Fores*ight* Intelligent Infrastructure Systems Project

One-Year Review

January 2006 – February 2007

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Executive Summary

'To want to travel is human nature and to travel intelligently can be sustainable. It is for us to decide how we develop and deliver a sustainable vision of the future.' - Sir David King, Chief Scientific Adviser to HM Government

The findings of the Foresight project on Intelligent Infrastructure Systems (IIS) were published as the Intelligent Infrastructure Futures (IIF) report on 26 January 2006.

The IIF report provides an innovative vision of the transport challenges which the UK will face over the next 50 years and explores the role that science and technology might play in meeting them. This groundbreaking analysis is an important addition to the body of evidence which stakeholders will wish to draw on when developing their long-term policies and strategies. It is crucial that the decisions made today exploit this evidence-base in order to maximise the benefits that future opportunities might afford and to manage future risks most effectively.

This review examines some of the IIF report's important impacts on stakeholders' decision-making and policy-development processes over the period January 2006 to February 2007. In particular, it sets out the actions which have been delivered against stakeholders' undertakings in the IIS project's 'Next Steps' document which was published alongside the Project's technical reports. These activities, which are informed by and catalysed as a result of the Project, demonstrate the crucial role of partnerships involving government, business and academia. These partnerships will play a key part in developing and delivering future solutions for intelligent infrastructure, which will stimulate economic growth, support social cohesion and be environmentally sustainable.

Key conclusions

The IIF project has met its overarching aim to explore how science and technology might be applied over the next 50 years to the design and implementation of IIS that are robust, sustainable and safe. The findings provide an independent analysis of what future science might deliver in the area of transport infrastructure, highlighting the opportunities and threats.

In achieving its aim, the Project has:

- Provided a clear framework for how the UK might deliver long-term, sustainable and robust transport solutions through the use of intelligent infrastructure;
- Introduced an innovative approach to analysis by using systems analysis to provide analytical rigour to enable the development of the IIS scenarios. This concept has been adopted elsewhere by Foresight and has provided a new approach for those working in strategic futures inside and outside government;
- Provided an overarching framework to inform government's research and development programme;
- Led to and defined the scope and criteria for a £12m research platform on future intelligent transport systems;

- Made clear to government departments the need to work together to deliver sustainable transport impacting on the development of a wide range of strategies including:
    - CLG Digital Challenge Framework;
    - DEFRA Policies on carbon trading and sustainable production and consumption; and
    - DCA Citizen Insight Project
- Provided a touchstone to inform the strategies of three Growth Areas for long-term sustainability. This included the £2.8bn development in Ashford;
- Challenges and informs international thinking and strategy development;
- Provided the basis for engagement with the next generation on the challenges which society faces in delivering sustainable transport, for example through work with the Association of Science Education and the London Transport Museum; and
- Explored novel and innovative methods to communicate and promote the uptake of the report's key findings and messages, such as the creation of DfT's 'Scenarios Toolkit' for use by government departments and agencies, teaching materials to support primary and secondary education and the use of architect's drawings to communicate the essence of the IIS scenarios.

1 Project overview

'The value of the Foresight report is that it will help us stimulate debate as to what kind of future we do want for transport, and help us shape it. I look forward to continuing this work with partners in and outside Government.'
Dr Stephen Ladyman, Minister for Transport

1.1 Introduction

The IIS project was developed out of ideas discussed at a brainstorming event held in July 2002 which was chaired by Sir David King, Chief Scientific Adviser to the UK Government (and Head of the Office of Science and Innovation) and involving leading academics. This event sought to identify significant challenges facing society over the next ten or more years, for which science and technology would play a key rôle in delivering solutions.

IIS was the sixth project in the new round of Foresight. The initial scoping event was held in September 2004.

Uniquely, the Project delivered a broad, multi-disciplinary analysis and brought together key players from government and over 300 leading experts from all relevant scientific disciplines, such as transport technology, communications, data management, behavioural psychology and sociology.

The work also involved a wide range of UK stakeholders from government and elsewhere, and was sponsored by the Department for Transport.

1.2 Aim

To explore how science and technology may be applied over the next 50 years to the design and implementation of Intelligent Infrastructure Systems that are robust, sustainable and safe.

1.3 Scope

The Project examined how transport systems might develop over the next 50 years, and the factors that will affect them. The comprehensive analysis was based on the best scientific evidence available.

The IIS project focused on the transportation of goods and people and the alternatives to mass movement. It considered the future of transportation systems and the application of information technologies and infrastructure.

For the purposes of the Project, the term 'infrastructure' is taken to include any platform used in the delivery of shared services to people. 'Intelligent infrastructure systems':

- Are aware of their environment, responsive and adaptive; and
- Collect and transmit relevant data to and from intelligent nodes to provide some or all of: critical information to responsible operator(s); feedback that results in local automated response; relevant and useful information to users

1.4 Structure and process

The project was divided into five phases:

1.Scope: workshops and commissioned futures work to identify where Foresight might add value and the Project's broad approach and focus

2. Review: commissioning the 18 state of science reviews of areas of particular relevance to ITS and the development of the technology roadmap.

3. Synthesis: scenario development, exploration of trends and futures analysis, modelling and testing hypotheses.

4. Engagement: broadening networks, communicating the project findings to influential individuals and organisations.

5. Action: link actions to stakeholders, publication of reports. The one-year review highlights the actions delivered since the Project launch.

2 Project Outputs

'As technology develops quickly and often diverges without a clear focus, the opportunity to harness some of the real benefits of Intelligent Infrastructure in a constructive and interoperable way require the direction and vision for the future to be set soon - the window of opportunity is quite short.' – Professor Phil Blythe, University of Newcastle

2.1 Reports and analysis

Collectively the IIS outputs combine to form a world-class report which provides a unique, cross-sectoral and interdisciplinary scientific analysis of the potential rôle of intelligent infrastructure in contributing to the solution of the long-term challenges of transport in the UK. This is an important and robust addition to the evidence-base to support decision-making in policy and strategy development. Outputs include:

2.1.1 Project Overview

A synthesis of the Project's state-of-science reviews and scenario-based futures analysis.

2.1.2 State of Science Reviews

A suite of 18 reviews and their summaries written by leading experts on subjects taken from across a wide range of science disciplines and presented in a form intelligible to those people from beyond the areas under consideration. These reviews explore a diverse range of topics and key technological trends which are likely to be important contributors to future intelligent transport solutions.

2.1.3 The Scenarios – Towards 2055

The project developed a novel set of scenarios and related systems maps to investigate how science and technology might be applied to infrastructure over the next 50 years. Experts from the research community, business and the public sector identified the key drivers and trends, and developed and explored four possible futures based on a range of future uncertainties. The report 'Scenarios Toward 2055 – Perspective and Process', not published in hard copy, sets of the background to the development of the main scenarios.

These scenarios do not predict the future; rather they provide a range of possible, internally consistent visions which together define a 'future space'. They provide a robust framework to support the analysis of how we might live and travel over the next 50 years and how future technologies might play their part in this. Importantly, the scenarios allow policy makers to test the potential outcomes and sustainability of today's and future decisions.

2.1.4 Technology Forward Look

The Technology Forward Look (TFL) reviews current roadmaps for the development and application of the technology, and considers how that technology could be applied in the longer-term. The TFL sits between the research reviews and the scenarios and provides a way of organising the discussion of the technology and how it influences scenario outcomes.

2.1.5 Consequential actions

As with all Foresight studies, it is crucial that the IIF report has a substantial, important and demonstrable impact on the actions of its stakeholders. The **'Next Steps'** document, published alongside the Project's technical reports, is made up of commitments from stakeholders to use the findings to inform their work. These undertakings and their associated progress reports are listed at Annex A.

3 Project Outcomes

There is a wide range of outcomes which have already flowed from the Project and others which are, at the time of writing, under development. Principally, these impacts, both delivered and planned, are the result of stakeholders' uptake and use of the findings to inform their policy and strategy development. They are a fascinating combination of departmental and cross-government activities, public and private sector investment in research and development, novel tools to communicate and disseminate the Project findings and innovative combinations of all three.

3.1 UK

3.1.1 Government

The IIF report has been widely disseminated across government. At the time of the launch, several departments gave undertakings to use the findings in their work. The progress against these commitments and a synopsis of the report's additional impacts are set out below and at Annex A.

Department for Transport (DfT)

As the sponsoring department, DfT was closely engaged and consulted during the IIS project rollout and led the government response to the IIF report.

