



**Consultation on BBSRC's
new Strategic Plan
2010 - 2015**

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Introduction to the consultation

Developing our new Strategic Plan 2010 - 2015

The Strategic Plan is one of our most important planning documents. It speaks to a wide audience of interested stakeholders, including researchers, policy makers, other funders and the broader public. Our new Plan will set out our leading high-level priorities and aspirations over the next five years, as well as some of the underlying principles upon which we will base our funding decisions. Through it we hope to convey the real sense of excitement and opportunity in UK bioscience that we feel ourselves and see daily in our research community.

Engagement

Early engagement with BBSRC Council, Strategy Advisory Board, institute Directors and our seven Strategy Panels, which comprise representatives of key stakeholder groups, has shaped our thinking and is reflected in this consultation.

BBSRC's developing strategy is also informed by the numerous daily interactions with our wide and varied set of stakeholders and by the many reviews and studies carried out in the course of our business as a science and skills based organisation. We also engage actively on the international stage and are acutely aware of the policy needs and drivers that shape publically funded science. We hope that all of this too is reflected in the thoughts and ideas contained within this consultation and will eventually help to form our new five-year Plan.

Consultation

We are now seeking input from our stakeholders to help crystallise, refine and prioritise our ideas. We invite you to submit your views on the proposed priorities, themes and other considerations, as set out on the following pages. Responses will help to shape the final Strategic Plan document prior to its anticipated launch in late 2009.

Key Questions

Embedded within the consultation are key questions where we would particularly like the views of stakeholders. The questions are intended to guide, not constrain, responses, so respondents need not focus exclusively on the questions posed nor answer them all.

Key information about the consultation

Date consultation launched: 03 July 2009

Closing date for responses: 14 September 2009

How to respond:

Responses from all interested parties are welcome. We encourage academic departments, institutions and other bodies to submit single coordinated responses. Please state whether you are responding as an individual or on behalf of an organisation; if the latter please provide brief summary information or web link about the organisation you represent.

Please note that BBSRC reserves the right to publish responses to the consultation, and that information provided in response to this consultation will be dealt with in accordance with the access to information regimes¹

Responses by email are preferred, and should be sent to:

strategic.planning@bbsrc.ac.uk

For enquiries about the consultation, to submit responses by post or to request printed copies of this consultation document, please contact:

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¹These are primarily the Freedom of Information Act (2000), the Data Protection Act (1998) and the Environmental Information Regulations (2004).

About BBSRC

About BBSRC

The Biotechnology and Biological Sciences Research Council (BBSRC) is the UK's leading funding agency for academic research and training in the non-clinical life sciences.

Sponsored by Government, BBSRC annually invests around £450 million in bioscience research that makes a significant contribution to the quality of life for UK citizens and supports important industrial stakeholders including the agriculture, food, chemical, healthcare and pharmaceutical sectors.

BBSRC carries out its mission by funding internationally competitive research in universities, centres and institutes, providing training in the biosciences, fostering opportunities for knowledge transfer and innovation and promoting interaction with the public and other stakeholders on issues of scientific interest.

Our present Strategic Plan 2003-08¹ centres around six high-level strategic objectives:

Strategic Objective 1 – Excellent Science addresses the need to fund world-class basic and strategic research. Four interrelated priority areas were identified:

- Integrative biology
- Sustainable agriculture
- The healthy organism
- Bioscience for industry

Strategic Objective 2 – Tools and Technology recognises that new tools, resources and technologies are vital for the multidisciplinary efforts necessary to increase understanding of the biosciences on all levels.

Strategic Objective 3 – People sets out BBSRC's plans, particularly in the light of the Roberts review, for improving training and career structure for all staff and students. This is an important and a central objective for the future success of UK bioscience.

Strategic Objective 4 – Knowledge Transfer recognises the importance of KT to translate research and innovation into economic prosperity and to ensure that society can ultimately reap the benefits of advances in the biosciences.

Strategic Objective 5 – Partnerships recognises that BBSRC cannot achieve its objectives alone. This objective explains how BBSRC will seek new and improved partnerships with stakeholders and engage the public in dialogue on the biosciences.

Strategic Objective 6 – Effective Organisation addresses the need for BBSRC to be a capable organisation and a responsible employer so as to deploy funding and resources with maximum effect.



Driving our 10-year Vision - 'towards predictive biology'

Integrative and systems biology were principles upon which the Strategic Plan 2003 - 2008 was built. Moving bioscience to become more quantitative and predictive is a long-term strategic aim for BBSRC, and we anticipate that these values will continue to feature prominently as a thread running through the new Plan.

¹http://www.bbsrc.ac.uk/publications/policy/bbsrc_strategic_plan.pdf

BBSRC's new Strategic Plan:

Proposals for 2010 - 2015

Overview: *Strategic Plan 2010 - 2015*

Delivering excellence with impact - we have worked with stakeholders to identify a number of leading priorities and themes that we judge are essential to keep the UK a world-leader in bioscience.

- World-class bioscience**

BBSRC will continue to support researcher-led excellent bioscience across our broad remit. Excellence is the lifeblood of innovation and through responsive mode we will fund the best ideas from the best people.

- Three key strategic priorities**

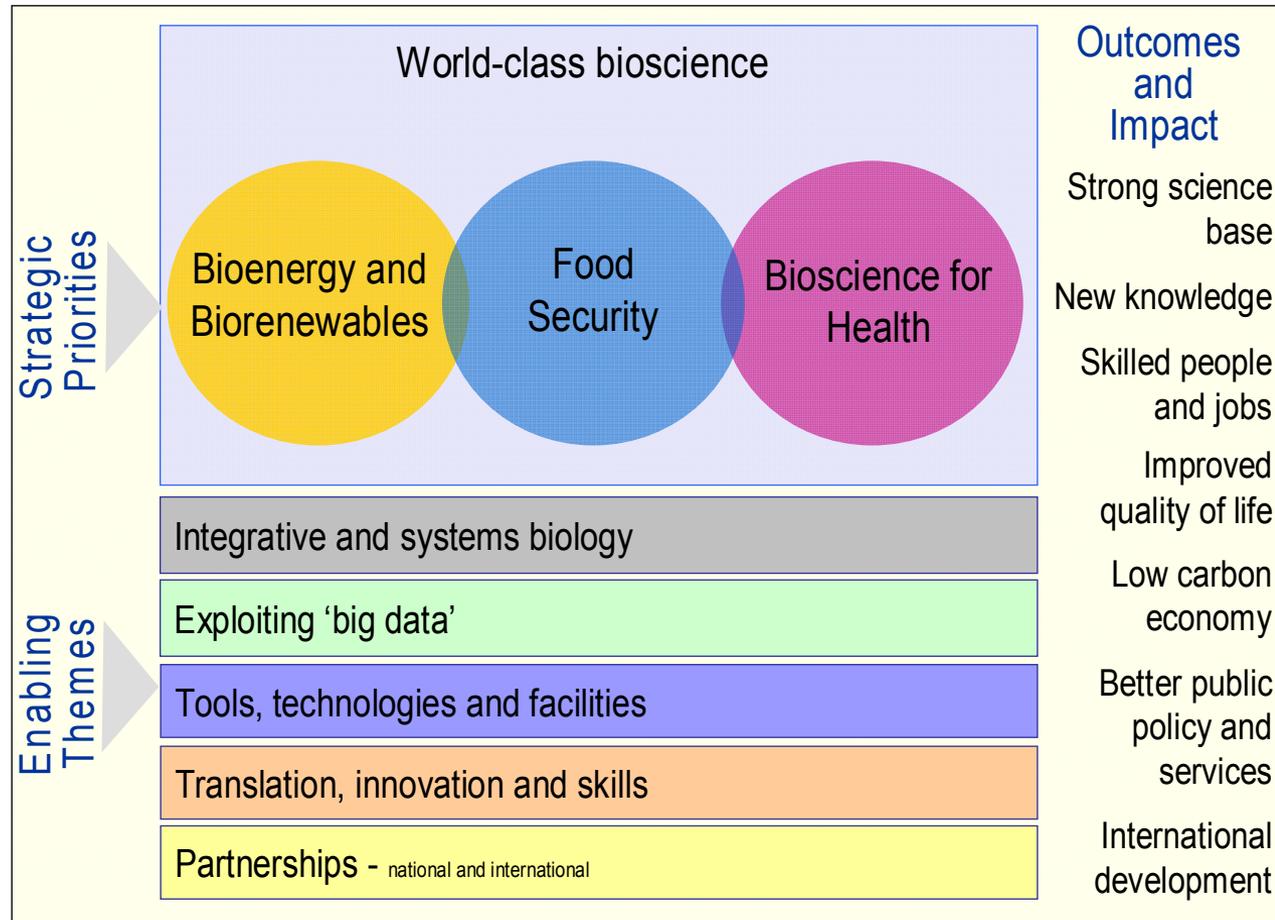
Embedded within our commitment to world-class, researcher-led, bioscience across our remit we highlight three key strategic priorities for particular focus. These are some of the most significant grand challenges facing society. They are areas at the heart of BBSRC's remit where the Council's funding can make a real difference on a national and international stage.

