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Policy Report

October 2009

The importance of the HE research base in addressing major global challenges and ensuring the UK's future prosperity

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This is a report by Professor Dianne Berry and members of the 1994 Group's Research and Enterprise Policy Group, supported by the 1994 Group Executive Office.

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Executive Summary

It is crucial that the UK's Higher Education research base is appropriately supported to play a major role in addressing global challenges and ensuring the UK's future prosperity.

The Government must develop national research policy and target funding and support mechanisms to create an environment in which UK research productivity and impact is world leading and our universities remain internationally competitive.

This report makes clear, sustainable long-term research policy recommendations to the Government and the HE sector. These include:

- Increase Government investment in research on a longer-term basis to enable universities to retain the scope to respond flexibly and rapidly to emerging challenges.
- Protect and enhance QR funding to allow universities autonomy and the capacity to invest in new and emerging areas, grow and support new talent, protect declining but important subjects, and initiate collaborations with new academic and business partners.
- Distribute QR funding according to excellence, while ensuring critical mass in world class research areas within our research intensive universities.
- Support increased collaboration between universities and businesses at a regional, national and global level to build on significant advances made on enterprise development that have been enabled by the Higher Education Innovation Fund.
- Complement investment in STEM subjects and medicine with continuing investment in new ideas and world-leading research in arts, humanities and social sciences, as innovation draws on the entirety of the research base.
- Ensure our future intellectual sustainability by providing the necessary resources to train the world-leading researchers of the future.

This report sets out the background to these and other key recommendations and includes a range of examples of world-leading multi-disciplinary research within 1994 Group institutions, which is meeting major global challenges and that has benefited from the provision of QR and responsive mode funding.

1. The need to meet current and future global challenges

The UK is currently facing many serious challenges. We not only have to address issues relating to our future environmental sustainability, global threats to security, and an ageing population, but we have to do this at a time of considerable global economic instability. We need to do more to combat global warming, find new sources of renewable energy, secure our future food and water supply, improve our life-long health and well-being, tackle widespread poverty, ensure public security, and support changing modes of communication and ways of doing business.

We are fortunate that we have a first class research base, much of it located within Higher Education Institutions, that can play a major role in helping to address these challenges. Indeed, we remain the most productive in the G8, in terms of both number of publications and number of citations per researcher, and rank second only to the US in the world rankings. It is vital that we do what is necessary to retain this position so that the HE research base can work with Government to address our most pressing challenges and help to ensure the UK's future economic prosperity.

At the same time, we have to ensure that our universities are an asset to the nation in the long-term so that we are in a position to address future challenges. Our future sustainability and prosperity depend not only on addressing today's most immediate challenges, but also on the generation of knowledge and discoveries which our coming generations can apply for the good of their society.

2. The role of the UK research base

The UK's universities play a central role in helping society, not only to meet our most pressing immediate challenges but also to ensure that we are able to address future challenges. The world class, innovative research at our universities underpins our prosperity and improves our quality of life. It helps to develop greater understanding and discover novel approaches and solutions to many of our current problems, while at the same time expanding the knowledge base in new areas that may well be needed in the future. Innovative research generates new ideas that can boost fast-growing modern industries such as those focused on the digital economy, environmental solutions and green energy. Knowledge is the new currency of economic growth, and our universities, as a source of new knowledge, are at the core of this, and are central to taking society forward.

Our universities also play a major role in ensuring that we have the right stock of skilled, talented and flexibly-minded people who will be needed to ensure our future intellectual sustainability and to provide the necessary workforce to enable the UK to compete effectively in a changing global economy. In addition to producing the next generation of researchers, we train large numbers of individuals to have the skills needed to interpret and use research evidence appropriately, and to apply questioning minds to address new challenges. As noted in the recent Government report, *New Industry New Jobs*, innovative businesses need educated, entrepreneurial and skilled people¹.

¹ *New Industry New Jobs: Building Britain's Future*. HM Government. BERR. April 2009.

The research-based teaching in our universities is a significant source of knowledge transmission, and the close relationship between research and teaching is central to providing students and society with the skills needed to engage with the growing complexities of the world².

