



Government
Office for
Science

**Science and Engineering
Assurance Review
of the
Department for Transport**

This report sets out the findings from a review of Science and Engineering in the Department for Transport. The review was carried out in late 2009 and early 2010 before the 2010 General Election.

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Foreword

By the Government Chief Scientific Advisor



As Government Chief Scientific Advisor I have a responsibility to ensure and maintain the quality of the science and engineering used in all Government Departments. This report is one of a series of Science and Engineering Assurance (SEA) reviews that supports this role. Reviews provide a 'benchmark' for how effectively departments use science and engineering (including social science) in their strategy, policy and decision-making. The reports make recommendations to support departments in developing their science and engineering capacity and capability, and highlights existing good practice.

The science review programme was first established in 2003. Following seven reviews of Government Departments and Agencies the standard approach was reassessed, resulting in significant enhancements to the review process. Timescales have been considerably shortened, and reviews are more tailored to the needs of each individual department. There is also an increased emphasis on the use of science and engineering to support delivery of departmental business priorities.

This review of the Department for Transport is the first of a programme based on this refreshed approach. It has found a positive recognition of the importance of evidence-based policy making across the Department, as well as some strong areas of good practice. The report also identifies areas where change is required, or where existing practices can be enhanced, and the ten recommendations made in this report flow directly from these observations. The ambition should be to bring the entire Department up to the level of the best observed.

Many of the findings, recommendations and good practice identified in this report will be relevant in other areas of Government. As Government Chief Scientific Advisor, I urge other departments to consider the findings of this review in light of their own circumstances.

Finally, I would like to thank members of the independent expert panel who have worked with us to advise on key issues, collect and analyse evidence, draw conclusions, and develop recommendations. I would also like to thank all of those who have contributed evidence to the review, including many staff within the department, and key stakeholders to the department.

A handwritten signature in black ink, which appears to read 'John Beddington'.

Professor Sir John Beddington

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Summary

This report provides a benchmark of how Science and Engineering (SE) are used within the Department for Transport (DfT). Each of the other Analytical Professions within the Department (Economics, Science and Engineering, Social Research and Statistics) have a Head of Profession (HoP), all of whom have been consulted during this review.

This review makes recommendations aimed at improving DfT's SE processes and practices, based on evidence collected from within the Department and their key stakeholders. The recommendations aim to enhance strategy, policy and decision-making in the Department. The report also highlights good practice, which can be drawn upon to enhance performance.

The mission of DfT is to support *“transport that works for everyone. This means a transport system that balances the needs of the economy, the environment and society.”*¹

In recent years, the Department has undergone several large scale changes, the most recent being a major structural reorganisation to facilitate an increased focus on transport systems rather than individual modes of transport. Arrangements for the strategic management and use of SE inputs into business planning and policy making have also been under review, and the Department is currently considering how best to take forward proposed changes.

The Summary sets out the recommendations made by this review including brief details of the findings that led to their development and their anticipated impacts. The Department's overall approach is good, and the importance of a robust evidence-base to underpin policies and strategy is well recognised. However, several areas have also been identified where improvements can be made. It is clear that there is a great deal of variety across the Department on the use of SE, and the recommendations made are intended to bring the whole Department up to the standards of the best observed. For recommendations to have real impact it will be essential to achieve buy-in and engagement across the whole Department at all levels.

¹ <http://www.dft.gov.uk/>

Good practice example summaries

Journey modelling

The Department focused on desired outcomes (reduction of carbon emissions) and worked across analytical disciplines to direct analysis on the *purpose* of journeys taken. Consideration of transport issues within a wider context enabled both a better understanding of the dynamics of the problem and a range of solution options to be identified.

Revisiting biofuels policy

In 2008, concern within the Department on the evidence base underpinning its policy on biofuels led to engagement between policy officials and the DfT Chief Scientific Advisor (CSA). The two teams developed a plan to meet evidence needs, and the DfT CSA now co-chairs a research programme with the DEFRA CSA to deliver the required evidence-base to support high quality policy in this area.

Supply of rare earths for transport

Rare earth metals are an important material for many present designs of electric vehicle and plug-in hybrid vehicle technology. By working together, the CSA and policy officials identified potential concerns around the future supply of these metals. From this they have initiated timely research (with the Department for Business, Innovation and Skills) on a number of issues regarding the supply and demand, and possible alternatives of rare earth metals. This forms part of the evidence-base that will inform policy work in this area.

The UK Transport Research Centre (UKTRC)

The UKTRC is a new approach to working with academia. It is jointly funded between DfT, EPSRC and the Scottish Executive and comprises two distinct work streams. In the first, the sponsors and academic consortium agree broad themes and the consortium defines specific research projects. In the second, projects are specified on an individual basis by the sponsors. Although UKTRC has taken some time to set up and is still at a relatively early stage, it represents an attempt to innovate when working with academia, and the Department has clear plans to evaluate the programme one year after its implementation.

Seat belt wearing

The Department used car accident data to select seat belt wearing as a target to form part of their THINK! Road Safety Campaign in 2008/9. Pre-campaign data collection was conducted to allow an evaluation of the impact of the resulting campaign against clearly set objectives. Some positive influence has been observed against objectives in a post-project evaluation, although there have also been some negative shifts.

Project Brunel with Transport for London (TfL)

TfL and DfT share concerns about skills shortages within the engineering, planning and technical sectors. They worked together to carry out an analysis of current trends and future demands in these sectors. This was completed in January 2009, and joint work is now underway to implement its recommendations.

Recommendations

The review's recommendations are set out below in the order they appear in the report, grouped under the high-level criteria which are used to guide the SEA Reviews.² Each recommendation includes references to relevant sections in the main report, which provide the background, evidence and argument underpinning them.

Because some recommendations are interdependent there will be a logical sequence for the order in which they should be implemented. Therefore recommendations have been classified according to whether the review panel believe action should be 'immediate' or whether a 'longer lead time' is required. Recommendations made will vary in potential impact, and recommendations have been classified accordingly as either 'significant' or 'desirable'.

Recommendations for Criterion 1 (Strategy, policy making and delivery are informed by science and engineering)

Recommendation 1

A standardised approach should be implemented to ensure that high-level policy objectives, business planning and research planning are effectively linked and supported at the high-level.

Significant, Immediate (incorporated into 2011/12 business planning cycle)

Background: There is clear evidence that DfT is committed to the use of good quality SE at all levels. The Department's Chief Scientific Advisor (CSA) engages with the Departmental Board and Ministers, providing advice on operational and strategic issues. However, mechanisms for aligning lower level research plans with business planning and strategy are not clear. This problem has been identified by the Chief Scientific Advisor's Unit (CSAU) and improving this process is highlighted as work in progress for 2010-2011.

Expected Benefits: Ensuring the Department has a clear system for aligning research planning with business planning will provide a 'cycle' where departmental prioritisation is informed by SE and other inputs, including evaluation data from implemented policies and initiatives. This in turn will drive the strategic planning and prioritisation of research to meet departmental objectives. This will also further facilitate a focus on 'innovative' research as well as incremental research driven by individual policy need.

² <http://www.bis.gov.uk/go-science/science-in-government/science-engineering-assurance/review-framework>

Recommendation 2

A 'systems-based' approach should be further developed for understanding immediate and longer term policy issues, and the evidence needs emerging from this. This approach should draw on a broad range of inputs and build on the Department's increased focus on policy outcomes rather than pre-conceived solutions. Relevant to sections: 2.4.2, 3.1.3, 3.1.8, 3.2.3, 3.5.1

Significant, Longer lead time. The review panel recognises that this represents a significant culture change, which will take time, but the Department should aim to begin incorporating this approach now.

Background: DfT policies play out in a complex environment of social, technical, economic and environmental considerations, drivers and effects. As such, it is important to consider a wide variety of inputs to frame policy questions and to understand possible options for developing policy solutions. Further developing of a 'systems-based' approach, that is capable of handling multiple or even competing evidence streams is desirable.

Expected Benefits: Taking a 'systems-based' approach to understanding policy problems will enable the complex interrelations of real world factors to be better reflected in decision-making, thereby increasing the effectiveness and robustness of emerging solutions. Further, it provides an approach that facilitates the balanced and open integration of factors that are not traditionally considered 'evidence' and considerations that may conflict (such as technical ease versus social acceptability or economic viability).

Recommendation 3

Approval processes for policies and projects should require that SE inputs and engineering feasibility (where relevant) have been fully taken account of throughout policy and/or project development. SE inputs should be integrated with other evidence sources to provide the overview and detail required for effective policy making. Processes should be proportionate and include relevant evaluation data emerging from other policies or schemes. Relevant to sections: 3.1.3, 3.1.5, 3.1.7, 3.1.8, 3.2.3, 3.2.4, 3.2.6, 3.3.3, 3.3.5

Significant, Immediate

Background: Individual directorates have responsibility for their knowledge and expertise in SE. In general the policy areas examined drew well on available evidence. For example, in some areas engineering specialists work on policy areas in an end-to-end way, embedding engineering advice throughout the process. This high standard of engagement was tempered by some examples of 'big ticket' items where adequate engagement with SE had not taken place in a timely manner, to the detriment of business plans or policy. The CSA and his Unit should have a role in improving this process by acting as a focus point for advice and challenge to the SE content of policies and projects.

Expected Benefits: A formal requirement to set out how the SE evidence-base has been taken account of and integrated with other types of evidence throughout the policy process should facilitate early engagement with SE expertise within the Department and beyond. Senior support for this discipline will help reinforce the culture of critical thinking that is endorsed by the analytical professions and the policy profession.

Recommendation 4

Further evaluation of policies and initiatives should be established to ensure information is captured throughout the entire policy cycle. Arrangements should ensure that there is effective and proportionate data collection, and that evaluation data is used to validate methodologies and inform future policy making. Relevant to sections: 3.1.2, 3.1.5, 3.1.7

Desirable, Immediate

Background: DfT recognises the value of policy evaluation to a point, and has created a small centralised evaluation unit within the Transport Analysis and Economic (TAE) division. It should build on current progress on the evaluation agenda to increase its focus on the evaluation of policies and initiatives following their implementation.

Expected Benefits: Evaluation requires dedicated resource but provides insight on the impact of specific interventions, including costs and benefits, as well as critical information on the enablers and inhibitors of policy delivery. Evaluation also provides 'real world' data to feedback into future policy making and to test and calibrate methodologies. As implementation lessons are frequently transferrable to a wide range of interventions this provides a crucial feedback loop to help the department improve its impact in a range of applications beyond the immediate policy area.