- Five enabling themes**

We have identified five enabling themes that will require clear focus and actions over the strategic planning period. These span diverse issues and getting these right, particularly through productive partnerships with other funders, users of our science and the wider society, will be essential for the continued international competitiveness of UK bioscience and for delivering the required impacts.

- Outcomes and impact**

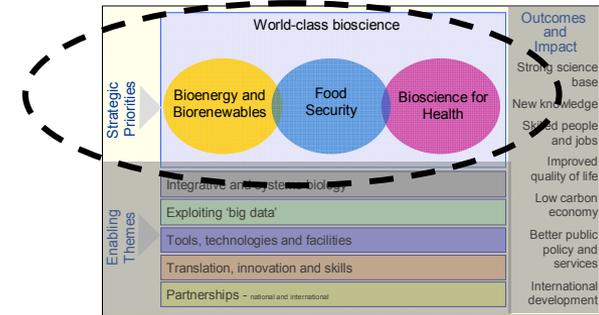
UK bioscience generates significant benefits for society and the economy. We should celebrate this and be better at capturing and articulating the return from our investment of public money.



Is this an appropriate high-level framework for BBSRC's strategy over the period 2010-2015? If not, please explain briefly your reasoning and what you would change.

World class bioscience

Delivering Excellence with Impact



Maintaining the UK's position as a global leader in bioscience...

The UK is ranked as one of the top nations in bioscience. In 2007 we moved to first place, ahead of the USA, on the proportion of most highly cited and influential papers - a widely accepted measure of quality. The challenge for BBSRC is to help to keep the UK as a global leader.

... by continuing to fund the best ideas from the best people

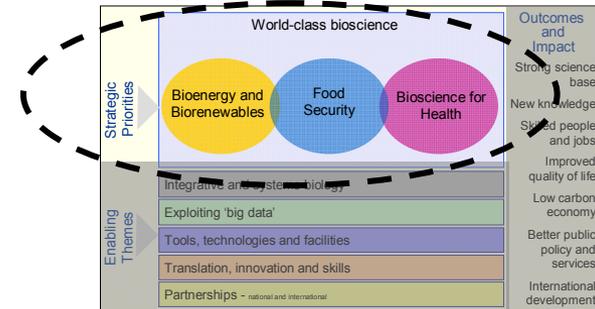
Excellent research and excellent people have long been cornerstones of BBSRC's strategy for the delivery of world class bioscience. Inspiration-led research underpins the health and international competitiveness of UK bioscience and provides the seed-corn for innovation. Over the period 2010 - 2015, we propose to:

- **attach a high priority to responsive mode funding** which enables us to support the best ideas from the best people and provides vital agility to respond rapidly to emerging areas
- **focus more on priority areas** where we can have the most impact, make the biggest difference and maintain capacity in crucial areas, through mechanisms such as through Council-wide responsive mode priorities and highlight notices
- **operate flexibly to support a full range of grant types** from small, pump-priming or proof-of-concept studies through to strategic longer, larger research programmes where the science demands it
- **support our world-class institutes** where strategically focused research and unique resources, facilities and expertise provide **critical national capability in key areas**, such as sustainable agriculture and land use, animal health, food security and biomedical sciences including diet and health. Our wider institute family includes IBERS and Roslin, which are now integrated with universities.
- **strengthen existing, and build new, partnerships** with other funders, users of our science and the wider society. Open and transparent public dialogue is essential if we are to have a society that is engaged with and supportive of advances in bioscience. We will build new and stronger partnerships with industry and with leading universities where we provide significant funding (see also Partnerships section, pages 21 and 22)
- **continue to evaluate and develop the most effective peer review processes** to meet the challenges of modern bioscience, including the handling of multidisciplinary grant applications. This will include monitoring the progress of our recently revised responsive mode committee structure
- **maintain an emphasis on integrative and systems approaches** to bioscience so that the use of mathematical modelling becomes a routine tool to drive and refine hypothesis-based investigation



Given the possibility of future constraints in public funding, do you agree our strategy should be to focus more on areas where we can have the most impact? What criteria should be used to identify priority areas? How can BBSRC best help to keep the UK internationally competitive in bioscience?

Three key strategic priorities ... at the heart of BBSRC's remit



● Next generation bioenergy and biorenewables

biofuels and industrial materials from novel sources to help position the UK as a low carbon economy and reduce dependency on fossil fuels

● Food security

bioscience underpinning an adequate, affordable, sustainable, nutritious and safe food supply in a changing world

● Bioscience for health

basic research supporting people's health across the lifespan for better quality of life and reduced need for health and social care

In consultation with BBSRC's stakeholders we have identified three high-level strategic priorities, where there is significant potential for growth over the next 20 years.

BBSRC institutes are significant centres of critical mass and national facilities in these areas, alongside world-class HEIs. The UK is well placed to be an international leader. Two of the priority areas in particular – bioenergy/biorenewables and food security – are set to make major contributions to positioning the UK as a low carbon economy and creating green industries and jobs.

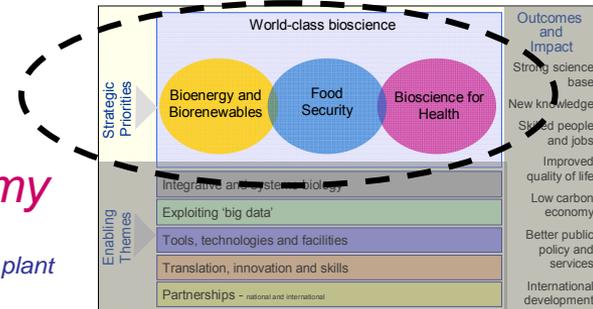
Integrated and systems-based approaches, building on quantitative and modelling techniques, will be needed to tackle these challenges in a coherent and holistic way. A thread running through these strategic priorities is the need to give attention to skills gaps and building national capability in critical underpinning disciplines. Strategic partnerships, working closely with industry, policy makers and other funders (national and international), and ensuring effective public dialogue are all essential for real progress in these complex and long-term challenges.

The three priorities do not exist in isolation, for example, between food security and bioenergy there are many common issues around competition for land use and natural resources such as water. There are also socio-economic dimensions such as whether demand for grain for biofuels contributes to food price spikes and depleted world grain stores. The interface between food security and bioscience for health includes research areas such as 'diet and health' and the psychology of consumer choice.

Do you agree that these three strategic themes should be at the heart of BBSRC's plans? If not, please explain your reasoning and alternative suggestions.

Next generation bioenergy and biorenewables ... *building a low carbon economy*

Reducing dependency on dwindling fossil fuels and cutting greenhouse gas emissions requires alternative sources of renewable energy and industrial materials. This is a major strategic priority for BBSRC, which builds on our excellent plant and microbial science that have long been strengths in the UK.



Drivers and opportunities

The Budget 2009 recognises that building a low carbon economy will require a transformation of the way the UK generates its energy, including increased investment in renewables.

Major investment in bioenergy will be vital in meeting Government targets for 20% of electricity to be produced from renewable sources by 2020. At the same time, the chemical industry is seeing a shift from a non-renewable to renewable feedstock base (e.g. the production of bioplastics, biocomposites and 'green' chemicals from plant materials or microbes), driven by:

- the stability and predictability of the price of renewables compared with, for example, the dramatic fluctuations and overall increase in oil prices
- reduced environmental impact: bio-based feedstocks in chemical manufacture can reduce emission by up to 50% compared with the use of non-renewable feedstocks
- limited availability of non-renewable feedstocks

As competition for land increases and the effects of climate change on agricultural productivity are felt, there is a clear need for new 'green industries' which bring together the food and chemical supply chains to increase the efficiency of biomass production and use, and to minimise waste.

