEXUS* RECOMMENDATION 3				
To ensure that companies in Wales have ready access to good university expertise within a reasonable travelling distance and that the international contacts of our academics are used to full business advantage.				
Ref.	**Sub-section**	**Lead Org.**	**Agreed actions**	**Current status**

3(a)	To enhance company support, WDA should work more closely with neighbouring RDAs and university/company networks.	WDA	Mining of existing contacts and cataloguing what we already have in the first instance in terms of links to other RDAs.	WDA is part of the DTI recently established RDA innovation network. Virginia Chambers visited Scottish Enterprise and discussed (also with Northern Ireland representatives) the DTI technology strategy and implications etc for UK devolved regions. Pat Jones (KEF) has taken part in discussions with UK Funding Councils and ESRC on a call for proposals to map the impact of HE in the UK giving regional perspectives Management of the DTI Manufacturing Advisory Service provides Welsh SMEs with links into UK R&D centres of excellence – new contract has been let RELAY service links Welsh SMEs with EU companies and R&D facilities via trans-national R&D framework projects. HEFCW continuing to raise profile of HE with employers/businesses in Wales through the Sector Skills Councils Network for Wales, following-up on the 4 early SSC Agreements and preliminary work on the next 6 during Autumn 2005. 10 TTNs supported by KEF and one about to become a part of WERC.

			Possible new role for KHW.	KHW is working with HEI and companies to support CIRPS
3(b)	Make maximum use of our internationally active support programmes, utilising and exploiting the range of national and international contacts of our world class academics.	WDA HEFCW	WDA to evaluate current activity and priorities, particularly in Indian and Chinese markets. Further thought to be given to better cataloguing key contacts of Welsh world class academics. Techniums and international collaborations and initiatives	T&I team working extensively with International division, UK Trade & Invest to explore opportunities for exploiting academic networks in these strategically important regions. WDA T&I have completed a report on academic links with China and India. Delegations from China have visited Wales to look at academic expertise and WDA is helping identify market opportunities in the remainder of the calendar year. WDA has established offices in both Beijing and Delhi. Alumni Project (WDA / WAG / HEFCW), aiming to capitalise on the strengths of former students of Welsh HEIs, has been commissioned. This work is expected to be completed giving salient recommendations on how this can be taken forward. Research contract to be awarded by end September 2005 A strategic alliance and incubator presence in Technium Swansea has been made between Fudan University, China, Technium

				and Swansea University. As part of the reciprocal agreement with Fudan they are making space and facilities available for Technium tenants to utilise while visiting. There is planned a formal ribbon cutting ceremony in October to coincide with the University centenary celebrations and a WTI trade mission. The Global Incubator Network is currently being developed in conjunction with Scottish Enterprise and the Pacific Incubator Network. The web site and the management company are now in place. A pilot of the network is currently underway. Already have had global interest for membership of the network including New Zealand, South Africa, USA, Canada, Scandinavia, various European networks and Brazil. Has enormous potential for Welsh businesses to collaborate on a global basis with like-minded partners. Technium has been invited by WTI to attend a trade mission to South Africa to discuss Technium and collaborate with their 'Innovation Hub', consisting of an incubation and academic network.

PRIORITY 5: *NEXUS* RECOMMENDATION 5				
To help maximise the direct commercialisation of our university knowledge/expertise.				
Ref.	**Sub-section**	**Lead Org.**	**Agreed actions**	**Current status**
5(a)	Create a more integrated and holistic support system for commercialisation of university ideas.	WAG WDA TCC	KEF and KB4B studies are key to delivering these recommendations with recognition that having the right people in the system is a pre-requisite to success. This activity is a part of what the WAG reconfiguration policy is intended to achieve	Deployment of HEFCW 3M fund & other funding streams such as SRIF and the SDF will also be critical alongside KEF and KB4B developments. HEFCW 3M Committee provides a vehicle for ensuring this happens. Following review of KEF there have been calls for: ▪ Patent & Proof of Concept (PPOC) – 46 projects approved (£2.3m). ▪ Collaborative Industrial Research Projects – 16 approved (£3m) ▪ Technology Transfer Centres (TTCs) – 8 approved (£3.1m) ▪ TTCs and incubator centres supported with contribution to revenue costs – 13 approved (£1.4m) ▪ Technology Transfer Networks – 10 approved (£0.7m)
5(b)	Enhance the calibre of the projects selected for PPoC funding. Resulting in more spin out companies or the licensing of the IPR.	WDA HEFCW	Work more closely with HEIs (involve ILOs) with objective of raising quality of PPoC bids. Review the success of the Scottish PPoC model.	The WDA Technology Counsellors will be working with institutions to support the development of PPoC applications and provide ongoing support for the projects