The Project has brought the most important issues about the long-term development of transport into the public arena in a way which:

- Provides a set of robust scenarios against which to test long-term strategic thinking;
- Improves understanding of and links with developments in the technological field; and
- Clearly demonstrates that transport policies cannot exist in isolation.

In addition to 'Next Steps' commitments, such as using the outputs to inform a research call from the DfT's Horizons programme and the move towards the adoption of a Hydrogen transport infrastructure, DfT has initiated several other areas of work in which it will draw on the outputs from the IIS project. Professor Brian Collins, DfT's Chief Scientific Adviser, will work towards bringing together existing DfT workstreams and research on intelligent transport systems (ITS) and intelligent infrastructure systems into one consolidated programme. This will allow DfT to take a cross-modal and cross-disciplinary approach in supporting the development of these technologies, the benefits of which the IIF report has highlighted.

The Report clearly demonstrates the need for, and potential benefits from, co-operation with other government departments (OGD) to tackle the crosscutting challenges arising from the 'four levels of intelligence' identified in the project. These cover intelligent design, intelligent data collection systems, infrastructure that is intelligent and intelligent use of infrastructure. The Chief Scientific Adviser network is one opportunity to facilitate joint working between the relevant departments, including Defra, CLG and DoH. For example the DfT will also work with CLG, to explore how ITS and intelligent infrastructure could inform policy on communities and spatial planning.

The DfT commissioned the development of a generic 'toolkit' which outlines how policy-makers and other stakeholders can use scenarios to support decision-making; this is published on the DfT's website. The toolkit provides a description of the different techniques that organisations can use to explore principal drivers of change, associated uncertainties and how they might play out in the future. The toolkit is based on the IIS scenarios but the methodologies covered can also be applied to others. DfT plans to use the IIS scenarios and the toolkit to assist its with long-term strategy development on transport, including where appropriate considering the outputs of recent and ongoing major reviews such as Eddington, Stern, Lyons & Barker
http://www.dft.gov.uk/pgr/scienceresearch/futures/secsceniss

The House of Commons Environmental Audit Committee report 'Reducing Carbon Emissions from Transport' – July 2006 recognises the value that the scenarios described in the IIF report. In particular, the Committee notes the scenarios' value in exploring what the future might look like, and that this is unlikely to be a simple continuation or projection of trends developed over the last 40-50 years. The Commission also recognises the growing political pressures to reduce carbon emissions, fuel shock and the development and deployment of new fuels and technologies. The Commission also notes that the potential divergence of economic outcomes that follow rapid change to transport and communications are projected to put transport at the very heart of public policy.

Department of Trade and Industry (DTI)

The DTI led Innovation Platform on Intelligent Transport Systems and Services (ITSS), which has been developed under the auspices of the Technology Strategy Board, is a key vehicle to explore and deliver future Intelligent Transport Systems (ITS). It draws heavily on the IIF report and DfT's strategic thinking to inform its activities; for example, in developing and supporting the Future Intelligent Transport Systems (FITS) initiative.

The £12m FITS initiative is funded jointly by DTI, DfT, the Engineering and Physical Sciences Research Council (EPSRC) and business. It brings together UK industry and universities to address key research issues for the longer-term development of the UK transport system. FITS was formally launched at the ITS World Congress in London in October 2006 and aims to deliver projects on 'next generation' technology. FITS will be closely aligned with the DfT's road-pricing demonstration projects that seek to assess the practical viability of Time-Distance-Place (TDP) charging. Outputs from this work will inform DfT's long-term strategy on ITS; especially, the development and production of the framework architecture. Specifically, DfT's TDP demonstration projects are being designed to allow for technology insertion as part of DTI's Innovation Platform on ITS.

The IIF report has also fed into the DTI's Sustainable Development Action Plan and informed the DTI response to Defra's consultation on climate change adaptation policy framework.

Communities and Local Government (CLG)

The IIF report has proved invaluable in developing the framework for launching the Digital Challenge, as part of the government's Digital Strategy. Also, this work has helped in taking forward the Social Exclusion Unit report on Inclusion through Innovation.

In considering longer-term priorities, CLG policy-developers are working with colleagues to build the next stages of digital inclusion into the Department's forward plans, particularly in the context of the Local Government White Paper. These discussions will conclude in Spring 2007.

Regional and Local

Foresight experts have sought to inject the IIF report's findings into the work of policy-makers at a regional and local government level.

The South East England Development Agency **(**SEEDA) has worked closely with the ITSS Innovation Platform Steering Group, chaired by Julia King, and with other partners including DTI, DfT and EPSRC, to identify the key challenges and develop a coordinated and coherent programme. In July 2006, SEEDA made the first £2.3m call for this first platform which will be followed by an EPSRC call in late 2006 and DTI/DfT calls in 2007.

Further ongoing work includes the South East Regional Economic Strategy (RES) 2006-2016, which was be formally launched at the House of Commons, has been influenced by the IIS Foresight thinking. Eight Transformational Actions have been identified in the RES that have the potential to have particular impact in achieving our overall vision to be a world-class region achieving sustainable prosperity.

Project experts have worked with 'Growth Area' teams to explore traction between the IIF report and their priorities. For example, a workshop with Ashford's Future Delivery Board in March 2006 considered how science and technology could deliver an intelligent infrastructure that would support sustainable robust and transport for the future. The work has already helped to ensure the development of a more robust approach for the Ashford Growth area, a £2.8 billion development of 30,000 homes.

Following this success, similar events were held; for example:

- With the Milton Keynes and South Midlands Growth Area. The seminar sought to engage those people with an interest in developing innovative solutions to key infrastructure challenges. This event exposed participants to a series of plausible futures and considered emerging technology and how it might influence the future and the relationships between personal mobility, cyberspace, smart flows and the urban environment; and,
- In Cambridge, to build a shared understanding of a preferred future for the city; to test the implications of this preferred future in a number of policy areas, eg housing, transport, energy use, business and innovation, social cohesion; and to understand the starting points for the journey towards the preferred future - and the risks and opportunities involved.

Department for Environment, Food and Rural Affairs (Defra)

There has been interest across Defra in the Foresight IIS project, and Defra has distributed links to the outcomes of the project to its policy divisions. It is too early to examine how the outcomes of the project will impact specifically on future policy however, there are a number of Defra-led initiatives which could benefit from the IIS work. Some of the initiatives are

currently at a very early stage, and the IIS work will become increasingly relevant as policies are developed.

The IIF report is particularly relevant to the initiatives supporting Defra's policy areas of:

- Rural Interests and Social Exclusion. The scenarios explored under Foresight examined the interactions between potential rural–urban interfaces and the need to guard against social exclusion, especially in rural areas;
- Carbon Trading. Emissions trading *could* offer a cost-effective way for surface transport to reduce its climate change impact in the future. Foresight IIS work could prove useful in exploring issues such as regulation, competitiveness, fuel pricing and security of supply and other related policy areas;
- Sustainable consumption and production through the work of the Sustainable Business Taskforce; and
- Sustainable Development Commission (SDC) which says that the IIF report will be useful in taking forward its current (eg land-use planning, climate change and road pricing) and future (eg ageing population, flexible bus services) positions on transport.

While the project findings are extremely useful, the SDC is concerned about the emphasis on the trade-off approach to sustainable development rather than the use of the Government's five sustainable development principles and the overarching goals of Living within Environmental Limits and Ensuring a Strong, Healthy and Just Society. The scenario outcomes, while illustrative, highlight the potential difficulties if joined up sustainable development thinking does not occur. Defra therefore recommends the DTI in taking this work forward use the Government's sustainable development principles.

Department of Health (DoH)

Although the IIS project aim might suggest an exclusive focus on technological solutions to address the challenges of designing robust, sustainable and safe transport for the future, the project expanded to include a diversity of other dimensions which bear a crucial relationship with transport. There is now a recognition that the contexts of population health and societal well being are as important as the technological perspectives. As a result, the project has taken on a broader remit with work being undertaken across traditional disciplines to achieve a balanced consideration in agreeing policy.

The cross-government approach which has been developed has enabled the impacts on physical and mental health of the future scenarios for transport to be given a very high priority for consideration. A high-level workshop with participants from a very wide range of government departments endorsed this by concluding that the scenarios should be adapted to take account of a fuller range of government priorities, including health.

A short summary of the health implications of each scenario has been commissioned. It is intended to follow this with a more detailed health impact assessment of the scenarios for publication at a later stage.

Department for Education and Skills (DfES)

In July 2006, the British Educational and Communications Technology Agency (Becta) was charged with taking forward the delivery of the DfES e-Strategy policy. As part of this work,

Becta will take into account the work and findings of other organisations and programmes, including IIF report, where these are likely to either impact directly upon or have influence in e-Strategy delivery and a successful outcome.