Considerations and potential priorities

Proposed key research areas and additional considerations over the period 2010 - 2015 include:

- **'next generation' bioenergy sources**, that will convert the large amounts of energy locked away in the structure of plant cell walls (lignocellulose) - including the waste from food crops - to derive ethanol and other versatile fuels
- **Algal or microbial sources** of biofuels and industrial materials. Genetic research to better understand and enhance oil synthesis and accumulation in algae, and suitable technologies to grow the cells on a vast scale and to harvest and purify the oil, could see production of oils from these sources become a realistic commercial prospect
- **Biological sources can also be exploited to produce renewable materials** for the chemical and other industries, substituting for petroleum based chemicals. More research is required to understand the molecular and cellular basis of key biosynthetic processes and to apply this knowledge to model and optimise production of biorenewable chemicals and materials
- **Holistic, systems-level approaches** will be required, integrating concepts, methods and models for the study of biological systems at many different scales from molecules to landscapes. Work is required covering all the relevant science disciplines, along with clear consideration of the economic and social impact of bioenergy production and use

Following BBSRC's [review of Bioenergy](#)



(2006), the BBSRC Sustainable Bioenergy Centre has been established as the single biggest UK public investment in bioenergy (£27M). Research over the period of the new Strategic Plan will address many topics, among them improving the efficiency of biomass crop production, optimising the composition of biomass, and developing new technologies to digest plant wastes to generate liquid biofuels.

Key partners (see also Partnerships section, pages 21 and 22)

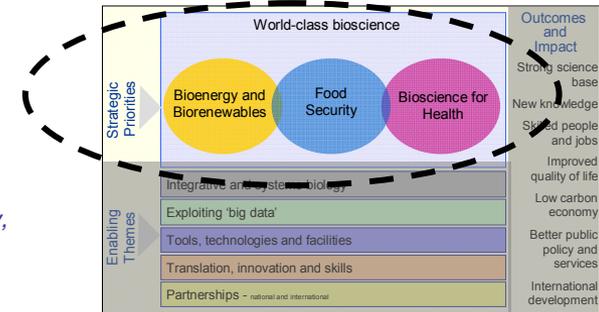
BBSRC funding for bioenergy research is part of the ongoing Research Councils Energy Programme. In addition to collaboration with other UK funders, policy makers and a wide industry base there is considerable opportunity to work for mutual benefit with overseas partners, such as Brazil and USA, who bring their own experience and strengths in this area.



Are these the most appropriate considerations and potential priorities? If not, please explain briefly your reasoning and what you would do differently?

Food security ...towards a sustainable, adequate, affordable, nutritious and safe food supply

The agriculture and food supply sectors need to focus on food quality and efficiency of production within economically, environmentally and socially sustainable systems. BBSRC-funded research will help to provide the new knowledge, technologies and skills to enable the UK to address the challenges of securing sustainable food supplies.



Drivers and opportunities

Global demand for food is rising under the influence of population growth, increasing affluence and dietary transition.

The UN has estimated that global food production will need to increase 50% by 2030, and double by 2050 to meet Millennium Development Goals on hunger.

Yet water is expected to become more scarce, and biofuel policies are introducing new sources of competition for land and grains, putting added pressure on production. Climate change is expected to reduce the reliability of food supply through changing patterns of rainfall and increased pressures from pests and diseases. Furthermore, the adverse environmental impacts of the food supply chain, such as greenhouse gas emissions from agriculture and from food transport and refrigeration, must be minimised.

Addressing the growing food security crisis will require a multidisciplinary, multifaceted approach. During the period of the new Strategic Plan, BBSRC expects to lead a **major cross-funder research programme** in Food Security. We recently launched a [consultation](#) on behalf of the Research Councils, seeking views on the future directions in research relating to food security.



Considerations and potential priorities

Proposed key research areas and additional considerations over the period 2010 - 2015 include:

- **Maintaining essential functions of soils and minimising inputs** including energy, fertilisers and water
- **Focusing the UK's strong basic plant science** on problems relevant to food production such as enhancing yield, preventing or combating pests and diseases and controlling weeds, improving quality and generating crops adapted to future environments
- **Research supporting animal production and welfare**, including genetics and genomics underpinning livestock and poultry improvement, where UK strengths in animal science will continue to be a cornerstone supporting food production
- **Maintaining animal health and food safety**, addressing both endemic and exotic animal diseases, and importantly, zoonoses
- **Research supporting food production from aquaculture and fisheries**, where there is a need to increase the diversity of species that are farmed/caught, and to develop sustainable sources of fish meal for farmed fish
- **Optimising the nutritional quality** of food, and maintaining food safety throughout the supply chain
- **Maintaining bee health** and that of other beneficial invertebrates for pollination and pest control
- **Rebuilding the UK skills base** at a number of levels to nucleate new research groups and build capacity in areas where there is a shortage of specialist research expertise, or of skills in the translation of research into practice
- **Enhancing national capability through major infrastructure and facilities** such as the Institute for Animal Health and the new genome sequencing and bioinformatics centre (TGAC)
- **Accelerating translation of research into practice**, for example the production of public sector germplasm, and through mechanisms to align academic research more effectively with industry needs

Key partners (see also Partnerships section, pages 21 and 22)

Food security is a complex issue where public dialogue is vital to help inform strategy. There is a pressing need to boost private sector investment and to ensure that public funders in this area are better coordinated for maximum synergy and value for money. So BBSRC needs, in particular, to look to partnerships with sister research councils via existing cross-council programmes, with policy makers such as Defra, DfID, DH and FSA, and with the agricultural, agrichemical and food production industries.

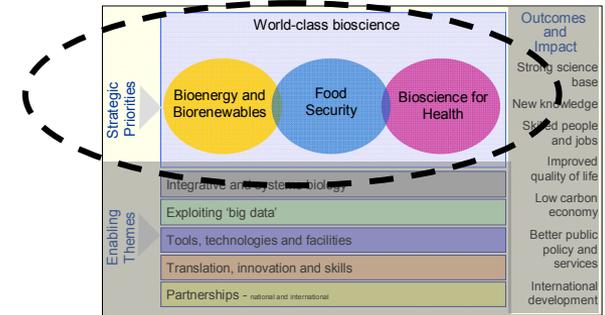


Are these the most appropriate considerations and potential priorities? If not, please explain briefly your reasoning and what you would do differently. How should we balance national and international research considerations?

Bioscience for health

...improving quality of life

Understanding the fundamental biology underpinning human development and health throughout the life-course, and the influence of the environment on these processes, remains a key challenge.



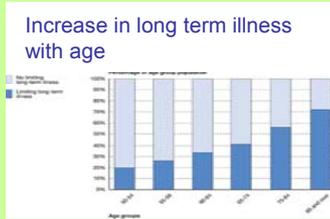
Drivers and opportunities

We are in a period of unprecedented demographic change with the proportion of older people in the population increasing such that by 2051, 40% of the UK population will be over 50, and 25% over 65.

While lifespan is increasing, 'healthy lifespan' is not increasing at the same rate.

The ageing population has been identified by the Government as a key policy challenge for which sustained investment in research will be necessary. It is important to understand the biological mechanisms underpinning health throughout the whole lifespan and how this can be influenced by developmental and environmental factors, nutrition and physical activity. Outcomes could have significant social and economic impact including novel drugs, and targeted dietary and lifestyle interventions.

Bioscience research is also vital in underpinning the UK pharmaceutical industry, where a fundamental understanding of biological processes, will help to improve the targeting and efficiency of production of new drugs.



Considerations and priorities

Proposed key research areas and additional considerations over the period 2010 - 2015 include:

- **Understanding the cell and molecular processes involved in normal physiology and homeostatic control** in the context of the whole organism during development and through life, using systems and other approaches.
- **Revealing the mechanisms whereby the ageing process itself can act as a risk factor for frailty and poor health**
- **Understanding the importance of biological rhythms** in maintaining physical and mental health and the physiological effect of twenty first century lifestyles
- **Elucidating the role of diet as a modifier of development and health**, including the impact of early nutrition, metabolic regulation and gut health
- **Understanding the psychological processes influencing food and lifestyle choices**

A further priority over the course of the new Strategic Plan will be the bioscience underpinning the pharmaceutical and diagnostic industries. Proposed areas of focus are:

- **Generating new targets and opportunities for safe and selective interventions** through underpinning research to further elucidate fundamental molecular mechanisms of relevant biological processes
- **Developing an improved understanding of basic human biology** to help to improve the efficiency and predictability of research and development, including research in areas such as biomarkers and bioimaging, metabolic modelling, integrated biological and chemical informatics, high content biology, high throughput and comparative genomics and understanding the blood brain barrier
- **Continuing to support industrially relevant research and training** in bioscience, recognising that the provision of skilled individuals is one of BBSRC's key contributions to the UK pharmaceutical and biopharmaceutical sectors.