Recommendations for Criterion 2 (Government as a whole and Departments individually should take a strategic approach to prioritisation, accessing, resourcing and delivery of science and engineering)

Recommendation 5

The Department should produce an updated evidence and research strategy. This recommendation should take account of the following sections of this report: 3.1.2, 3.1.7, 3.1.8, 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.2.8, 3.2.9, 3.3.3, 3.5.1.

Significant, Longer lead time (within the next 12 months)

Background: DfT last published a department-wide research strategy, the Board Level Evidence and Research Strategy (B-ERS), in 2006 but this strategy appears to have failed to gain traction. When publishing the initial B-ERS, DfT set out the intention to update it every two years, and there were various reasons for the delay to this happening. These reasons are understandable, but a renewed focus on this strategy is now required. Its renewal should address several issues identified in this report, such as the evaluation and prioritisation of research and how individual Research Units fit into the wider departmental strategy.

Expected Benefits: The Department has gone through many changes since the B-ERS was published and its renewal should provide strategic direction to the Department's research, particularly in assisting with complex and innovative research delivery, and how the Department can best leverage external evidence. It will also set clear standards for the whole Department to aim for, and reflect the changes that have emerged from the Department's *Strategic Review of Research Management* (see Section 2).

Recommendation 6

The Department should develop more robust mechanisms to ensure it receives external critical challenge at the strategic level with regard to its use of SE. These mechanisms must be co-ordinated with arrangements in place for other evidence streams. Relevant to sections: 3.1.1, 3.1.8, 3.2.3, 3.2.4, 3.2.7

Desirable, Longer lead time. The review panel recognises that these mechanisms will take some time to fully establish, but the Department should consider the first steps required towards this now.

Background: When involved the CSA is viewed by officials as influential at the strategic level in providing critical challenge to the Department's use of SE. DfT does not have an overarching Science Advisory Council (SAC), which some other departments have used to enhance their access to advice at the high-level and to support the CSA's challenge function. DfT have considered a formal SAC in the past and decided not to adopt this model. However, the review panel recommends that the Department revisit the issue of how to secure the benefits a SAC provides in a way that is practicable for them.

Expected Benefits: Increased strategic challenge and advice on the Department's use of SE and how this could fit in with other evidence should help ensure DfT take a strategic view across all of its portfolio and to bring in different perspectives at the high-level. This will allow access to a high calibre network which will bring expertise to the Department in an efficient way, driving up the quality of evidence used.

Recommendations for Criterion 3 (science and engineering results should be robust, relevant and high quality)

Recommendation 7

To enhance quality and standards in research procurement, the Department's research procurement strategy should be revised to ensure:

- maintenance of a broad, effective, and competitive supplier base within the Research Procurement Framework
- consistency of supplier suitability
- support of innovative commissioning where required
- minimisation of bureaucracy with flexible processes
- appropriate skills to support effective procurement

Relevant to sections: 3.3.1, 3.3.2, 3.3.3

Desirable, Longer lead time (as part of next review of procurement process)

Background: The prioritisation, specification and procurement of DfT research is devolved to individual units and is managed by Research Programme Managers (RPMs), with Strategic Framework Agreements available for the commissioning of research. Relevant officials interviewed have mixed views on the efficacy of the Department's arrangements, particularly with regard to the Strategic Framework Agreements. These are not unusual issues in any organisation and effective management and procurement advice should support speed and convenience while maintaining quality assurance and enabling innovation.

Expected Benefits: Enhancing the Department's procurement procedures and increasing understanding of the different options available will help ensure the Department accesses high quality research in a timely and cost effective way. Options to enable innovation through development of the supplier base should ensure that DfT does not become reliant on too small a number of regular suppliers.

Recommendation 8

The Department should develop a systematic and proportionate process for quality assurance of the SE evidence it uses, to bring the whole Department up to the highest standards observed. Relevant to sections: 3.2.3, 3.3.3, 3.4.1, 3.5.1

Significant, Longer lead time (within 12 months, as part of the refreshed Evidence and Research Strategy)

Background: DfT's approach to quality assurance of SE evidence appears to vary, with the potential to impact on the quality of the evidence used. Some of this variety is a result of resource and time considerations, but some appears to be due to mixed understanding and awareness of quality assurance practice. Good practice was seen in many areas, but in some cases teams did not display an up-front understanding of the different methods that could be used for quality assurance, and the impact they might have on confidence.

Expected Benefits: Clearly specified, proportionate and organisationally supported methods for quality assurance will enable a high-level of confidence in the evidence supporting policies and decisions, and their robustness in the face of scrutiny and challenge.

Recommendation 9

The Department should evaluate the skills and knowledge required to be an intelligent customer at all stages of the research cycle against their current capabilities, with the aim of bringing the whole Department up to the strong standards observed in some areas. The Department should also review their balance of in-house expertise and contractors (including those within teams) to ensure arrangements are optimal for securing required knowledge in a cost-effective and sustainable way. Relevant to sections: 3.1.5, 3.2.4, 3.3.3, 3.3.4, 3.3.5, 3.5

Significant, Longer lead time (within 2011/12 business cycle)

Background: Each policy area has the responsibility to fulfil the intelligent customer role for the SE evidence they use. Impressions of the capabilities of different policy teams are mixed, as is the confidence of DfT officials in the Department's capability as a whole to act in this capacity. The panel also considers that, in some areas, the balance of in-house expertise and consultants working within teams is too far weighted towards consultancy.

Expected Benefits: An enhanced intelligent customer capability will enable parts of the Department to specify research needs more clearly, manage research more effectively, challenge throughout the process, and exploit outputs more fully. The correct balance of in-house expertise will allow sustainable capability to be built in the most cost-effective way possible.

Recommendations for Criteria 4 to 6

This report makes no recommendations directly under Criteria 4-6 but Section 3 covers the evaluation of the Department's performance in these areas.

Criterion 7: Ensure that capability and capacity is in place to manage and deliver the science and engineering work required by the Department

Recommendation 10

The Department should develop a plan to ensure adequate SE (including social science) skills within the Department. Arrangements should include:

- recording SE skills at the point of recruitment and keeping them up-to-date
- sharing specialist skills across units where full-time positions are not sustainable
- promoting effectively existing SE skills within the Department as a source of advice and support for policy colleagues
- enhancing the role and function of SE specialists within the Department
- developing opportunities for progression whilst maintaining SE specialist status scientists and engineers within the Department – as is the case for some other analytical professions

Relevant to sections: 3.5.1, 3.5.3

Significant, Longer lead time (within 2011/12 business cycle)

Background: The review panel has concerns that no plan or strategy for ensuring adequate sustainable SE skills is evident. In most areas, there are not immediate skills concerns, but in a few areas this is proving to be a challenge. The Department does not keep a full central record of official's SE skills and expertise and this is a serious hindrance for planning and developing its Science and Engineering Profession. The role and function of the Science and Engineering Profession should be enhanced, including developing further opportunities for progression as an SE specialist.

Expected Benefits: A clear strategy for acquiring, maintaining and developing specialist SE skills will help the Department secure the key expertise and knowledge essential for them to meet their objectives.

1 Introduction

1.1 Approach of the review

Following the 2008 Cleasby review³ of the Government Office for Science's former Science Review process, the review methodologies have been significantly revised. The Science and Engineering Assurance (SEA) reviews are much shorter, using a smaller number of carefully targeted interviews to develop an overview of the SE capability and capacity of a department. Conclusions and recommendations are based on information from DfT documents, interviews with DfT officials, case studies, and the perspectives of DfT stakeholders. Further details on methodologies used for this review can be found at Annex 1.

1.2 Scope of review

The relevance of different disciplines will vary depending on the responsibilities and challenges of each department, and departments are expected to consider evidence from all relevant scientific and analytical disciplines.

The exact scope of each review is agreed with individual departments. For this review 'SE' encompasses the physical, biological, engineering, medical, natural and social disciplines, although economics, statistics, and operational research are not included, apart from consideration of how SE evidence is aligned and integrated with this analysis. This is because the Department has separate review arrangements for these disciplines.

1.2.1 Agencies and NDPBs

Details of SE processes and practices in the Department's Agencies and NDPBs are not considered in this review, except with reference to the relationship and interface between themselves and the core Department.

1.2.2 The Government professions

This review encompasses science and engineering and social sciences in its definition of 'SE', but across Government these elements are divided into the 'Science and Engineering' and 'Social Research' Professions, with separate Departmental Heads of Profession (HoP). There is also an 'Economic' and 'Statistics' Profession in the Department, both with their own HoP. These arrangements have implications for how knowledge and evidence will be accessed, managed, and used, and all of the analytical professions within DfT have been consulted during the course of this review.

³ Using Better Evidence: A Review of the Science Review Programme (2008)
<http://www.bis.gov.uk/assets/biscore/goscience/docs/c/cleasby-report.pdf>

1.3 Terms of reference

Full Terms of Reference (TOR) can be found at Annex 2. These set out the agreed terms of the review and possible areas for case studies. Final case studies were selected at the beginning of the review based on discussion and agreement between the expert panel, DfT officials and the SEA team. The TOR also specifies exclusions, notably decision-making and policy surrounding the expansion of Heathrow. There is considerable ongoing activity in this area within Government, including engagement with the Government Chief Scientific Advisor and it was not considered desirable to duplicate this activity.

2 The Department of Transport (DfT)

This section sets out key background information on DfT. Further information can be found on their website: www.dft.gsi.gov.uk.

2.1 Objectives

2.1.1 Public Service Agreements (PSAs)⁴

To note that these PSAs were in place prior to the 2010 General Election, and represent the objectives of the Department when this review was carried out.

- CSR07 PSA 5: Deliver reliable and efficient transport networks that support economic growth (sole responsibility).
- PSA 26: Reduce the risk to the UK and its interests overseas from international terrorism (joint responsibility: led by the Home Office).
- PSA 27: Lead the global effort to avoid dangerous climate change (joint responsibility: led by DECC and also shared by DEFRA and BIS).
- PSA 28: Secure a healthy natural environment for today and the future (joint responsibility: shared with DEFRA).
- SR04: Road Safety: Reduce the number of people killed or seriously injured in Great Britain in road accidents reported to the police by 40 per cent and the number of children killed or seriously injured by 50 per cent by 2010 compared with the average for 1994-98, tackling the significantly higher incidence in disadvantaged communities (legacy PSA).
- SR04: Bus and light rail use: By 2010, increase the use of public transport (bus and light rail) by more than 12 per cent in England compared with 2000 levels, with growth in every region (legacy PSA).