As part of the delivery of the e-Strategy, Becta will consider how it might advise stakeholders and partners on use of the teaching materials developed under the auspices of the project.

Department for Constitutional Affairs (DCA)

DCA has considered the long-term implications of the IIF report for citizenship and engagement and the courts and has addressed this in a *Citizenship Insight Project.* A cross-departmental Steering Group has overseen the project and over 100 stakeholders across Whitehall and external to government have been involved in workshops to develop the future drivers, scenarios and next steps. Therefore whilst the focus has been on DCA policy areas – including citizenship, democratic engagement and the justice system – the report articulates impacts for other government departments as well.

The DCA comments that a key message from the scenarios is that tackling climate change would require sustained engagement with the public, putting severe pressure on current governance and democratic systems, as well as pressures for the legal system. The DCA also notes that title *Intelligent Infrastructure Systems* rather obscures the widespread relevance of this work and might indicate that it only be relevant to IT policy issues.

3.1.2 Business

The IIS project has excited considerable interest in the business community. The work highlights many areas for research and development which would provide opportunities for the further commercial exploitation of the UK's world-class scientific and technological expertise; for example, in the areas of enabling road-user management (including road-user charging), 'ubiquitous services', delivery efficiency, telecommunication standards and security.

Also, the Report provides an important addition to the evidence-base which will support the joint engagement of the business, government and academic sectors in meeting the challenge of delivering future intelligent transport systems.

13th Intelligent Transport Systems (ITS) World Congress

The ITS World Congress in London in October 2006 provided an excellent opportunity for the DfT to explore the long–term futures of intelligent infrastructure with the business community.

The IIS project findings were injected into this major, influential event in a number of ways. Notably, Dr Stephen Ladyman MP, Minister of State for Transport chaired an Executive Session on 'The future vision of intelligent infrastructure systems' with Foresight stakeholders, science experts, and decision makers from around the world. They discussed and debated the Foresight vision of how IIS could help to better manage travel demand, influence travel behaviour and mode choice, reduce congestion and improve the safety and efficiency of transport networks. Also, Professor Frank Kelly, former Chief

Scientific Adviser, DfT, chaired a Special Session and lead IIS project experts chaired technical and scientific sessions on areas such as road pricing, freight and intelligent vehicles, all of which were well received.

BT

BT hosted the industry launch of the IIF report at the BT Tower in May 2006. The Report resonated with and reinforced a number of BT's activities in the areas of corporate social responsibility credentials and sustainable business and societal practices. The project has helped to build a better awareness within the company, informed long range strategic thinking and focused activities on specific areas in future sustainable transport. The main areas of impact include transport research, road user charging, ICT and sustainability.

Innovation Platform

A wide-ranging joint DTI/DfT Innovation Platform (IP) workshop held in June 2006 to discuss potential solutions to DfT's policy challenges, both in relation to Road Pricing and ITS generally. This workshop was well attended by the ITS community, including industry, academia, central government and local authorities. The findings from this event were used inform the current intelligent transport systems and services (ITSS) call development.

DfT will continue to engage with industry and government groups to raise the awareness of the potential benefits of ITS to the wider public, including via ITS (UK) and InnovITS (the DTI funded ITS Centre of Excellence).

Confederation of British Industry (CBI)

Better use of infrastructure, which might involve application of IIS, has an important role to play in boosting network capacity, alongside more conventional enlargement and enhancement of networks. The CBI is supporting the trial of the Highways Agency's Active Traffic Management initiative in the West Midlands, and believes that it is potentially capable of being extended to other parts of the motorway network. Road pricing has great potential for ensuring better use of scarce network capacity, and the CBI is actively developing its position in this area so that road pricing can deliver positive benefits for business. The CBI also sees potential for IIS to revolutionise the railways, with a particular focus on the passenger interface where the passenger experience could be enhanced, but also on the operational side. These opportunities were the subject of a CBI seminar held last year, and this work is on-going.

Royal Institute of British Architects (RIBA)

RIBA is planning a conference entitled 'Futures Fair' in May 2007 which will be sponsored in part by Foresight. This event will aim to encourage architects to consider the role of the built environment in delivering a sustainable future. The conference will draw its audience of around 200 from the UK's top architects' practices, experts in futures thinking, key government officials and academia. The outputs are intended not only to help shape architects' thinking but will also inform other Foresight work such as the projects on 'Sustainable energy management in the built environment' and 'Mental capital and wellbeing', which have an interest in this area.

3.1.3 Research Councils

The IIF report has informed the work of Research Councils and stimulated a range of action some of which are described below.

Economic and Social Research Council (ESRC)

The IIS project outputs were taken into account in developing the specification for the new ESRC/ DfT/ Scottish Executive Collaborative Transport Research Centre. One of the priority research areas identified for the Centre is 'Transport and Technology' and the IIF report was used to inform the potential research questions highlighted under this heading. For example, the question in the specification 'What are the social conditions under which new transport technologies might be taken up and transform transport practices?' closely maps onto one of the research needs identified on page 14 of the *Intelligent Infrastructures Futures Project Overview*. Commissioning of the new Centre is currently ongoing and likely to be completed in late April 2007, so at this point it is too early to say exactly what research in this area it might conduct.

Engineering and Physical Sciences Research Council (EPSRC)

EPSRC, working in collaboration with the DTI and DfT under the auspices of the ITSS-IP, is leading the commissioning of a programme of research on FITS.

The new approach to research is expected to result in far greater advances than simply awarding funding to a single organisation. It will allow a small number of consortia with wide ranging expertise to work in collaboration to tackle some of the major transport challenges we face over the next decade.
The initiative is intended to stimulate new ideas, concepts, products or services that will:

- Further improve safety on our roads by reducing collisions, casualties and deaths;
- Result in better, more reliable, accessible and safer public transport services;
- Lead to even greater efficiency in the road freight industry;
- Improve road network management; and,
- Provide better travel information, allowing travellers to make informed choices on how and when to travel.

The vision for the initiative is to support highly innovative and wide-ranging research and technology demonstrator projects, combining the best UK expertise in industry, Local Authorities, transport service providers and universities that can help deliver better transport whilst reducing environmental impacts.

The initiative will bring together UK industry and universities to address key research issues for the longer-term development of the UK transport system. It will open up the possibility of new science and engineering techniques and processes being developed and introduced experimentally to address transport problems.

Natural and Environmental Research Council (NERC)

NERC's Centre for Ecology and Hydrology (CEH) leads one of UK Energy Research Centre's (UKERC) six themes addressing issues of Environmental Sustainability. This theme includes a topic on transport and IIS outputs have informed the following aspects of Projects, Programmes and Themes within CEH:

- UKERC (Sustainable Economies theme in Biodiversity
- Emissions and deposition (Biogeochemistry)
- Completed research (Environmental Informatics)
- Monitoring (Biodiversity)

Also, the IIF report will add to the knowledge base used to develop bids and research programmes by Safety Standards and Research consortia of which CEH is part.

3.1.4 Education

Projects such as the IIS study can have widespread implications and impact beyond their immediate area of concern. One particular area is that of education in general but on science, technology, engineering and maths (STEM) in particular. The potential impact can take place at various levels from some exploitation of the outcomes of the Foresight project as a way of introducing the contexts in which STEM subjects might be explored to more fundamental questions about the medium to long term future of what is taught and how.

Although there is potential to use the Foresight materials in a school or college context a note of caution must be added. Due thought and attention should be given to how such materials might be introduced and made available – it is not as simply a matter of producing glossy materials and expecting teachers to use them.

The more fundamental question as to the implications and impact on curriculum in the longer-term almost requires some scenario planning in itself. For example if the IIS project along with the others is highlighting the issues and challenges that we face in the future, what does this mean for preparing young people to be citizens in such an environment. What does it mean for the preparation for our future scientists, engineers and others? One interpretation is that the developments that are already taking place with changes to the GCSEs at Key Stage 4 are moving in the right direction but have a long way to go, need further refining and should be introduced at other stages of education from primary through to postgraduate.

Foresight has commissioned the development of educational material for use by teachers to communicate some of the IIF report's key findings: the *'Transport and Cities Project for Secondary Schools'*. Wherever possible the starting points will be pupils' own experience. The activities are divided into two parts: *understanding the present* and *thinking about the future.*

The materials pack will draw on selected elements of the IIF report's wealth of information about new technologies, which can be related to the current, crowded curriculum fairly easily. The pack will be available on-line via the Foresight (www.foresight.gov.uk) and other websites.