				SMARTCymru due diligence methodology adopted for PPoC applications.
5(c)	Greater emphasis to be placed on supporting technology licensing, building on the strength and expertise of IP Wales, WIN, NHS Wales IPR. Consideration to be given to commissioning a call-off licensing operation.	WDA WAG	Consider the establishment of a KEF funded call-off contract for licensing expertise. WDA to review with WILO and HEFCW.	WDA currently reviewing integration of IP Wales' activities into T&I group. Possible use of expertise to help with valuing and exploiting university IP. **Ongoing** T&I team currently offer academics support with commercial technology licensing in certain sectors. **Ongoing** WDA met with NHS re the Intellectual Property and Innovation Advisory Service, which has been set up to advise NHS bodies on how they can best manage, share and capitalise on innovations that are developed within the NHS in Wales.

PRIORITY 6: *NEXUS* RECOMMENDATION 6				
To increase greatly the awareness in all walks of life of the importance of generating implementable new ideas.				
Ref.	**Sub-section**	**Lead Org.**	**Agreed actions**	**Current status**
6(a)	Those organisations involved in IP to work together to raise profile of the role of individuals in generating new ideas	WDA		InnovationWorks up and running. At this stage the focus is on businesses. HEIs receive support through KEF to increase innovation in institutions.

PRIORITY 7: *NEXUS* RECOMMENDATION 7				
To measure better the strength of the knowledge-economy in Wales.				
Ref.	**Sub-section**	**Lead Org.**	**Agreed actions**	**Current status**
7a	Identify better sustainable development and innovation indicators to produce a more robust set of knowledge economy performance measures.	WAG WAG/ WDA/ HEFCW	Embrace European innovation indicators and gain access to PriceWaterhouseCoopers innovation survey reports. Develop better communication between economists/statisticians in WAG, WDA and DTI as appropriate. A recent report from DTI and UK treasury about measuring impact of science and innovation	Further work needed to build on HEFCW 3M committee's sub-group report on metrics (although new TMF incorporates some of its recommendations already). HEFCW involved in UK level activity via its seat on Steering Group for annual survey of HE-Business & Community Interactions (HEBCIS). Latest survey results due November 2005. WDA, EPD and ERU working on innovation indicators. 2003-04 Business R&D data published. Consider using, adapting or adopting these metrics for measuring performance in Wales to save re-inventing the wheel. Judith Cole liaising with Jonathon Price and Gareth Morgan (EPD) to see what is relevant in a Wales context.
7b	Joint HE Funding Councils & ESRC Research Project on the impact of HEIs on Regional Economies		HEFCW contributing to this £2m+ three year project & represented on project steering group	An anticipated outcome of this research programme is the identification of metrics to evaluate impact of HE sector on both social & economic well-being. The sustainable economic impacts arising from

				society/community orientated activities are likely to be a key feature in this programme.

