The Sector Skills Council for Science, Engineering and Manufacturing Technologies

Bioscience Sector Skills Agreement

Stage 3: Gap Analysis – England

Version 3, December 2007

Contents

1 The Bioscience Sector Skills Agreement

The Bioscience SSA covers the following sectors:

- Research based pharmaceutical companies that discover, develop, market and distribute medication and drugs.
- Research and development in pharmaceutical manufacturing companies.
- Bioscience companies that are a spin-off from universities.
- The application of bioscience to produce innovative medicines and therapeutics.
- The application of bioscience for the processing and production of materials i.e. the use of bioscience in engineering industries. This currently excludes agricultural bio-technology and bioscience that is for the processing and production of chemicals and energy.
- Research and experimental development

Therefore, the Bioscience SSA does not attempt to cover the pharmaceuticals industry *per se* (SIC 24.4: Manufacture of pharmaceuticals, medicinal chemicals and botanical products), which is covered by Cogent SSC. Even so, it has not been entirely possible to separate pharmaceutical research or development from pharmaceutical manufacturing.

Similarly, the medical devices sector, technically a small part of the electronic engineering sector, is included here, since it is important in the development of the application of bioscience.

All those employers who were interested in contributing to the SSA were included in the research and consultations. Therefore, meetings across the UK have included representatives from companies involved in pharmaceutical research, development and manufacture, medical devices and diagnostics and biotechnology, as well as higher and further education institutions (as employers and providers of science skills) – all those that have an interest in the supply of scientists to the sector.

2 Introduction

This report provides a link between the first two stages of the Sector Skills Agreement: the Skills Needs Analysis and the Assessment of Current Provision, and informs the later action planning stages: Scoping Collaborative Action and the development of the Costed Action Plan. It summarises the demand issues and identifies the trends in supply to highlight the gaps in workforce development.

The scenario planning brings together the issues highlighted in the earlier stages and focuses on what needs to be done to ensure a successful future for the sector in the UK.

Vision for the sector

The Bioscience Sector Strategy Group (SSG) comprises Bioscience employers, representatives from Trade Unions, the DBERR Bioscience Unit and Industry Associations. The SSG developed the following vision for the sector:

- **Strategic Alignment of the UK Bioscience Sector needs with the education supply chain to ensure a good supply of well qualified and appropriately skilled employees.**

- **Transform the perception of the sector to be attractive and underpinned by effective Information, Advice and Guidance.**

Supporting points and aspirations:

- UK Bioscience Sector Internationally recognised for World Class Science, Education & Research training provision with significant reach (accessibility).
- An increase in science literacy across the UK.
- An aspiration to become a net exporter of science talent
- Match the skills demand with the supply ‘Skills Balance Sheet’
- Identify ‘CORE’ subjects and activities within the curriculum i.e. the STEM subjects and a focus on Practical skills
- Requirement for some form of high level review on an on-going basis

3 Policy Context in England

3.1 England

Within England each of the Regional Development Agencies (RDAs) has five statutory purposes[1], which are to:

- Further economic development and regeneration.
- Promote business efficiency, investment and competitiveness.
- Promote employment.
- Enhance development and application of skill relevant to employment.
- Contribute to sustainable development.

Each RDA's agenda includes regeneration, taking forward regional competitiveness, taking a lead on inward investment and, working with regional partners, ensuring the development of a skills action plan to ensure that the skills training available matches the needs of the labour market and to this end, each RDA has developed Regional Skills Partnerships.

Each region has a Regional Economic Strategy and, within it, an area of bioscience that it seeks to promote as a cluster or priority sector, and there are a number of regional organisations that support the bioscience clusters within each region.

The table below summarises the regional priorities.

Table 3.1: Bioscience regional priority sectors

Region	Priority sector
North West	Biomedical – including biotechnology, pharmaceuticals and healthcare
Yorkshire & the Humber	Bioscience, Healthcare technologies
North East	Biotechnology, healthcare and life sciences
West Midlands	Medical technologies
East Midlands	Healthcare – life and health technologies: pharmaceutical, biotechnology, medical instrument manufacturing
East of England	Pharmaceuticals and biotechnology; high technology, research and development
South West	Biomedical and healthcare
South East	Health Technologies - Pharma Bio and Healthcare, R&D
London	Life sciences

Science Cities

Across England, there are six designated Science Cities: Birmingham, Bristol, Manchester, Newcastle, Nottingham and York. The Government intends that these should lead the development of stronger and more widespread engagement between businesses and the science base. As such, these cities will spearhead the Government's campaign to build Britain's knowledge economy and make sure the UK thrives in an increasingly competitive global market over the next 10 years and beyond.

[1] Pera, July 2007, *Bioscience Regional Activity and Profile* – unpublished report prepared for SEMTA.

Genetics Knowledge Parks (GKPs)

Six Genetics Knowledge Parks (GKPs) were set up in 2002, five of these in England: Cambridge Genetics Knowledge Park, London IDEAS Genetics Knowledge Park, Newcastle LIFE Knowledge Park, North West Genetics Knowledge Park, Oxford Genetics Knowledge Park, all funded by the Department of Health and the DTI. The only GKP outside England is the Wales Gene Park, funded by the DTI and the Welsh Assembly Government. GKPs collaborate closely with the new NHS Genetics Education and Development Centre in Birmingham and the West Midlands Centre for Education in Medical Genetics. Their aim is to translate the benefits of research in genetics into clinical practice and to develop genetics knowledge and understanding within health services for the benefits of patients.

Science Parks

A Science Park is a business support and technology transfer initiative[2] that:

- encourages and supports the start up and incubation of innovation led, high growth, knowledge based businesses.
- provides an environment where larger and international businesses can develop specific and close interactions with a particular centre of knowledge creation for their mutual benefit.
- has formal and operational links with centres of knowledge creation such as universities, higher education institutes and research organisations.

There are 80 Science Parks across the UK, 59 of them in England. The table below shows their distribution across the UK. There are 13 in the East of England and the same number in London and the South East together.

Table 3.2: Location of Science Parks

North West	6
Yorkshire	7
North East	2
West Midlands	8
East Midlands	5
East of England	13
South West	5
South East	9
London	4
Northern Ireland	3
Scotland	16
Wales	2
Total	80

3.2 Regional Bioscience approaches

As stated, each region seeks to promote bioscience as a cluster or priority sector. The sections below summarise briefly the main clusters and the regional organisations that support those clusters within each region.

[2] Source: www.ukspa.org.uk

3.2.1 North West

The vision of the Northwest Science Council is that:

'England's Northwest will be renowned as an areas of world-class scientific achievement, creating a magnet for talent and science investment, a powerful driver for innovation and enterprise, and an effective force for delivering benefits to health, the environment and society.'

According to the NWDA, the north west of England is one of the UK's top three clusters for the biomedical sector, including biotechnology, pharmaceuticals and healthcare.

Clusters

Bionow is a specialist biotechnology cluster development organisation and is helping the north west region to create a successful regional biotech industry. Bionow assists both existing companies and new ventures in the region by supporting strategic infrastructure programmes. It is the region's key source of information and is home to a significant commercial bio/pharmaceutical sector and a world-class centre of excellence for basic and clinical research. It also manages a large strategic project portfolio and encourages and supports the region's clusters through workshops and networking.

Key NWDA-funded projects include:

- The National Biomanufacturing Centre (NBC) in Liverpool is a project developed for product development and early stage biopharmaceutical manufacturing. This is one of Europe's leading biopharmaceutical design centres. With the capability to develop and manufacture a wide variety of novel biopharmaceutical medicines for early phase clinical trials, the NBC works with biotech companies or academic groups to bring new medicines from the research laboratory into the clinic.
- Funding for the Liverpool School of Tropical Medicine to expand.
- The Core Technology Facility in Manchester provides grow-on space and specialist services for companies moving from the Manchester Biotechnology Incubator.
- UK BioBank in Manchester looks at genetic and environmental factors that impact on human health and disease.
- Nowgen is the Northwest Genetics Knowledge Park, based in Manchester, which is supported by the NWDA. This provides a service to the public, healthcare professionals, industry and education. It represents a partnership between Central Manchester & Manchester Children's University Hospitals NHS Trust, and the Universities of Lancaster, Liverpool and Manchester. Its purpose is to make sure that the latest information is made widely available and that the results of human genetics research are used in the best possible way.

MerseyBio

At sub-regional level, MerseyBio leads the development of the life sciences sector in the Liverpool and Merseyside region. It has formulated a common vision to achieve and sustain growth of the sector through:

- the commercialisation of life science technology from universities, NHS trusts and research-based organisations
- the start-up and incubation of new companies
- providing assistance to local companies
- developing an infrastructure which supports the future growth of the sector

3.2.2 Yorkshire and the Humber

Clusters

The Cluster strategy is Yorkshire Forward's key economic focus and its teams work closely within the Business Directorate to support its interventions.

Yorkshire Forward has identified seven key clusters that have the potential for growth in the Yorkshire area, and these include bioscience and healthcare technologies. The Healthcare Technologies Cluster has been identified recently as a priority area for investment. This acknowledges the diverse range of activity in a number of key healthcare technology sectors in the region, including broad-ranging R&D, manufacturing and related supporting activity across the Pharmaceutical and the Medical devices sectors and related areas.

In the pharmaceutical industry the specific areas of importance are:

- Chemical & biological drugs
- Nutraceuticals
- Functional foods
- Medical Foods

In the medical devices industry specific areas are:

- Surgical instruments
- Implantable devices
- Medical and assistive equipment
- Medical consumables
- Prosthetics and orthotics

The cluster approach takes into account the key links between businesses, strong academic research areas, the NHS trusts, regulatory agencies and trade associations and other organisations such as Medilink (Yorkshire & Humber) and MedIPeX – a managed services organisation for the NHS.

3.2.3 North East

One North East and regional partners are investing in the healthcare sector and driving economic growth by recognising and acting upon the following: achieving leadership and recognition in major research fields; enabling innovation, diversification and new product development; building skills and the potential of businesses to join the supply chains of major companies and the NHS and promoting the sector internationally

Clusters

The North East Process Industry Cluster (NEPIC)
NEPIC is an organisation established by chemical, pharmaceutical, biotechnology and associated support companies and agencies based in North East England. Its role is to coordinate activities of mutual benefit and strategic importance to the industry and its supply chain, as well as promote the capabilities of the industry as a whole.