3.1.5 Public Engagement

The IIF report has attracted a high level of public interest in how IIS and ITS technology might contribute to the future of transport. This has contributed to raising awareness of future challenges for transport policy, and of the impact of individual travel choices on sustainability, as well to advancing the public debate on the application of ITS technology.

During the year, the DfT has worked with Foresight in their efforts to engage the public more widely in the project, such as the production of material based on the IIS project for schools and the proposal for a long-term exhibition at the London Transport Museum (LTM) on the future of travel, based on the project.

Foresight has developed a partnership with the LTM to take advantage of a high profile opportunity to communicate the IIS project to the public. This partnership coincides with LTM's redevelopment due to open in October 2007. Subject to funding being available, a stimulating and engaging interactive exhibit will raise awareness of the issues explored in the IIF report. This will engage visitors, opinion formers and the transport industry with the need to take significant initiatives in response to climate change and congestion. Using their new 'transport futures' gallery as a platform for public programme and events, the findings of our research will reach broad audiences, including young people LTM will work to set up a media partnership to further extend the message.

The intention is to develop the four scenarios to create an engaging and stimulating exhibit. The exhibit's primary purpose will be to influence individual and governmental decisions in response models of future sustainability. The exhibit will use London as a lens through which audiences will question and debate individual and societal behaviour. Exploring the exhibit will encourage visitors of all ages to (re-)consider their current use of all forms of transport and reflect on lifestyle changes which they could make. Particular emphasis will be given to the trade-offs that individuals will need to make in the future; for example, prioritising some journeys over others and re-considering how they spend their leisure time.

An important aspect of the exhibit will be to convey the critical responsibility that individuals have for determining the future of London in terms of its transport infrastructure and consequently the lifestyle of its residents and visitors.

3.2 International

13th ITS World Congress

The ITS World Congress (8-12 October 2006), which aims to encourage and enable the exchange of information on every aspect of ITS deployment, represented a major opportunity to showcase UK ITS expertise in front of a global audience (see above).

IIS project stakeholders and lead experts made the most of high-profile opportunities to present some of the key messages and technical findings of the IIF report to an audience of over 8,000 leading policy makers, science and technology experts and commercial developers from across the world.

OECD

The OECD has undertaken to disseminate the 'excellent' IIF report and scenarios to the government-sector and industry participants in the OECD Futures Project on *Global Infrastructure Needs: Prospects and Implications for Public and Private Actors* and will make every effort to take its findings on board.

The DfT's representative on the steering group of the OECD's Global Infrastructure Futures project has kept the group informed of the outcomes from the IIS project. There are extensive references to the IIS project outputs in the opening chapter of the first OECD report 'Infrastructure to 2030' (published in June 2006) and the OECD plan to make use of it again in the second volume (due for publication in early 2007).
http://www.oecd.org/department/0,2688,en_2649_36240452_1_1_1_1_1,00.html

Individual initiatives

There have been a number of individual foreign initiatives which have drawn on the IIF report. They include:

- Dynamic Cities Project – Vancouver, Canada. The DCP has undertaken to incorporate much of the IIF report findings into its work. It is an enterprising non-profit organization that helps local communities adapt to unprecedented global challenges including oil depletion and climate change. The DCP conducts scenario-based research in collaboration with local professionals and governments, in order to develop practical tools that foster the growth of more resilient cities, towns, and neighbourhoods.
- US Transportation and Research Board (TRB). The US TRB's Telecommunications and Travel Behavior Committee (ADB20) notes the important body of work at www.foresight.gov.uk and will to take it into account. The Transportation Research Board (TRB) is a division of the National Research Council, which serves as an independent adviser to the federal government and others on scientific and technical questions of national importance.
- The South Australian Water Centre for Water Science and Systems, University of South Australia will use the IIF report to inform its consideration of sustainability. The Centre has a particular interest in water science and engineering, specifically in respect of sustainable cities and water sensitive urban design.
- Toronto World Future Society conference 2006 –Toronto, Canada. At the Conference, the US Government Accountability Office (GAO), an arm of the US Congress, organized and conducted a panel on the importance of integrating foresight with governance. To illustrate how foresight can be linked to governance, a GAO senior analyst presented slides detailing: (1) how the UK Foresight project emphasises the importance of stakeholders throughout the different stages of the foresight process, and (2) how the results of Foresight can be linked to proposed actions by key stakeholders. The panel was well attended and received excellent reviews by an audience consisting of officials from the U.S., Canadian and other governments, as well as academic researchers and futurists.

4 Dissemination

As with all projects, the Foresight team seeks to maximise the opportunities to disseminate of the IIF report. The communication and uptake of the project findings and the Report's capacity to make a significant impact to decision-making and to the development of key areas of policy and strategy are key measures of the Project's success. The principal ways in which this has been achieved are as follows.

4.1 Enduring networks

Networks which continue to promulgate project findings are a crucial feature of all Foresight projects. Importantly, a number of networks have been created, which are well placed to promote the Project's approach and key messages. Such networks include the many experts who contributed to the Report's technical findings and their synthesis, and the working and high-level, inter-departmental links, developed during the Project rollout and follow-up phases, should help to deliver a cohesive and robust cross-government response to the IIF report.

4.2 Conferences and other events

Using the Project findings to inform the considerations of key conferences, workshops and other scientific and technical fora has been an essential and effective method of promulgating the IIF report. Foresight is grateful to the many technical contributors to the Project and to its stakeholders who have presented and injected the Project outputs at a wide range of diverse events before and after the project launch in January 2006; Foresight particularly welcomes the contributions of Professor Philip Blythe, Professor Glen Lyons and Professor Bill Sharpe. Examples include:

- **Challenges for Future Intelligent Infrastructure,** Royal Society, London, 11 July 2005
- **Symposium on the Success and Failures of TDM Measures,** Napier University, Edinburgh, 2-4 August 2005
- **Future Intelligent Infrastructure: Societal Challenges,** Academy of Social Sciences, Royal Academy of Engineering, London, 31 August 2005
- **IPQ Conference on Modernising Transport,** London, 29th September 2005
- **12th World Congress on Intelligent Transport Systems and Services,** San Francisco, USA, November 2005
- **IEE International Conference on Automotive Electronics**, The Institution of Electrical Engineers, London, March 2006
- **Unwin Lecture, 'Transport of Delight',** Institution of Civil Engineers and Institution of Mechanical Engineers, April 2006
- **Intellect Transport Group,** 6 Apr 2006
- **Road User Charging,** Royal Academy of Engineers seminar 24th May 2006
- **TRA Transport Arena Conference,** Gothenborg, Sweden, June 2006
- **CBI/Railway Forum Intelligent Infrastructure seminar**, 20 June 2006
- **County Surveyors' Society Transport Futures Panel,** 6 Jul 2006
- **Evidence-Based Policies & Indicator Systems Conference** London, UK on the 11-13 July 2006

- **ICE Conference**, Friday 8 September 2006
- **CMI Workshop on the Connected Car,** Cambridge University, 17-18 September 2006
- **13th World Congress on Intelligent Transport Systems and Services**, London, 8-12 October 2006
- **ASK-IT Conference,** Nice, France, 26-27 October 2006
- **IEE Seminar on Road User Charging,** London, 6 November
- **RTIG,** Manchester. 15th Nov 2006
- **Future Dialogue on "Transition Towards a Europe of transportation without oil",** ERA-NET, Paris, France, 27 Nov 2006
- **Congestion and Carbon Conference**, University of Essex, 11-12 January 2007
- **Association for Commuter Transport, Annual Conference,** London, 7 February 2007

4.3 Media coverage

The IIF report received excellent exposure in the media at the time of the launch. In the press, national broadsheets gave positive coverage, notably in articles in the Daily Telegraph*, 'Back to the future in a horse and cart'*; the Guardian, *'Vision of the future where getting stuck in traffic is a thing of the past';* the Times, '*Transport experts have seen the future, and it's got pedals';* and the Financial Times, *'Scientific signposts point way for transport'.* International reportage included an article in 'The Weekend Australian'. The BBC also covered the project on Radio and on its website at http://news.bbc.co.uk/1/hi/uk_politics/4651562.stm http://news.bbc.co.uk/1/hi/uk_politics/4652534.stm.

Importantly, the project findings were also reported or informed articles in a range of learned journals, 'trade association' publications and local press during following year. The following list is not intended to be exclusive, however, it does provide an idea of the diversity of publications.