Annex 12

RAE Unit of Assessment (2001) versus HEI (3/4/5/5* in Science Engineering and Technology)

	Cardiff University	Univ Glam	NEWI	UWA	UWB	UWIC	UWC Medicine	UWN	UWS	SIHE
Clinical Laboratory Sciences							5			
Community-based Clinical Subjects							4			
Hospital-based Clinical Subjects							4			
Clinical Dentistry							4			
Pharmacy	5									
Other Studies and Professions Allied to Medicine	5*					3b				
Psychology	5*				5*				4	
Biological Sciences				3a	4					
A - Mammalian and Medical Biology	5									
B - Ecological and Environmental Biology	4									
Agriculture				3a	5					
Food Science and Technology						3b				
Chemistry	4		3a (1)		3a (1)				4	
Physics	5			4					5	
Earth Sciences	5									
Environmental Sciences					4					
Pure Mathematics	5			3b	3a				5	
Applied Mathematics				4						
Computer Science	5	4		4					5	
Civil Engineering	5*								5*	
Electrical and Electronic Eng.	5			2	4				4	
Mechanical, Aeronautical and Manufacturing Eng.	4							3a	4	2
Built Environment	5	3b								
Town and Country Planning	5*									1
Art and Design			2	3a		4		5		3b
Sports-related Subjects		3b			5	3a				

Annex 13

Funding of Research in Welsh Higher Education Institutions

Funding of HEIs in Wales

		Cardiff University	Univ Glam	NEWI	UWA	UWB	UWIC	UWC Medicine	UWN	UWS	SIHE
Funding											
Research Councils	**Allocation to HEIs (Fiscal Year 2002-2003)**	11,775,000	294,000	6,000	4,504,000	3,198	0	2,606,000	81,000	5,355,000	0
Wellcome Trust	**2002**	1,400,000				200,000		3,100,000			
(Calendar years)	**2003**	5,600,000				1,000,000		1,600,000			
	Total	**7,000,000**				**1,200,000**		**4,700,000**			
HEFCW	**QR 2004 -2005**	28,293,748	1,109,870		4,838,200	7,249,269	868,539	6,347,510	306,537	7,082,217	
	RIF 2004 -2005	49,696	691,014	120,202	1,039,832	464,695	252,575		93,260	1,231,388	81,218
	SRIF1 2002-2003	5,950,390	246,641	136,055	1,514,994	2,159,905		2,634,195		2,718,470	
	SRIF1 2003-2004	7,749,259	321,177	176,950	1,970,527	2,810,650		3,423,439		3,539,916	
	Total	**13,699,649**	**567,818**	**313,005**	**3,485,521**	**4,970,555**		**6,057,634**		**6,258,386**	
	SRIF2 2004-2005	10,437,336	761,780	115,755	2,277,903	2,910,986	287,834	2,945,100	97,725	3,278,517	12,533
	SRIF2 2005-2006	10,437,336	761,780	115,755	2,277,904	2,910,986	287,834	2,945,100	97,725	3,278,517	12,532
	Total	**20,874,672**	**1,523,560**	**231,510**	**4,555,807**	**5,821,972**	**575,668**	**5,890,200**	**195,450**	**6,557,034**	**25,065**
INDICATIVE THIRD MISSION FUNDING (HEFCW)	**ALLOCATIONS PA FOR 2004/05 TO 2006/07**										
	Foundation Funding	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Supplimentary Funding	656,929	167,884	10,928	222,442	342,398	143,710	290,316	95,463	487,662	27,553
	TOTAL	**706,929**	**217,884**	**60,928**	**272,442**	**392,398**	**193,710**	**340,316**	**145,463**	**537,662**	**77,553**
KEF (5)											
Support for HEIs in Wales (2004 - 2005)	**ESF - Entrepreneurship**	79,000	74,006	79,132	79,167	79,167	79,166		79,916	79,167	79,916
	ESF - Innovation	50,647	9,517	79,046	75,631	79,167			68,824	79,167	79,166
	ESF - E-Training			315,000							315,000
	ESF - Consortia		315,000							27,822	
	ERDF - Patent & Proof of Concept (PPoC)		272,000	316,000		274,905	87,570			414,995	
	ERDF - Technology Transfer Network (TTN)				128,691					50,495	
	ERDF - Technology Transfer Centre (TTC)				166,045	95,833				50,000	
	ERDF - Incubator Centre (INC)				190,100						
TOTAL (2004 - 2005)	**ESF & ERDF**	**129,647**	**670,523**	**789,178**	**484,836**	**529,072**	**166,736**		**148,740**	**701,646**	**474,082**
Support for HEIs for ALL Phase II of KEF (To include ERDF totals above)	ERDF Only (TTN, TTC, PPoC & INC)		272,000	316,000	484,836	370,738	87,570			901,196	
CETIC	**Support for HEIs in Wales 18 Centres (2004 - 2005)**	**450,000**	**200,000**	**50,000**	**100,000**	**250,000**	**100,000**	**100,000**	**100,000**	**400,000**	
	2005 - 2006	**450,000**	**200,000**	**50,000**	**100,000**	**250,000**	**100,000**	**100,000**	**100,000**	**400,000**	
	2006 - 2007	**450,000**	**200,000**	**50,000**	**100,000**	**250,000**	**100,000**	**100,000**	**100,000**	**400,000**	
TOTAL	**(All Phase II)**	**1,350,000**	**600,000**	**150,000**	**300,000**	**750,000**	**300,000**	**300,000**	**300,000**	**1,200,000**	