HE research is also fundamental to informing public policy making and improving Government decision making. Our universities contribute to the effective delivery of public services and the proper organisation of the welfare state and the formation of international aid policy and foreign policy. They offer evidence-based solutions to help improve and refine current policy developments, and provide independent scrutiny of Government initiatives³.

As a result of the challenges brought about by global competition and the changing emphasis on research and development, UK businesses are also increasingly drawing on the university sector in order to achieve competitive advantage and reduce financial risk. Collaborations with universities are enabling businesses to gain access to expertise they do not have in-house and to specific markets, renew and expand technology, leverage internal research capacity, and make contact with potential employees⁴. The science base is a key resource for the high tech companies and start-ups that will grow into the world leading businesses of the future⁵.

3. Ensuring our universities can play their maximum role

The Government has rightly recognised that increased investment in research is crucial and that Higher Education is more critical to our future prosperity and well-being than ever before. The funding for STEM subjects and medicine has also been enhanced, since these disciplines are clearly vital for key sectors of the economy. They encourage new technological developments and drive economic growth, and improve population health and well-being. It is essential, however, that resources are available for a broad and robust research foundation in order that we can compete effectively in the new global economy and ensure future sustainability and prosperity. There are several elements to this.

First, we need to retain a system of funding the best research ideas, through responsive mode funding, in addition to supporting research that is directly aimed at addressing the problems that we currently face. We must retain a significant funding stream for what might currently seem like fundamental, curiosity-driven research, but may well enable us to think in new ways, to train new skills, and to provide some of the answers to tomorrow's problems. As John Denham, former minister for Higher Education, noted in his speech to the Royal Academy of Engineering in February 2009, "any research base which does not include a substantial element of fundamental, curiosity-driven research, conducted by researchers who simply want to know, will not be economically relevant in anything but the shortest of terms"⁶.

2 Rammell, B. Exploring research based learning. Presentation at Research based Learning in Higher Education. Higher Education Academy, University of Warwick, 25 October 2006.

3 How academia and Government can work together. Council for Science & Technology submission to HE Debate, 2008.

4 Universities, Business & Knowledge Exchange. Council for Industry & Higher Education Report. 2008.

5 New Industry New Jobs: Building Britain's Future. HM Government. BERR, April 2009.

6 Staying ahead – Investing in research in the down. Speech by John Denham. Royal Academy of Engineering, London, 19 February 2009.

4 1994 Group

Second, we need to protect our ability to drive innovation and respond flexibly to the needs of others. We must be able to retain our autonomy and capacity to invest in new and emerging areas, grow and support new talent, protect declining but important subjects, and initiate collaborations with new academic, business, and other partners. The provision of QR income is vital to all of these, in that it brings a necessary element of continuity, supports forward planning, and enables institutions to develop local strategies. The Dual Support system has helped us to reach our current enviable position in the world rankings, and is needed to ensure that we retain it. In this context, we support the decision to distribute QR according to excellence but recognise that it is vital to retain critical mass in those areas necessary to deliver world leading research. In line with UUK's position, we believe that the level of research concentration prior to RAE 2008 was appropriate⁷. We would not want to see any further dilution of funding as a result of the new assessment methodology that will be introduced in the Research Excellence Framework (REF).

In parallel with the on-going provision of QR funding, we need to build on the advances made in terms of enterprise development and interaction with business that have been enabled by the Higher Education Innovation Fund. As noted in a recent report to HEFCE, investment in third stream activity in English Universities has yielded benefits worth many times the investment⁸. Encouraging closer ties between the UK's growing pool of talented researchers and industry and private investors is now key to ensuring that we are able to benefit economically from ground breaking science⁹.