- **Institution of Engineering and Technology, Transport Journal,** published the suite of science reviews commissioned by the IIS project
- **Urban Design,** the quarterly journal of the Urban Renaissance Institute
- **New Scientist,** *'Ecopolis now'*, 17 June 2006
- **Freight Transport Review,** issue 12
- **RSA journal,** *'Putting the Future into Perspective'*, June 2006. http://www.rsa.org.uk/journal/article.asp?articleID=753
- **Northern Echo**, '*How much would you pay to drive to work?'*, March 2006,
- **Transport times,** two articles - http://www.transporttimes.co.uk/files/tt011_10feb06.pdf http://www.transporttimes.co.uk/Features/

Annex A

Progress report on 'Next Steps' commitments

	Test policies for robustness using the IIS scenarios	
	Advantage West Midlands	
1	Use scenarios in discussions both with the Agency and with partners and stakeholders to encourage debate on the longer - term strategic issues around transport and how we invest in infrastructure for the future	AWM has used the underlying themes from the scenarios to inform its contribution to both the National and Regional Transport Policy debate, in particular to take forward the delivery of the three national Regional Development Agency Transport priorities: • A Policy Framework which delivers a National Strategic and Integrated Transport Network across the English Regions and sets the context for regional transport planning and decision making; • Reduced lead times for transport schemes; and • Planned and increased investment in transport infrastructure and services.
	Ashford's Future Delivery Board	
2	Ashford's Future Delivery Board will host a 1-day workshop to consider the implications for its Masterplan, which will double the size of Ashford by 2031.	A workshop was held in March 2006 to consider how science and technology could deliver an intelligent infrastructure that would support sustainable robust and transport for the future. The work has already helped to ensure the development of a more robust approach for the Ashford Growth area - a £2.8 billion development of 30, 000 homes.
	Department for Constitutional Affairs (DCA)	
3	Use scenarios to consider long-term implications for citizenship and engagement and the courts	DCA addressed this in a *Citizenship Insight Project which* was overseen by a cross-departmental steering group. The project used scenario planning techniques plus qualitative research to investigate how societal notions, definitions and behaviours of citizenship in the UK might evolve over the next twenty years, and what the implications of these possible changes are for Government policy, planning and communications. The final report is titled *The Future of Citizenship*.

	Department for Education and Skills (DfES)	
4	Use the scenarios to test Education White Paper commitments on the extended offer on school transport and other pilots	To be advised
	Department for Transport (DfT)	
5	Use and or develop the scenarios to inform DfT policy development, which could include identifying corporate risks, planning against DfT's budget guideline and other strategic workstreams	The DfT has used both the IIS scenarios and futures techniques in general to inform DfT policy development on transport, both in specific areas such as rail as part of its strategic cycle. This included hosting an internal strategy workshop that explored how scenarios could be used to stress-test DfT policies against a wide range of potential futures and sensitivities, including a review of risks. One outcome of this work is that DfT has commissioned the development of a toolkit outlining how scenarios can be used to support decision-making (see main body of review). DfT plans to use the IIS scenarios and the toolkit to assist long-term strategy development on transport, including where appropriate considering the outputs of recent and ongoing major reviews such as Eddington, Stern, Lyons & Barker. The importance of futures thinking to the DfT is highlighted in our Evidence and Research Strategy, published in October 2006: http://www.dft.gov.uk/stellent/groups/dft_science/documents/page/dft_science_610967.pdf David Thompson, the DfT's Chief Economist and Professor Brian Collins, the DfT's Chief Scientific Adviser will continue to monitor progress in this area as part of their annual scrutiny of Unit-level strategies. The DfT will build on this year's experience and continue to use scenarios and futures techniques to inform future strategies and long-term planning.

	Department for Environment, Food and Rural Affairs (Defra)	
6	Choose areas of policy to be tested for robustness against the IIS scenarios. This might involve, for example, testing the implications of extending carbon trading and considering how best to guard against social exclusion, particularly in rural areas	There has been interest across Defra in the Foresight IIF report, and links to project outcomes have been distributed to policy divisions. It is too early to examine how the outcomes of the IIS project will impact specifically on future policy, however, there are a number of Defra-led initiatives which could benefit from the Report. Some of the initiatives are currently at a very early stage, and the IIF report will become increasingly relevant as policies are developed. The Report is particularly relevant to the initiatives supporting Defra's policy areas of: rural interests and social exclusion; carbon trading; sustainable consumption and production through the work of the Sustainable Business Taskforce; and Sustainable Development Commission (SDC) for which Report will be useful in taking forward its current (eg land-use planning, climate change and road pricing) and future (eg ageing population, flexible bus services) positions on transport.
	Department of Health (DoH)	
7	Use scenarios to consider the implications for public health	Foresight commissioned a paper fro Dr Harry Rutter, Department of Health to explore the health impacts of the four scenarios developed under the auspices of the IIS project. Foresight will consider publishing this work alongside the IIF report at www.foresight.gov.uk
	European Commission	
8	Host a workshop to consider the implications for public health	A Foresight team made a presentation in the DGTREN's series of lunchtime lectures on 6 July 2006 on Intelligent Infrastructures. DGTREN Director General asked Foresight to explore further opportunities with DGTREN Director of logistics, innovation, co-modality and maritime transport. This meeting is to be arranged.
	Communities and Local Government (CLG)	
9	Use the scenarios to inform board recommendations for the Digital Cities Challenge, launched in December 2005	The IIF report has proved invaluable in developing the framework for launching the Digital Challenge, as part of the government's Digital Strategy. The Digital challenge Project Board received a full presentation and briefing from the IIS team early in the process of specifying the Challenge. CLG has continued to hold the IIS findings as a key reference point in considering the progress of the challenge, and as a means to inform judgements about the foresightedness of the bids received in January 2007.

	ONE NorthEast	
10	Use Scenarios and regional expertise to explore future IIS for regional economic growth and regional transport connectivity.	At the launch of the IIS project in 2006, One NorthEast made a commitment to consider how IIS might impact on economic development at a regional level. The planned approach comprised a high-level strategic workshop event utilising the already developed Foresight scenarios model, overlaying the economic objectives of the region and testing how IIS might impact on these potential emerging scenarios. To maximise the value of this work at a practical level, it was planned to also incorporate current thinking about transport policy and its relevance to productivity and growth. The intention therefore is to include the study findings of the Eddington report 'Transport's role in sustaining the UK's productivity and competitiveness' published in January 2007. One NorthEast is currently planning a dedicated workshop and will report the outcome of this work by Spring 2007.
	Royal Commission on Environmental Pollution	
11	Inform, members of the outcomes of the IIS project and encourage use of IIS scenarios to inform member strategies as appropriate	The Commission has circulated information on the IIS project to its members and, where appropriate encouraged them to consider using the report findings in their policy and strategy development
	South East England Development Agency (SEEDA)	
12	Use IIS scenarios to inform their board during the consultation process for their Regional Economic Strategy	Involvement with the DTI Innovation Platform for Intelligent Transport Systems and Services. SEEDA worked closely with the Innovation Platform Steering Group, chaired by Julia King, and with other partners including DTI, DfT and EPSRC, to identify the key challenges and develop a coordinated and coherent programme. In July 2006, SEEDA made the first £2.3m call for this first platform which will be followed by an EPSRC call in late 2006 and DTI/DfT calls in 2007. Further ongoing work includes the South East Regional Economic Strategy (RES) 2006-2016, which was be formally launched at the House of Commons, has been influenced by the IIS Foresight thinking. Eight Transformational Actions have been identified in the RES that have the potential to have particular impact in achieving our overall vision to be a world-class region achieving sustainable prosperity.