2.1.2 Goals

DfT states a high-level ambition of *'transport that works for everyone. This means a transport system that balances the needs of the economy, the environment and society.'*⁵ Underpinning this are five strategic objectives that were first articulated in their 2007 White Paper *'Towards a Sustainable Transport System'* (TaSTS)⁶ and refined following consultation. These objectives are:

⁴ All information in this section is taken from the Department for Transport Autumn Performance Report (2009) <http://www.dft.gov.uk/about/publications/apr/ap/apr2009/>

⁵ <http://www.dft.gov.uk/about/>

⁶ Department for Transport, *Towards a Sustainable Transport System* (2007)

<http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/about/strategy/transportstrategy/pdfsustaintranssystem.pdf>

1. To support national economic competitiveness and growth, by delivering reliable and efficient transport networks
2. To reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of avoiding dangerous climate change
3. To contribute to better safety, security and health and longer life-expectancy through reducing the risk of death, injury or illness arising from transport and promoting travel modes that are beneficial to health.
4. To promote greater equality of opportunity for all citizens, with the desired outcome of achieving a fairer society
5. To improve quality of life for transport users and non-transport users, and to promote a healthy natural environment

2.1.3 Goals in context

Towards a Sustainable Transport System (TaSTS) was published in response to *The Stern review (2006)*⁷ and *The Eddington Transport Study (2006)*.⁸ It was a major piece of work which articulated the Department's approach to long-term transport planning. Subsequently, in 2008, *Delivering a Sustainable Transport System (DaSTS)*⁹ set out plans for delivering the vision of TaSTS. The effort within the Department that contributed towards both of these documents helped shape the Department's approach to the use of evidence and analysis, and is described as '*providing the strategic context for future evidence needs.*'¹⁰

2.2 Departmental Structure

2.2.1 Organisation

The current DfT structure was established in response to the *Eddington Transport Study*, which recommended a shift in focus from separate modes of transport to transport issues. This resulted in four policy Directorate Generals:

1. International Networks and Environment
2. Motoring and Freight Services
3. National Networks
4. City and Regional Networks

The Department has a Transport Analysis and Economic (TAE) Directorate (within the International Networks and Environment Directorate-General), led by the Departmental Chief Economist. This contains the Department's central analytical capability, including economists and social researchers. In addition to the central team, further analysts are embedded in policy areas across the Department. All of the Department's engineers are embedded in policy teams, with no central 'pool' as there is for some of the other analytical professions.

⁷ HMT, Stern Report on the Economics of Climate Change (2005)

http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/stern_review_report.htm

⁸ Department for Transport, *The Eddington Transport Study* (2006)

<http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/>

⁹ Department for Transport, *Delivering a Sustainable Transport System* (2008)

<http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/about/strategy/transportstrategy/dasts/dastsreport.pdf>

¹⁰ Paper on DfT arrangements against the SEA Framework, submitted by DfT for the SEA review

2.2.2 The Departmental Chief Scientific Advisor (CSA)

The current Departmental Chief Scientific Advisor (CSA) was appointed in 2006 and has three days per week dedicated to DfT. The CSA role is described as: *'(the CSA) facilitates the understanding of high-quality scientific evidence within the Department, seeks to challenge DfT thinking, to inject innovation and to guide evidence and research agendas.'*¹¹ The CSA reports directly to the DfT Permanent Secretary and is supported by a Chief Scientific Advisor's Unit (CSAU), which consists of twelve people and sits within the TAE for business planning purposes.

2.2.3 The Strategy Sub-Committee (SSC)

The SSC is chaired at Director-General level and has approximately 25 members at Deputy Director level and above (including the Chief Economist and CSA). It is expected that the group will have a future role in overseeing cross-cutting research areas identified by the recent internal DfT review of research management (see section 2.3.1). It also has a role in strategic prioritisation of science and technology for both short term Departmental policy need and longer term development areas. These arrangements are designed to increase 'top down' strategic direction and co-ordination. Details of how they will engage with this role are currently being established with department.

2.3 Research

In 2009-2010 the DfT research budget was approximately £60 million per year. This funds research from *'a wide range of disciplines, from engineering and technology, through social and economic research to the physical and natural sciences.'*¹² This does not include expenditure on activities such as technology trials for road demand management or DfT statistics programmes.

Individual policy directorates have responsibility for SE research programmes, with commissioning and management entirely devolved from the centre. Current arrangements were finalised in 2006, with the aim of *'responding to a need to take a more strategic look at our evidence and research requirements, and to facilitate better co-ordination and communication of those requirements.'*¹³ The CSAU and TAE also have a central research budget, which has previously accounted for approximately 5% of total research spend.

DfT commission research for one or more of the following reasons:

- to inform development of policy or operational service
- to reduce risk in programmes and schemes and enhance ability to deliver outputs and objectives
- to develop relevant evidence and research to stimulate innovation¹⁴

¹¹ Paper on DfT arrangements against the SEA Framework, submitted by DfT for the SEA review

¹² Paper on DfT arrangements against the SEA Framework, submitted by DfT for the SEA review

¹³ DfT internal paper

¹⁴ Paper on DfT arrangements against the SEA Framework, submitted by DfT for the SEA review

They state that *investing* in research may not necessarily mean *commissioning* research because they may also influence others' research agendas. There is some evidence of this strategy working – for example the Highways Agency believe that the '*CSA role has become more influential across the department, and has helped to influence the research agenda of the Highways Agency.*'

2.3.1 DfT Research Management Report

In April 2009 DfT produced an internal review of strategic research management across the Department.¹⁵ It was based on consultation with stakeholders and within DfT and aimed to:

- recommend how overall research and expenditure should be prioritised
- recommend the most effective balance of local delivery and central direction with regards to research (including the processes by which research expenditure is prioritised, managed, exploited and evaluated)
- recommend how the research units be realigned to reflect revised DfT organisation
- ensure research planning is embedded in normal business processes and adequately resourced

Based on this, the Department opted to retain its devolved research arrangements and Research Units despite structural changes prompted by the *Eddington Transport Study*. It decided upon some changes - such as the development of cross-cutting research areas, improved links to business planning, review of the scrutiny process, and re-enforcement of the Department's evidence and research strategy. The issues addressed in DfT's Research Management Report and resulting changes are discussed throughout Section 3.

2.4 Policy

2.4.1 Delivery

Most transport policy is implemented by organisations other than the core Department. Some delivery is achieved through their Agencies and Non-Departmental Public Bodies (NDPBs) and other bodies, such as local authorities and train operating companies, also have a large stake. The levers with which DfT manage delivery are described as '*guidance, principle and regulation.*'¹⁶ This has implications for the nature and role of SE in policy delivery as well as placing an imperative on effective communication and knowledge transfer to key delivery partners. It is worth noting that some delivery partners have significant research budgets of their own – for example the Highways Agency.

¹⁵ Internal DfT document

¹⁶ Interview with DfT official

2.4.2 Appraisal and analysis

The Department uses highly developed methods of appraisal and analysis to assess possible policy options and projects. The 'New Approach to Transport Analysis' (NATA) model is designed to assess the impacts of investment in infrastructure, using a cost-benefit approach as recommended by Her Majesty's Treasury.¹⁷ NATA aims to capture multiple impacts of a proposal, economic, environmental and social, in one place by use of qualitative, quantitative and monetised (where possible) data, drawn from a variety of sources such as models of travel behaviour and environmental impact assessments. Factors taken into account include carbon emissions, biodiversity, time savings and physical fitness. The Department are currently updating the NATA model and have consulted externally as part of this process.

The National Transport Model (NTM) is an analytical and policy-testing tool. NTM provides a systematic means of comparing the national consequences of alternative national transport policies or widely applied local transport policies, against a range of background scenarios based on factors affecting future travel patterns. This model has been used extensively across the Department – for example, in the production of the Department's July 2009 carbon reduction strategy.¹⁸ The NTM is refined as it is used, and recently, a method for assessing the social and distributional impacts of transport schemes has been developed, to be used alongside more traditional value for money criteria.

This analytical approach to decision-making is a strength to be commended, and should be further built upon. When using modelling and appraisal it is important to be aware of, and acknowledge, gaps in available information. The climate change case study (see Annex 3) is an example where many behavioural effects are not yet fully understood. The policy team recognise this, and acknowledge the importance of continuing to build this evidence base. Modelling will only be as strong as the information and assumptions it uses. Previous assessments¹⁹ suggest that improving the balance between different types of evidence in appraisal work would be beneficial – a view the review panel agrees with.

¹⁷ HMT, The Green book: Appraisal and Evaluation in Government
http://www.hm-treasury.gov.uk/data_greenbook_index.htm

¹⁸ Department for Transport, Low Carbon Transport: A Greener Future (2009)
http://www.hm-treasury.gov.uk/data_greenbook_index.htm

¹⁹ Interviews with DfT officials, and the joint analytical professions input into the evidence and analysis in DfT compiled by the Analytical Coordination Working Group (ACWG) for the Head's of Analysis Group's formal advice to the Cabinet Office Capability Review Team for the 2009 DfT Capability Review Update

2.5 Previous reviews

2.5.1 Capability review

A capability review of DfT was carried out in 2007²⁰ and a progress report published in 2009.²¹

The Department was assessed as ‘strong’ on the capability to base choices on evidence in both 2007 and 2009. Comments in the 2007 report were very positive and included: ‘*a strong evidence-base and analytical capability*’ and ‘*universal recognition [from external stakeholders] of the Department’s analytical capacity and its contribution of high quality evidence to...for example, the Eddington study.*’ The 2009 update commented that DfT had ‘*continued to improve its already strong evidence-base.*’ The report also highlighted the fact that a number of stakeholders praised the Department for their use of evidence, citing examples such as end-to-end journey analysis.

On skills, the 2007 report noted that there was no long-term plan for the recruitment and retention of specialist staff, and that the Department is reliant on high-value, commercial, technical and engineering skills that are in short supply. The 2007 report recommended that ‘*the Department needs quickly to develop a forward-thinking HR strategy to address the challenge of securing the right level of commercial and specialist skills to support future business needs.*’ The 2009 update did not comment specifically on specialist skills but did say that ‘*there are now a number of new HR processes and plans in place which are expected to improve skills, leadership, [and] performance.*’

The 2007 review also found that some stakeholders did not feel adequately engaged in the development of DfT’s strategic thinking, and that some considered DfT could be more receptive to requests to share evidence and transport data. The picture of stakeholder engagement in 2009 was more positive, with comment on a ‘*more proactive approach to consulting*’ and that ‘*some (stakeholders) are beginning to feel that they are involved as joint owners in both the design and delivery of policies.*’²² The report recommended that the ‘*Department should build on its strengthened relationship with stakeholders and ensure that it is consistent across the organisation.*’ This conclusion is supported by some responses to the stakeholder consultation conducted as part of this SEA Review – for example Transport for London (TfL) commented that ‘*engagement has improved due to the hard work of the DfT to engage with stakeholders.*’

²⁰ Cabinet Office, Capability Review of the Department for Transport (2007)
http://www.civilservice.gov.uk/Assets/Capability_Review_DfT_tcm6-1059.pdf

²¹ Cabinet Office, Capability Review: Department for Transport: Progress and Next Steps (2009)
http://www.civilservice.gov.uk/Assets/296680_Capability_DfT_web_tcm6-8286.pdf

²² Cabinet Office, Capability Review: Department for Transport: Progress and Next Steps (2009)
http://www.civilservice.gov.uk/Assets/296680_Capability_DfT_web_tcm6-8286.pdf

3 Conclusions, good practice & recommendations

This section discusses findings on DfT's use of SE evidence under the high-level criteria of the Science and Engineering Assurance (SEA) Review framework.²³

Criterion 1: Strategy, policy making and delivery should be effectively informed by science and engineering.