Third, we need to complement investment in STEM subjects and medicine with continuing investment in new ideas and world-leading research in arts, humanities and social sciences to support the culture and heritage on which so much of UK GDP depends, and to support research on national priorities. We cannot afford to conceive our 'science' base too narrowly. We must protect our entire research base. Addressing current and future global challenges depends on the successful interplay of all subjects. Increasingly, success in markets, which have frequently been assumed to be dominated by technological advances, depends just as much on factors such as design, economics, branding, and consumer understanding and changing behaviour. Innovations in the form of new products, processes and services will inevitably occur at a faster rate when technical feasibility is allied with an understanding of cultural and social change. Thus, the sciences, technology, arts, humanities and social sciences complement one another; they do not exist in a hierarchical relationship. Furthermore, the boundaries between the natural sciences and the social sciences and humanities are becoming increasingly fluid as research at the frontiers of knowledge become increasingly inter- and multi-disciplinary. If we are serious about identifying national priorities and making new investments in solving global problems, we will need to retain a comprehensive research capacity and make greater effort in trans-disciplinary initiatives. This in turn will require resources to be allocated in such a way as to sustain a comprehensive research capacity, and enable flexibility and inter-disciplinarity to flourish.

Fourth, we need to ensure our future intellectual sustainability. We have to have the resources and be organised appropriately so that we can train the researchers of the future. Funding and support for postgraduate research students and other early career researchers is essential to ensure that we have adequate numbers of appropriately trained people, who will be needed to replenish the research base and provide necessary skills in the wider workforce¹⁰. We also need to protect against the loss of vital expertise in particular disciplinary areas to overseas countries.

7 RAE 2008 outcomes and funding. Research Policy Committee Report. RPC/09/03

8 Evaluation of the effectiveness and role of HEFCE / OSI Third Stream Funding. Report to HEFCE. 1 May 2009.

9 New Industry New Jobs: Building Britain's Future. HM Government. BERR, April 2009.

10 Survey of the impact of the Robert's Fund at 1994 Group institutions. 1994 Group Research Report. January 2009.

4. Illustrating our case

We have argued that in order to do what is asked of us we need to ensure there is an appropriate balance of funding across STEM subjects and medicine, and the arts, humanities and social sciences, a continuation of the Dual Support system with appropriate levels of QR and responsive mode funding, and support for new researchers and capacity building.

To illustrate our arguments we have selected, and set out over the following five pages, a small number of ‘case studies’ that show how our world class research is enabling us to address three of the current global challenges – environmental change, global threats to security, and the digital economy – and also illustrate how this research would not have been conducted without QR funding, responsive mode grant income, and talented people from a range of disciplines.

Tackling Climate Change

The Walker Institute for Climate System Research, University of Reading

Combating Hazards and Reducing Global Risks

Institute of Hazard and Risk Research, Durham University

Developing the Small Satellite Industry and Enabling Low Cost Entry to Space

Surrey Space Centre, University of Surrey

Strengthening the Security of Information and Communication Technology

The Information Security Group, Royal Holloway, University of London

Developing cutting-edge Information and Communication Technologies for Communities and Businesses

InfoLab21, Lancaster University

Further examples of how we are addressing these, and the other global challenges, are listed below and can be found in more detail on the 1994 website (www.1994group.co.uk)

Institute for Sustainable Energy and the Environment, University of Bath

Climate Research Unit and Low Carbon Innovation Centre, University of East Anglia

Energy Policy and Environmental Sustainability Group, University of Exeter

Narrative and Interactive Media Centre, Goldsmiths, University of London

Sleep Research Centre, Loughborough University

Centre for Digital Music, Queen Mary, University of London

Centre for Communication Research, University of Surrey

The Psychosocial Oncology Group, University of Sussex

Centre for Genome Damage and Stability, University of Sussex

Transforming Medical Diagnosis with New Scanning Technology, University of York

Tackling Climate Change

The Walker Institute for Climate System Research, University of Reading

Case study

Meeting Global Challenges

- Climate change has been described by the UN Secretary General, Ban Ki-Moon as the “defining challenge of our age”. Water resources, food security, biodiversity and human health are all under threat from a changing climate. The vision of the Walker Institute for Climate System Research is to deliver better knowledge and understanding of future climate and its impacts for the benefit of society and apply climate research to practical issues.

A Multidisciplinary Approach

- Climate change is an inherently inter-disciplinary problem. A key strength of the Institute’s approach to finding solutions is that it brings together the broad range of climate expertise that exists at Reading cutting across traditional boundaries between physical, biological and social sciences. This includes specialists in meteorology, geography, oceanography, agriculture, biology, archaeology, hydrology, business modelling, economics, soil science, social and policy studies, environmental science, mathematics and physics.