The region's industrial sector has thriving clusters in diagnostics, medical devices, clinical trials and pharmaceuticals. There are strongly supported regional initiatives in ageing and health, bio-informatics and stem cells.

Centre for Excellence in Life Sciences

The Centre for Excellence in Life Sciences (CELS) provides business support services to companies in the region and others moving to the North East. It funds BioNEt which is the North East England's network for research scientists, and is the major platform for sharing ideas and developments in the health, healthcare and life sciences sector. It includes members from the region's universities, industry, research institutions and the NHS.

CELS InSTeP

The InSTeP Initiative (Integrated Services Training and Products) is available to businesses and organisations involved in the development and delivery of products and services for the healthcare sector. It offers an integrated programme providing a clear and practical route for the transfer of state-of-the-art applied research and expertise into market ready products. North East England has a range of business incubators, bio-parks and business parks for healthcare companies. CELS manage some of these and provides business support services to tenants of others.

Healthcare Network North East England

The Healthcare Network engages with organisations currently involved with Health, Healthcare and Life Sciences, and also aims to attract new organisations wishing to diversify into this sector. The Healthcare Network covers all types of organisations, including: companies, universities, research institutions, charities, not-for-profit organisations and the NHS.

3.2.4 West Midlands

The Advantage West Midlands report: 'Medical Technologies -Cluster Research Project', identifies the following sectors as providing key opportunities for the region:

- Materials and their processing through to manufacturing
- Structures for devices, including their control systems and software
- Orthopaedics and assistive technologies
- Telemedicine, especially monitoring of wellness and care in the community
- ICT/e-technology
- Infection control

Clusters

In the West Midlands, the medical technologies business cluster aims to grow the competitive advantage and reputation of the region to increase economic prosperity. They do this by facilitating businesses in each cluster to collaborate when exploiting opportunities i.e. by sharing resources, knowledge and expertise.

Medilink West Midlands is the regional network for companies involved in the manufacture, supply and distribution of medical and healthcare products. This includes companies throughout the supply chain from materials and design to manufacturing, packaging and support services in the West Midlands. The organisation is part of a network of formal associations, which brings together medical and healthcare companies, universities, hospitals and community trusts for profitable developments in healthcare. The network, operating as Medilink UK, spans all of England, Scotland, Wales and Northern Ireland.

Medilink West Midlands is a central point for medical technology industry related activity in the area, and works closely with Advantage West Midlands (AWM), the NHS, other Government bodies, private healthcare providers and others that will ensure continued development of the regional medical technology sector.

MidTech – The West Midlands NHS Innovation Hub

MidTech is part of a national network of Innovation Hubs throughout the NHS in England, which will provide an Innovation Management service for NHS Trusts including, amongst other things, the identification, registration and evaluation of intellectual property, additional R&D to produce evidence of clinical application, commissioning the production of prototypes, commercialising intellectual property and the setting up of spin-out companies.

The West Midlands Central Technology Belt

The Central Technology Belt is part of Advantage West Midlands' model of clusters and corridors and is owned by a group of regional partners. The area runs from Birmingham to Worcestershire and includes the important knowledge centres of the region: the three Birmingham-based Universities, the University of Worcester and QinetiQ, with its base in Malvern. The area currently contains three science parks - Aston Science Park, Birmingham Research Park and Malvern Hills Science Park, with three more in development at Pebble Mill, Longbridge and Bromsgrove.

The University Science Park, Pebble Mill includes a substantial bioscience-related development:

- A Biomedical science park with a planned purpose built space for companies bringing new medical solutions to market.
- A state of the art bio-medical incubator space including wet lab facilities.
- Full business support services available covering financial, legal, marketing and training needs.

In addition, it is adjacent to the University of Birmingham with its international reputation in medicine, biosciences, engineering and cancer studies and located near Europe's largest transplant centre, a Life Sciences Academy, a new 1200 bed super hospital and the planned Institute for Translational Medicine – the latter turning the region into an international player regarding clinical trials and new treatments.

3.2.5 East Midlands

Clusters

The East Midlands' healthcare cluster's activity has been dominated by the creation of Europe's biggest biotechnology science park – BioCity. BioCity is a healthcare and science innovation centre, formed by the collaboration between Nottingham Trent University and the University of Nottingham. The organisation also manages Eminates, an initiative to provide the industry with open access to a nanotechnology facility.

Medilink East Midlands

Medilink East Midlands is a dynamic networking and information resource facility for the healthcare sector in the East Midlands. Its aim is 'to stimulate growth in the East Midlands' healthcare sector, by forging effective and sustainable links between customers, innovators and suppliers for the mutual benefit of members.

East Midlands Incubation Network

The EMIN Healthcare cluster provides support in the following key areas:

- Pharmaceuticals
- Diagnostics & Therapeutics
- Bio-Sciences
- Devices and Instrumentation Management

3.2.6 East of England

Clusters

The Eastern Region Biotechnology Initiative ERBI was established in 1997 with a grant for 3 years from the DTI. It was formed as a networking organisation for Cambridge and the East of England, and its original goal was to provide a platform for biotechnology and related companies to meet and interact. In 2000 ERBI became a private, not-for-profit, self -financing, membership based company, with a board and steering group made up of representatives from all areas of the bio-community, including major pharmaceutical companies, large and small biotechnology companies and professional advisers. ERBI is currently Europe's leading regional bio industry group.

East of England Stem Cell Network

The East of England Stem Cell Network (EESCN) works to promote innovation in stem cell research and its applications, and establish the East of England as a global leader in this field. It was established to facilitate and encourage collaboration and interaction between those from the academic, clinical and commercial sectors with an interest in stem cell science in this region. The East of England is an acknowledged centre of excellence in all aspects of stem cell research. As well as the location of the Cambridge Stem Cell Institute and the UK Stem Cell Bank, it contains expertise across the fields of developmental biology, epigenetics, clinical translation of research into practice and the ethics and regulation of stem cell technology.

Medilink East

MedilinkEast was formed to stimulate growth in the medical technology sector by establishing effective and sustainable partnerships between customers (hospitals, clinicians etc.), innovators (Universities and research organisations) and suppliers (companies providing medical equipment). It is a key network for businesses engaged in medical equipment and/or medical devices in the region.

3.2.7 South West

Clusters

Bio-medical and healthcare clusters are growing in the southwest region. Strong networking and collaboration with academic institutions, as well as facilities at Royal Cornwall & Devon NHS Trust, Knowledge Spa in Cornwall, Tamar Science Park in Plymouth, Winfrith Science

Park in Dorset and Tetricus Ltd in Wiltshire, provide the right environment for biomedical companies to locate.

Bioapproaches SW

BioApproaches SW is the hub for the Lifesciences and Biotechnology Knowledge Economy of the South West, focusing on the industry's immediate needs. It is committed to the economic growth of the sector through strategic steering, promotion and proactive networking. BioApproaches SW objectives include:

- Networking for biobusiness growth
- Access to business support and funding
- Promoting the sector regionally and beyond
- Professional development and graduate placements

Bristol is one of the six designated science cities. A new science park, Spark - is planned for Bristol. University linked incubators already exist in Exeter and Bath.

3.2.8 South East

Clusters

The South East has the highest concentration of health technologies companies in the UK and employs a third of the sector. It is home to world-renowned universities, medical schools and institutes undertaking pioneering health research. 30% of the UK's life sciences research and development activity is carried out in the South East; 9 out of 10 of the world's leading life sciences companies; and the top 12 global pharmaceutical companies have operations in the South East. Therefore, the following industries are key to the region:

- Health Technologies
- Biotechnology
- Diagnostics
- Medical device
- Pharmaceutical

The South East Health Technologies Alliance is a catalyst for innovation and international competitiveness in South East England's health technologies sector. It helps business in a number of ways:

- Leadership and influence – raising the profile of the sector
- Facilitation – bringing people together from all parts of the sector to produce innovative and competitive solutions to healthcare challenges
- Signposting – making it easier for businesses to find and access the help that already exists

The South East Health Technologies Alliance aims to:

- Engage with significant numbers of people in the supply chain
- Catalyse innovation and collaboration
- Address the shortage of medium sized companies
- Make it easier for businesses to find information and support
- Improve public and policy maker's understanding of the sector
- Help tackle skill shortages

Biosmile

The overall objective of the BioSmile project is to strengthen and promote the competitiveness of North West Europe in the field of biotechnology, through transnational cooperation within and between polycentric urban areas, medium-sized cities and their regions in the BioSmile region. Its aims are:

- To stimulate start-ups & facilitate the growth of existing companies
- To create a transnational platform of biotech companies, branch-organisations and institutions in the BioSmile region based on existing structures
- To stimulate innovation and entrepreneurship in biotechnology

The project is operating in South East England, Flanders, Northern France and Walloon to the Meusse-Rhine Euregio, Zuid-Limburg, Liège and Rheinland

3.2.9 London

With over 28 research institutes, 80,000 students and millions of public funding a year, London hosts a thriving life sciences community. However, the global life sciences and biotechnology market is dynamic and competitive. Recognising this, the LDA is committed to progress and development that will ensure the sustainability of London's life sciences industry.

In order to support this high growth sector, the LDA aims to:

- establish the space for life sciences by creating incubators, science parks and other specialist facilities
- build the life sciences cluster by creating support systems, promoting the cluster's image, promoting inward investment and working with the NHS
- encourage company growth by supporting and unlocking management resources
- bridge the finance gap by enabling access to early stage funding

The strategy will be delivered through the following key action areas:

- making the space for life sciences – incubators, grow-on, science parks and specialist facilities (clinical trials and bioprocessing);
- building the life sciences cluster – support systems, promoting the cluster's image, cluster leadership, inward investment, supporting commercialisation in London NHS and facilitate access to London's research base;
- people and skills for growth – pan-London incubation, company growth mentoring and unlocking management resources;
- bridging the finance gap – seed funding and accessing business angel networks.

Clusters

The London life sciences sector is not clustered around a single university or science park. This makes its size and activities less visible to both those outside and inside the sector. As a result, London will have to work harder than other regions to develop a single, cohesive image.

The objective of the life sciences support strategy is to "develop a commercial life sciences cluster around London’s world class knowledge base". This will be achieved by building on London’s strengths, addressing its constraints and ensuring that appropriate resources are in place right throughout the value chain.

4 Scenario Planning

The scenario thinking was developed at a series of five workshops facilitated and led by the DTI Futurefocus team.