Criterion 2: Government as a whole, and individual government departments, should take a strategic approach to the prioritisation, accessing, resourcing and delivery of science and engineering.

Criterion 3: All science and engineering used by government should be robust, relevant and high quality.

Criterion 4: Science and engineering evidence should be made publicly available unless there is clear justification for not doing so.

Criterion 5: The implications of science and engineering for society should be fully considered, engaging the public whenever appropriate, using good practice.

Criterion 6: Government should ensure effective knowledge transfer, innovation and pull through of its research to the economic development of new technologies and services.

Criterion 7: Departments should ensure that they have the science and engineering capacity and capability to manage and deliver the first six criteria of the SEA Framework effectively.

Recommendations emerging from this review do not necessarily relate to one single criterion of the SEA framework. As such, each recommendation includes reference to the sections of text in the main report which underpin it.

Because some recommendations are interdependent there will be a logical sequence for the order they should be implemented, and so recommendations have been classified by whether the review panel believes action should be made 'immediately' or whether a 'longer lead time' is required. The review panel believes that the recommendations vary in their potential impact and have been classified accordingly as either 'significant' or 'desirable'. These two classifications have been attributed to each recommendation made by the Review.

²³ <http://www.bis.gov.uk/go-science/science-in-government/science-engineering-assurance/review-framework>

3.1 Criterion 1

Strategy, policy making and delivery should be effectively informed by science and engineering

Throughout the Department there is recognition of the importance and benefits of evidence-based policy. Officials believe that the Department is evidence-driven and endorse this approach. As one official noted, this does not automatically lead to the effective use of SE, but it is a good starting point. The following section explores how these attitudes are translated into practice.

3.1.1 Departmental CSA influence at the high-level

The current Departmental CSA does influence strategy and policy making at a high-level and is a non-voting member of the DfT Board and the Strategy Sub-Committee. He has regular meetings with the Permanent Secretary, Director Generals and other members of the senior management team.

The CSA frequently briefs and provides direct advice to Ministers on SE issues. There have been occasions, however, when the CSA has been asked to brief Special Advisors rather than Ministers directly. Although there may have been practical reasons for these situations there is a risk that key information can be 'lost in translation', or critical points of interpretation missed or misunderstood.

3.1.2 Departmental business planning

The presence of the CSA on the Board and the Strategy Sub-Committee enables his direct input of SE advice into high-level business planning. The CSA is respected and considered to be influential at this level.

It is not clear how lower-level research plans are aligned with more strategic thinking on evidence requirements and with business planning. Research should be driven by strategic plans, and fed back in turn to influence subsequent planning cycles. The DfT internal report on research management observes that *'at present there is little linkage between business planning and research planning.'*²⁴ The Department's 2006 Board Level Evidence and Research Strategy (B-ERS)²⁵ set out the need for adequate processes, and emphasised the importance placed on *'ensuring that evidence is an essential element of our short, medium and long-term planning.'*²⁶ However, discussions with relevant DfT officials highlight that this is out of date, and does not give an accurate picture of current processes.

²⁴ DfT Internal paper

²⁵ Department for Transport, Evidence and Research Strategy (2006)
<http://www.dft.gov.uk/adobe/pdf/163944/evidenceandresearchstrategyd1904>

²⁶ Department for Transport, Evidence and Research Strategy (2006)
<http://www.dft.gov.uk/adobe/pdf/163944/evidenceandresearchstrategyd1904>

As noted in 2.3.1, the CSAU has reported a commitment to ensuring better links between research planning and business planning across all areas of the Department. At the time of this review improved linkage is described as *'work in progress for 2010-2011.'*²⁷ The aim as understood is to allow the identification of research priorities and resources in parallel with decisions on policy and operational priorities and resources. This will not be implemented for the 2010-11 business plan, however, because delivery planning was underway before preparations for effective research resourcing could be made.

The review supports these ambitions, noting that all policy divisions of the Department should fully engage with the planned changes. A culture where business planning is fully informed by SE evidence, with fully linked research, will increase the efficacy, defensibility and robustness of business plans and the policy decisions that flow from them.

Recommendation 1

A standardised approach should be implemented to ensure that high-level policy objectives, business planning and research planning are effectively linked and supported at the high-level.

Significant, Immediate (incorporated into 2011/12 business planning cycle)

Expected Benefits: Ensuring the Department has a clear system for aligning research planning with business planning will provide a 'cycle' where departmental prioritisation is informed by SE and other inputs, including evaluation data from implemented policies and initiatives. This in turn will drive the strategic planning and prioritisation of research to meet departmental objectives. This will also further facilitate a focus on 'innovative' research as well as incremental research driven by individual policy need.

3.1.3 A 'systems-based' approach

DfT policies play out in a complicated environment of social, technical, environmental and economic considerations, drivers and impacts. To respond effectively to these factors it is important to consider a wide variety of inputs in framing policy questions, and to understand possible options in developing policy solutions. Using multiple evidence streams in a 'systems-based' approach allows a more comprehensive, and realistic, assessment of the known issues, specification of desired outcomes and articulation of realistic solutions.

This report recommends that the Department should take up a 'systems-thinking' approach more fully and interviews with stakeholders, including the Commission for Integrated Transport (CfIT), support this view. The

²⁷ Interview with DfT official

Department should ensure that this approach explicitly includes the social sciences alongside the physical and engineering sciences. This would help to ensure that consideration is given to how 'social networks' of work, family and friends are organised and sustained over geographical distance, and how these social networks will shape their behaviour and travel requirements now and in the future.

Recommendation 2

A 'systems-based' approach should be further developed for understanding immediate and longer term policy issues, and the evidence needs emerging from this. This approach should draw on a broad range of inputs and build on the Department's increased focus on policy outcomes rather than pre-conceived solutions. Relevant to sections: 2.4.2, 3.1.3, 3.1.8, 3.2.3, 3.5.1

Significant, Longer lead time. The review panel recognises that this represents a significant culture change, which will take time, but the Department should aim to begin incorporating this approach now.

Expected Benefits: Taking a 'systems-based' approach to understanding policy problems will enable the complex interrelations of real world factors to be better reflected in decision-making, thereby increasing the effectiveness and robustness of emerging solutions. Further, it provides an approach that facilitates the balanced and open integration of factors that are not traditionally considered 'evidence' and considerations that may conflict (such as technical ease versus social acceptability or economic viability).

It will be important for the Departmental Heads of Analytical Professions to work together, and evidence suggests that this is their aim. The Department has developed cross-cutting research areas to focus on core issues for the Department (such as climate change mitigation) in an attempt to create an overview of many types of evidence related to key topics (discussed further in section 3.2.9).

Some Departmental analysis is taking on elements of this 'systems-based' approach. For example, the Department appointed its first Systems Engineer in 2009 to help develop a 'whole life whole system' approach to rail policy, and are increasingly focusing on 'end-to-end' journey analysis. In 2008 the CSAU commissioned a 'think piece' entitled *System of systems*. This has recently been a subject of a CSA seminar aimed at widening awareness of systems-thinking, and the CSA and CSAU are currently seeking ways to further promote this approach.

3.1.4 Good Practice 1 Journey modelling

This highlights the analysis around journey modelling that takes on elements of systems-thinking. This was a deliberate attempt to break out of 'modal silos' characterised by types of transport, with analysis that recognised that problems which manifest as transport issues may not necessarily require transport solutions.

Journey modelling: good practice 1

Journey modelling was one of the first attempts by the International Networks and Environment Directorate to break out of 'silos' within the Department and use an analytical approach to explore and frame a problem around desired outputs – namely a reduction in carbon emissions. This analysis recognised that although problems may manifest themselves in transport issues, the solution will not necessarily be transport-based. It involved a cross-disciplinary approach, using social science expertise within the Department, to assess the *purpose* of journeys taken. This provided valuable information towards developing a greater understanding of the problem dynamics and the appropriate range of outcome focused policies. An example of a policy initiative emerging from this research is support for businesses to help them reduce the carbon emissions incurred from business related transport. This was based on the finding that 37% of all domestic transport carbon emissions are incurred through commercial operations.

See <http://www.dft.gov.uk/pgr/sustainable/businessrelatedtransport> for more details

3.1.5 Policy engagement with SE evidence

Individual directorates have responsibility for identifying and accessing the SE knowledge they require, and are empowered to use resources to meet their business priorities, including developing their evidence-base. As a rule, individual policy leads have the responsibility to assess and co-ordinate all evidence for their policy area.

The case studies in this review highlight some positive examples of evidence being used to develop policy and inform decision-making. The model described to the panel is one of evidence collection by a variety of methods to aid decision-making, assess policy options and influence future direction, which represents a good use of the evidence cycle articulated by the Government Analytical Professions. Observations on specific processes within this model, such as quality assurance of evidence, are more mixed (discussed in Section 3.2).

In some areas engineers specialising in policy areas appear well integrated, acting in both a technical and policy capacity to effectively embed SE into policy thinking. For example, engineers within the Transport, Technology and Standards Division *'own a policy area and work on it in an end-to-end way.'*²⁸ Examples of work include using

²⁸ Interview with DfT official

technical skills in Brussels working groups and more traditional policy work such as the provision of advice to Ministers.

3.1.6 Good Practice 2: Revisiting bio-fuel policy

Revisiting bio-fuel policy: good practice 2

DfT's current position on biofuels policy is an example of the benefits that the CSA and CSAU can bring when engaged on a policy area, and also of the Department learning from mistakes where this engagement has not taken place in the past. The Department's initial policy on biofuels did not reflect a full understanding of their impacts with regard to food supply. In 2008, concerns on the evidence-base underpinning the policy led officials to consult with the Departmental CSA and his Unit. This allowed the two teams to work together to take a view of the evidence that was required, and develop a plan to meet these needs. The CSA now co-chairs a research programme with the DEFRA CSA to deliver the evidence-base required for high quality, evidence-based policy making in this area, and the Department has revised its policy on biofuels accordingly.