Notes

1 Table does not include Awards of EU Framework 5 and Framework 6 funding to HEIs

2 Table does not include individual successful EU (Objective 1 and 2) funding by HEI(s)

3 UWCM and CU Merger 2004

4 Timescales of awards and applications differ, totals therefore best compared horizontally per funding steam rather than vertically

5 Does NOT include KEF latest round of Funding TTN, TTC and CIRP (all figures correct as of 28/11/2004)

Annex 14

Academic expertise in support of key sectors:

	Industry / Sectors / Technologies *(Knowledge Economy Nexus Report)*	CETIC	Other Academic Groups	Facilities / *Fora*
1	**Healthcare / Bioscience** *(Chemicals / Pharmaceuticals / Bioscience)* *(Social Care)*	Wound Healing Research Unit (CU - formerly UWCM) AberBioCentre (UWA / IGER) Centre for Applied Marine Sciences CAMS (UWB) Institute for Bioelectronic and Molecular Microsystems IBMM (UWB) Centre for Advanced and Renewable Materials CARM (UWB)	Institute of Medical Genetics (CU - formerly UWCM) Cardiff Institute of Tissue Engineering and Repair CITER (CU - formely UWCM) Cardiff School of Bioscience (CU) Wales Cancer Trials Network Welsh Heart Research Institute (CU - formerly UWCM) Biomedical Research Centre (CU - formerly UWCM) Wales Institute for Forensic Medicine (CU - formerly UWCM) Welsh School of Pharmacy (CU) - Medicinal chemistry - Drug Action - Drug Delivery - Health & medicines Department of optometry & Vision Sciences (CU) Wales Network in Wound healing, tissue repair and burns and plastic surgery - (Proposed) TTN	Wales Gene Park Human Gene Mutation database (CU - formerly UWCM) Institute of Life Sciences (UWS) Clinical Research in Diabetes (CU formerly UWCM) Cardiff University Brain and Repair Imaging Centre (CUBRIC)

			Biomechanics - Meditech (CU - formerly UWCM)		
1	**Healthcare / Bioscience (continued)**		Aquaculture Wales (UWS)		
			Institute for Medical and Social Care Research IMSCAR (UWB)	Biobank Cymru	
			Bangor School of Biological Sciences (UWB)		
			Centre for Cognitive Neuroscience (UWB)	Research Vessel Prince Madog (UWB)	
			Bangor School of Psychology (UWB)		
			Bangor School of Ocean Sciences (UWB)		
			Wolfson Institute of Clinical and Cognitive Neuroscience (UWB)		
			Bangor School of Sport, Health and Exercise Sciences (recovery from injury) (UWB)		
		National Centre for Product Design & Development Research (Medical Applications Group) (UWIC)			
			Cardiff School of Biosciences (CU), including research groupings in Connective Tissue Biology; Genetics; Molecular Cell Biology; Neuroscience; Microbiology; Biodiversity and Ecological Processes.		
			Wales Cancer Institute (CU) - Wales Cancer Trials Network - Wales Cancer Bank		
			School of Optometry & Vision Sciences (CU)		
			ESRC Research Centre on Social and Economic Aspects of Genomics (CU & Lancaster)		