Futurefocus undertook the five workshops in the following locations:

27 February 2007	**Manchester**
15 March 2007	**London**
24 April 2007	**Edinburgh**
26 April 2007	**Bridgend**
8 June 2007	**Nottingham**

The workshops were designed to assist engaging with sector representatives in order to:

- Identify what is driving change.
- Identify the key trends in society the environment and technology that will impact the bioscience and pharmaceutical industry.
- Prioritise the key trends in order of importance and uncertainty and consider the implications for supply and demand in the labour market and types of skills.
- Consider the key critical success factors for the sector and look at the implications of the trends for the critical success factors.
- Develop a positive and negative scenario.
- Identifying the key actions by employers, Higher Education, Further Education, Government and other stakeholders that the SSA would need to influence.

The scenario planning also contributed to the consultation on the Stage 1 Skills Needs Analysis, particularly on the key drivers of business competitiveness and their implications for demand for skills; future skills and priorities. It built on the Critical Success Factors (CSFs) identified by the SSG by considering how these are affected by various possible future developments and it therefore helped to prioritise the issues and identifying the actions that need to be taken and by whom. It also identified views on the reasons why these actions have not already been undertaken with substantial impact, which is important in drawing up the plan for collaborative action. The scenario planning also helped in categorising the actions needed into short, medium and long term.

The number of employers involved in the scenario planning workshops was disappointing, even though some of the events were shortened in order to encourage more participation. Additional methods of consultation were included at all stages of the SSA:

- Scenario planning workshops – included review and consultation of the CSFs
- Skills Needs Analysis consultation presentations, questionnaire and interviews with employers
- Stage 2 supplementary employer questionnaire
- Stage 2 training provider questionnaire
- Stage 2 HE interviews

The scenario planning process included looking at what is driving change. Participants developed two scenarios for 2020, one positive and one negative. They considered the importance of the change drivers for demand and supply in the labour market and the implications for the types of skills required.

Participants also considered the CSFs and added to them as appropriate. They went on to consider what the implications of the trends in each of the two scenarios for the CSFs were, how to prioritise the issues and what the key actions would need to be to work towards the positive scenario or mitigate the negative scenario.

They developed short, medium and log term action areas, with measures of success, identified the barriers and how to overcome them and considered the question of why this wasn't happening now. Then they identified who needs to take action: the government, HE, employers, etc.

The positive scenario, developed from an aggregation of all the scenario planning events is shown in Table 4.1 on pages 17 and 18.

The Goals and Critical Success Factors

Goal: Technical and scientific workforce development – ensure availability of a high quality technical and scientific workforce across all disciplines and functions.

CSFs: (1) Actively encourage HE and FE to take into account the workplace requirements of industry when designing and revising courses.
(2) Assist schools in promoting science and delivering an exciting and purposeful science curriculum.
(3) Ensure CPD is available in key science areas and where it is required.

Goal: Recruitment and retention – Capacity building – attraction and retention of high quality staff in sufficient numbers to meet employer requirements.

CSFs: (1) Young people keen to be scientists and engineers.
(2) Further development and wider communication of company culture.

Goal: Management and leadership – exceptional management and leadership talent working across all sizes of organisation.

CSFs: (1) Strategic leaders fully able to grow UK businesses.
(2) Operational leaders able to deliver agreed strategies
(3) Worldwide talent electing to work in UK Bioscience sector
(4) Pool of serial entrepreneurs and intrapreneurs.
(5) Attractive environment for top talent.

Table 4.1 The Positive Scenario

• Globalisation is a challenge; however UK is in a good position to exploit the advantages. The legislative framework is positive and takes account of health and safety issues within a risk benefit framework.
• UK is "number one" in bioscience from the global perspective. There is an abundance of high quality candidates for science and technology roles who benefit from interesting and creative careers in companies. The UK leads in technology development. There are high expectations of what bioscience can achieve and bioscience has strengthened the economic position of Britain. There is a stable political environment, with the government supportive of the bioscience industry in recognition of value of the sector to the economy. The sector has been successful in making break through in disease management such as Cystic Fibrosis.
• There is a positive relationship between sector and society. The bioscience sector is involved in solving various environmental issues and leading debate on broad areas of influence including – fuel, epidemics, food, bio remedial etc. This has resulted in a more positive perception of the sector and increasing scope for solutions from science to large environmental problems. There is a higher level of trust in science and informed public debate. There is a strong degree of ethical consensus. The image and awareness of the sector is positive with role models and sector champions. There are "Science Translators" in senior positions in both government and corporations who are able to present science and market the ideas and concepts to people. Improvements in education and public debate has resulted in increasing knowledge and perceived or real and access to information sources, often uncensored. Public debate is informed and championed by relevant people to ensure promotion of public education of science. This is particularly relevant around University hubs that are attempting to commercialise their own resources, IP, services and consultants. There is a strong networked science base and the UK recognised as "number one" for science and innovation.
• Science, education and training is recognised as being world class with greater rigour in school science teaching and separate sciences at GCSE. Teaching is recognised as a prestigious occupation and there are more scientists than ever teaching in schools. There is a strong higher education and universities network with opportunities for people to move around from academic roles to business to regulation. There is funding for universities to deliver suitable science courses and there are more scientists than ever teaching in schools as people were seconded who were passionate about science. This has resulted in young people being informed of the possibilities of science at the earliest age. There has been opportunity for a review of the education system from ages 3-18 to develop the broad principles and the whole agenda in a connected way to deliver good skills including strong language skills. UK education is now internationally held in high esteem. UK produces top quality science graduates who become leading scientists of the future. International jobs available to UK graduates who are ready to invest in their own CPD and there is an increased willingness to collaborate, innovate and take risks. There are good career ladders in bio medical research. International jobs bring people from overseas and there is a flow of high calibre of graduates coming into companies and abundant high quality multifaceted university students and skilled workers at all levels as candidates for science and technology roles and interesting and creative careers in companies based in the UK.

• There are strong links between industry and academia which have enabled ground breaking spinouts from leading UK academic institution. Collaboration and swift innovation have been evident when rapid deployment was necessary to enable solutions to a health problem and prevent a global disaster.
• UK has a strong reputation for innovation and a track record of people coming together from different disciplines to develop new products to respond to problems in the environment. Bio-chemical technological solutions have resulted from cross -sector discipline problem solving. New communications technologies have been developed as well as new materials and clean fuel sources which are cheap and impact the cost of production.
• The ageing population provides demand and opportunities for drug development. Increased life expectancy is matched by better health care and work/life balance. Personalised medicine and preventative health care is increasingly delivered through expanding community drop in health centres to take health monitoring to the public. New and improved medicines give a better quality of life.
• UK becomes a genuine bioscience network of big companies and SMEs and an environment exists to nurture small companies and provide a community to exploit ideas, share resources. International companies are attracted to the UK to exploit skill base.
• There is a truly global industry with demand from China and emerging markets. Africa and South America emerge as stable political forces and more balanced economies. China and Eastern Europe no longer seen as the major source for science skills. There is strong economic growth in Africa as a result of use of bioscience to develop crops.
• Single EU with common currency and more sharing of knowledge across Europe. EU collaboration, verify results from research. European companies able to take advantage of joint working backed by EU assembly.
• Devolution and regional approach may create a more positive environment similar to US model of federal states.

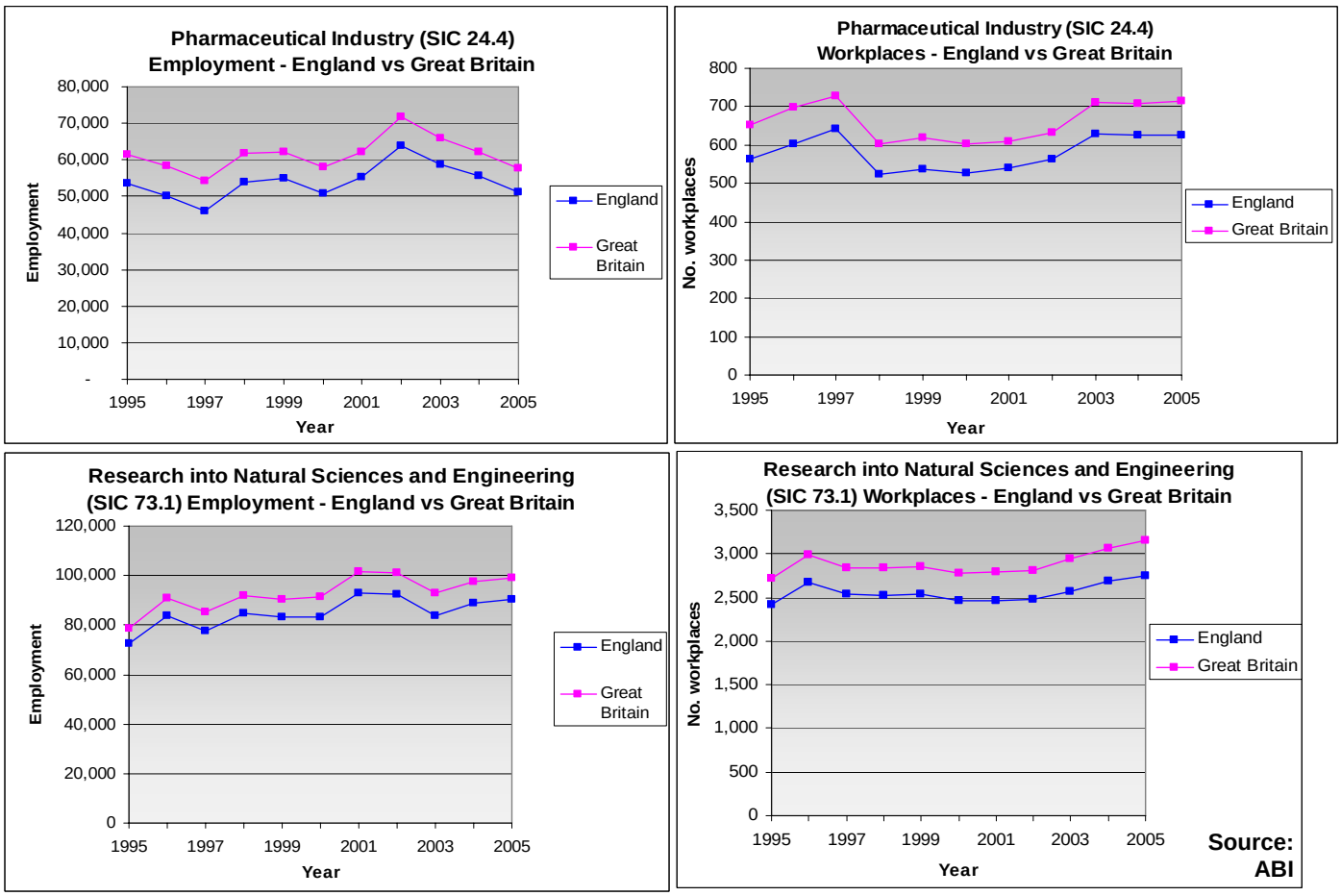
5 Summary of demand

5.1 Profile of the Bioscience sector

The dynamic nature of the bioscience industry and the difficulties in defining its scope, particularly in terms of SIC codes, means that the employment and workplace figures quoted by the DTI, and the industry itself, vary depending on the definition of the parts of the sector covered. For example, large pharmaceutical companies are not included in the DTI's figures for biotechnology, but medical devices companies are included.