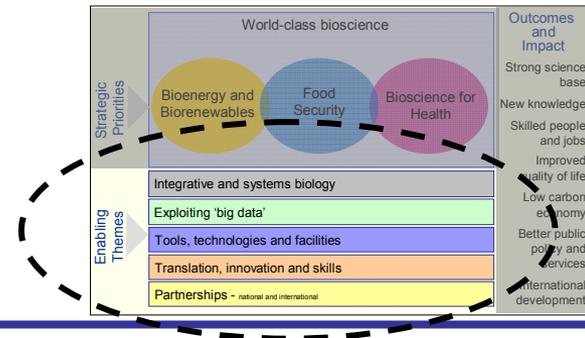
Key partners (see also Partnerships section, pages 21 and 22)

MRC, ESRC, NIHR, OSCHR, medical research charities and the pharmaceutical industry

Like the other two strategic priority areas, **bioscience for health** sits in a complex network of many other funders and users of the research. There are significant opportunities for effective joint working with policy makers, other major funders, and for public dialogue around potentially contentious issues where advances in bioscience stretch societal boundaries (e.g. stem cells, cloning).

Are these the most appropriate considerations and potential priorities? If not, explain briefly your reasoning and what you would do differently.

Five enabling themes



We have identified five underpinning enabling themes that will require particular focus and clear actions over and beyond this strategic planning period if we are to maximise the impact from BBSRC's funding.

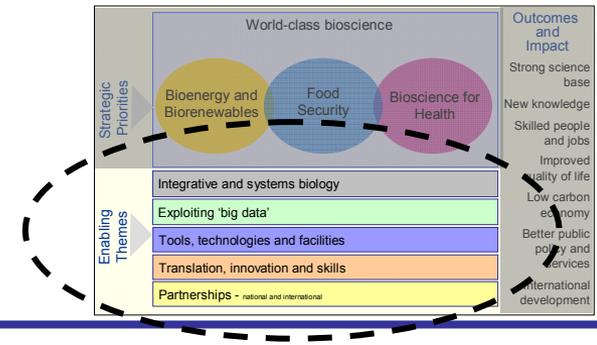
The themes are a mixture of interconnected issues, mostly representing long-term commitment by BBSRC, and all are essential for the continued international competitiveness of UK bioscience.

We consider all of these themes to be important, but in particular innovation and skills are crucial for delivering economic and social benefits from our investment of public money. The attention we afford these activities in this Plan reflects their importance to the Council

- **Integrative and systems biology** - maintaining BBSRC's long-term commitment to integrative and systems approaches to bioscience
- **Exploiting 'big data'** – seizing new opportunities to generate knowledge and impact as we enter an era of data intensive science
- **Tools, resources and facilities** – providing the tools, technologies and infrastructures that are essential for 21st century bioscience, and that are at the heart of the UK's world-class bioscience research base
- **Translation, innovation and skills** – ensuring that our world-class science and skilled people have maximum impact in boosting the UK economy, connecting to policy and improving quality of life by:
 - Supporting our scientists
 - Developing skills and capability
 - Engaging with industry
 - Supporting knowledge transfer and translation
 - Recognising the importance of culture change
- **Partnerships** – working with our many stakeholders and other funders, nationally and internationally, to deliver our exciting vision for UK bioscience

Do you support these five themes? If not, please explain briefly your reasoning. How else can we support excellent bioscience and maximise impact? What would you do differently?

Integrative and systems biology



BBSRC investments in research, training, infrastructure and resources for systems biology have helped the UK to become a major international force in this science and its applications...

Over the period 2010 - 2015 and beyond, BBSRC's vision for the development of the biosciences is for researchers to **routinely apply mathematical and computer modelling techniques to quantitative biological data**, and to use the models generated to test new hypotheses and inform experimental strategies. This will enable a more rapid and deeper understanding of complex biological problems.

An integrative and systems biology approach to biological research is relevant to all science in BBSRC's remit. BBSRC expects to maintain a high level of investment in systems biology, to drive forward a culture change in UK bioscience and promote new ways of working. We propose to:

- **embed systems approaches** as 'normal business' in responsive mode funding, initiatives and institute programmes
- **encourage the development of the necessary mathematical and computational skills** in the UK bioscience community, and encourage those skilled in the engineering and physical sciences to study biology, to enable their skills to be used to investigate biological problems
- **increase the uptake of systems-based approaches in the private sector** through collaborations with BBSRC institutes, Systems Biology Centres and other BBSRC-funded researchers, and through Industry Interchange and CASE studentship schemes
- **provide support for tools and resources** e.g. computation, modelling, data management and high through-put technologies (see Tools, Resources and Facilities section, page 15)

International collaboration will be important in addressing the challenges that lie ahead in the field of systems biology. BBSRC will seek to develop further partnerships with our counterparts in Europe and worldwide.

Building on previous investments

To date, BBSRC has invested more than £90M directly in integrative and systems biology approaches through a series of initiatives to build capacity and provide a foundation for further developments, including the establishment of six [Systems Biology centres](#), major research grants and support for a range of collaborative international programmes with the funding agencies of other nations including [ERASysBio](#), a [joint funding initiative between the UK and France](#), and a [partnership agreement with Japan](#).

Synthetic biology

In encouraging mathematical and computational modelling approaches to biological research, BBSRC will also support the application of bioscience engineering design principles through investment in synthetic biology via UK research networks and transnational partnerships (e.g. Eurocores, KBBE Industrial Biotechnology), including consideration of the social and ethical challenges in this area.



Digital organisms

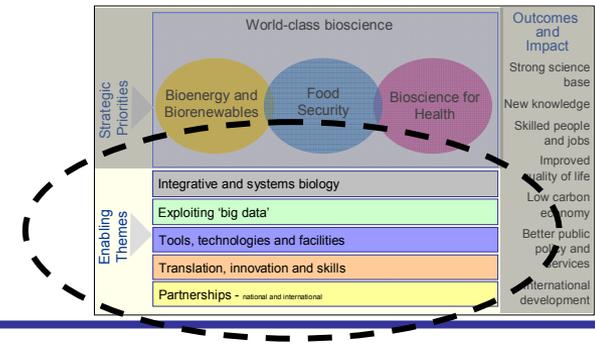
Modelling the cell in the way that Boeing modelled the 777, so that computer programs can be used to test new biological hypotheses and mathematical models of behaviour, is the ultimate realisation of the vision of predictive biology. The development of 'Digital Organisms' as collections of integrated models underpinned by quantitative data, which together represent key biological systems and processes at an appropriate level of detail, will allow realistic predictions of biological behaviour under particular physiological challenges. Whilst developing digital organisms will be a long-term, international effort, it is expected to deliver major insights to the workings of living organisms with significant impacts across many industrial sectors and other users.

The UK has a chance to lead these developments, building on investments in systems modelling, synthetic biology, bioinformatics and e-science.

Are the proposed targets above appropriate and realistic? Are there any significant omissions? How can BBSRC best encourage wider adoption of systems approaches?

Exploiting 'big data'

... Modelling, data standards, interoperability, software, skills, Web 2.0, Semantic Web...



We are entering an era of data intensive science...

Bioscience is undergoing its own version of Moore's law, with cheap DNA sequencing and systems biology spearheading a massive explosion in data.

The volume of data generated in biological research is expanding massively, driven by the widespread use of high-throughput experimental technologies. For example, it is estimated that new DNA sequences are pouring into international databases at the rate of 1.5 billion bases per month. Similarly, the sources of available knowledge relevant to any one research area are also growing rapidly, reflecting the data explosion and expansion of the bioscience research base; Medline's publication rate is currently two papers per minute.

For the UK to stay internationally competitive in bioscience we must harness and then exploit the knowledge from diverse and complex datasets, using new e-tools, data resources, and infrastructures. In addition, adoption of web-based 'social communication' will extend collaboration and participation in the biosciences.

Turning the massive amounts of text, data and images available over the Web into real information and scientific knowledge will generate a huge intellectual and economic advantage.