There is also evidence of policy/project areas not engaging adequately with quality SE advice in a timely way. A significant example was found with respect to business planning for the ThamesLink project. It became clear at a late stage in the procurement process that the business case had been built on inaccurate engineering data and assumptions. An intervention by the CSA at Board level at a late stage in the business plan, followed by the commissioning of further work, led to significant revision of the business case.

The lack of timely oversight afforded to the CSA on this occasion is viewed by the CSA as the exception rather than the rule, but concern was expressed that when this issue does arise it is often in relation to 'big ticket' items. As such, this is considered a clear area for improvement. It is crucial to ensure that policies take account of SE evidence and considerations from the outset, and that the CSA and his unit (CSAU) have timely and appropriate engagement. **Good Practice 2** demonstrates the potential benefits of engaging fully with the SE evidence-base.

Recommendation 3

Approval processes for policies and projects should require that SE inputs and engineering feasibility (where relevant) have been fully taken account of throughout policy and/or project development. SE inputs should be integrated with other evidence sources to provide the overview and detail required for effective policy making. Processes should be proportionate and include relevant evaluation data emerging from other policies or schemes. Relevant to sections: 3.1.3, 3.1.5, 3.1.7, 3.1.8, 3.2.3, 3.2.4, 3.2.6, 3.3.3, 3.3.5

Significant, Immediate

Expected Benefits: A formal requirement to set out how the SE evidence-base has been taken account of and integrated with other types of evidence throughout the policy process should facilitate early engagement with SE expertise within the Department and beyond. Senior support for this discipline will help reinforce the culture of critical thinking that is endorsed by the analytical professions and the policy profession.

3.1.7 Evaluation of policy

In 2004 DfT revised its approach to policy evaluation, with the Board agreeing to a more targeted use of limited central evaluation expertise. A small central evaluation branch was created within the TAE division, which is led by the Departmental HoP for Social Research. There is evidence of further development of the evaluation agenda, for example:

- the development of approaches to address productivity impacts that are consistent with the Department's appraisal approaches
- two large scale evaluations of sustainable travel demonstration programmes
- taking the taking of initial steps to improve the quality of local evaluation of major schemes

Whilst DfT prioritises policy appraisal it has traditionally invested fewer resources in evaluation activity compared to other government departments.²⁹ In addition, some evaluations begin too late to ensure that adequate baseline data are collected to allow assessment of impact. Effective evaluation of policies has the potential to yield valuable data to inform future policy making and investment decisions, as well as helping to understand enablers and inhibitors of successful delivery. The Department does recognise this to a degree, but more can be done. It is noted that DfT are discussing the development of a strategy to evaluate the impact of policies and initiatives (the level of these discussions was not specified).

²⁹ DfT Internal paper 2

Recommendation 4

Further evaluation of policies and initiatives should be established to ensure information is captured throughout the entire policy cycle. Arrangements should ensure that there is effective and proportionate data collection, and that evaluation data is used to validate methodologies and inform future policy making. Relevant to sections: 3.1.2, 3.1.5, 3.1.7

Desirable, Immediate

Expected Benefits: Evaluation requires dedicated resource but provides insight on the impact of specific interventions, including costs and benefits, as well as critical information on the enablers and inhibitors of policy delivery. Evaluation also provides 'real world' data to feedback into future policy making and to test and calibrate methodologies. As implementation lessons are frequently transferrable to a wide range of interventions this provides a crucial feedback loop to help the department improve its impact in a range of applications beyond the immediate policy area.

3.1.8 Horizon scanning

The CSAU recognises the importance of horizon scanning and has previously commissioned think-pieces on transport futures, as well as attempting to exploit the thinking generated during the Foresight Intelligent Infrastructures project.³⁰ Officials interviewed by the review panel recognised the CSAU as a source of 'generic' futures advice – for example on future drivers of transport and technology direction. In addition, the CSA and CSAU use contacts with external stakeholders and research to consider futures issues on an ad hoc basis – an example of where this has been effective can be seen in **Good Practice 3: Supply of rare earths for transport** (3.1.9).

Individual policy areas have responsibility for more specific 'horizon scanning'. Most officials show awareness of this, describing the measures they take to keep up-to-date, which include accessing external work, linking with work of other Government departments, and talking with industry and academics on emerging technologies and factors influencing their development and deployment.

In some areas there is evidence of teams considering policy questions and framing research from an innovative and far-looking perspective as well as in an 'incremental' manner. In other areas there appears to be scope to take a more long term and strategic approach both in perspective and research planning. The CSA has a key role in supporting this.

³⁰ Foresight, Intelligent Infrastructure Systems project (2006)

3.1.9 Good Practice 3: Supply of rare earths for transport

Supply of rare earths for transport: good practice 3

A major element of the Government's carbon reduction strategy is increased transfer to the use of electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs). Key power-train components in such vehicles are magnets and rechargeable batteries. Rare earth metals ('lanthanides') are an important material for efficiency in many current designs of these technologies.

As a result of the anticipation and engagement of the CSA, a number of concerns about these rare earth metals were identified at an early stage - in particular, their availability, growing Chinese control over known reserves, and difficulties in extracting them. These concerns prompted the CSA and the CSAU to begin a dialogue with policy colleagues in the Department and to commission, in concert with the Automotive Unit at BIS, research into these resources and alternatives. The work involves exploring a number of aspects of supply of and demand for lanthanides, as well as their availability, their economic and environmental benefits, and the scope for alternatives to their use. Due to the anticipation and engagement of the DCSA and his Unit taking rapid early action in this way, the Department and BIS will be able to identify and take the measures, including further research, needed to ensure the continued viability of this significant part of the Government's response to climate change in a timely fashion.

3.2 Criterion 2

Government as a whole and Departments individually should take a strategic approach to prioritisation, access, resourcing and delivery of science and engineering

3.2.1 Board level evidence and research strategy

DfT published a department-wide research strategy (B-ERS) in 2006.³¹ This was a substantial document which addressed research needs under five major policy 'themes' (which have now been revised as part of the Department's sustainable transport work). The strategy also addressed collaboration, communication, professional skills, evidence and research management, technology and innovation, and transport futures. However, it appears to have failed to gain much traction across the Department.

B-ERS stated the intention to update the strategy every two years. This has not happened to date, with several reasons cited:

- departmental reorganisation, the need to define the responsibility of the strategy committee for cross-cutting research areas
- the uncertainty over consequences of the 2010 General Election, current and anticipated fiscal issues
- the possibility of Copenhagen negotiations changing the landscape of carbon reduction requirements

The review panel recognises the significance of these issues, but considers the need to have an updated, well understood and effective research strategy as critical. Updated, clear guidance on the use of evidence, including SE, would be beneficial, particularly in the light of changes the Department has undergone since 2006. In doing this, the Department should reflect on lessons learned from the development and implementation of the 2006 strategy.

3.2.2 Unit level evidence and research strategies

B-ERS was designed to be supported by Unit-Level Research Strategies (U-ERS), which were intended to set out the plans of each Research Unit in more detail, and to be updated each year. Typically, these strategies sit alongside, but are not integral to the overall business planning cycle of the Department. This is considered to be a potentially critical weakness as it risks separation of identification of advice and research requirements from the business planning process (see section 3.1.2).

For the year 2009-2010 the format of the U-ERS was altered, with one summary of the major upcoming projects being coordinated and published by the CSAU.³² Current approval processes expect U-ERS to be signed off by the CSA and Chief Economist before being submitted to the relevant

³¹ Department for Transport, Evidence and Research Strategy (2006)
<http://www.dft.gov.uk/adobe/pdf/163944/evidenceandresearchstrategyd1904>

³² Department for Transport, Overview of Evidence Needs and Planned Research (09/10)
<http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/pgr/scienceresearch/evidenceplannedresearch0910.pdf>

Minister for approval. However, resource limitations mean that not all strategies can be properly scrutinised and challenged by the CSA and his Unit.³³

Engagement with the U-ERS process is variable and views on its value are mixed. Some see it as a useful overview. Others do not see its value, viewing it as a compendium of plans that does not include consideration of value, evaluation, and use of research. The CSAU has developed a template to help units develop their U-ERS, although it appears that this is not consistently used.³⁴ One of the reasons cited for low levels of engagement is a lack of resource within teams to engage fully.

Recommendation 5

The Department should produce an updated evidence and research strategy. This recommendation should take account of the following sections of this report: 3.1.2, 3.1.7, 3.1.8, 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.2.8, 3.2.9, 3.3.3, 3.5.1.

Significant, Longer lead time (within the next 12 months)

Expected Benefits: The Department has gone through many changes since the B-ERS was published and its renewal should provide strategic direction to the Department's research, particularly in assisting with complex and innovative research delivery, and how the Department can best leverage external evidence. It will also set clear standards for the whole Department to aim for, and reflect the changes that have emerged from the Department's *Strategic Review of Research Management* (see Section 2).

3.2.3 Central strategic support and oversight

The CSAU has invested time and effort to help Departmental units take a strategic approach to SE and other research. They have, for example, put together a comprehensive set of guidance (called the Evidence and Research Quality Framework), to assist units in developing their U-ERS. However, this guidance was last updated in 2006 and does not have a high-level of recognition or visibility with policy officials.

Engagement with the CSAU as the focus for SE in the Department varies between directorates and teams. Different teams will have different SE requirements, but even allowing for this the CSAU appear to be 'distant' from some policy areas. While a number of policy officials report positive experiences and benefits from engagement, others do not have this view, and in some areas the CSAU do not appear to have a presence. At least one policy official thought that *'the CSAU do not show what they have to offer to officials when requesting engagement with them.'*³⁵ Related to this, the CSAU feel that they do not have adequate oversight of the SE agenda of some areas of the Department. The CSA and CSAU must ensure that their policy colleagues are fully aware of the range of support on offer, and should consider more effective ways to engage across the Department.

³³ Interview with DfT official

³⁴ Interview with DfT official

³⁵ Interview with DfT official

The CSAU aims to act as a ‘critical friend’, to capture good practice and provide guidance to help commissioning and management of research wherever required. However, they cannot require policy colleagues to engage with them, or enforce guidance. They have a concern that units who engage most readily with them need the least guidance, and that those with the least engagement would benefit the most. Recommendation 3 addresses this issue.