The graphs below show how employment and the number of workplaces has changed in pharmaceutical manufacturing (SIC 24.4) and research and experimental development in natural sciences and engineering (SIC 73.1).

Figure 5.1 Workplace and employment trends in England 1995-2005

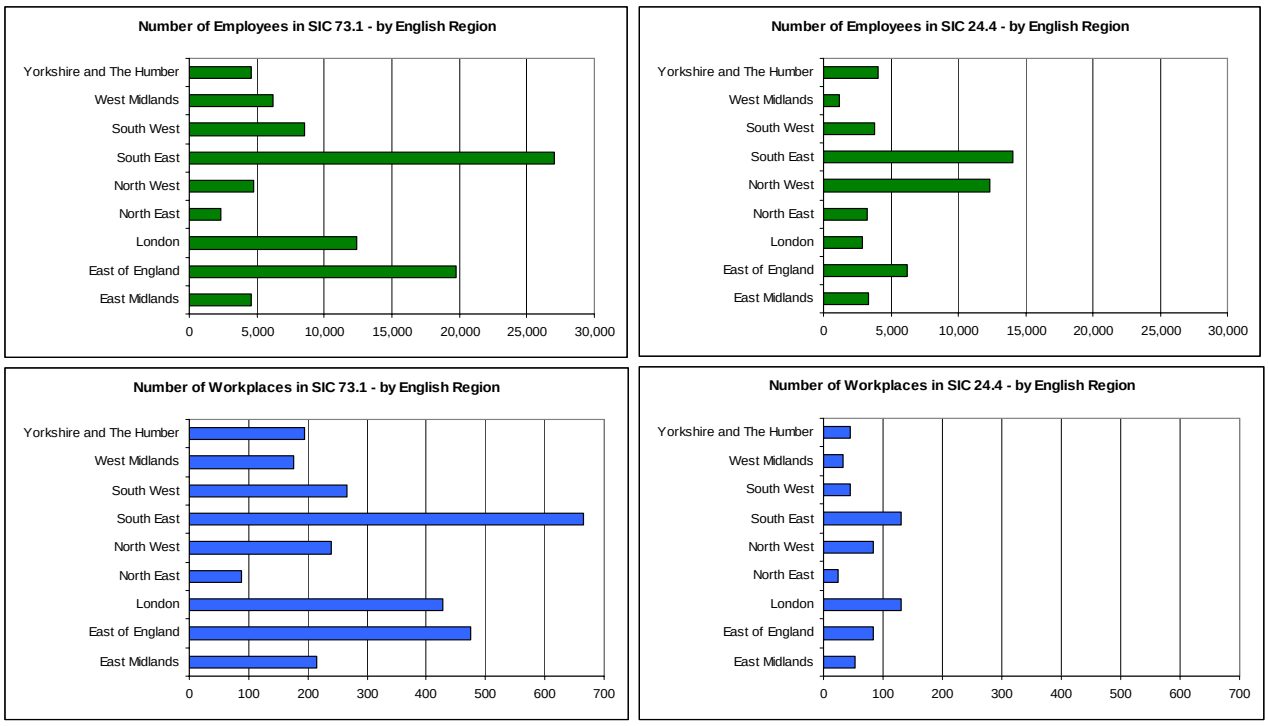


Bioscience forms only part of the pharmaceutical manufacturing sector (that dealing with R&D) and part of research and experimental development (that dealing with research in the natural sciences, particularly (but not exclusively) biological sciences.

Regional distribution of bioscience

The distribution of employment and workplaces in the pharmaceutical sector and the research and experimental development sector by region is shown below. The South East is the largest region in terms of employment in both sectors. In the pharmaceutical sector, the North West is also very important, but there is relatively little employment in research and experimental development. The East of England employs large numbers in research and experimental development as well as substantial numbers in pharmaceuticals.

Figure 5.2: Distribution of employment and workplaces by English region



Source: ABI

The DTI's research on *Biotechnology*[3] shows a similar distribution in terms of employment and workplaces.

Bioscience related companies are located in clusters, the main ones of which are around the 'golden triangle', around Cambridge, Oxford and London, in Scotland centred around the Dundee, Edinburgh, Glasgow triangle and in the North West of England, where there is a long established pharmaceutical industry.

5.2 The Bioscience Labour Market

The SEMTA Labour Market Survey[4] shows the Bioscience sector has a young age profile. Even so, the retirement of key staff is still an issue for some companies. Women are well represented in the sector, although there are fewer at more senior levels.

Over the last year, most companies had increased employment and most expected to grow in the coming year.

The LMS also shows that, compared to other sectors, bioscience has very high levels of:

- Hard-to-Fill Vacancies HtFVs (experienced by 39% of companies)
- Skills Shortages Vacancies (SSVs) (experienced by 22% of companies)
- Skills Gaps in the current workforce (experienced by 29% of companies).

There is strong competition for science skills, internationally and from other sectors. Just over one quarter of the companies that contributed to the LMS had recruited graduates from overseas in the previous year.

82% of the companies had engaged in training and CPD activity and this is also high. However, there is training that is mandatory across parts of the sector to meet regulatory requirements which means that training activity within the sector needs to be maintained.

Hard-to-Fill Vacancies and Skills Shortages

The main areas of HtFVs and skills shortages cover a wide range of generally scientific skills:

- Biological and medical sciences
- Chemical sciences
- Process engineering
- Mathematics and statistics.

In terms of specific scientific areas, the greatest skills shortages are in:

- Clinical/pharmacology/experimental medicine
- Bioscience and molecular biology
- Analytical and physical chemistry
- Process and chemical engineering
- *In vivo* sciences
- Bioinformatics.

Skills Gaps in the current workforce

[3] Comparative statistics for the UK, European and US biotechnology sectors-2003-2004 - RDA analyses (Critical I – presentation to DTI Bioscience Regional Networking meeting 27th June 2006)
[4] SEMTA (2006) Labour Market Survey of the Pharmaceutical and Bioscience sectors

Skills gaps are found in a range of both scientific and generic skills.

The main scientific skills gaps were in:

- Bioscience and molecular biology
- Analytical and physical chemistry
- Biochemistry
- Biotechnology/biopharmaceuticals
- Geomics/proteomics/metabolomics
- Synthetic organic chemistry/medicinal chemistry
- Mathematics or statistics.

The main generic skills gaps were in:

- Business skills
- Management skills
- IT skills (general)
- Project management
- Team working
- Regulation.

5.3 The Bioscience Labour Market in England

There were 120 companies that contributed responses to the SEMTA LMS in England across a range of sub-sectors, the largest being: 27 in pharmaceutical R&D, 22 contract research organisations, 17 in medical devices/diagnostics and 16 in biopharmaceutical R&D/medical biotechnology.

Three quarters of the companies are small (<50 employees) with 40% (48 companies) having ten or fewer employees. Only 11 of the companies had more than 250 employees.

With 120 companies overall involved in the labour market survey in England, comparisons between the regions are difficult to make due to the small numbers in each area. The regions with the largest number of responses are: the East of England (36 companies), South East (25), North West (18) and Yorkshire and the Humber (16). A summary of the responses from the participants in England is given below, with comments on the regions where the numbers allow:

- The loss of staff due to retirement is not seen as a problem by most of the employers in England. Only five are currently experiencing this problem and another 10 believe it will be a problem in the next five years.
- Eighteen (47%) of the companies had grown in the previous 12 months, about the same percentage as across the UK as a whole. Only 16 (13%) companies had declined in employment.
- 77 companies (64%) expect employment to grow over the next 12 months (this is a higher percentage expecting growth than in other areas of the UK). The percentage of companies expecting employment to grow seems to be higher in the East of England (75%) and the North West (72%). Across England, 33 companies (28%) expect employment to remain the same and three companies expect employment to decrease.
- 97 (81%) companies had recruited in the previous 12 months and 45 (46%) of these had experienced HtFVs. This is a similar level of recruitment activity and HtFVs as in the UK as a whole. These HtFVs are in a wide range of mainly scientific disciplines.
- The main impacts of HtFVs were an increased workload or pressure on other staff (in 14 companies), projects not being taken forward (eight companies) and turning away business (in six companies).
- 25 (21%) of the companies stated that they had skills gaps in the current workforce. This compares to 29% of the 178 companies in the LMS across the UK and 51% of companies in Scotland. The skills gaps were in a range of occupations, mostly in scientific roles: laboratory scientists, science managers, senior scientists, senior researchers and also in general management, engineering and sales and administrative roles.
- 70 of the 120 companies (58%) have a training plan, compared with 63% overall. In England, 97 (81%) of the companies had arranged training in the previous 12 months, similar to the UK average. Probably reflecting their different sizes, companies spent varying amounts on training, with seven companies spending over £100,000 in the previous year and 37 spending less than £5,000 in total.

- The companies used a wide range of training methods:

Table 5.1. Type of training/CPD in previous 12 months: England

Type of training/CPD	No. of sites
On-the-job training	88
Off-the-job training	87
Specialist meetings	85
International conferences	74
Employer networks or fora	59
Expert mentoring	57
Day release	49
Online training	34
Total number of companies engaged in training/CPD	**97**
Source: SEMTA LMS (2006)	

- 62% of the companies expected training spend to increase in the coming year, just slightly higher than in the UK as a whole.
- The barriers to training most commonly mentioned were that the companies could not afford the time off for staff to train (identified by 51 companies) and the high cost of training locally (identified by 33 companies). 29 companies said that they thought there were no barriers to training.