	Consider strategic cross-departmental issues	
	Department for Transport (DfT)	
13	Lead a multi-departmental group, including Defra, DfT, DTI, DCLG, DCA and DoH, to consider cross-departmental issues and oversee a strategic, joined up response to the findings of this work	The DfT hosted a multi-departmental group in September 2006 that included senior representatives from DfT, Defra, DTI, DCLG, DCA, CO, DoH and DfES. The workshop provided a valuable opportunity for cross-department discussion of the IIS project and its application to policy-making. Participants recognised the value in working together on these issues and one important outcome was the commitment to further inter-departmental cooperation to tackle the challenges arising from the "four levels of intelligence" identified in the project. Opportunities were also identified for other government departments to apply project findings to their own policies and strategies.
	Work with the business community to capture opportunities	
	BT	
14	Sponsor an event to consider the long-term implications for business. This will be aimed at a broad participant base from relevant industries, including transport, utilities and ICT	BT hosted the industry launch of IIF at the BT Tower in May 2006. The IIF report resonated with and reinforced a number of BT's activities in the areas of corporate social responsibility credentials and sustainable business and societal practices. The project has helped to build a better awareness within the company, informed long-range strategic thinking and focused activities on specific areas in future sustainable transport. The main areas of impact include transport research, road user charging, ICT and sustainability.
	Confederation of British Industry	
15	Review the implications of IIS findings for their transport infrastructure policy work.	Better use of infrastructure, which might involve application of IIS, has an important role to play in boosting network capacity, alongside more conventional enlargement and enhancement of networks. The CBI is supporting the trial of the Highways Agency's Active Traffic Management initiative in the West Midlands, and believes that it is potentially capable of being extended to other parts of the motorway network. Road pricing has great potential for ensuring better use of scarce network capacity, and the CBI is actively developing its position in this area so that road pricing can deliver positive benefits for business. The CBI also sees potential for IIS to revolutionise the railways, with a particular focus on the passenger interface where the passenger experience could be enhanced, but also on the operational side. These opportunities were the subject of a CBI seminar held last year, and this work is on-going.

	Department for Transport – Newcastle University	
16	Include an Executive Session at the Intelligent Transport Systems World Congress in London on long-term futures of intelligent infrastructure and make Foresight material available to participants.	The Intelligent Transport Systems World Congress hosted in London in October 2006, provided an excellent opportunity for the DfT to explore the long–term futures of intelligent infrastructure with the business community. Dr Stephen Ladyman MP, Minister of State for Transport chaired an Executive Session on this topic at the Congress and Frank Kelly, then DfT's Chief Scientific Adviser, chaired a Special Session. Both sessions were well received. Presentations at this Special Session highlighted the UK's leading role in current thinking in this area. Discussions covered the need to consider what role technology, and ITS in particular, might play in the future and the related real, and or perceived, privacy concerns. Participants recognised the value in taking this work forward.
	Herman Miller	
17	Commission research to explore the implications of IIS findings for productivity in the future workplace, through its Workplace Intelligence Unit (WIU)	The WIU has extended the Foresight IIS project. It has taken the scenarios and explored how and where we might work within them and considered the implications for business today and how we might best prepare for these eventualities. The findings of this work are found in the WIU 'the future of work' publication.
	InnovITS	
18	Develop a technical architecture and roadmap for an intelligent infrastructure. This would take account of issues such as privacy and market structure. Feed in InnovITS expertise to other strands of activity	A roster of workshops and projects is under development on a wide range of topics that include such issues as how emerging telecommunications standards can form the basis for multi-application ITS solutions and, also, how we can integrate specific solutions into multi-function suites and systems of systems in an evolution of products towards an IIS based industry future. An initial version of the technology road map focussed upon capturing the requirements of the DfT ITS Framework. One of its next stages is to review this road map content to ensure it reflects the IIS reports.
	Intelligent Transport Systems UK	
19	Develop a new Intelligent Infrastructure Interest Group, with launch at the ITS-UK annual meeting in Newcastle	Following the publication of the IIF report, ITS UK was tasked with developing a new 'IIS Interest Group'. ITS UK passed this task for consideration by the ITS UK Public Sector Liaison Group (PSLG) to ensure that ITS UK form the appropriate response A key group of PSLG members met at the ITS World Congress in October to discuss

		the best course of action. It was decided that in the first instance ITS UK PSLG would set up a Task Force who would determine the best course of action to take, and this would be presented for approval to ITS Council in April 2007.
	International Futures Forum	
20	Use the work to inform a set of scenarios under development with the FCO to explore the challenges of simultaneously addressing security of supply and climate change, in an international context	Working with one of its core supporters, Shell, International Futures Forum used the IIS work as the springboard for a more detailed consideration of the challenges involved in addressing energy security and climate change simultaneously in government, in both a domestic and international political context and with a focus on achieving 2050 outcomes. An IFF team conducted a number of in-depth interviews with senior officials in HMT, DTI, DEFRA and FCO focussed on pathways to 2050. A range of other senior players from outside government was also interviewed, and two workshops were held to assist in the processing of the material.
	Mobile VCE	
21	Feed the findings of the project into work with business on the development of ubiquitous services	The Intelligent Personal Support concept developed by the IIS project is very close to the 'Personal Mobile Assistant' described in Mobile VCE's 'Visions 2010' paper. Similarly, many of the necessary enabling technologies identified and described in the IIF report are being researched within Mobile VCE's ongoing core research programmes such as those in the areas of 'enabling road user management' (including road-user charging), 'ubiquitous services', delivery efficiency and security.
	Newcastle University / Department for Transport	
22	Bring IIS into the next meeting of the international workshop of Future Research Challenges in Road User Charging	The concept of future IIS is now firmly embedded in thinking on future road user charging. This was included in presentation at various events listed in the main body of the report.
	Organisation and Technology Research (OTR)	
23	Support the development of a model to help identify areas of innovation in intelligent transport technology which would also present commercial opportunities for business in the UK	OTR plc has supported the IIS project by undertaking research for public sector and commercial organisations. OTR has investigated the implications of the 'pay-as-you-drive' systems initiated by several insurance companies. OTR researched in North America, Europe, Asia and the Middle East and found a variety of systems and noted several different technologies and methodologies to charge vehicles for road use. OTR has also undertaken research into emerging and current technologies of context aware systems that combine the users or device positional data with other contextually relevant information. Both these areas will require significant additional research effort.

	Inform specific strategies	
	Department for Education and Skills (DfES)	
24	Consider the implications for the e-learning strategy	In July 2006, Becta were charged with taking forward the delivery of the DfES' e-Strategy policy. As part of this work, Becta shall take into account the work and findings of other organisations and programmes, including 'Intelligent Infrastructure Systems', where these are likely to either impact directly upon or have influence in e-Strategy delivery and a successful outcome.
	Department for Environment Food and Rural Affairs (Defra)	
25	Ask the Sustainable Business Task Force and the sustainable Development Commission to consider the implications of the findings of the project for their work	The Sustainable Consumption and Production (SCP) Business Taskforce has been established to access business expertise committed to making progress on SCP by working through business networks. Its aim is to identify and communicate the most effective ways for business to encourage and deliver SCP and inform Government policy. SCP working-groups are exploring how product roadmaps can help accelerate the shift to lower-impact products and services (focusing on personal mobility and the car and concentrating on existing and emerging technology). It is in this area that the Foresight IIF report may have relevance and, while this element of Taskforce work is still at an early stage, it will, where appropriate, take account of the work on IIS.
	Department for Transport (DfT)	
26	Inform the policy framework for intelligent systems in road networks	The IIS project outputs informed the priorities of the joint DfT/EPSRC/DTI Future of Intelligent Transport Systems (FITS) call, launched at the ITS World Congress in October 2006. FITS will provide £12M of funding for research and innovation, £3M each from the three Government sponsors with the balance provided by industry. These projects on 'next generation' technology will be closely aligned with the DfT's road-pricing demonstration projects that seek to assess the practical viability of Time-Distance-Place (TDP) charging. Outputs from this work will inform DfT's long-term strategy on ITS especially the development and production of the framework architecture. Specifically, DfT's TDP demonstration projects are being designed to allow for technology insertion as part of DTI's Innovation Platform on ITS.
27	Use IIS work to inform Department's Horizon Scanning work on Hydrogen infrastructure	The IIS project outputs have also fed into a research call from the DfT's Horizons programme, on moving to the adoption of a Hydrogen transport infrastructure. http://www.dft.gov.uk/stellent/groups/dft_science/documents/page/dft_science_611048.