3.2.4 Academia/Industry

Individual units within the Department have responsibility for accessing appropriate external advice to support their policies, and use various methods to achieve this. Examples include the use of Advisory Committees, informal consultation with known experts, and formally contracted advisory and research work. Advisory groups officially declared as Scientific Advisory Committees (as opposed to Science Advisory *Councils* – see 3.2.7) are: Medical Advisory Panels, The Disabled Persons Transport Advisory Committee (DpTAC) and the Commission for Integrated Transport (CfIT).

DfT has concordat research arrangements with the Engineering and Physical Sciences Research Council (EPSRC) and the Economic and Social Research Council (ESRC), and maintains relationships with other research councils where they share interests. For example Natural Environment Research Council (NERC) stated that they have “*approximately annual bilateral meetings with the CSA and colleagues; and/or occasional working level meetings with relevant policy officials*”³⁶, and EPSRC highlights the CSA’s membership on their high-level strategic boards such as their Technical Opportunities Panel.³⁷ Given the need for the Department to engage with the engineering, natural sciences and social sciences, it is important that the Department’s engagement with the EPSRC and ESRC is co-ordinated to ensure comprehensive support. In some areas this relationship is being managed very well, and achieving these standards across the Department is desirable.

In 2008, the Council for Science and Technology (CST) published a report exploring how academia and government work together³⁸ which concluded that: ‘*a healthy engagement between academics and policy makers is essential to the provision of informed, evidence-based, world-class policy making.*’ Although most officials describe a situation where they access and use external research and engage with academia, some express desire to engage at a deeper level, and the CSAU describes plans to explore its role in facilitating this. In parallel, EPSRC highlighted a desire for more formal connections with the DfT, where it sets out a specific aspiration to explore ‘*the possibility of a placement/attachment with DfT.*’

³⁶ NERC response to stakeholder consultation

³⁷ EPSRC response to stakeholder consultation

³⁸ Council for Science and Technology, How Academia and Government Can Work Together (2008)
<http://www.cst.gov.uk/reports/files/academia-government.pdf>

Stakeholder views on DfT's ability and motivation to engage with external evidence and expertise are mixed, although generally positive. For example, the Transport Research Laboratory (TRL) feel that the Department seeks advice effectively, and the Commission for Integrated Transport (CfIT) feel that while some parts of the Department do this very well, others parts are less effective (although they do feel that, as a whole the Department is strong). Stakeholders also feel that the CSA role has led to a general increase in engagement with key groups such as the Technology Strategy Board and Research Councils.

3.2.5 Good Practice 4: The UK Transport Research Centre

The UK Transport Research Centre: good practice 4

The UK Transport Research Centre (UKTRC) is a consortium of universities focussed on addressing transport questions, particularly those with a strong economic/social element. DfT, ESRC and the Scottish Executive jointly fund it. The programme is divided into a core programme and a policy programme. The former is driven by high-level objectives agreed by the sponsors but project details are developed, managed and delivered by the consortium. For the policy programme, DfT will commission work on a project-by-project basis. Unlike the core programme, the Department will engage with specifications for individual projects.

Whilst this programme has taken a long time in the planning stages, it is now getting underway. It is an example of an innovative approach to engaging further with academia, and has the potential to bring benefits to the Department's use of SE. This new approach should be evaluated to assess its impact, and the Department's plans to do so after 1 year are considered Good Practice.

DfT should ensure that knowledge of the UKTRC is well communicated across the Department, and that future strategic research planning takes account of this initiative.

3.2.6 Knowledge transfer within the Department

The CSA and CSAU are ambassadors for DfT, and use their position to develop contacts and knowledge of the external evidence landscape. They are active in pursuing these networks with bodies such as the Research Councils, universities, the Technology Strategy Board and EPSRC (EPSRC commented favourably on the value of this engagement). Both the CSA and CSAU comment that sharing this knowledge with the Department is more challenging than accessing it. A recognised channel for communication is through CSA seminars, which are open to all members of the Department. Over the past year nine seminars have been held, with a variety of topics and speakers, including representatives of Research Councils, universities, and other government departments as well as DfT officials. These appear to be well attended and well-received, and the review panel commends them as a positive initiative.

3.2.7 Science Advisory Councils (SACs)

Science Advisory Councils (SACs) are independent science advisory bodies that a number of departments, such as DEFRA, have adopted. They provide independent, high-level overview and challenge of the management and use of science across a whole department to help it meet its delivery challenges.³⁹ They may also advise on specific topics at the request of the department and/or on their own initiative. In addition to providing independent advice, departments also gain direct access to a network of experts covering a department's entire policy portfolio at FRS/FREng level.⁴⁰

The (then) Innovation, Universities, Science and Skills Committee stated that: *'strong consideration should be given to increasing the number of departments that have Science Advisory Councils with a departmental remit. The Department of Health, the Department of Energy and Climate Change and the **Department for Transport** are obvious 'top-of-the-list' candidates, with the latter two in particular needing high quality engineering advice.'*⁴¹

DfT does not have an overall SAC. It does, however, have an advisory Non- Departmental Public Body in the form of the Commission for Integrated Transport (CfIT). The CfIT was established in 1998 to provide independent advice to Government on the implementation of integrated transport policy, monitor developments across transport, environment, health and other sectors and to review progress towards meeting objectives.

Whilst the CfIT does fulfill some of the aims of a SAC, it is principally focused on policy and economics and does not have strategic oversight and a challenge function on SE issues. This challenge function *is* part of the CSA role, but with only 3 days per week in DfT there are inevitable limits to the extent of his influence and input. The Department has previously considered setting up a full SAC, and concluded this is not its most effective option. It would be beneficial for DfT to consider alternative options or models for accruing the benefits of an external SAC, with an independent challenge function incorporated into any solution developed.

³⁹ Government Office for Science, Science and Engineering in Government: An Overview (2009) <http://www.bis.gov.uk/assets/biscore/goscience/docs/s/science-engineering-government.pdf>

⁴⁰ Fellow of the Royal Society and Fellow of The Royal Academy of Engineering

⁴¹ Innovation, Universities, Science and Skills Committee, *Putting Science and Engineering at the Heart of Government Policy* (2009) <http://www.publications.parliament.uk/pa/cm200809/cmselect/cmdius/168/168i.pdf>

Recommendation 6

The Department should develop more robust mechanisms to ensure it receives external critical challenge at the strategic level with regard to its use of SE. These mechanisms must be co-ordinated with arrangements in place for other evidence streams. Relevant to sections: 3.1.1, 3.1.8, 3.2.3, 3.2.4, 3.2.7

Desirable, Longer lead time. The review panel recognises that these mechanisms will take some time to fully establish, but the Department should consider the first steps required towards this now.

Expected Benefits: Increased strategic challenge and advice on the Department's use of SE and how this could fit in with other evidence should help ensure DfT takes a strategic view across all of its portfolio and to bring in different perspectives at the high-level. This will allow access to a high calibre network which will bring expertise to the Department in an efficient way, driving up the quality of evidence used.

3.2.8 Prioritisation of research

The aim of devolving research programmes to policy directorates within DfT is *'to maximise linkages between policy and research'*⁴² which should theoretically facilitate effective research prioritisation. There is support for this approach across the Department. Prioritisation of current and future needs should be informed by a gap analysis of the current evidence-base, including DfT commissioned evidence and other sources. By devolving research to specific policy areas DfT aims to facilitate this process. It must be recognised, however, that there is an associated risk of omission or duplication at a Departmental level where work could fall between areas, or to more than one area (see section 3.2.9 for further discussion).

The review panel has concerns that sole reliance on a 'bottom-up' approach to assessing evidence requirements, with most high-level plans being approved by individual Directors, does not always result in strategic and co-ordinated outputs. There is also a concern from one official that research can be commissioned to *'ensure the available budget is spent'*⁴³ rather than reflecting agreed business need although this is not exclusive to devolved systems of research management. These issues are recognised by the CSA and the CSAU who have attempted to achieve oversight by engaging with Director Generals on their key SE issues and priorities as it is important to ensure this is translated into practical outcomes.

3.2.9 Coordination of research

A key risk of a devolved research system is a lack of co-ordination across the Department which could result in:

- duplication of effort
- difficulty in managing 'cross-cutting' research areas
- difficulty in identifying links between research

⁴² Paper on DfT arrangements against the SEA Framework, submitted by DfT for the SEA review

⁴³ Interview with DfT official

- important research ‘falling between the cracks’, including strategic or ‘visionary’ research rather than incremental research

There is evidence of this risk being managed in a number of ways, including formal mechanisms such as policy/project boards through to more informal day-to-day contact between policy leads and analysts. A small number of stakeholder interviews raise a specific instance where the Department has failed to take advantage of ‘cross-fertilisation’ of research between road and rail, which may be a symptom of the difficulties in co-ordinating research within a system of devolved research.

The DfT report on research management (section 2.3.1) considered whether Research Units should be reorganised either to reflect changes in departmental structure (see section 2.2.1) or around the Department’s five strategic goals. This would be in order to produce a less modally driven approach to research and improved coordination. This approach was not adopted because it was felt that significant issues regarding cross-cutting areas (i.e. across departmental goals) should remain. However, the Department *has* created specific cross-cutting research arrangements for certain topics, which were chosen following early identification of issues by the Strategy Sub-Committee, and refined by discussion with policy leads. The first of these are:

- climate change mitigation
- behavioural change
- freight
- end-to-end journeys

This is a promising initiative, requiring engagement, recognition and buy-in from a number of players across the Department in order to succeed. Most officials interviewed were aware of the initiative, but some who may have been expected to be engaged already were not.

At the day-to-day level officials need visibility of other Departmental research to build a picture of the available evidence-base and identify beneficial linkages (in some cases this will occur naturally through co-operation around policy agendas). Besides informal links and formal board arrangements, the CSAU describes the DfT Research Management Database as the main tool to facilitate this oversight. The intention is for details of all research plans and results to be added to this database. In practice, it is used in a very variable way. The Panel, CSA and CSAU all note that lack of engagement limits the database’s value, and its use is encouraged through Research Project Manager (RPM) network meetings (section 3.3.1). The CSAU could also explore improving the database to increase engagement, developing ideas from reference to systems such as the British Library Research Information Centre.

3.3 Criterion 3

Science and engineering results should be robust, relevant and high quality

The Department has a devolved approach to the prioritisation, commissioning, procurement, management and evaluation of research, which has implications for strategic coordination of SE across the Department.

DfT's recent review of research management considered whether devolved research management continues to best suit their needs, and decided upon no major changes. The panel recognises that no system will offer a perfect solution, and that DfT should focus on optimising the advantages and minimising the disadvantages of their chosen arrangements.