6 Assessment of Provision

6.1 Background

The major skills shortages in the bioscience sector are substantially higher than the UK average across all industries. These are having serious consequences for companies – including loss of products in pipeline, projects not being taken forward. This makes a *prima facie* case that the education and training system is not delivering the quantity and quality of recruits needed. About a quarter of companies are actively pursuing recruits from outside the UK for skilled scientific posts.

What do employers look for?

While employers experience a range of skills shortages and gaps, they are clear that when they are recruiting, generally at graduate level, they are first and foremost looking for a depth of scientific knowledge and skills, in Chemistry, Biological Sciences and Mathematics.

They are also looking for interdisciplinary awareness, practical skills, experience in industry and the ability to work to regulatory standards and communication skills.

In terms of first degrees they have a preference for four-year degrees (batchelor or masters) and degrees with industrial placements are strongly favoured.

Some combined degrees, if they are with another science or mathematics, are relevant to the sector, but other combined degrees are not of use to employers.

Employers are also looking to recruit graduates with first or upper second class degrees.

Changes in science and technology

With scientific developments proceeding rapidly, there are also some highly specialist skills that employers are seeking, which require specialist training and courses. These areas include bioprocessing and biomanufacturing as the sector moves to the biological delivery of drugs and medicines. There is also an increased requirement for the ‘omics’ disciplines, such as genomics, proteomics, metabolomics, etc.

There is also a need for multidisciplinary approaches covering genetics, molecular biology, biochemistry, IT, mathematics and statistics. There is a growth in the use of *in silico* design tools and *in silico* modeling.

6.2 Current provision

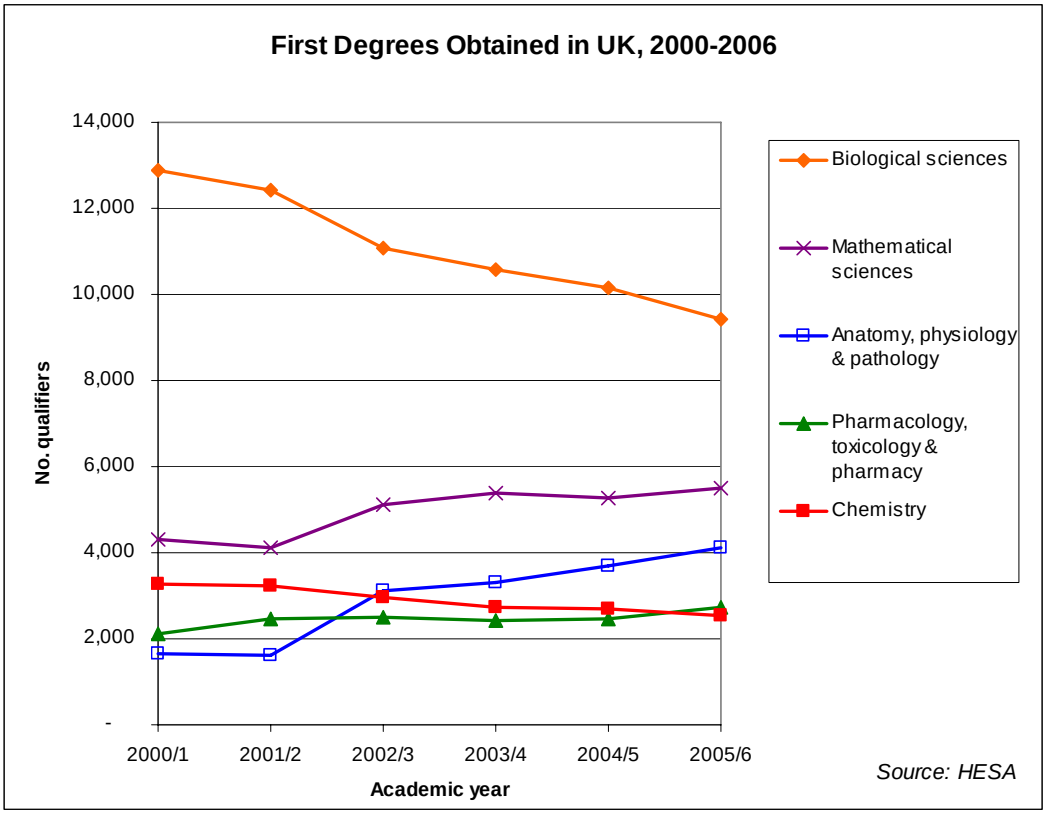
6.2.1 Higher Education (HE)

The main entry to the bioscience sector, especially for laboratory scientists and research scientists, is from universities, particularly those with established scientific Research Departments.

Since 2004, the number of universities offering courses in biological sciences has gone down. There are 20 fewer universities offering for Biology-related subjects; 13 fewer offering Microbiology. There are 19 fewer universities offering Chemistry. The decline in provision of Chemistry has triggered action but the situation for biological sciences has not received great attention.

Over the last six years, the number of first degrees gained by all students in Biological Sciences has declined by 27% if Sports science and Psychology are excluded from the figures. In Molecular Biology, Biophysics & Biochemistry, there is a 6% decline and in Chemistry, a 22% decline.

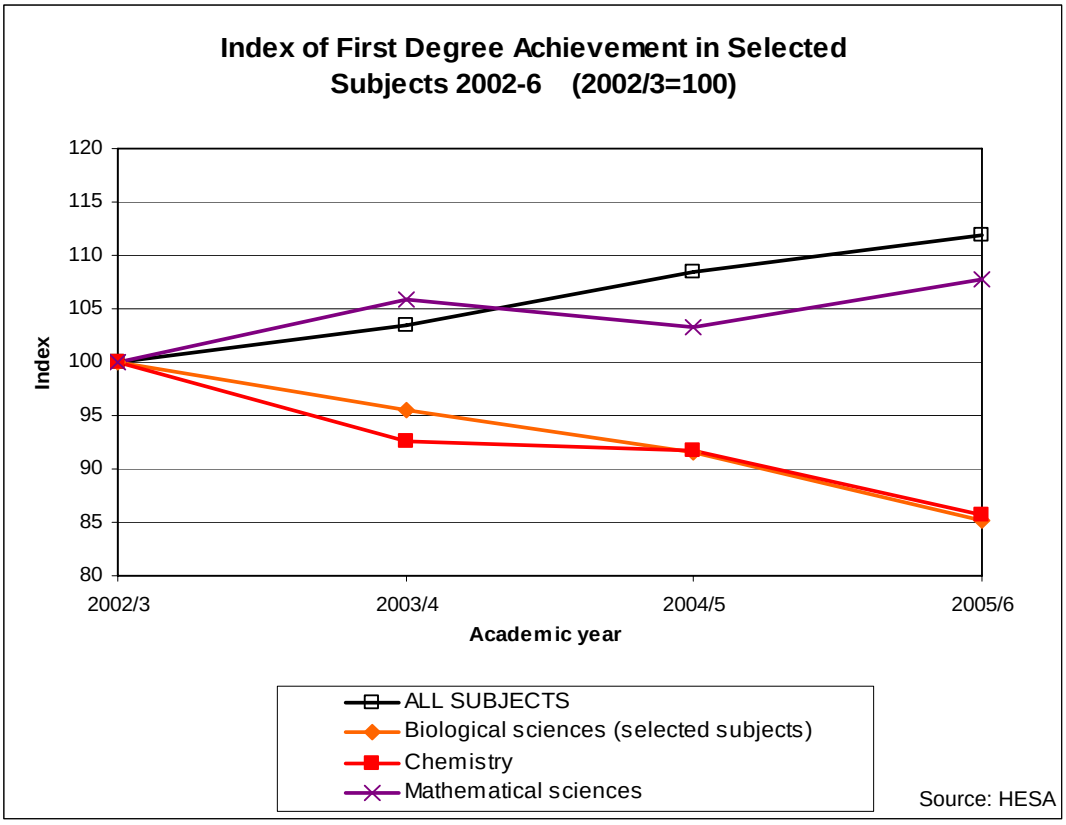
Figure 6.1: Number of first degrees obtained in UK in subjects relevant to Bioscience



About 5% of all the first degrees achieved in 2006 were in the sciences relevant to the bioscience sector. Overall, 9,400 students gained first degrees in relevant Biological sciences, with a further 4,100 in Anatomy Physiology & Pathology; 2,500 in Chemistry and around 600 in Pharmacology or Toxicology (if the numbers doing Pharmacy are excluded).

Even where there has been an increase in the numbers graduating as in mathematics, this has not kept up with the increase in overall student numbers in all subjects (see Figure 6.2 below).

Figure 6.2: Index of first degree achievement in selected subjects

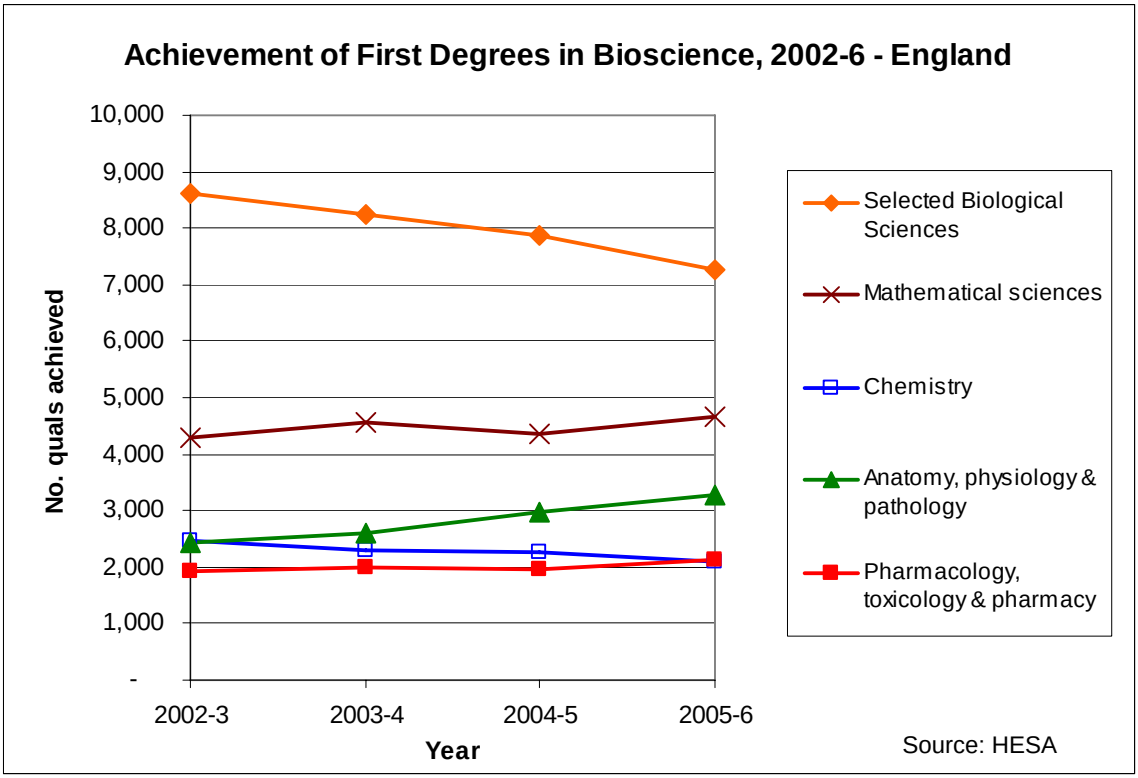


First Destination data indicate that a minority of graduates from these courses enter the sector. Among Biology graduates 3% join the pharmaceutical sector, 6% take up jobs in research and 8% go into HE. For Microbiology the figures are each 9%. In Molecular Biology the figures are 9%, 9% and 16%, while for Chemistry they are 13%, 8% and 13%. The proportions are far smaller for graduates in Pharmacology, Toxicology & Pharmacy graduates and for Anatomy Physiology and Pathology.