Research Impact

- A major project is assessing the global-scale impacts of climate change, particularly water resources, biodiversity, agriculture and the urban environment to help policymakers formulate national and global adaptation strategies. It is providing advice to governments on avoiding dangerous climate change and informing major international climate negotiations.
- Research is improving predictions of climate-related catastrophe. The development of high-resolution global climate models allows the simulation of extreme weather more accurately to inform emergency, contingency and insurance planning. A partnership with Deloitte is researching the implications of climate change and weather extremes for business.
- Scientists have developed new prediction methods to study how climate change will impact crops across the world and how to cope by specifying new crop varieties. This research will be used by the UK negotiating team at the international climate conference in Copenhagen.
- A research partnership with the Met Office is improving 5-20 year predictions of climate which is crucial for government and business climate change adaptation planning.
- An Institute partnership with Government and aircraft companies is assessing the impact of greenhouse gases from industry and aircraft. It is providing scientific evidence to advise policy on how to incorporate aviation into emission reduction targets internationally.
- The Institute’s scientists and economists made significant contributions to the Stern Review on the “Economics of Climate Change”, writing sections on crops and climate change, greenhouse gases, monsoons, and provided experts to reviewing the report as a whole.

Funding Sources

- The Institute was established with a combination of QR resources, responsive mode funding from the Research Councils, and a range of grants from charities, trusts, the Department of Energy and Climate Change, the Department for Environment, Food and Rural Affairs, and Business.

Combating Hazards and Reducing Global Risks

Institute of Hazard and Risk Research, Durham University

Meeting Global Challenges

- The Institute of Hazard and Risk Research (IHRR) is changing the way we think about hazards and risks to meet the challenges of international security, health and well being and climate change. Recent research includes studies to improve security at major events, investigations into an environmentally sustainable and socially resilient long-term energy policy, support for earthquake hit areas, work to develop the global insurance industry and assistance with the reconstruction of tsunami devastated communities.

A Multidisciplinary Approach

- The institute has particular expertise in reframing problems and developing solutions by allowing a broad range of expertise to be brought to address a problem. The Institute challenges the core scientific, economic and social assumptions about how we live with hazard and risk. This can only be done by bringing together researchers from across the natural and social sciences, engineering, health and humanities, including history, theology, english and music.

Research Impact

- An investigation into how communities can live with future energy sources and the risks of nuclear power is informing energy policy development and mapping out implications.
- A study into security issues and border control within airport risk management and security politics at large sporting events is informing the security policy at the 2012 London Olympics and helping to combat terrorism.
- The Institute has worked in partnership with Project Sri Lanka, which assists the reconstruction and regeneration of tsunami devastated communities in Southern Sri Lanka and the long term sustainable development of both coastal and inland villages. It has advised governments across South Asia on landslide hazard and associated risks.
- Dr Alex Densmore, Director of Hazards at IHRR visited Sichuan Province to analyse the earthquake zone soon after the major earthquake hit. Building upon his pre-quake predictions about an increased risk of earthquakes he analysed the zone and advised on reconstruction efforts and how to protect against loss of lives from future quakes.
- A team of geographers working in partnership with engineers are discovering how storms, floods and heatwaves caused by climate change might affect the elderly and how infrastructure, health and social care provision can be tailored to cope involved. The research is informing planning, environmental and health policy globally.
- Research on global flood risks is making a major contribution to the global insurance and reinsurance industry in partnership with the Willis Group of insurance brokers.

Funding Sources

- The Institute was established in 2005 with initial funding by QR resource for staffing, alumni benefactions and SRIF3 support for a building. Building on its early success, more recent funding has been secured from OneNorthEast, the Environment Agency, NERC, the ESRC and a 2008 grant of £1.06M from the EPSRC to bringing together researchers in engineering, health and geography to make use of the Institute's state-of-the-art facilities.

Developing the Small Satellite Industry and Enabling Low Cost Entry to Space

Surrey Space Centre, University of Surrey

Meeting Global Challenges

- Surrey Space Centre is a fully integrated mix of academic researchers and a university owned commercial company. Its aim is to underpin the technical development of the small space industry – low costs spacecraft and small satellites – through original technologies, concepts, designs and software.
- The Centre develops new innovative technologies which are exploited by the burgeoning small satellite industry, including the University's highly successful commercial company Surrey Satellite Technology Limited (SSTL) with a global reputation for the design, build and launch of low cost, multi-purpose satellites.