3.3.1 Research programme management

Research Programme Managers (RPMs) manage tranches of research and act as a link between the CSAU and Departmental research activity. Some RPMs are full-time, but others dedicate only a small amount of time to this role. The CSAU estimates that around 200 people are engaged with research management across the Department, but few are dedicated to this activity full-time (details on full-time equivalents are not available).

Capability in research management appears to vary across the Department – possibly reflecting how much of a focus this is in individual roles and staff experience. The CSAU runs a Research Programme Managers Network forum to support effective research management, which is held approximately every two months. These provide an opportunity to discuss important current topics such as feedback on proposed guidance, the procurement framework and research methodologies.

Engagement with these meetings appears mixed, although it is estimated that around 70% of research programmes are usually represented.⁴⁴ Most relevant officials interviewed are aware of them, but have different views on their efficacy, regularity and aims. Most officials interviewed feel the RPM Network meetings are valuable, but cite time constraints as the main reason for not attending. This is a common management concern but active overview of research management is necessary to ensure continuing effective delivery.

3.3.2 Procurement

DfT has a research procurement strategy which includes Strategic Framework Agreements to facilitate the commissioning of much of its research. Agreements are divided into 'Lots' where each Lot has a lead contractor or lead partnership with an associated supply chain. Supply

⁴⁴ Interview with DfT official

chains include universities as well as more ‘traditional’ transport consultancies. Officials commissioning research have the option to use the frameworks or go to full competitive tender.

Some officials interviewed consider the framework to be a useful tool. However, the majority of officials who discussed it have concerns about its efficacy. These include views such as:

- lead contractors seem to receive the majority of contracts
- it is anti-competitive
- it is designed purely for ease of procurement rather than to facilitate excellence and innovation in research
- there are not contractors on the framework suitable for all those who wish to use the framework
- there are not enough contractors in the framework. In addition, some supported a ‘matrix’ framework with competition permitted between the existing framework Lots

These are common issues for research procurement, with practical decision-making requiring consideration of relevant procurement legislation, departmental policy and the scope and scale of individual procurement cases. An effective procurement strategy should enable frameworks to deliver speed, convenience and value for money without hindering the engagement of new or innovative suppliers where there is a clear case for this.

Recommendation 7

To enhance quality and standards in research procurement, the Department’s research procurement strategy should be revised to ensure:

- maintenance of a broad, effective, and competitive supplier base within the Research Procurement Framework
- consistency of supplier suitability
- support of innovative commissioning where required
- minimisation of bureaucracy with flexible processes
- appropriate skills to support effective procurement

Relevant to sections: 3.3.1, 3.3.2, 3.3.3

Desirable, Longer lead time (as part of next review of procurement process)

Expected Benefits: Enhancing the Department’s procurement procedures and increasing understanding of the different options available will help ensure the Department accesses high quality research in a timely and cost effective way. Options to enable innovation through development of the supplier base should ensure that DfT does not become reliant on too small a number of regular suppliers.

3.3.3 Quality assurance

Individual policy areas are responsible for quality assurance of their SE evidence, and observed approaches to this vary. This is in part due to devolved responsibility and also due to different requirements and resources. This variety has the *potential* to impact on the quality of evidence underpinning policies and decisions. Approaches include:

- formal peer review
- 'sounding boards' which include interested stakeholders
- 'buddies' for internal analysis
- Executive Boards including academics and stakeholders

In some areas a robust, fit-for-purpose approach is evident. For example, one research manager described a formal arrangement in place for accessing independent peer review and a clear rationale for when to use it. In some cases, however, there was no evident recognition of the different levels of assurance provided by 'peer review' and more informal methods of quality assurance, such as the use of 'sounding boards', and the implications of this for confidence. Both methods may be useful for different purposes, but the understanding of this distinction is crucial for those responsible for the quality assurance of research.

The panel considers that in at least one case there was insufficient methodological quality assurance and that improvements would have been relatively easy to identify if the right type of expertise had been used.

It is important that enough freedom is retained to ensure fit-for-purpose quality assurance, but more consistent principles are desirable. Heads of Profession (for SE and Social Research) could have a role in ensuring this, but evidence suggests that this may place a strain on available resources.

Recommendation 8

The Department should develop a systematic and proportionate process for quality assurance of the SE evidence it uses, to bring the whole Department up to the highest standards observed. Relevant to sections: 3.2.3, 3.3.3, 3.4.1, 3.5.1

Significant, Longer lead time (within 12 months, as part of the refreshed Evidence and Research Strategy)

Expected Benefits: Clearly specified, proportionate and organisationally supported methods for quality assurance will enable a high-level of confidence in the evidence supporting policies and decisions, and their robustness in the face of scrutiny and challenge.

3.3.4 Evaluation of research

Effective research management should include evaluation such as:

- performance of the contractor
- whether research filled the identified gap which led to its commission
- how the research fits in to the wider evidence-base
- considering the implications and possible applications of the research
- sharing findings
- lessons learnt

A stakeholder perspective gathered for the DfT internal review of research management stated that '*with a few exceptions, evaluations are carried*

out only very rarely if at all.⁴⁵ To some degree this is supported by evidence gathered during the current review, with the most negative view being that little value is extracted from some research because time is not taken to evaluate its implications and applications properly. It is important that DfT considers evaluation a key element of research planning.

3.3.5 Consultancy

The balance of in-house and contracted research varies across the Department and, as a rule, a great deal of research is commissioned to consultants (almost entirely in the case of some policy areas). The reasons cited for this are mainly related to capacity and expertise. This requires teams to consider whether they have the correct balance of in-house skills and consultancy and places an imperative on the ability to be an intelligent customer for consultancy.

Each policy area must fulfil the intelligent customer role for their SE evidence, and this capability is dependant on the skills, experience, and knowledge of individual teams. The review panel believes this has led to variable intelligent customer capabilities with scope for improvement, and this is supported by stakeholder perspectives. Some areas appear extremely competent in the technical and project management skills required to ensure good value and high quality work, whereas others do not seem to have as much capacity or motivation to fulfil this role.

Opinions of those interviewed on the capability of DfT as a whole also vary from confidence in a high capability to concern that very few areas are competent to act as intelligent customers. In particular, some evidence suggests this function for social research devolved to policy teams would benefit from being strengthened in some areas.

The Department traditionally commissions a great deal of research as well as using evidence from other sources to support policy making and underpin decision-making, so it is vital that it has the capacity to be an intelligent customer. It is also essential for individual policy areas to be confident that they have the correct mix of 'experts' and 'professionals' able to use expert advice effectively. The Panel believes this area is in need of attention.

⁴⁵ DfT Internal paper

Recommendation 9

The Department should evaluate the skills and knowledge required to be an intelligent customer at all stages of the research cycle against their current capabilities, with the aim of bringing the whole Department up to the strong standards observed in some areas. The Department should also review their balance of in-house expertise and contractors (including those within teams) to ensure arrangements are optimal for securing required knowledge in a cost-effective and sustainable way. Relevant to sections: 3.1.5, 3.2.4, 3.3.3, 3.3.4, 3.3.5, 3.5

Significant, Longer lead time (within 2011/12 business cycle)

Expected Benefits: An enhanced intelligent customer capability will enable parts of the Department to specify research needs more clearly, manage research more effectively, challenge throughout the process, and exploit outputs more fully. The correct balance of in-house expertise will allow sustainable capability to be built in the most cost-effective way possible.

3.4 Criteria 4, 5 and 6

Science and engineering evidence should be made publicly available unless there is clear justification for not doing so.

The implications of science and engineering for society should be fully considered, engaging the public whenever appropriate, using good practice.

Government should ensure effective knowledge transfer, innovation and pull through of its research to the economic development of new technologies and services.

For the purposes of this review criteria 4, 5 and 6 are discussed together.

3.4.1 Publication of research

Current DfT practice is to publish strategies, as well as the evidence-base used in their development unless there are specific reasons not to, such as security considerations. DfT guidance on timing of publication of evidence is that final research results will be published:

- within 6 months of project completion
- or when quality checks including relevant peer review are completed
- or when a policy decision based on research findings is publicised

Case studies and interviews suggest that this principle is consistently followed in practice. Results are published through traditional media, distribution lists and the DfT website (although one stakeholder stated that it is only easy to find research and information on evidence if you already know what you are looking for). No other views on this were given, but the Department may wish to test with users to assess more fully.

Some officials cited publication of all research as contributing to quality assurance. However, if research is published only when a policy decision is made this may reduce the value of this scrutiny so it should not be the sole method relied upon.

3.4.2 Knowledge transfer

Arrangements for delivery of DfT policies place an imperative on effective knowledge transfer between the core Department and its delivery partners. Different arrangements with DfT stakeholders and delivery partners are in place across the Department with regard to the 'ownership' and development of the evidence-base. The rail industry is an example where maximum 'leverage' appears to be generated, with a large amount of knowledge held by industry. Indeed, the majority of DfT investment in rail research is granted to and managed by industry (via the Rail and Safety and Standards Board - RSSB). DfT are members of RSSB committees that guide and manage research themes, and interviews with stakeholders indicate that this arrangement is effective.⁴⁶

⁴⁶ Interview with First Direct and RSSB

Another example of knowledge transfer, highlighted by the 'shared space' case study, is traffic management. Here, the Department has traditionally produced the evidence-base and communicated it to delivery partners such as local authorities in the form of guidance. This case study highlighted some thoughtful and forward looking consideration of the future ownership of evidence.

Within these different contexts, there was evidence of engagement by the core Department in different ways to facilitate two-way communication. Examples include workshops and forums and 'testing out' of proposals with Local Authorities. One official described a specific dissemination contract - this has resulted in short research summaries aimed at stakeholders and policy makers and also themed workshops for local practitioners to disseminate evidence and explore effective specifications for research. Overall, stakeholders seem to think that DfT are about average at knowledge transfer and communication.

Some officials suggest that the capacity of stakeholders such as Local Authorities to interpret and use SE effectively could be improved. While not within its direct responsibility, DfT has a central role in stimulating this capacity to help ensure service and policy delivery, and will need to consider how to manage this in the future. This is particularly important because evidence suggests that what the DfT intend as *guidance* is sometimes used locally as necessary or sufficient, without the need to interpret for individual circumstances.

3.4.3 Public engagement

DfT's policy portfolio has high public visibility and is relevant to many people in their everyday lives. In 2008 DfT set up an online Citizens' Panel as part of a wider strategy for ensuring that evidence on the public's needs and priorities informs its work. Information from this initiative has contributed to the development of policy and communications for the public – for example in helping to shape the DfT led Act on Co2 campaign.