Provision in England - Higher Education

English HEIs awarded 80% of all Bioscience First Degrees, across 83 institutions. In Molecular Biology (88% of qualifications in this subject) and in Mathematical Sciences (85%), England is particularly well represented. In Zoology (53% of all bioscience first degrees), Microbiology (57%) and Botany (62%), English HEIs award proportionately fewer first degrees than would be expected, with Scotland and Wales being particularly strong in these subjects.

Figure 6.3: Achievement of First Degrees in Bioscience, 2002-6



There has been a substantial decline in the number of students gaining first degrees in England in the relevant biological sciences subjects in the last few years, and also a decline in the numbers achieving degrees in Chemistry. There has, however, been a growth in the number achieving degrees in Anatomy, Physiology and Pathology and to a lesser extent in Mathematical Sciences over the same period.

6.2.2 Vocational HE, Further Education (FE) and Work-based Learning (WBL)

Technical skills for Laboratory Technicians, bio-manufacturing technicians and other skilled occupations at Level 3 are provided by colleges of Further Education (FE).

Fourteen colleges in England, 9 in Scotland and one in each of Wales and Northern Ireland, offer Higher National Diplomas in subjects such as Applied Biology, Biomedical Sciences, Chemistry, Pharmaceutical Science/Chemistry. Across the whole of the UK there are relatively few HNDs achieved in the Bioscience-related subjects: only 130 students gained Higher National qualifications in Biology in 2006 and in each of the other subjects relevant to Bioscience there are no more than a few dozen.

About 20 Universities in England offer the new Foundation degrees in science, although take up is low, with only 130 new entrants per year in Biological Sciences excluding Sports Science and Psychology. Foundation Degrees do not apply in Scotland and Northern Ireland. In Wales, HEIs are free to develop and offer Foundation Degrees in their portfolios, including through franchise arrangements with FE colleges, although none are currently offered in bioscience-related subjects. Unlike in England, there is no specific policy direction in Wales at present to expand this route above other types of provision. Table 6.2 shows the institutions that offer Foundation Degrees in Bioscience-related subjects in England

In England, Wales and Northern Ireland, there are 84 colleges that offer at least one 'BTEC qualification'[5] in Applied Sciences and in 2005-6 almost 2,000 qualifications were awarded. FE colleges also teach GCE 'A' levels in science.

28% of BTEC Science learners are studying in London, 18% in the North West and 17% in the West Midlands. 9% are found in both the south east and south west, and 6% in the east midlands and in Yorkshire and the Humber. Only 3% are in the East Midlands and the North East. Most Level 2 BTECs[6] are awarded in London and the West Midlands, while Level 3 BTECs[7] are more evenly spread across the regions.

In 2005/6, there were over 400 people in training on the Laboratory and Associated Technical Activities National Vocational Qualification at all levels. There are Apprenticeship programmes and also a new Young Apprenticeship in Science for young people still in school to gain experience in the sector.

Table 6.1 Number of learners working towards NVQ in Laboratory and Associated Technical Activities by English region (Further Education and Work Based Learning)

	FE	WBL	Total	%
East of England	3	0	3	1%
East Midlands	0	0	0	0%
London	9	3	12	3%
North East	19	76	95	23%
North West	58	103	161	39%
South East	20	0	20	5%
South West	38	6	44	11%
West Midlands	14	21	35	8%
Yorkshire & the Humber	34	11	45	11%
Total	195	220	415	100%

Source: LSC

[5] National Diplomas, National Certificates, First Certificates and GNVQs.
[6] First Certificates and First Diplomas
[7] Nationals Awards, National Certificates and National Diplomas

There are more LATA NVQs being undertaken in the North West than any other English region (39% of the total). 23% are in the North East and 11% in both Yorkshire and the Humber, but there are none in the East Midlands and very small numbers in the East of England.

It is clear that the vocational education and training part of the learning infrastructure is under-utilised by the bioscience sector.

Table 6.2

Institutions offering Foundation Degrees			
Region	**Course Title**	**Validating Institution**	**Delivering Institution**
East of England	Biomedical Science	University of Bedfordshire	University of Bedfordshire
East Midlands	Biology	Nottingham Trent University	Nottingham Trent University
	Chemical Sciences	Nottingham Trent University	Nottingham Trent University
	Physics	Nottingham Trent University	Nottingham Trent University
	Science Technicians	University of Leicester	University of Leicester & Wiggeston and Queen Elizabeth I College
London	Science	Birkbeck (University of London)	Birkbeck (University of London)
	Bioscience (Biochemistry)	London South Bank University	Ealing, Hammersmith and West London College
	Medical Biology	Middlesex University	Middlesex University
	Medical Sciences	University of Greenwich	Bromley College
	Biomedical Sciences	University of London	St Georges University of London and Kingston University (distance and work-based learning)
North West	Bioscience (Forensic, Biochemistry, Microbiology)	Liverpool John Moores University	Riverside College Halton
	Biology	University of Salford	St Helens College
	Microbiology	University of Salford	St Helens College
South East	Biological Sciences	University of Brighton	City College Brighton and Hove
	Laboratory Technologies	University of Kent	Mid Kent College
South West	Applied Biology	Bournemouth University	Bridgwater College
	Biomedical Science	University of Plymouth	Truro College
	Applied Ecology	University of Plymouth	Duchy College (Newquay)
	Biology (with European Field Studies)	University of Plymouth	Truro College
	Human Biosciences	University of Plymouth	North Devon College
	Human Biosciences with Psychology	University of Plymouth	North Devon College
	Applied Science	University of Plymouth	Cornwall College (Camborne)
	Chemistry	University of Plymouth	Cornwall College (Camborne)
	Marine Science	University of Plymouth	Cornwall College (Falmouth Marine School)
West Midlands	Pharmaceutical Technology	Aston University	Matthew Boulton College of Further and Higher Education
	Technical Support in Laboratories	University of Leicester	Bourneville College
	Technical Support in Laboratories	University of Leicester	Newman College Birmingham
Yorkshire & the Humber	Biomedical and Applied Science	Leeds Metropolitan University	Hull College
	Metallurgy and Materials	Leeds Metropolitan University	Bradford College
	Biosciences	Sheffield Hallam University	Sheffield College
	Applied Science	Sheffield Hallam University	York College
	Chemical Science	University of Hull	University of Hull

6.2.3 Secondary Education

Few people are recruited directly from school into the Bioscience sector, but relevant school qualifications are a requirement of entry into courses in HE and FE. Science is compulsory up to Key Stage 4, but in England, Wales and Northern Ireland only a very small minority go on to take GCE A levels in science. 6.8% of all leavers achieve an A level in Biology, 5% in Chemistry, 3.4% in Physics and 7.5% in Mathematics. In Scotland the figures are much higher: 8.8% of all leavers achieve a Higher qualification at Level 6 (A-C) in Biology. Similarly, 2.8% achieve a Higher at Level 6 in Human Biology, 9.4% in Chemistry, 9.1% in Physics and 17.9% in Mathematics. Additionally, 1.6% of all leavers achieve a Higher at Level 7 (A-C) in Biology, 1.8% in Chemistry, 1.5% in Physics and 2.4% in Mathematics.

Changes to the school science and maths curriculum have meant that students are reportedly less well prepared to take up tertiary level study. Academics report that first year students lack fluency in algebraic manipulations; the analytical powers for multistep problems and a proper appreciation of precision and proof. Remedial action in university reduces what can be taught in a 3 year degree.

There is no clearly established set of career pathways to guide young people in the choices they make when considering careers in science.

6.2.4 CPD

Enhanced CPD is supported by employers and Trade Unions in building the skills of the workforce. There is also a range of specialist private training companies offering courses in generic and management skills as well as continuing professional development. Senior scientific staff often keep their skills up to date through more informal specialist networks and conferences. BBSRC and others sponsor specialist courses. Three universities offer MBAs for bioscientists.