2	**Behavioural sciences** *(Social Care)*		Centre for Experimental Consumer Psychology (UWB) Wolfson Institute of Clinical and Cognitive Neuroscience (UWB) Institute for the Psychology of Elite Performance (UWB) Institute for Medical and Social Care Research (IMSCAR (UWB) Bangor School of Sport, Health and Exercise Sciences (UWB) School of Psychology (CU) Dept of Psychology (UW Bangor) School of Journalism (CU) International Politics (UWA) School of Social Sciences (CU) - Cardiff Institute of Society Health and Ethics	
3	**Creative industries** *(Creative industries)*	Centre for Advanced Software and Intelligent Systems CASIS (CU / UWA) Wrong place should be in software!! National Centre for Product and Design Research PDR - (UWIC)	UWN : - The Centre for Photographic Research - Smart Clothes and Wearable Technology - Metatechnology - International Film School, Wales - Computer Games Research Group - ArtLab SIHE : Faculty of Advanced Design Engineering: - School of Computer and Internet Technology - School of Digital Media - the Glass portfolio - School of Industrial Design UG : Media and Cultural Studies (NEWI and UWA also active in the broad descriptor of Creative Industries) Welsh Institute of Social and Cultural Affairs WISCA (UWB) Centre for Design and Technology (UWB)	Design Wales Digital Matrix Technium Digital Technium CAST (Centre for Advanced Software Technology) Molecular Modelling and Visualisation Centre (UWB) Theatre Film and TV Studios (UWA)

3	**Creative industries (continued)**		Bangor School of Arts and Humanities (UWB) Bangor School of Music (UWB) Innovative Manufacturing Centre (CU) CU: School of Journalism UWIC : - Cardiff School of Art & Design - Interpreting Ceramics Research Group (with UWA and English University partners) - The Cardiff Group (design, developpment studies and economics) with partners.E33	South West Wales eTraining network (Trinity Carms)
4	**Electronics / Optoelectronics** *(Electronics)*	Institute of Bioelectronic and Molecular Microsystems IBMM (UWB) Industrial and Commercial Optoelectronics ICON (UWB) Centre for Advanced and Renewabe Materials CARM (UWB / NEWI) Centre for Electronic Product Engineering CEPE (UG) Manufacturing Engineering Centre MEC (CU) EPOCS (UW Newport) Wolfson Centre for Magnetics Technology (CU)	Cardiff Centre for Multidisciplinary Microtechnology (CU) Power Electronics Design Centre (UWS) High Frequency Laboratory (CU) • School of Electronics • System Identification & Control Research Group • Radiowave Propagation and System Design Research Group • Medical Electronics and Signal Processing Research Group • Creative Technologies Research Group (University of Glamorgan) School of Informatics (UWB) School of Physics (CU)	Technium OpTIC Technium Swansea Manufacturing Advisory Service (MAS) Cymru State-of-the-art laboratory including an anechoic chamber (University of Glamorgan)