A Multidisciplinary Approach

- A multidisciplinary approach to research underpins the Centre's success. Researchers in geography, economics and business work alongside leading experts in technology, physics, engineering, software and mathematics to develop innovative new approaches.

Research Impact

- The centre pioneered small and affordable satellites for environmental monitoring and security protection. The satellites are used for monitoring river pollution, deforestation, CO₂ and for security purposes to monitor forest fires and earthquakes. The Centre has set up a world wide disaster monitoring constellation and club of developing countries.
- Research at the Centre has been exploited commercially through SSTL. The successful partnership between the academic research group and SSTL guarantees that new technologies, as they are developed, can be incorporated into products. The research generates novel ideas for space applications and small satellites and the commercial organisation exploits these techniques into cutting-edge products.
- The research programme provides enhanced capabilities for satellites whilst maintaining a low cost platform using off-the-shelf technologies. This has led to significant growth in the market for small satellites with the emergence of many new users who can afford to enter space. A major market is the "space developing" nations. SSTL's unique ability to combine university R&D, academic and hands-on training with the design, manufacture, test and launch of small satellites has enabled 13 nations to become space-faring.
- Following the success of Surrey Space Centre research and development of small satellites the large space agencies such as NASA and ESA are also now developing small satellite programmes, realising that these technically advanced small satellite systems are highly capable and provide a low cost and short lead time for missions.
- The centre has demonstrated a number of world firsts in small satellite use including the first GPS receiver to work on a microsatellite in space; the fastest position fix in space; and the world's smallest fully functional nanosatellite at only 8.5kg. These advances have increased the capability of satellites and reduced the costs of space missions.

Funding Sources

- The research was funded and developed using QR money and further developed by an EPSRC grant. SSTL is now a company employing over 300 people which by 2009 has generated over £200 million in commercial export contracts.

Strengthening the Security of Information and Communication Technology

The Information Security Group, Royal Holloway, University of London

Meeting Global Challenges

- The Information Security Group (ISG) is one of the largest academic security groups in the world. It conducts research on the protection of critical infrastructures, security for fixed and mobile networks, systems and device security, management and organisational aspects of security and fundamental security technologies.

A Multidisciplinary Approach

- The ISG draws on expertise from a wide range of academic disciplines including mathematical, computer science and high-tech science-based research into technical information security problems and sociological and management research into the human factors issues of information security. The multi-disciplinary approach and deep engagement with industry ensures maximum impact from the Group's research.

Impact of Research

- The Smart Card Centre of Excellence is a partnership between the ISG and Vodafone, and one of the largest global card manufacturers. The centre is leading the development of this major new industry.
- ISG staff have acted as consultants to more than 100 organisations, including national governments, major financial institutions and the telecommunications industry.
- The ISG is a partner in the International Technology Alliance, a joint MoD (UK) - DoD (US) programme conducting research on networks deployed in warfare situations including humanitarian relief, civilian and insurgent control, or full combat operations. The ISG worked on a Ministry of Defence Security Programme which explores the use of commercial 'off the shelf' equipment to provide high level security in Information Technology structures within affordable costs.
- Members of the mobile communication industry commissioned ISG to investigate the future of SIMs/USIMs and alternative security solutions for mobile devices which led to more than ten vendors updating their products in response to vulnerabilities.
- Collaborations between the ISG and European partners on a succession of European Union Framework programmes, including a roadmap for future mobile privacy and security; a study examining security issues for post 3rd generation mobile networks and a project developing secure computing systems based on open source software. The ISG has designed and analysed algorithms for the European Telecommunications Standards Institute which are used by millions of mobile phone users across Europe.

Funding sources

- The ISG was established with QR funding and SERC Industrial CASE awards. EPSRC research grants have allowed the Group to develop. In many cases, the case for funding has been built on new research ideas developed with QR funding.
- Much of the ISG's current research portfolio and consultancy is sponsored by business and government departments including British Telecom, Giesecke and Devrient, Hewlett-Packard, Microsoft Research, the UK Ministry of Defence and Vodafone, and the EU.