BBSRC, in partnership with other stakeholders, must work to extract knowledge and economic impact from the 'data deluge' and employ new 'social tools' (known as Web 2.0) and the emerging Semantic Web to enhance the scientific process. Over the period of the new strategic plan BBSRC proposes to drive forward the 'big data' and modelling agendas by:

- **building the skills base** - developing a new cadre of:
 - computationally proficient biologists
 - software engineers that understand the heterogeneity of biological data
 - biological engineers that can deploy computational models to design and manipulate biological systems
- **developing and interfacing with computational research hubs** focused on standardising, building and exploiting biological data sets of strategic importance (e.g. crop plants, animal health, model systems and/or systems relevant to industrial biotechnology)
- **development of research community software** for supporting and interrogating biological data
- **developing standards of interoperability** for exchanging data sets
- **driving a cultural change by promoting data sharing** to ensure that data sets are accessible and available for exploitation
- **development of the next generation of e-tools** for biological data management and interrogation, covering both experimental data and text mining solutions
- **providing a robust and accessible computational infrastructure** that meets the diverse needs of the biosciences, working with ICT industries to develop new methods of engineering for biology

Previous investments

Since 2000, BBSRC has invested over £23M in bioinformatics and e-science research, as part of the UK e-science programme, primarily through the Bioinformatics and e-Science Programme (BEP) initiatives. Recognising the need for skilled researchers, we also invested £0.5M through the Proteomics and e-Science Training initiative. An additional £1M e-Science Development Fund supported the expansion of e-science and the Grid as a working research tool, collaborative networks, pump-priming projects and follow-on funds for existing e-science projects.

Data sharing

In 2007, BBSRC introduced a [data sharing policy](#) to encourage its community to practise and promote data sharing, determine standards and best practice, and to **create a scientific culture in which data sharing is embedded**. BBSRC-funded researchers are now required to set out their plans for sharing of data arising from their work as part of their proposals

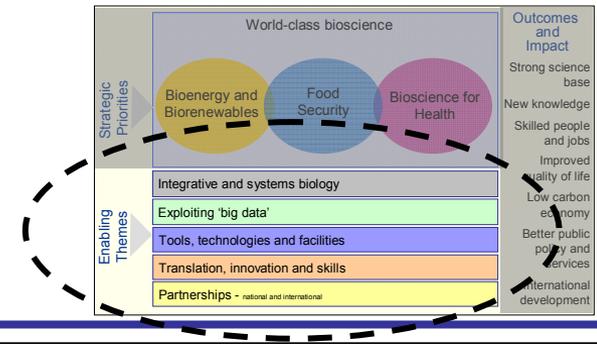
ELIXIR

BBSRC is heavily involved in the ELIXIR project, funded under the FP7 capacities programme, to construct and operate a sustainable infrastructure with robust annotation and curation for biological information in Europe. This project will be important in helping to take forward the 'big data' agenda.



Are the proposed targets above appropriate and realistic? Are there any significant omissions? How can BBSRC help UK bioscience to better exploit 'big data'?

Tools, resources and facilities



The development and use of tools, resources and facilities is at the heart of the UK's world-class bioscience research. BBSRC intends to continue to support significant expansion in research infrastructures and technologies, including:

- **Advances in areas such as bioimaging, 'omics' technologies and biomolecular characterisation** are essential in pushing back the frontiers of biological knowledge. BBSRC will support development of the next generation of bioscience technologies and will work with others stakeholders to stimulate the UK's life science technology sector
- **Informatics:** as dependence on e-tools increases (see 'exploiting big data', page 14) BBSRC will continue to invest in the development of new software tools, databases and data standards; support training in the use of bioinformatics tools; and encourage the development of web culture communities and services (semantic web and Web 2.0)
- **Biological resources** such as molecular genomics tools, cell lines and culture collections are important prerequisites for both academic and industrial bioscience research. Recent BBSRC investment has helped put these resources on a more sustainable footing and we will continue to provide longer term funding for bioresources of high strategic relevance
- **The Diamond synchrotron:** BBSRC will build upon its commitment to Diamond and previous investment in structural biology to support research on interactions between biomolecules and their role in biological processes. We will also seek to expand the use of the national supercomputing facility (Hector) both within and beyond structural studies.

The Genome Analysis Centre (TGAC)

In partnership with regional stakeholders, BBSRC has established a world-class **genome analysis centre** for the study and application of genomics in animals, plants and non-medical microbes. The sequencing technologies, including 'low-cost, high yield' next-generation approaches, will underpin priorities in food security and healthy ageing, and will fundamentally change UK genetics.

TGAC will develop a centre of excellence for bioinformatics, operating as a facility for the processing, management and storage of large quantities of computer data generated by genome sequencing machines, and working with the **European Bioinformatics Institute** to deposit data in the public domain making it available to scientists throughout the world.

The period 2010-2015 will see the centre fully operational, providing an essential resource to the UK bioscience community



National facilities - Institutes of BBSRC

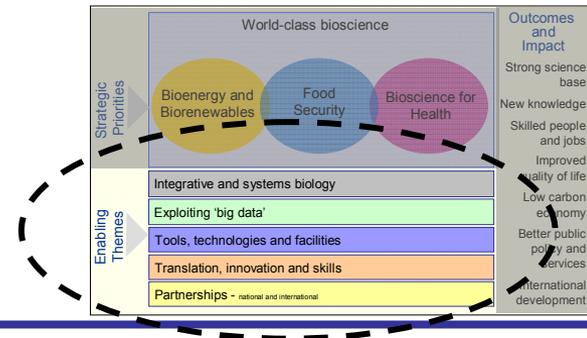
BBSRC institutes, including those integrated within universities (IBERS and Roslin) will continue to provide **national facilities underpinning major strategic areas** such as sustainable agriculture and land use, animal health, food security and biomedical sciences including diet and health. These research-centred environments enable strong interactions with industry, government departments, academia and other stakeholders, and generate knowledge transfer activities that meet policy and business needs.

An ongoing major strategic priority for BBSRC will be the **redevelopment of the Institute for Animal Health** as a single-site, national facility and a vital component in protecting the UK against exotic/endemic animal diseases (e.g. foot and mouth, bluetongue, African swine fever) and the associated risks to trade and human health.



Are the proposed targets set out above appropriate and realistic? What other tools, resources and facilities are required to underpin the UK's world-class bioscience research base?

Translation, innovation and skills: supporting our scientists

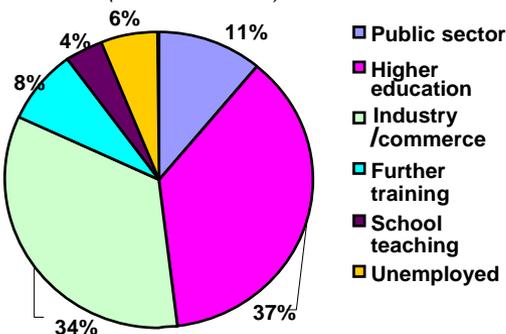


Drivers and opportunities

A supply of highly skilled researchers is vital to the strength of the science base and to attracting knowledge-intensive industries and investment to the UK. BBSRC has a key role in supporting the training of PhD students, currently funding over 2000, 40% of which are with industry.

More than half of BBSRC funded PhD students go on to work in non-academic roles and careers, and it is important to prepare them for these wider experiences. With the increasing complexity of research and interactions around this, the wider management and leadership skills of academic researchers needs to be developed and enhanced, so as to ensure the strongest possible bioscience base in the UK.

Employment of BBSRC PhD Students, completing in 2005-6 (Data from HESA)



During the period of the Strategic Plan, BBSRC intends to:

- **Strengthen the wider skills development of scientists** by exploring opportunities for experience outside of research science, for example, through encouraging all postgraduates to spend a period of time working within industry or with other users of research
- **Drive culture change in the employment of postdoctoral researchers:** postdoctoral research is a crucial phase for early-career researchers. BBSRC will work with partners to promote the new *Concordat* to help ensure bioscience postdocs are developed to enable them to pursue careers in a broader range of sectors.
- **Support development of academic leadership:** modern bioscience increasingly needs principal investigators to have high-level leadership and management skills for working in complex partnerships and teams to take forward their research. BBSRC will be seeking to support its fellows to become the research leaders of the future.
- **Research-teaching linkages** are vital to attracting the best students into research careers in academia and industry, and strengthening their practical skills. BBSRC intends to use its Vacation Research Bursaries scheme to raise the profile of research in undergraduate degrees.