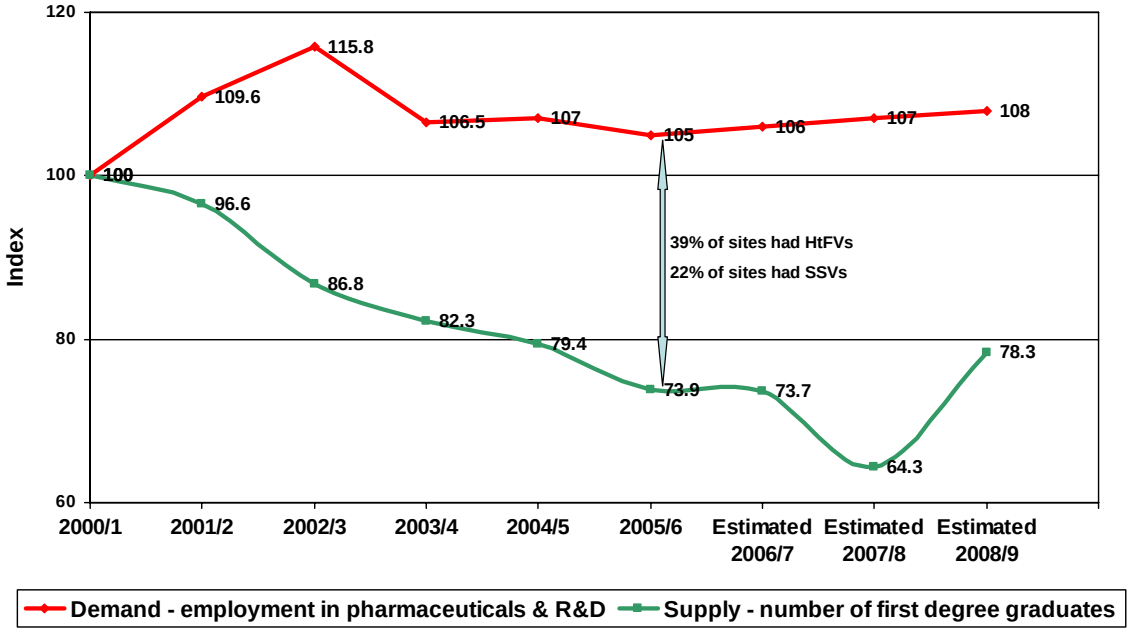
For teaching staff and school Laboratory Assistants, Science Learning Centres provide CPD courses for teachers and for school laboratory technicians. Other schemes, for example in Northern Ireland, offer the chance for academics to spend time in industry. These are popular and help to establish networks between industry and education.

7 Gap Analysis

Overall, the current system is not providing the number of cutting edge researchers, good bench scientists, or skilled technicians required for the development of bioscience and the adoption of biotechnologies in manufacturing. Supply is not meeting demand and is in fact diverging from it as figure 7.1 below shows in terms of the number of first degree graduates in chemistry and the relevant biological sciences.

Figure 7.1

Supply of first degree graduates in relevant Biological Sciences and Chemistry and Demand (employment change) in the Bioscience Sector



Sources: Employment – Annual Business Inquiry (ONS)

First degree graduates and number of 1st year students – HESA

One of the most significant trends of recent years has been the strong growth in numbers of young people going into Higher Education, but this has not been reflected in the number of students undertaking chemistry and the relevant biological sciences.

While sizes of cohorts through the relevant courses, in particular within Higher Education provision have waxed and waned between specific subjects, overall many of the courses of relevance to Bioscience have suffered since the 1990s from a fall in the numbers of young people wanting to study highly technical subjects, not least since they are often perceived to be (too) difficult. There are some indications of shifts back away from this trend, particularly within schools, but the 'appetite' of the fast-growing sector for an increasing flow of good science graduates and post-graduates requires not just a reversal of falls, but strong increases.

Employers within the Bioscience sector appear to recruit comparatively very low fractions of the First Degree graduates in relevant HE subjects – many good science graduates go to work in other sectors. This suggests that effort to improve the attractiveness of work in the Sector is probably needed, to be focused both at university students, and probably, in order to ensure that negative stereotypes are overcome, at secondary school students.

Within the relevance subjects, the specific courses of interest to Bioscience employers are those involving some time in industry, and, for joint Honours degrees, those whose second subject is appropriately complementary (rather than 'less mainstream').

In addition to the main science subjects, there is interest from some employers in new areas like Bio-informatics and more engineering-oriented degrees in Chemical and Process Engineering. This depends on the particular product/market niche of the company.

In principle, it would be desirable to try to increase the comparatively small numbers of young people who choose science subjects at school and then Science, Technology Engineering and Mathematics courses at university. It is likely that the greatest influence Bioscience employers would have in contributing to tacking this problem is as part of the overall national strategies emerging. SEMTA will review the relevant steps and advise employers on the steps likely to have the greatest impact.

Within the Vocational Education and Training provision system, there are a number of relevant courses. While not all newer provision has yet found strong employer take-up by employers, SEMTA will work with employers to examine how those achieving in this area might be able to provide good candidates in certain occupational areas.

Considerable refinement and improvements have been made over recent years to provision in schools. Cohorts of those choosing relevant GCSE and A Level (and equivalent) courses have recently been growing, but the challenge of encouraging more good young people to take such subjects continues.

It is understandable and natural that, in a fast-growing and fast-moving industry like bioscience, with a strong element of research and development and products and services of considerable technical complexity, the main focus on recruitment has been on the supply of the leading technical people, which has resulted in the greatest interest on Higher Education, and on the flows of people with First and Postgraduate Degrees in relevant subjects. However, a valuable opportunity exists in the development of the SEMTA Bioscience Sector Skills Agreement for Bioscience employers to review their past assumptions and practices to see whether new options might be available, given the various constraints that exist.

The major players in the Sector, in particular the large Pharmaceutical companies, are already engaging actively with the Education agenda at all levels, both in terms of a number of specific

initiatives and in terms of following and contributing to the various policy developments. This provides a sound base for developing an effective Sector Skills Agreement.

Summary

- **Skills shortages and gaps are higher in the bioscience sector than in other sectors**
- **The number of universities offering bioscience-related subjects is declining**
- **The number of first degrees gained in bioscience-related subjects has declined over the last six years: by 27% in Biological Sciences and by 23% in Chemistry**
- **Only a small minority of the graduates in these relevant subjects enter the bioscience industry or go onto higher degrees in the subject.**
- **Only 5% of all the higher educational qualifications achieved in 2006 were in the sciences relevant to the bioscience sector**
- **The take up of Foundations Degrees, HNC/Ds and BTEC National Certificates is low and there may be opportunities to expand capacity in this area to increase the number of technicians coming into the industry by this route.**

8 Proposed actions

Before moving into the actions the following statement aims to characterise the Bioscience sector and articulate the characteristics and challenges faced by the sector.

Characteristics and Issues

In contrast with other parts of the SEMTA footprint the Bioscience Sector has some unique issues and challenges, which are characterised below. It is however, important to recognise some strong linkages and threads of common need throughout the entire footprint.

- Bioscience in contrast with Automotive, Aerospace and Marine sectors is a relatively young sector and appears to less well understood, in-part underpinned by a general lack of science literacy across the population.
- There are some similarities with Electronics that the employer base has few large companies and a high number of small organisations which makes the sector difficult to engage at a representative level.
- The sector appears to have a higher reliance and dependency on high level skills at degree, doctorate and post-doctorate level and has moved away from the FE and WBL aspect of skills and knowledge acquisition, although this is now recognised as a risk.
- The sector has to wrestle with more challenging moral and social issues than other parts of the footprint, which has an adverse impact on the image of the sector.
- Biology is a science subject generally exclusive to this sector.

The issues and concerns that emerged across stages 1 and 2 of the SSA, primarily fall into the following themes:

1. Leadership & Entrepreneurships
2. Networks and Clusters
3. Image and Attractiveness of the Sector
4. Availability of a top quality workforce

Leadership & Entrepreneurship: Viewed as a significant area of opportunity and improvement for the sector, not only in the large companies, but also in the smaller biological labs where often technically competent and academically strong young entrepreneurs require improved support and business acumen/skills to grow and develop the business. We need to encourage leadership at a regional/local level in partnership and through existing clusters and networks in order to develop a critical mass of influence.					
Priority	**Action**	**Semta activity**	**Employer activity**	**Delivery partner activity**	**Measure of Success**
Develop a pool of strategic leaders to drive, challenge and champion the sector as a whole - including SMEs and larger organisations - to create real value for industry, which is more robust	Develop, broaden and endorse access to the BBSRC 'YES' Programme (Young Entrepreneurs Scheme) http://www.biotechnologyyes.co.uk/ (M)	Promote and endorse scheme. Identify funding to expand	BIA to develop and endorse BBSRC 'YES' Programme	BBSRC to further develop and expand 'YES' Programme across other Higher Education Institutions / expand number of HEIs involved Other delivery partners: BIA & ABPI	Increase in number of undergraduates involved in YES programme.
	Identify and establish a leadership body for the sector across the UK	Liaise with relevant government departments of agencies such as the Technology Strategy Board	Work with Semta, government departments and agencies, clusters groups and contribute members of leadership body	Regional and national clusters & networks to act as a focal point to bring leadership body together DBERR, TSB, cluster organisations to promote role of leadership body	Leadership body established and having impact across the UK in increased take-up of managerial & leadership training
Promote value and importance of CPD	Identify good MBA modules appropriate for the sector, plus, identify existing good provision (S)	Identify and promote appropriate MBA modules	Contribute to MBA courses. Release staff for MBA courses. Identify appropriate MBAs	BBSRC, BIA, ABPI to promote and identify 'good' MBAs with appropriate bioscience content	Increase in numbers of MBA course with appropriate bioscience content
		Identify other areas of CPD for entrepreneurship e.g. consider development of appropriate NOS	Release staff for CPD activity & encourage take up	BBSRC, BIA, ABPI to promote and identify good practice CPD for leaders and entrepreneurs appropriate bioscience i.e. with recognition of Intellectual Property Rights and regulatory environment. Prospect & other Trade Union leaders to help identify CPD required by the workforce	Increased CPD activity
Ensure correct approach is taken by Home Office re work permits for overseas non-EU bioscientists	Move quickly to ensure correct approach is taken by Home Office re work permits for overseas non-EU bioscientists (S)	Semta to provide evidence to Home Office Migration Advisory Committee re work permits	Employers to recruit overseas workers through Skills Shortage Occupation list (tier 1) route	Semta to work with BIA / ABPI and other SSCs on the Skills Advisory Panel of border and Immigration Agency to provide evidence	Reduction in skills shortages in high level occupations

S indicates Short–term action, M indicates medium–term action, L indicates long–term action.