		hcsp#top Five projects investigating various aspects of this subject have been supported and these will report during 2007. The results will be used when considering the levels and timing of different policy interventions which might be required to stimulate Hydrogen infrastructure and allow consideration of the need for new or revised legislation in this area.
28	Inform OECD steering group for their Global Infrastructure Futures Project on the findings of the IIS project	The DfT's representative on the steering group of the OECD's Global Infrastructure Futures project has kept the group informed of the outcomes from the IIS project. The OECD project brings together experts from the public and private sector to take stock of the long-term opportunities and challenges facing infrastructures worldwide, and to propose a set of policy recommendations for OECD Governments. There are extensive references to the IIS project outputs in the opening chapter of the first OECD report 'Infrastructure to 2030' (published in June 2006) and the OECD plan to make use of it again in the second volume (due for publication in early 2007). http://www.oecd.org/department/0,2688,en_2649_36240452_1_1_1_1_1,00.html
29	Review the implications of the IIS project in respect of ports into the forthcoming Review of Ports Policy	The DfT is also considering the implications of the IIS project in the ongoing Ports Policy Review, due to conclude in the first half of 2007. Outputs from the project have offered an interesting, albeit deliberately stylized perspective, to inform the review alongside other evidence including commissioned work and consultation responses.
	Department of Trade and Industry (DTI)	
30	Feed the implications of the IIS project into the Intelligent Transport Systems Technology Platform project	At the ITS World Congress in London in October 2006, an executive session on 'The future vision of intelligent infrastructure systems' was held. This involved members from the Foresight Stakeholder Group, science experts and decision makers from around the world who discussed and debated the Foresight vision of how IIS could help to better manage travel demand, influence travel behaviour and mode choice, reduce congestion and improve the safety and efficiency of transport networks. The FITS initiative, formally launched at the Congress (see '26' above), had an overwhelming response from industry and academia, and received 172 'expression of interest' applications. Successful applicants were invited to a 3-day 'sandpit-style' workshop, where Foresight Scenarios to 2055 were used in a visionary exercise to enable applicants to consider the future of Intelligent Transport Systems and Services (ITSS). Five FITS Project teams emerged from this workshop and full proposals are to

		be submitted by 31January 2007. Successful applicants will be informed in March 2007.
31	Explore opportunities to use IIS findings through the Intelligent Transport Systems Knowledge Transfer Network (KTN) managed by InnovITS	innovITS is now formally involved with the ITSS Innovation Platform (IP) which is itself taking the IIS findings as core to its mission. Part of the innovITS contribution to ITSS-IP is operating the associated ITS KTN which is now underway with workshops in several areas, a functioning website and baseline for a comprehensive technology roadmap for ITS. Specifically, innovITS has been helping the telecommunications industry understand how its emerging standard, IMS, can benefit a wide range of ITS applications and contribute a core component of the emerging intelligent infrastructure – providing a seamless and secure communications backbone to the full range of applications. An early result is development of a short video presentation that helps to explain the role of IMS to support a range of ITS solutions and thus a core part of IIS. It is still too early to see real benefits from these activities but there is growing awareness amongst transport professionals.
	Economic and Social Research Council (ESRC)	
32	Disseminate the findings of the IIS project to decision makers in Research Councils to raise awareness	The IIS project outputs were taken into account in developing the specification for the new ESRC/ DfT/ Scottish Executive Collaborative Transport Research Centre. One of the priority research areas identified for the Centre is 'Transport and Technology' and the IIF report was used to inform the potential research questions highlighted under this heading; for example, the question in the specification 'What are the social conditions under which new transport technologies might be taken up and transform transport practices?' maps on closely to one of the research needs identified on page 14 of the *Intelligent Infrastructures Futures Project Overview*. Commissioning of the new Centre is currently ongoing and likely to be completed in late April 2007, so at this point it is too early to say exactly what research in this area the new Centre might conduct.
	Engineering and Physical Sciences Research Council (EPSRC)	
33	EPSRC has a substantial portfolio of research and training activity of relevance to the IIS Foresight project. In planning future investments, EPSRC will consider the IIS report	EPSRC, working in collaboration with the DTI and DfT under the auspices of the ITSS-IP, is leading the commissioning of a programme of research on FITS. The new approach to research is expected to result in far greater advances than simply awarding funding to a single organisation. It will allow a small number of consortia with wide ranging expertise to work in collaboration to tackle some of the major transport challenges we face over the next decade. The initiative is intended to stimulate new

		ideas, concepts, products or services that will deliver a range of benefits. The vision for the initiative is to support highly innovative and wide-ranging research and technology demonstrator projects, combining the best UK expertise in industry, Local Authorities, transport service providers and universities that can help deliver better transport whilst reducing environmental impacts.
	European Commission	
34	Host a meeting to explore the IIS project	A Foresight team made a presentation in the DGTREN's series of lunchtime lectures on 6 July 2006 on Intelligent Infrastructures. DGTREN Director General asked Foresight to explore further opportunities with DGTREN Director of logistics, innovation, co-modality and maritime transport. This meeting is to be arranged.
	Institution of Electrical Engineers (IEE) (now Institution of Engineering and Technology, IET)	
35	Disseminate the findings of the project to the membership through the Institution's magazines, website and journals and consider its implications to the engineering profession through meetings of its expert committees on communication and transport.	The IEE disseminated the IIS project findings to its 120,000 members through the Institution's principal magazine "Engineering Review" in February 2006 (see http://www.iee.org/oncomms/magazine.cfm?issueID=96#articles. Also, the IEE (now the IET) published all the Project's learned papers in its new quarterly Journal 'Intelligent Transport Systems' (circulation of over 250 UK and international institutions) - see http://www.ietdl.org/IP-ITS . Free open access to the journal was provided via the website throughout 2006 The IET also disseminated the report to the IET's transport related Technical Professional Networks (TPN) - the Automotive and Road Transport TPN organised a special session on UK national road pricing the ITS World Congress in 2006. Also, papers based on the IIS report were also given at the IET's 'Automotive Electronics Conference' in March 2006 and the 'RFID and Electronic Vehicle Identification in Road Transport' event in December 2006. Developments in intelligent infrastructure technologies will also figure largely in future TPN events. The IET's Transport Sector Panel and Communications Sector Panels (the IET's senior policy committees for transport and communications) have both debated the findings of the project. The Transport Sector Panel has agreed to consider the findings in future work. The Communications Sector Panel is beginning an investigation into the impact of intelligent systems technology on 'conventional' communications networks.

	Welsh Assembly Government	
36	Transport Wales is in the forefront of the development of intelligent infrastructures for the operation and management of its road network. The implications of the findings of the IIS project will inform policy as NAW moves further towards fully integrated transport systems	Transport Wales (TW) continues to further develop its intelligent infrastructure on the M4 motorway in South Wales and the A55 Expressway in the North. Working in conjunction with academia (Institute of Advanced Telecommunications, Swansea) infrastructure is being developed to provide a test bed for future technologies and link with specialist Technium Centres, where business and technology meet. TW sees the future of road operations demanding integration of the road and vehicle infrastructures along with partnership between road operators and road users. To this end it has agreed a collaborative memorandum of understanding with the Michigan Department of Transport relating to their vehicle infrastructure integration (VII) activities which focuses on the benefit and use of accrued VII data by the highway authority. Ultimately, TW anticipates that its investment in the development and use of intelligent infrastructure in Wales will help promote opportunities for businesses and communities to adopt and exploit ICT and will result in people having better access to jobs and services in Wales.
	Natural and Environmental Research Council (NERC)	
37	NERC's Centre for Ecology and Hydrology (CEH) will use the IIS reports to inform input to UK Energy Research Centre (UKERC) theme on Environmental Sustainability. The reports will also be a focus for discussions on NERC's future work on transport infrastructure and the associated environmental sensitivities involved in building, using and maintaining such infrastructures in a world of changing climatic regimes	CEH leads one of UKERC's six themes addressing issues of Environmental Sustainability. This theme includes a topic on transport and IIS outputs have informed the following aspects of Projects, Programmes and Themes within CEH: 1. UKERC (Sustainable Economies theme in Biodiversity) - IIS is an information source and raises profile of maintenance and modification of transport infrastructure when considering energy and the sustainability and environmental impacts of transport options - IIS scenarios informed the shaping, in particular the form, of UKERC scenarios - IIS links in CEH project outputs 2. Emissions and deposition (Biogeochemistry) – IIS scenarios explore impacts and damage linked to environmental conditions 3. Completed research (Environmental Informatics) – EI programme provides an authoritative knowledge base against which IIS scenarios might be examined. 4. Monitoring (Biodiversity) – 2007 survey will describe not only the area and condition of rural land contributing to transport, but will also set it in context for Britain as a whole.