BBSRC is a signatory (as part of RCUK) to the new Concordat to Support the Career Development of Researchers

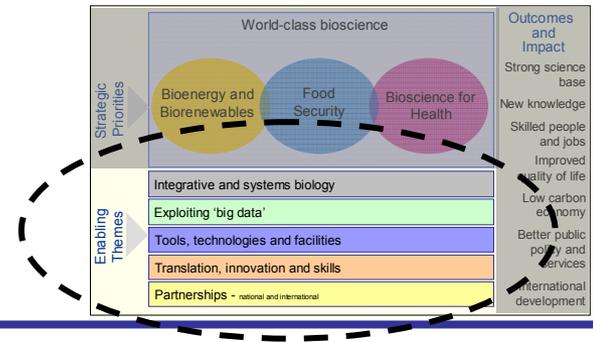


BBSRC is an active supporter of the **Vitae** programme, which is jointly funded by the Research Councils. Vitae was launched in 2008 as a major new initiative in supporting the generic and transferable skills development for PhD students and postdoctoral researchers.

Vitae works to support universities in providing early-career scientists with the broader range of skills they need to take their research expertise out of academia and make an impact in other areas of employment; these broader skills are also vital within the academic context in terms of the vital management and leadership skills which are crucial to managing research and developing collaborations.

Achieving a culture change in the employment and development of postdoctoral researchers is crucial to maximising the impact of the public investment in their training. How can BBSRC best support this change?

Translation, innovation and skills: *skills and capability*



Drivers and opportunities

BBSRC is responsible for supporting research skills and capability in all aspects of bioscience, for the benefit of all bioscience-based R&D intensive industries and the academic sector. We have particular responsibilities to support the skills base in science areas around the managed environment, crops and farm animals, food research, quality and safety and the important areas of bioenergy and biorenewables.

Other areas, including the pharmaceuticals industry, medical and environmental research and industries are underpinned by basic bioscience research and the skilled scientists that BBSRC trains.

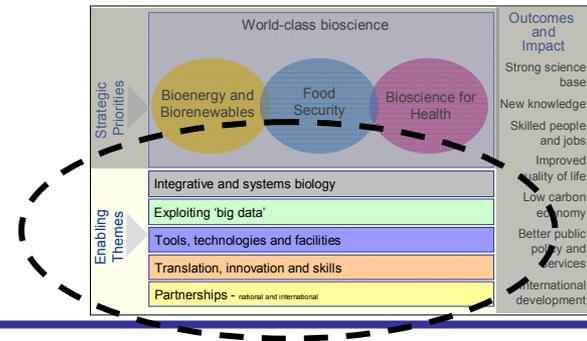
In all cases we need to ensure that the UK maintains strategically important 'niche' areas of expertise. In order to derive maximum benefit from the deluge of data being generated in modern biology, there is also an urgent need to address the mathematical skills of biologists at all levels.

Over the course of the new Strategic Plan, BBSRC intends to:

- **Address the skills and capability needs in key areas** by fostering new training partnerships
 - In particular, addressing skills and careers vulnerabilities in the agri-food area will need innovative forms of public-private training partnerships and doctoral training
- **Develop solutions to strategically important and vulnerable areas of 'niche' bioscience research expertise.**
 - There will be a need to develop clear understanding of the issues and how to address these, including an identification of areas where BBSRC can make a strategic difference
- **Support interdisciplinary research training** recognising that many of the most exciting advances in biology will occur at the interfaces with other disciplines.
 - In particular ensure that BBSRC studentship funding mechanisms are fostering interdisciplinary training in universities
- **Ensure that the skills needs of key bioscience user sectors are addressed**
 - MSc and modular CPD training, targeted and CASE PhD studentships
 - Industry fellowships and people exchange schemes
 - Funding more of the full cost of PhD studentships in strategically important areas, such as *in vivo* skills.
 - Explore further ways of attracting veterinarians into research careers
- **Improve the mathematical skills of biologists**
 - Engage more at school and undergraduate levels to ensure more biology students are developing higher-level mathematical skills
 - Expand training provision in mathematical and systems biology for bioscience researchers

How else should BBSRC be seeking to ensure a strong supply of the very highly skilled individuals needed in academia and for a knowledge-led economy?

Translation, innovation and skills: *engaging with industry*



Drivers and opportunities

Bioscience generates new knowledge, and provides skilled people for important UK business sectors that include agriculture, food & drink, pharmaceuticals, chemicals and biotechnology. Research and training conducted collaboratively with business has greater relevance and is more likely to generate impact.

BBSRC plans to continue to increase our investment in collaborative activities with business, realising opportunities to build on successful partnership models such as the Research and Technology Clubs but also seeking new ways of working with business and other partners. In particular, we will continue to work with the Technology Strategy Board to ensure effective support from bioscience research to commercial application.

BBSRC recognises that our activities underpin a range of business sectors, each of which has different research and skills needs and patterns of interaction with researchers in academia. Over the period of the Strategic Plan, BBSRC intends to increase the scale and breadth of our interaction with business. We will work with business and other stakeholders to help us focus support on areas and activities where BBSRC can make a real difference and ensure bioscience research has the highest potential impact. This will include the need for partnership with other funders including other Research Councils, Defra and the Technology Strategy Board. Proposed key areas for activity include:

- **Building on the success of the Research and Technology Club model** and developing clubs in new areas to support the delivery of Council's strategy. Areas under consideration include: Crop Improvement, Healthy Ageing and Animal Health.
- **Continuing to deliver a range of support mechanisms for working with business** and encouraging company engagement in research and training activities. These include for example Industrial Partnership Awards, Collaborative R&D/LINK, Industrial CASE/CASE and Modular Training for Industry. In addition, BBSRC will explore innovative models for working with business.
- **Engaging in dialogue with business** to ensure that both the specific and generic skills needs of business are met
- **Taking forward the recommendations of recent Innovation Growth Teams** in Industrial Biotechnology (IBIGT) and Bioscience (BIGTR2), working with other Councils, and Technology Strategy Board

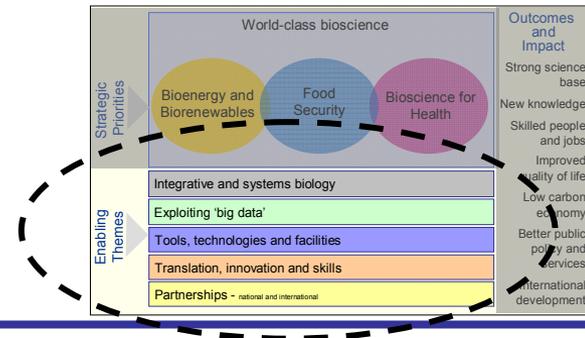
Research and Technology Clubs

The Research and Technology Club model has proven highly successful in delivering against the strategic research and skills needs of a range of companies in a particular sector. BBSRC currently supports three Clubs in Biopharmaceutical Bioprocessing, Diet and Health, and Biorefining, with substantial investment from 43 company partners.



Are there other areas of industrially relevant research that would suit the club model? What new ways of engaging with industry should BBSRC explore?

Translation, innovation and skills: *supporting knowledge exchange & translation*



Drivers and opportunities

BBSRC has a responsibility to support the successful translation of ideas, knowledge, skills and technology arising from BBSRC funded research to practical application.

BBSRC recognises that the timescales from basic bioscience research to application are long (typically 10 – 15 years). This means that the scope of all potential applications might not be clear and that routes to application are diverse and can be diffuse.

Knowledge exchange and movement of people between academia and users of research are vital to success.

There is also increasing evidence that ideas are not matured for sufficiently long within the research context to ensure successful translation.

Support from BBSRC must reflect these diverse opportunities to enable innovation and ensure that the successful application of research outcomes contribute to the recovery and future resilience of the UK economy and society.