Networks and Clusters: Networks and Clusters are viewed as a CRITICAL enabler and cluster development is central to the growth of bioscience and has been supported by the government since the 1999 Sainsbury report (Biotechnology Clusters - Report of a team led by Lord Sainsbury, Minister for Science). Skills are an important component of successful clusters, along with proximity to suppliers and markets. Delivery of provision will be more successful if pursued through the clusters and networks already developed.					
Priority	**Action**	**Semta activity**	**Employer activity**	**Delivery partner activity**	**Measure of Success**
Support networks & clusters in expanding skills - related activities	Research & develop a UK picture of the bioscience sector landscape , stakeholders and networks	Map stakeholders clusters and networks and their linkages	Identify emerging clusters and contribute relevant information on linkages	Existing networks & clusters to enable development of the UK map for their areas	Map provides a consolidated view across the UK that is used by employers & stakeholders to improve cluster development
	Look to see whether clusters could share short course provision where close or by distance learning i.e. share work of one cluster across others	Identify clusters & encourage co-operation across clusters	Promote skills within their clusters	Clusters within each region / nation to promote skills delivery and work with national bodies such as the Science Forum & National Science Learning Centre	Increase level of skills delivery within each region
	Where areas have lower skills gaps - arrange links between other clusters to 'promote' / share good practice in relation to skills	Investigate how clusters have contributed to lower skills gaps		Take into account findings of research & promote good practice identified Delivery partners: Other clusters working together across the UK	Reduction in skills gaps in the sector
	All provision to take into account the role of cluster development in bioscience (and other knowledge-based industries). Clusters tend to be centred around HEIs. Investigate ways of including FE and VET in clusters	Encourage links between FE & HE in interested clusters	Identify occupations / roles that could be best filled by a vocationally trained workforce e.g. technicians	FE, HEI, VET providers' business units to co-operate Other delivery partners: Cluster organisations	FE & VET providers linked in to clusters and developing VET to meet employers' needs
	Establish a mechanism to provide a robust demand signal from the sector on a continuous basis	Continue & enhance labour market research in the sector to provide detailed understanding of skills shortages and gaps	Continue to labour market research and provide insight into emerging technologies and future scientific developments	Liaise with employers to provide enhanced labour market information at a regional level, to identify specific skills	Action and initiatives undertaken as a result of the labour market research. Increased level of skills delivery within region / cluster

Image and attractiveness: To help the public at large have a better informed understanding of science generally (science literacy) and Bioscience as a consequence of improved general education and a more balanced representation of information in the public domain i.e. industry take a more participative role in this area. Encourage young people aspire to a career in science and engineering. Increase the number of adults employed in other sectors to consider Bioscience as an attractive and rewarding sector when retraining and up-skilling as a consequence of redeployment and/or career advancement.					
Priority	**Action**	**Semta activity**	**Employer activity**	**Delivery partner activity**	**Measure of Success**
Improve public understanding of science generally (scientific literacy) and particularly understanding of Bioscience	Develop image activity plan	Lead development of image activity plan	Employers to enable development of plan through their PR and Marketing departments	Input from Cogent and Trade Associations. Input from Science Media Centre	Image activity plan developed of implemented and image of sector is improved
		Establish a team to review and develop quick wins and review the image approach	SSG to contribute	Team to include Cogent and Trade Associations	
	Expand the influence of the Science Media Centre (SMC) to the public in a coherent fashion	Promote SMC	Use & contribute information to the SMC	Trade Associations, Research Councils, Clusters & STEMNET to work with SMC	
Develop a policy for Information, Advice and Guidance, in order to improve / enhance with partner bodies	Develop a policy and strategy to improve IAG for the sector	Liaise with other bodies in developing IAG policy careers advice	Employers to enable STEM careers advice and activities	Support from Careers Service, Connexions, Next Step, LearnDirect, JobCentre Plus, Institute of Career Guidance, Association of Graduate Careers Advisory Services, ABPI, BIA, Science Council, etb, Cogent and Union Learn to develop IAG at various levels	More people interested in working in the sector
For young people to aspire to a career in Science	Establish clear set of career pathways for science	Develop a draft route map and, following employer-led feedback, publish UK wide (with appropriate guidance for all 4 nations)	Promote bioscience through providing work placements , visits, science ambassadors, etc.	Careers activity: etb, JobCentre Plus, Science Council developing by 2008 route / career pathways	Bioscience sector able to recruit new staff more easily. Reduction in hard to fill vacancies and skills shortages
	Make better use of (exploit) existing organisations in support of the challenge in communicating the messages better an in a more coherent fashion	Supply LMI to appropriate organisations to support promotion of sector	Taking part in careers activities in schools, universities, career fairs, etc.	Support from Careers Service, Connexions, Next Step, LearnDirect, JobCentre Plus, Institute of Career Guidance, Association of Graduate Careers Advisory Services, ABPI, BIA, Science Council, etb, Cogent and Union Learn to develop IAG at various levels	

	Support Schools in the promotion of science & delivering the subjects in a purposeful science curriculum Support links between schools, bioscience employers and HEIs through work experience schemes and site visits	Promotion and communication	Taking part in careers activities in schools through employers websites	Schools to commit time for visits (influence head teachers)	Increase in take up of appropriate science subjects at school (GCSE, 'A' level , Ordinary, and Higher). Increase in numbers wanting to take biological sciences, appropriate biomedical science, chemistry and maths at degree level
Emphasise the importance and value of all science subjects with linkage to associated career paths. This can be supported by STEMNET, TA's, Research Councils, Industry and the launch of the NEW Diploma lines in England	Promotion of science subjects, particularly relevant biological sciences, chemistry & mathematics	Contribute to national reviews of Science Policy. Seek resources to support implementation of relevant qualification e.g. build on GCSE Applied Science & support Science Diploma	Promote bioscience though providing work placements visits, science ambassadors, etc. Taking part in careers activities in schools through employers websites	Promote science with DCSF, DIUS, STEMNET, Professional bodies, RSC, BBSRC, etb, Biosciences Federation, Science Council and Cluster organisations	Increased number of graduates going into the bioscience sector and PhDs being retained by the sector in the UK

Top quality workforce: Closing the skills gap by increasing the supply of quality people. Identify 'CORE' subjects and activities within the curriculum i.e. the STEM subjects and a focus on Practical skills.					
Priority	**Action**	**Semta activity**	**Employer activity**	**Delivery partner activity**	**Measure of Success**
Improve practical skills as an integrated component of the education system at all levels	Development of appropriate National Occupational Standards (NOS) for the sector with a strong emphasis on practical skills and application	Semta to develop NOS for the sector with a strong emphasis on practical skills and application Practical skills provision linked to SQS developments and progression routes. To be highlighted in route map of career pathways	Contribute to the NOS development and review	Awarding Bodies to Quality Assure NOS (accredit/certificate)	Adoption and use of NOS to meet skills deficiencies and gaps. Employers using NOS to solve skills gaps
	Identify the range of practical skills required to en-rich the curriculum and learning process, plus identify where and how these can be acquired i.e. Science Learning Centres and Techniums Develop a mechanism to better utilise spare laboratory capacity in universities to be exploited by schools and FE	Semta to develop list of practical skills with employers	Bio SSG to collaborate on identification of practical skills required to en-rich the curriculum and learning process	Providers at all levels to enhance delivery of practical skills Other delivery partners: HE / FE /VET providers and BBSRC	Reduction in practical skills deficiencies in new recruits and the current workforce
	Industry to be invited to participate in the Bioscience Subject Benchmarking exercise to review and redefine Subject Benchmarking Statements at Higher Education level, and therefore influence the HE output directly, particularly in relation to practical skills	Semta to organise / enable meetings with funding councils, Research Council and SSG	Review & help redefine subject Benchmarking Statements at Higher Education Level Other delivery partners: QAA	Funding Councils & Research council to assist in reviewing and redefining Subject Benchmarking Statements at Higher Education level	Employer representatives involved in Bioscience Subject Benchmarking. More emphasis given to practical skills in degrees
	Review the demand for 'sandwich courses' with a view to ramp up this activity across the UK. This will help bolster the practical experience so desperately sought after within the sector	Investigate demand for sandwich courses	Offering Sandwich placements	HEIs, FE to expand provision of sandwich courses	Reduction in practical skills shortages & gaps

Reduce skills shortages: Where there are particular skills shortages we need to develop a robust and substantive demand signal in order to gear-up a range of suitable solutions to address the needs articulated	Increase number of graduates with appropriate scientific skills in the following disciplines: Biological sciences Biomedical sciences Chemical sciences Process engineering Mathematics / Statistics Specific scientific areas to be addressed are: Clinical/pharmacology/experimental medicine Bioscience and molecular biology Analytical and physical chemistry Process and chemical engineering In vivo sciences Bioinformatics	Promote importance of biological sciences to government to gain status of physics, chemistry and mathematics	Industry links with HE to be expanded through visits, work placements, etc.	Higher Education Institutions expanding number of places on relevant biological science courses Other delivery partners: Higher Education Funding Councils and DIUS	Increases in number taking up the relevant sciences
	Move quickly to ensure correct approach is taken by Home Office re work permits for overseas non-EU bio scientists (S)	Semta to provide evidence to Home Office Migration Advisory Committee re work permits	Employers to recruit overseas workers through Skills Shortage Occupation list (tier 1) route	BIA / ABPI to work with Semta to provide evidence	Reduction in skills shortages in hard to fill vacancies and skills shortages across the sector
	Assess opportunities for industry to recruit from non-HE (non-traditional) routes e.g. from FE, through apprenticeships, etc. (following on from the development of NOS) (M)	Examine market for non-traditional (non-HE) recruits to the sector	Consider recruiting through vocational HE, FE and VET routes (L)	Develop appropriate provision that meets the needs identified in the employers' demand signal. Awarding Bodies to explore potential for delivering relevant qualifications Other delivery partners: HE / FE /VET providers and funding councils	Reduction in hard-to-fill vacancies particularly technician, craft and operator level
		Promote routes into industry from VET	Industry collaboration with FE and VET providers	FE to develop business links with bioscience sector employers and HE in local clusters	Increase in numbers moving onto HE courses in relevant subjects
Promote and develop a responsive system in order to design short courses to address the emerging high level specialist demand signals and up-skilling requirements for the sector. This will require a process to gather the demand signals in order to develop a solution/service.	Highlight examples of good practice in promoting links between employers and the supply side	Highlight examples of good practice in promoting links between employers and the supply side	Increase employers links to Business Units of HE, FE and VET providers	Improving links between the Business Units of HEIs, FE & VET providers and the sector	More employees involved in CPD

	Ensure CPD is available in key science areas and where it is required. Promote relevant networking , short courses, etc.	Promote the key science areas within Science Learning Centres, Techniums, Research Council, etc	Promote CPD	Promotion of relevant + provision partners: BBSRC, Science Learning Centres, Techniums, HE/ FE /VET providers	
Change Metrics for undergrads and university outputs to make more responsive to employer needs	Identify measures that are meaningful to the sector	Work with employers to identify those HE programmes / degrees that best meet their needs	Identify courses that employers value and provide evidence in terms of the relevant metrics	Institutions to endorse courses valued by industry Incentives offered to subsidise courses and qualifications valued / endorsed by industry	Increase in courses identified as meeting employer needs. Decrease in level of skills shortages across the sector