		A time line is growing that will contribute to the interpretation of scenarios such as IIS. Also, IIS reports will add to the knowledge base used to develop bids and research programmes by Safety Standards and Research consortia of which CEH is part.
	Northern Ireland Executive	
38	Department for Regional Development will examine the implications of the project findings for Northern Ireland	The Department for Regional Development will continue to consider the implications of the Foresight Intelligent Infrastructure Futures for Northern Ireland.
	Organisation for Economic Co-operation and Development	
39	Use the results to inform their Global Infrastructure Futures (GIF) project	The IIS project findings have been fully considered by the OECD's GIF project steering group
	Communities and Local Government (CLG) - formerly Department of Communities and Local Government	
40	Use IIS project implications to inform ongoing policy development within CLG, particularly the implementation of the Social Exclusion Unit (SEU) report on inclusion through Innovation	This IIF report has helped in taking forward the SEU report on Inclusion through Innovation. The recommendations of that report are now being delivered through both the Digital Challenge and through a small team focusing on leadership and best practice in digital inclusion. Again they have used the IIF report as a reference point to frame questions and analysis in identifying forward facing initiatives, and in providing a good context for the scoping, landscape, document which they have produced.
	Railway Forum	
41	Review the implications of the IIS project for the railways and communicate the findings to others in the industry	The Railway Forum in conjunction with the CBI hosted an industry wide seminar entitled 'Making Railways Intelligent'. This seminar was a great success and helped to stimulate a wide-ranging debate on the application of intelligent transport solutions to the railways. In addition, the Forum has outlined the conclusions of the Foresight work and its importance for the railways in a wide range of public speeches to the rail industry and other key stakeholders. Finally, the Forum has published a series of papers on the application of Intelligent Transport to the railways entitled 'We will even know the way you like your coffee: thoughts on Intelligent Transport' on its website at www.railwayforum.com

	Royal Academy of Engineering	
42	Consider the Implications of the IIS project and use it to inform their discussions and statement on Road User Charging	In practice, these two activities were rolled into a single all-encompassing activity. The Academy held a briefing on Road User Charging on 24 May 2006 bringing together the outputs from three major Academy studies: The Challenges of Complex IT Projects; Transport 2050; and Dilemmas of Privacy and Surveillance. Following the briefing, the Engineering Policy Committee agreed that a statement on Road User Charging should be prepared for submission to the Department for Transport. The Statement was issued on 10 August 2006 and a response from Dr Stephen Ladyman MP, Minister of State for Transport was received in early September. An electronic copy of the statement can be found on the Academy's website along with presentations from the meeting (http://www.raeng.org.uk/policy/reports/road_user_charge.htm).
43	Consider the implications for its work on privacy and identity	
	Royal Society for Arts, Manufacturers and Commerce (RSA)	
44	Base a Design for Debate programme on ideas from IIS, to stimulate debate on Social, cultural and ethical issues raised by new technology.	RSA developed a project that would engage student designers in a debate to examine the social, cultural and ethical issues raised by new technology and stimulate them to propose visualisations that demonstrated both the positive, and more threatening, possibilities that such technologies might precipitate. The highest award was given to Maria Araya, Shajay Bhooshan and James Warton's (Architectural Association School of Architecture) proposal which was positioned as an extension of the London Ambulance Service and the NHS: a 'mobilised emergency response architecture' distributed throughout the urban landscape. The project is based on research into integrating data driven systems, CAD/CAM technologies and 'network' intelligence. The proposal is for a de-centralised, intelligent infrastructure of transport and healthcare - a system or organisation of discrete medical units that patrol through the city and aggregate for specific (medical) cases, enabling the swift transport and treatment of people.
	Scottish Executive (SE)	
45	Transport Scotland will consider the implications of IIS and how this might influence the future development of strategy for the	SE has developed an action plan for the enhancement of its Traffic Scotland service – Scotland's Intelligent Transport System for its trunk road network. The delivery of this action plan over the next 5 years will result in a stepped change in terms of level of service for trunk road users in the functional areas of monitoring, controlling and

	use of intelligent transport systems in their transport networks	informing. The Traffic Scotland service is a pivotal part of our Network Operator role, helping to contribute to the delivery of the SE's National Transport Strategy aims and outcomes by allowing Transport Scotland to operate and manage a safe, reliable and efficient system of strategic trunk road routes covering the whole of Scotland. As SE moves forward, utilising a wide range of Intelligent Transport Systems and maintaining the Traffic Scotland system at the forefront of technology developments will ensure that it is able to be proactive in our response to the transport challenges of the future.
	Smart Market Protocols for Road Transport (SMPRT) team	
46	Develop SMPRT tool to test intelligent infrastructure for road pricing in various cities or regions	The collaboration on smart market protocols for the auctioning of road-space 'slots' and the trading of travel permits based upon CO2 emissions between Newcastle and Essex University and Cranfield School of management has been a key research output for the IIS programme. Initial desk-based research of the concept was undertaken on a traffic model for Gateshead. As part of the plan to take this forward, Gateshead has been included in the EPSRC/DfT funded Message project where 'smartdust' environmental sensors will be deployed to measure traffic pollution, pervasively in real time. In addition the research team provided a response to the DfT PIN notice on road user charging trials, outlining a vision for a trial based upon the smart market principles. Several key conferences have included papers on the smart market idea, and a conference (part sponsored by Foresight) was held in Essex in January 2007, to explore in detail the whole area of smart trading 'Public Policy: Markets for Carbon and Congestion Charging' http://www.essex.ac.uk/eccc/. (See main report for publications)
	Transport for London (TfL)	
47	Use the IIS findings and scenarios to inform programme development, including demand management, network impact assessment and bids to the Transport Innovation Fund	In November 2006, TfL published *Transport 2025, Transport vision for a growing world city*. This will provide a basis for discussions with Government on the 2007 Comprehensive Spending Review, as well as forming the foundation for a revision of the Mayor's Transport Strategy. The rôle of demand management within the overall policy mix is still under discussion. The conclusions of the Foresight Study are being used to help inform the development of a strategy for taking forward demand management in the context of the Government's intention to implement a national road user charge sometime in the next decade.

		TfL is engaged in a range of discussions with the Government regarding the strategy, particularly around the rôle of technology in enabling the flexibility to achieve national and local aims and how, through the Transport Innovation Fund, TfL might contribute.
	Universities Transport Study Group	
48	Promote intelligent infrastructure as a major theme of transport research in the academic community	There is a history of research engagement and excellence in the field of intelligent transport systems in the UK academic community and many members of that community were engaged in the IIS project itself. Two significant developments coincident with and catalysed by the IIS project and following its launch have been: 1) the 2006 ITS World Congress at which the UK's Universities Transport Study Group had an exhibition stand (sponsored by EPSRC) to promote UK research; and 2) the announcement by the DTI, DfT and EPSRC of 'FITS', a major new research and innovation programme (see '26' and '30' above). The IIS outputs have played their part in stimulating creative thinking and interactions across the research community and industry.
	Public engagement	
	Department for Education and Skills (DfES)	
49	Support the development of lesson plans, which can then be used as part of the national curriculum	Foresight has commissioned the development of educational material for use by teachers to communicate some of the IIF report's key findings: the *'Transport and Cities Project for Secondary Schools'*. Wherever possible the starting points will be pupils' own experience. The activities are divided into two parts: *understanding the present* and *thinking about the future.* The pack will draw on selected elements of the IIF report's wealth of information about new technologies, which can be related to the current, crowded curriculum fairly easily. The materials pack will be available on-line. As part of the delivery of the e-Strategy, Becta shall consider how it might advise stakeholders and partners on use of the teaching materials developed under the auspices of the project.

	Department for Transport (DfT)	
50	Consider how to develop a wider discussion on the issues raised by the project, possibly including media engagement	The DfT welcomes the high level of public interest that the IIS project has attracted on how IIS and ITS technology might contribute to the future of transport. This has contributed to raising awareness of future challenges for transport policy, and of the impact of individual travel choices on sustainability, as well to advancing the public debate on the application of ITS technology. During 2006, the DfT has worked with OSI in their efforts to engage the public more widely in the project, such as the production of material based on the IIS project for schools and the proposal for a long-term exhibition at the London Transport Museum around the future of travel, based on the project.
	Newcastle University	
51	Developing continuing professional development courses, workshops and Masters-level Modules in aspects of Future Intelligent Infrastructure with technology, transport, environmental and policy oriented foci. In collaboration with the Institute for Sustainability and the Environment, Informatics Institute and the Nu Energy Centre	The University has embraced the outputs and recommendation of the IIS project and have included this ware in both its teaching material and outputs (publications). IIS is firmly embedded in the postgraduate teaching of the Transport MSc's module ITS and e-Services which is offered as both a standard module and a continuing professional development course. On the undergraduate civil engineering courses, a stage 1 module which looks at the 'big picture issues' in engineering includes lectures on IIS and its implications by Phil Blythe and on climate change and flooding by Jim Hall who was a Foresight expert on the costal flooding study. The University is building up capacity and knowledge in the area and has recently brought Prof. Margaret Bell (one of the IIS state of science authors) to join the Newcastle team along with Professor Eric Sampson, who recently retired for the DfT. Dr Stephen Ladyman MP, visited the ITS research team on 29 November 2006 and witnessed demonstrations of future wireless intelligent infrastructure systems.