Over the period of the Strategic Plan BBSRC intends to increase support for Knowledge Exchange and Translation from BBSRC funded research to increase the successful application of research outcomes for the benefit of the UK. To do this we propose to:

- **Increase support to enable opportunities for Knowledge Exchange** through current mechanisms, particularly to encourage the **movement of people**
- **Develop a better understanding of potential routes to translation** in key areas of BBSRC funded research.
- **Deliver innovative models and solutions to address barriers to successful translation**, particularly in the agriculture and food sector.
- **Develop approaches to ensure that ideas and technologies are incubated** for sufficient time within the research base to enable effective application. This might include, for example, expanding the Follow-on Fund and exploring with other funders innovative ways to incubate ideas within the research base.
- **Increase support for people in translational roles**, including developing the wider skills of these individuals, exploring opportunities for postdoctoral researchers to become engaged and expanding support for Enterprise and Business Fellows.
- **Work with the Technology Strategy Board, and other funders**, to support translation, particularly in the Agri-food sector; with SMEs; and exploring the effectiveness of a centre-based approach through the Innovation and Knowledge Centre Model
- **Support the development of enterprise skills and business awareness** of researchers through mechanisms such as Biotechnology YES and RCUK Business Plan Competition

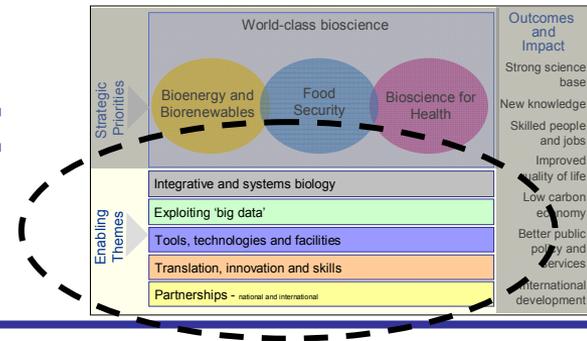
RCUK knowledge transfer portal



All of the Research Councils encourage knowledge transfer by supporting schemes and activities to transfer good ideas, research results and skills between, for example, universities and other research organisations, business, the third sector and/or the wider community. The RCUK Knowledge Transfer portal offers a single point of access to these schemes and activities.

BBSRC has developed effective routes to understanding and supporting the needs of users. We also need to encourage user communities to work with the BBSRC to support knowledge transfer and translation. In what ways can user communities assist and support BBSRC in these areas?

Translation, innovation and skills: *the importance of culture change*



Drivers and opportunities

BBSRC recognises that the impact of bioscience research is seen in many different ways, across industry, the economy, government, education and the wider public interest (see diagram below). Encouraging and rewarding the appreciation of this is both essential and an exciting challenge. The benefits are many, ranging from recognition by government and users of the benefits of supporting bioscience research through to fostering public excitement about science.

The introduction of Impact Statements in grant applications provides an important opportunity for researchers to explore and identify the impact their research may have. It also brings a challenge for BBSRC in developing ways of supporting and encouraging this, both for applicants and in the review process.



BBSRC is already driving significant changes in culture across bioscience research in encouraging and recognising the impacts from this research. We intend to build on this, using recently established and new approaches, and in particular seeking to support all bioscience researchers in their understanding and delivery of impact. During the period 2010-2015, we plan to:

- **Develop innovative ways of rewarding and celebrating impact**, through awards such as Innovator of the Year and Excellence with Impact. The REF and other Research Council/HEFCE/HEI-wide mechanisms offer further opportunities to recognise and reward impact, and these will be explored
- **Use the impact statements** to encourage researchers to think through and understand the wider impact of their research
- **Understand and share the impact of bioscience research**
 - Work with the academic community to ensure that there is mutual sharing of research outcomes and impact, to the benefit of society and all parties
 - Develop methods for capturing and interpreting the outcomes of bioscience research, sharing the resulting awareness of bioscience research with a variety of audiences such as government, the public, and the user and research communities.
 - Support established and novel routes to understanding impact
- **Use new technologies and tools to enable and drive culture change**, exploring the value of social networking, new web tools, excellent information management and introducing these wherever appropriate
- **Demonstrate that all at BBSRC are engaged with the impact agenda**, recognising the increasing understanding of its importance in bioscience research. We will support and demonstrate this recognition in all our major spheres of influence, including the Swindon Office, our Institutes, our Fellows and those centres and units in receipt of major funding from BBSRC.

Celebrating innovation success

The **Innovator of the Year** award celebrates the UK bioscientist who has been best at delivering economic or social impact from their world-class research. Following the success of the scheme in 2009, BBSRC intends to run the competition again in future years



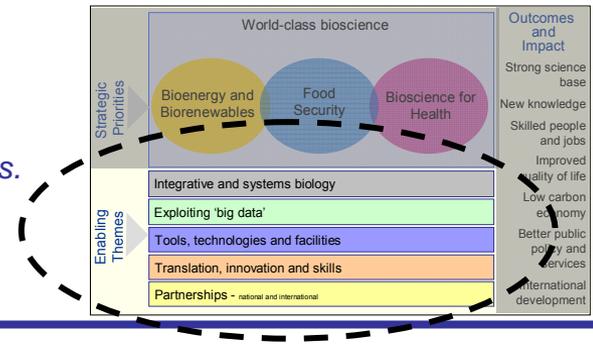
The **Excellence with Impact** award 2011 is an opportunity to support departments in their efforts to drive culture change and recognise impact, and will be judged at the end of 2010.



Working in partnership with universities and other bodies is vital in encouraging this culture change. How can BBSRC encourage universities to recognise and reward impact? How can we capture outputs and outcomes from their research?

Partnerships

Throughout this consultation document we have highlighted some of our key partnerships. We will work closely with a wide range of partners to realise our ambitious plans. We propose to review the interfaces with many key partners to identify mutual interests, opportunities for collaboration and better ways of working



Research Councils

The Research Councils working together, through RCUK, has brought many benefits for UK bioscience, such as concerted action on training and skills, and through investment in major cross-Council multidisciplinary research programmes.

We will continue to give the highest strategic priority to our partnerships within RCUK, especially in helping to deliver our major priorities.



We will also review our interfaces with key sister research councils to ensure seamless integration, particularly in areas where bioscience funded by BBSRC is taken up and used in other major fields like health (MRC) and the environment (NERC).



Charities and other funders

BBSRC recognises its position within a network of bioscience research funders, which includes research charities. We will continue to identify areas where value can be added by working either directly with individual organisations or as part of a group of funders, working together to build the best possible UK research base in the biosciences. Activities may include, for example, joint highlight notices to encourage applications in an area of mutual interest, co-funding of research, or workshops to bring together communities to explore problems of common strategic relevance.

HEIs

In addition to maintaining dialogue with the heads of university bioscience departments on issues such as national research policy, research careers funding schemes and the Council's research plans, BBSRC will explore the potential for developing closer strategic partnerships with key HEIs in areas of strategic importance to BBSRC and UK bioscience. Potential benefits from a closer relationship between BBSRC and our university community include the development and delivery of our strategy, maximising the impact of BBSRC funded research and improving training and research career structures.

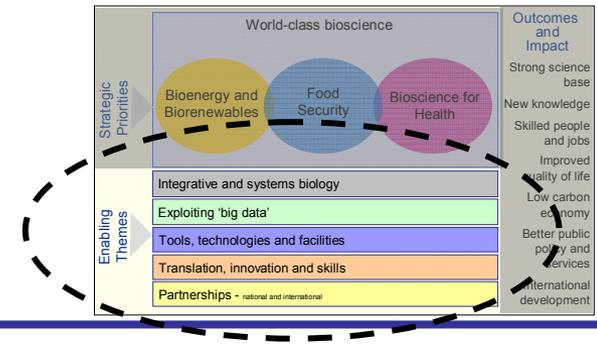
The Public

A growing number of advances at the forefront of bioscience, such as cloning, genetic modification, stem cells and synthetic biology, hold great promise to increase prosperity and transform lives for the better, but they also raise many challenging issues for society. BBSRC will continue to work hard at identifying public attitudes and promoting debate in the early stages of research. We will continue to work with other Research Councils and through RCUK to improve the effectiveness and impact of public dialogue activities.

BBSRC is committed to making information about the biosciences and our funding widely available to people through publications, consultation, workshops and exhibitions, as well as by making the best use of modern communications such as blogs and video networking sites to reach the largest audience. We will continue to encourage and equip BBSRC-supported scientists to engage with the public and, in collaboration with our institutes, we will also focus on work to engage young people with bioscience research and its impacts.

How can we work better with our partners? Who else should we be working with?

Partnerships (continued)



Government

BBSRC will continue to build on its relationships with government departments and agencies, and devolved administrations, to the benefit of UK bioscience. We intend to:

- work closely with government in areas where BBSRC-funded science is required to provide an evidence base for the development of policy and regulation
- continue to explore opportunities to co-fund research with government departments and agencies in areas of national and international strategic importance.
- engage with policy makers in developing our strategic activities to maximise the benefits of BBSRC-funded research to the UK economy and society

International

Modern bioscience is a truly international activity in which the UK excels. BBSRC will continue to work to maximise the UK's interests both in the EU and worldwide by building and maintaining international relations and links with international science policy, and by establishing working relationships with counterpart organisations overseas. We will continue to deliver our [international strategy](#) by:

- Promoting the movement of people
- Enabling international research and collaboration
- Ensuring access to world-class infrastructure and information
- Discharging our global responsibilities



Technology Strategy Board

BBSRC will continue to develop a close working relationship with the Technology Strategy Board to ensure effective support for taking bioscience research through to commercial application, and to explore opportunities for complementary and collaborative activities. Engagement with the Board will also inform the ongoing development of our [Technology Strategy](#).