				IBMM's Laser Micromachining Centre (UWB)
5	**Nano and Micro Technology** *(Electronics)*	Institute of Bioelectronic and Molecular Microsystems IBMM (UWB)	Cardiff Centre for Multidisciplinary Microtechnology (CU)	
		Industrial and Commercial Optoelectronics ICON (UWB)	Power Electronics Design Centre (UWS)	Nanotechnology Centre (UWS)
		Manufacturing Engineering Centre MEC (CU)	School of Informatics (UWB)	
		Centre for Complex Fluids Processing (UWS)	Welsh Centre for Printing and Coating (UWS) and Multidisciplinary Nanotechnology Centre (UWS)	Micro manufacture by Printing laboratory - UWS (Proposed)
		Wolfson Centre for Magnetics Technology (CU)	Multidisciplinary Research and Innovation Centre (NEWI) - Carbon nanotubes	Institute of Life Sciences (UWS)
			Dept of Chemisty (CU)	Technium OpTIC
		Centre for Advanced and Renewable Materials (NEWI) (CARM) - - Carbon nanotubes, Nano particules, polymer assembly		1 - Centre for Water Soluble Polymers (NEWI) - 2 - Advanced Materials Research Laboratory (NEWI - 3 - Optic Technium, St Asaph (NEWI)
				UK Laser Machining Centre (UWB) MEC (CU) Microbridge Proposal CU / Coleg Sir Gar MNT Training CU / TRIKON Pfab
6	**ICT / Software / Communications** *(Electronics)*	Centre for Communications and Software Technologies (UWS)	Communication Systems - School of Informatics (UWB)	Technium OpTIC
		Centre for Advanced Software and Intelligent Systems CASIS (UWA / CU)	Mobile Computing and Networking - Computer Studies (UG)	Technium Auto (Proposed) - Telematics and Communications
		Centre for Electronic Product Engineering CEPE (UG)	Wireless Communications - Computer Science (UG)	
		EPOCS (UW Newport)	Communications Research Centre (CU)	Agilent Teaching Laboratory (CU)
			High Frequency Research Group (CU)	Technium Digital
			Faculty Advanced Design Engineering (SIHE)	Technium CAST
			IAT (UWS)	Technium Aberystwyth
				Technium Swansea
				The Centre for Visualisation in Wales (UWA)
			e-commerce Innovation Centre (CU)	Welsh e-Science Centre - Grid Computing (based at CU)

			Mobile Communications Group - School of Computing (CU)	
7	**Transport (inc Aero and Automotive)** *(Aerospace and Automotive)*	Civil and Computational Engineering (UWS)	Qinetic / Cardiff Technology Centre in Sustainable Power - ECM²	
		Materials Centre of Excellence (UWS)	Welsh Aerospace KEF TTN (Proposed) NEWI	
		Centre for Electronic Product Engineering CEPE (UG)	• Wales Transport Research Centre • Mechanical and Manufacturing Engineering Research Unit	Linked to the International Centre for Aerospace Training (ICAT) @ Rhoose
			(University of Glamorgan)	(University of Glamorgan)
			Network in Sustainable Power Management and Energy Systems Modelling KEF TTN (UWS)	Virtual Reality Prototyping Suite - MEC (CU)
		National Centre for Product and Design Research PDR - (UWIC)	School of Automotive Engineering (SIHE)	Enginering Centre for Manufacturing and Materials (ECMM) Port Talbot
		Manufacturing Engineering Centre MEC (CU)	Lean Engineering Research Centre - LERC (CU)	Manufacturing Advisory Service (MAS) Cymru
		Industrial and Commercial Optoelectronics ICON (UWB)		
		Institute for Bioelectronic and Molecular Microsystems IBMM, (UWB)	The Biocomposites Centre (UWB)	UAV Centre - Parc Aberporth
		Centre for Advanced and Renewable Materials CARM, (UWB/NEWI)		Design Wales
		Centre for Applied Marine Sciences CAMS (UWB)		
		EPOCS (UW Newport)		
		Wolfson Centre for Magnetics Technology (CU)	Logistics Systems Dynamics Group - LSDG (CU)	
			EPSRC Innovative Manufacturing Research Centre - CU-IMRC (CU)	
			Fluid and Structures Computational Centre (NEWI)	Molecular Modelling and Visualisation Centre (UWB)
				Management Development Centre (UWB)
			IAT (UWS)	
				Materials and Chemical Pilot Plant, Biocomposites Centre, (UWB)