Developing cutting-edge Information and Communication Technologies for Communities and Businesses

InfoLab21, Lancaster University

Meeting Global Challenges

- InfoLab21 is a world-leading research, development and business centre in Information and Communication Technologies (ICT). It brings together leading researchers, businesses and communities. The research has a practical focus with an emphasis on building experimental systems and testing them in the community.
- More than 250 researchers and experts in fields including communication systems, computer networks, internet and web technologies, wireless mobile and multimedia systems and software systems development tools are located at the centre and all are supported to commercially exploit their research.

Multidisciplinary

- InfoLab21 recognises that solutions are rarely found within one single discipline. Research groups are drawn from across departmental boundaries – crucial given the real world problems they are addressing. It draws on the Computing and Communication Systems Departments and expertise across the university, including the largest group of environmental researchers in Europe, and collaboration with business and management experts, engineers and psychologists.

Impact of Research

- InfoLab is committed to the practical applications of research, developing ICT solutions for global telecom network operators, equipment manufacturers and software providers including Microsoft, Nokia, BAE Systems, BBC, BT, Orange, Cisco, and Ford. Within the centre academics and business people work alongside each other to mutual benefit, and many partnerships have developed with regional businesses, to assist their development, create jobs and safeguard sales.
- The centre develops technology that directly improves people's lives. A wireless broadband network was developed for Slavutych in the Ukraine to address the social and economic consequences of the nuclear power plant closure. Slavutych was built to house workers evacuated after the Chernobyl nuclear disaster but a lack of internet connectivity hampered job creation. The network has transformed the town into a ground breaking e-city. Providing high speed internet access and creating new, information based services, has improved residents standard of living, made use of their skills and attracted new hi-tech business. The town's population is expected to double as businesses take advantage of connectivity to create jobs.
- Project Isis is a three-year Child Protection Initiative to develop practical new technological tools for policing websites, support law enforcement and protect children online. Experts at Infolab are harnessing new developments in language analysis to identify paedophiles posing as children in online chat rooms to pick up on their vocabulary choices and trail them as they move around the internet.

Funding

- The centre was established using QR funding from HEFCE with support from the Northwest Development Agency (NWDA) and the European Regional Development Fund (ERDF). Today, InfoLab21 research projects have secured funding from a range of business partners, the EPSRC, PPARC, the EU, and IST.

5. The Government's responsibilities in creating and supporting the environment in which the best use can be made of research

It is clear from the preceding sections that both the Government and the HE sector have an important role in ensuring that the very best use is made of our world leading research base. As far as Government is concerned, it needs to address the following:

- a. The Government must increase its investment in research, but not solely through short term initiatives aimed at addressing immediate challenges. We should resist introducing incentives that distort the research base in inappropriate ways. Research must be funded on a longer-term basis to enable universities to retain the scope to respond flexibly and rapidly to emerging challenges.
- b. Investment must be made in new ideas and world leading research in the arts, humanities and social sciences, in addition to STEM subjects and medicine. Innovation draws on the entirety of the research base and, accordingly, the whole academy must be sustainable financially.
- c. The Dual Support system has contributed to the international success of UK research to date, and it is essential that the Government retains this. As part of this, there need to be appropriate levels of QR and responsive mode funding, to ensure sufficient autonomy and flexibility, and the capacity to drive innovation. In addition, the Government must continue to distribute QR funding according to excellence, but at the same time it must not spread resource more thinly, as a result of the new assessment methodology in the REF, so that we risk damaging our world class research areas within our research intensive universities.
- d. As part of REF, it is also important that the Funding Councils recognise the widest range of impacts that excellent research might have across different disciplinary areas, rather than focusing overly on economic impact interpreted in its narrowest sense.
- e. In addition, the Government should continue to support Universities in their enterprise development and interaction with businesses through the discrete Higher Education Innovation Fund, which has been very successful in providing the platforms for HE – industry interactions¹¹.
- f. The Government needs to provide an under-pinning to enable Universities to work in partnership with, and be co-funded by, other bodies including charities, the European Union, and NHS. It also needs to facilitate our ability to collaborate with world leading teams across the globe by removing any unnecessary barriers.
- g. Finally, the Government must provide support for the development of new researchers, through the Research Councils, and through ring-fenced funding that supports the necessary advanced skills training and career development of postgraduate research students and early postdoctoral researchers¹².