For example, we will work together with EPSRC and the Technology Strategy Board to assess the success of the recently piloted Innovation and Knowledge Centres, and to develop other novel mechanisms to support innovation and knowledge exchange



In addition, we will continue to engage with the TSB-funded Knowledge Transfer Networks, including through the management of the BBSRC Research and Technology clubs.

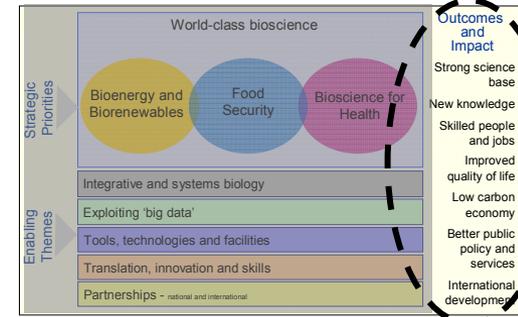
Industry

Bioscience generates new knowledge and provides skilled people for important UK business sectors that include agriculture, food & drink, pharmaceuticals, chemicals and biotechnology. Research and training conducted collaboratively with business has greater relevance and is more likely to generate impact.

BBSRC recognises that our activities underpin the needs of a range of business sectors, each of which has different research and skills needs and patterns of interaction with researchers in academia. Over the period of the Strategic Plan, BBSRC intends to increase the scale and breadth of our interaction with business, realising opportunities to build on successful partnership models such as the Research and Technology Clubs but also seeking new mechanisms for collaborative working. This will include the need for partnership with other funders including other Research Councils, Defra and the Technology Strategy Board. (see also Translation, innovation and skills section, pages 16-20)

How can we work better with our partners? Who else should we be working with?

Outcomes and Impact



BBSRC's investment in research, innovation and training creates a vibrant bioscience base in the UK and generates new knowledge and the skilled people needed by business, public services and education.

Bioscience makes a significant contribution to our economy, informs Government policy and improves the quality of life for UK citizens.

But we have to get better at capturing, demonstrating and explaining the impact of our investment from the public purse.

We will work with partners and stakeholders to improve our understanding of the impact of our research and thereby encourage, identify and demonstrate that impact, and ensure the huge potential of biosciences research is realised. Activities will include:

- Maintaining our commitment to **funding the highest quality research** wherever it will deliver excellence with impact
- Working with the research community to **embed consideration of the impact of research** as a central pillar of designing new research projects and programmes
- Working with economists and evaluation experts to **develop robust methodologies for identifying and demonstrating the impact of our research**
- Renewing and re-launching our **evaluation strategy** to reflect new thinking
- Running a **diverse programme of evaluations** covering all forms of research, funding schemes and our sponsored institutes, and publishing the key findings

Proposed evaluations include...

Impact:

A series of economic impact case studies, published as short monographs

Schemes:

- Bioprocessing RTC
- David Phillips Fellowships
- Industrial Partnership Awards

Research:

- Genomics
- Meta evaluation of all responsive mode
- RELU

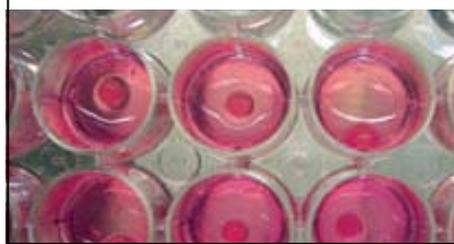
Bluetongue research at BBSRC's Institute for Animal Health saved £485M in 2008 through prevention of outbreaks, and protected 10,000 jobs



John Innes Centre research has helped increase UK wheat production by £75M pa, and its impact on world wheat production could be as much as £4.6 billion pa



The first tissue-engineered trachea (windpipe) to be successfully transplanted was developed using a technique for growing cells pioneered by BBSRC-funded scientists



A BBSRC grant led to the development of the Solexa next generation sequencing platform, which was sold to Illumina for \$600M in 2007

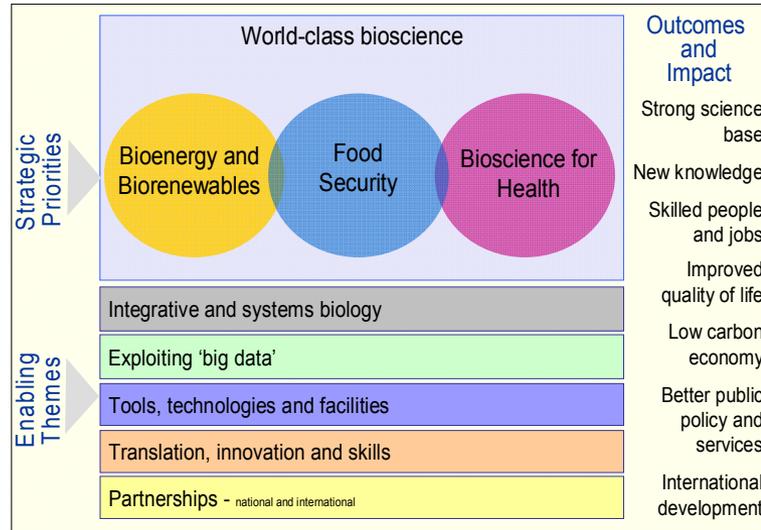


How else can BBSRC capture and demonstrate the impacts of the research and training we fund?

Summary

Consultation

In this consultation document we have set out our proposed structures and themes for our Strategic Plan 2010 - 2015, based on this diagram. We are now seeking input from our stakeholders to help crystallise, refine and prioritise our ideas, and invite you to submit your views.



Responses will help to shape the final Strategic Plan document prior to its anticipated launch in late 2009.

Key Questions

We have included within the consultation a number of key questions where we would particularly like the views of stakeholders. However these questions are intended to guide, not constrain, responses, so respondents need not necessarily focus exclusively on the questions posed nor answer them all.

Thank you for taking the time to consider this consultation document.

Key information about the consultation

Date consultation launched: 03 July 2009

Closing date for responses: 14 September 2009

How to respond:

Responses from all interested parties are welcome. We encourage academic departments, institutions and other bodies to submit single coordinated responses. Please state whether you are responding as an individual or on behalf of an organisation; if the latter please provide brief summary information or web link about the organisation you represent.

Please note that BBSRC may publish responses, or a summary, and that information provided in response to this consultation will be dealt with in accordance with the access to information regimes

Responses by email are preferred, and should be sent to:

strategic.planning@bbsrc.ac.uk

For enquiries about the consultation, to submit responses by post or to request printed copies of this consultation document, please contact:

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Tel: 01793 41 3323; Fax: 01793 41 3203

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Abbreviations

AHRC	Arts and Humanities Research Council	RCUK	Research Councils UK
BBSRC	Biotechnology and Biological Science Research Council	REF	Research Excellence Framework
CASE	Collaborative Awards in Science and Engineering	RELU	Rural Economy and Land Use
CPD	Continuing Professional Development	RTC	Research and Technology Club
Defra	Department for Environment, Food and Rural Affairs	SMEs	Small and medium-sized enterprises
DfID	Department for International Development	STFC	Science and Technology Facilities Council
DH	Department of Health	TGAC	The Genome Analysis Centre
EPSRC	Engineering and Physical Sciences Research Council	TSB	Technology Strategy Board
ESF	European Science Foundation		
ESRC	Economic and Social Research Council		
EU	European Union		
EUROCORES	ESF European Collaborative Research Scheme		
FSA	Foods Standards Agency		
HEFCE	Higher Education Funding Council for England		
HEIs	Higher education institutions		
HESA	Higher Education Statistics Agency		
IBERS	Institute of Biological, Environmental and Rural Sciences		
ICT	Information and communication technologies		
KBBE	Knowledge Based Bio-economy		
KT	Knowledge transfer		
MRC	Medical Research Council		
NERC	Natural Environment Research Council		
NIHR	National Institute for Health Research		
OSCHR	Office for Strategic Co-ordination of Health Research		