				Research Vessel Prince Madog (UWB)
8	**Renewable Energy (earth / environment) - low carbon/high resource efficiency**	Centre for Research in Energy, waste and the Environment (CU)	H2 Research Group (UG)	Technium Sustainable Technologies
		Centre for Engineering Research and Environmental Applications CEREA (UG)	• Sustainable Environmental Research Centre • Hydrogen Research Unit • Advanced Treatment Technology on Resource Reuse -proposed (University of Glamorgan)	Linked to EPSRC's SUPERGEN programme (University of Glamorgan)
			Low Carbon Materials Development Centre (UWB - Proposed)	Manufacturing Advisory Service (MAS) Cymru
		Centre for Applied Marine Sciences CAMS (UWB)	Advanced Treatment Technology on Resource Reuse (UG) - Proposed	
			Centre for Health & Environmental Research & Expertise (UWA)	
	(Energy and Renewables)		Aquaculture Wales (UWS)	
			Bangor Department of Chemistry - Photovoltaics Solar Energy (UWB)	*Hydrogen Valley Partnership*
			Bangor School of Agriculture and Forest Sciences (UWB)	Free Air Carbon Dioxide Enrichment FACE (UWB)
			ESRC Centre for Business Relationships, Sustainability and Society - BRASS (CU)	Wales Waste and Resources Research Centre - WWRReC (all-Wales, CU base)
			Wales Biomass Centre (CU)	Welsh Energy Research Centre (based at ECMM, proposed)
			School of Earth, Ocean and Planetary Sciences (CU)	Consortium (led by Cardiff University) for a Geoenvironmental Research Park (Trinity Carms)
			School of City and Regional Planning (CU)	
		AberBio Centre (UWA / IGER)	IGER	IGER
			Global Warming Research (UWA)	
			Fluvio River Basin and Hydrology Research Group (UWA)	
9	**Materials**	Centre for Advanced and Renewabe Materials CARM (UWB / NEWI)	Interdisciplinary Research Centre (UWS)	Enginering Centre for Manufacturing and Materials (ECMM) Port Talbot
		Materials Centre of Excellence (UWS)	Printing and Coating Research Centre (UWS)	

9	**Materials (continued)**	National Centre for Product and Design Research PDR - UWIC Wolfson Centre for Magnetics Technology (CU) Centre for Research and Environmental Applications CEREA (University of Glamorgan)	Engineering Doctorate Scheme (UWS - Corus) CU? Bangor School for Agriculture and Forest Sciences (UWB) The Biocomposites Centre (UWB)	Manufacturing Advisory Service (MAS) Cymru
10	**(Sustainable) Construction** *(Construction)*	Centre for Research in the Built Environment CRiBE (CU) Centre for Research in Energy, waste and the Environment (CU) Centre for Research and Environmental Applications (UG) Centre for Advanced and Renewable Materials CARM (UWB/NEWI) Centre for Research and Environmental Applications CEREA (University of Glamorgan)	Civil Engineering (CU) - Concrete and Masonry Expertise - Structural Analysis and Informatics Geoenvironmental Research Centre (CU) Environmental Water Management Research Centre (CU) City & Regional (Town and Country) Planning (CU) Welsh School of Architecture (CU) • Building Materials Research Unit • Construction Management Research Unit • Sustainability Research Group • Civil Engineering Mechanics Research Unit • Wastewater Treatment Research Unit (University of Glamorgan) Bangor Department of Chemistry - Photovoltaics Solar Energy (UWB) The Biocomposites Centre (UWB)	Facilities / Laboratories (CRiBE - CU) - Environmental Design and use of Buildings - Urban sustainable development - Environmental Laboratory (sky and helidome) Technium Sustainable Technologies (Proposed) UKAS approved laboratories (University of Glamorgan)

			Bangor School for Agriculture and Forest Sciences (UWB)	
11	**Agri-food** *(Agri-food)*	AberBio Centre (UWA / IGER)	IGER Welsh Institute of Rural Studies - Welsh Organic Centre - Business survey unit UWB - Animal Science Research - Environmental Research - Crop Science Research - Forest and Fibre Products Research - Rural Science UWIC - Food Industry Centre Institute of Food, Active Living and Nutrition, Cymru (UWB) Bangor School for Agriculture and Forest Sciences (UWB) Bangor School of Psychology (UWB) Centre for Experimental Consumer Psychology (UWB) Bangor Food Research Unit (UWB) The Biocomposites Centre (UWB) Environmental Planning Research Unit (EPRU) in School of City and Regional Planning (CU) The Biocomposites Centre (UWB) • Health and Exercise Science Research Unit – expertise in food science and technology (University of Glamorgan)	IGER University Farms (IGER Farms not University) *Timber Forum* Centre for Alternative Land Use CALU (UWB)