11 Evaluation of the effectiveness of HEFCE / OSI Third Stream Funding: Report to HEFCE. 1 May 2009.

12 Survey of the impact of the Robert's Fund at 1994 Group institutions. 1994 Group Research Report. January 2009.

6. The responsibilities of the HE research base

It is clear from the above sections that our universities are already playing a major role in helping the UK to address major challenges and ensure future economic prosperity. However, we recognise that there are ways in which we could be better organised in order to ensure that the very best use is made of our world class research.

- a. We need to continue to address the sustainability of our research infrastructure. As part of this, we need to ensure that we have the mechanisms in place to understand the costs across the portfolio of our activities, and also to adopt more flexible attitudes to pricing. We need to enhance the extent to which we are working globally, collaborating with the best research groups across the world, and attracting leading researchers here, to ensure that we develop as truly global institutions.
- b. We also need to do more to foster research collaboration between UK universities to build the scale needed to compete globally.
- c. Greater efforts must be taken to communicate the outputs of our research work more effectively so that we can work better with Government and NGOs, and feed into public policy making, by adding value and offering insights to key issues of concern for policy makers.
- d. We need to enhance both the extent to which, and the way, we are working with business and industry, at a regional, national and global level. As part of this, we need to be more flexible and responsive to changing business demand.
- e. More generally, we need to enhance our ability to demonstrate the wider economic, social and cultural impact of our research, and work actively to ensure that any potential impact is realised, in line with the increased emphasis on impact in the REF. This will involve continuing to review our reward and incentive structures to ensure that we reward engagement with government, business, and the wider public.
- f. Finally, we must continue to provide first class research-led education, and ensure that we are producing a supply of talented and appropriately trained people who can meet the needs of tomorrow's employers, and sustain a base of innovation that has served the UK well to date. An important part of this will be to ensure that we do our best to implement the new Research Concordat.

7. Conclusions

Universities are vital for the future economic and social prosperity of the UK. Government recognition of the key role for research with potential long-term benefit, as well as giving short-term advancement, is critical and will ensure that the UK remains at the forefront of the knowledge-based world that will emerge from the current economic crisis. The case studies presented here and on our website clearly demonstrate the enormous potential for the research base in our leading Universities to play a constructive role in social and economic development in a period when public resources will be stretched and contested. It is vital that the outstanding record of the HE sector is recognised, but also that pressure on public support is not translated into policies which will inhibit the future contribution of the UK research base. The arguments and exemplars provided here should inform a continuing and constructive dialogue with Government, and the wider sector, about the means by which investment in the University sector can best be enhanced, productive, and targeted at long term success for the benefit of all.

Professor Dianne Berry (Chair, 1994 Group Research and Enterprise Policy Group and Pro Vice-Chancellor for Research, University of Reading) and members of the Research and Enterprise Policy Group, supported by the 1994 Group Executive Office.

The 1994 Group

- > The 1994 Group is established to promote excellence in university research and teaching. It represents 19 of the UK's leading research-intensive, student focused universities. Around half of the top 20 universities in UK national league tables are members of the group.
- > Each member institution delivers an extremely high standard of education, demonstrating excellence in research, teaching and academic support, and provide learning in a research-rich community.
- > 1994 Group Universities achieved outstanding results in the Research Assessment Exercise (RAE) 2008. 1994 Group members are UK leaders in seventeen major subject areas, achieving 1st place in their field. 57% of the 1994 Group's research is rated 4* world-leading or 3* internationally excellent.
- > The 1994 Group represents: University of Bath, Birkbeck University of London, Durham University, University of East Anglia, University of Essex, University of Exeter, Goldsmiths University of London, Institute of Education University of London, Royal Holloway University of London, Lancaster University, University of Leicester, Loughborough University, Queen Mary University of London, University of Reading, University of St Andrews, School of Oriental and African Studies, University of Surrey, University of Sussex, University of York.



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