One official felt that the Department's social research capacity allows construction of sound research programmes to gain the views of stakeholders in different policy areas. This information can then be used to develop effective policies and public communications. An example that draws on this approach can be found in **Good practice 5: Seat belt wearing**. This also demonstrates good practice in planning and carrying out an evaluation of impact against stated objectives.

3.4.4 Good Practice 5: Seat belt wearing

Seat belt wearing: good practice 5

In 2008/9 seatbelts were identified as a target for the THINK! Road Safety Campaign. During 2007, over 1400 people were killed while in a car. It is estimated that 487 of them were not wearing a seat belt, and that nearly 300 lives would have been saved if all occupants had been wearing a seat belt.

Research consisted of:

- an accident and survey data analysis to identify the characteristics of accidents involving vehicle users who most frequently do not wear seat belts
- a qualitative investigation of why these people do not wear seat belts, and possible ways to change their behaviour
- a quantitative survey, based on the earlier findings, estimated that approximately 14% of the adult UK population are inconsistent seat belt wearers

Given the greater risk of being involved in a road traffic accident amongst young people, and the finding that some young people choose to wear seat belts when they feel they need to, the research supports the Department's focus on this group to secure the largest casualty saving.

The resulting campaign, 'Three Strikes' launched on November 2008. Prior to the campaign launch pre-stage research was carried out to provide benchmark attitudinal and behavioural data for future evaluation. All post stage measurements are compared with this initial pre stage data in order to evaluate the impact of the campaign.

Post campaign evaluation shows that the campaign delivered the message of the dangers of an unbelted crash at 30mph, although there is a little way to go to close the gap in the perceived safety of not wearing a seat belt at 30mph compared with higher speeds. Changes in attitudes and behaviours have been mixed. In some cases the movements have been positive, although there have also been negative shifts. More details can be found at <http://think.dft.gov.uk/think/mediacentre/recent>

3.5 Criterion 7

Ensure that capability and capacity is in place to manage and deliver the science and engineering work required by the Department

3.5.1 Science and engineering Skills

The 2007 DfT Capability Review⁴⁷ identified DfT as a Department requiring high-value, commercial, technical and engineering skills which are in short supply. It also drew attention to a lack of forward planning to ensure these skills for the future. The 2009 update⁴⁸ did not comment specifically on specialist skills, although it did comment on improved planning for 'skills, leadership and performance.'

No evidence was found of plans for a forward looking SE skills strategy, and this is a source of concern. However, the stakeholder write out conducted for this review did yield an example where DfT has been proactive in developing skills alongside Transport for London (TfL). More details can be found at **Good Practice 6**. At present it is not possible to assess the existent SE skills capacity in the Department, or where these skilled are based, as information available centrally is supplied by self-nomination only. Fuller, up to date information on staff skills will be important for future planning.

Some areas of the Department do have access to strong engineering expertise where required, and these officials civil service appear to be well integrated and influential. There are also officials with SE backgrounds working in 'generalist' roles. For the most part, individual teams appear aware of the need to acquire and retain these skills and are using various methods to do so. The rail electrification case study highlights an example where rail policy in this area was led by those with an engineering background and experience 'on the ground'. Another official interview gives an example where specific SE skills were actively recruited because a gap had been identified.

In other areas the expert panel has concerns regarding the availability of in-house SE expertise, with a specific need for adequate project management and SE skills on DfT projects noted. In some areas a full-time SE specialist would not be viable, but some units would benefit from sharing these skills.

Organisational changes have significantly altered the profile of skills across the Department in recent years. Much of the technical expertise formerly found in the core Department is now in agencies (notably the Highways Agency) or the Transport Research Laboratory (TRL), which is now in the private sector. Although there is some movement of staff between the Department and these bodies through secondments and

⁴⁷ Cabinet Office, Capability Review of the Department for Transport (2007)
http://www.civilservice.gov.uk/Assets/Capability_Review_DfT_tcm6-1059.pdf

⁴⁸ Cabinet Office, Capability Review: Department for Transport: Progress and Next Steps (2009)
http://www.civilservice.gov.uk/Assets/296680_Capability_DfT_web_tcm6-8286.pdf

permanent transfers, it is less free than in the past. Areas of the Department that do not exploit this source of expertise should do so where appropriate.

3.5.2 Good practice 6: Project Brunel with Transport for London (TfL)

Project Brunel with Transport for London: good practice 6

TfL and the DfT share concerns about skills shortages within the engineering, planning and technical sectors, and the effect this may have on achieving business objectives in the future. With this in mind, DfT worked with TfL's Skills and Organisational Development team worked on 'Project Brunel'. The first step was to commission a piece of work to examine the current and future demand and supply trends for these sectors. This study was completed in January 2009 and TfL is now working with the DfT to implement its recommendations.

3.5.3 The Science and Engineering Profession

This review encompasses science and engineering as well as social sciences in its definition of 'SE', but across Government these elements are divided into the 'Science and Engineering' and 'Social Research' Professions. Most evidence gathered in this review focuses on the Science and Engineering Profession.

DfT's arrangements are unusual in that the CSA is not also the Head of Profession (HoP) for Science and Engineering. This situation was inherited by the incumbent CSA. Given time constraints on the current CSA, the Panel considers this to be reasonable.

The exact number of SE specialists is not available as this information is not collected centrally, although approximately 100 people have self nominated as members of the Science and Engineering profession. Collection of data on SE skills will be beneficial for forward planning and to facilitate a stronger Science and Engineering community, it is currently much less defined than other analytical Professions. This is not unusual across government, and some DfT officials feel this is because a wider range of SE skills do not lend themselves as naturally to a discrete Profession. However, it is of concern that many officials interviewed do not know who fulfils the Science and Engineering HoP role. There is also a sense that to progress beyond a certain career point, most SE specialists need to become generalists in the way that members of some of the other analytical professions do not. It should be noted, however, that SE specialists interviewed do not feel their contributions were any less valued due to this.

Recommendation 10

The Department should develop a plan to ensure adequate SE (including social science) skills within the Department. Arrangements should include:

- recording SE skills at the point of recruitment and keeping them up-to-date
- sharing specialist skills across units where full-time positions are not sustainable
- promoting effectively existing SE skills within the Department as a source of advice and support for policy colleagues
- enhancing the role and function of SE specialists within the Department
- developing opportunities for progression whilst maintaining SE specialist status scientists and engineers within the Department – as is the case for some other analytical professions

Relevant to sections: 3.5.1, 3.5.3

Significant, Longer lead time (within 2011/12 business cycle)

Expected Benefits: A clear strategy for acquiring, maintaining and developing specialist SE skills will help the Department secure the key expertise and knowledge essential for them to meet their objectives.

Annex 1: Methodologies

Independent panel

An independent Panel was appointed to assess the Department against the Science and Engineering Assurance Framework. This panel were appointed by Professor Sir John Beddington, the Government Chief Scientific Advisor. The Panel were supported by the Science and Engineering Assurance Team, within the Government Office for Science, to define case studies for the review, carry out evidence gathering and produce the final report.

Independent panel members

Professor Philip Blythe, FIET CEng, Professor of Intelligent Transport Systems and Director of the Transport Operations Research Group, Newcastle University

Dr Chris Elliott FEng, Director of Pitchill Consulting Ltd, Non-executive Director of the Office of Rail Regulation

Prof Roger Kemp FEng, Professorial Fellow, Engineering Department, Lancaster University

Professor Nick Tyler, Head of Civil, Environmental and Geomatic Engineering Department and Chadwick Professor of Civil Engineering, UCL

Professor John Urry, Distinguished Professor and CeMoRe Director, Lancaster University

Evidence sources

This review draws on three sources of information and the final report is a synthesis of these three evidence sources.

1. Desk research

Prior to the commencement of the review the SEA team conducted desk research using documents published both by DfT and other sources. Some of this research was used to frame interview questions and case study areas. Others have been used directly in the report, and these documents are referenced throughout.

2. Department for Transport Officials

- Initiation workshop: DfT officials provided presentations from the Central Strategy Unit, Appraisal Teams and from the CSAU. In advance of this meeting, the CSAU also provided a statement of DfT practice against the SEA Framework for reviews.
- Interviews with DfT officials: The independent panel and SEA team decided which the types of roles within the DfT where officials were expected to be able to provide evidence against the SEA Framework. The CSAU then suggested specific officials to

interview. Following these interviews, one extra interview with a specific official was set up at the request of the panel to follow up on some specific issues. Numbers of interviews of different role ‘types’ can be seen below:

Interview Type	Number
Policy	2
SE specialist	3
Director General	1
Research Management	2
Head of Profession	4
Central SE function	3
Communications	1
Total	16

- **Case studies:**
Three case studies were selected to help provide evidence on the use of SE evidence in current policy areas. More ‘general’ issues regarding the SE framework, as well as discussion of SE related to the policy area, were covered in these sessions. The table below show details of case studies, and a summary of the key points emerging from them can be found at Annex 2.

Case Study	Rationale for selection	Officials interviewed
‘Shared Space’ guidance	Support for policy delivered by others	3
Carbon Reduction	Current, high priority policy	3
Rail Electrification	An area where it is perceived there has been a change of policy	2
	Total	8

All Interviews and case studies with DfT officials were conducted on the basis that no comments made would be attributed to any individual. For this reason, individual interviews are not included in this report.

3. Stakeholders

- **Write out to stakeholders:** The SEA team conducted a write-out to key stakeholders, identified by desk research, consultation with the independent panel, and consultation with DfT.
- **Interviews with stakeholders:** A small number of interviews were conducted with external stakeholders. These stakeholders were chosen either to follow up points made in their original responses to the SEA stakeholder write out, to follow up specific points under the SEA Framework, or because of relevance to particular case studies.

Analysis

Interviews and case studies were recorded and analysed by the panel and the SEA team with reference to the Science and Engineering Framework Criteria, which helped to guide evidence of interest to the SEA process (the framework was also considered when collecting evidence to help

guide topics for discussion). The same approach was used when interviewing external stakeholders.

Responses from the stakeholder write out were analysed in a more 'general' manner, to build a picture of stakeholders' experiences of engaging with the Department. Specific points made were also noted in reference to the SEA framework criteria.

This evidence, as well as desk research, was considered as a whole and used to comment on and evaluate the Department on specific areas of interest under each criteria of the framework. Recommendations were developed from these evaluations.

Annex 2: Terms of Reference

Aims

1. To review DfT's capability and capacity to access, manage, quality assure and use science and engineering (SE) evidence in policy making and strategy. This will provide assurance to the Permanent Secretary and help to enhance delivery of departmental objectives.
2. To put forward effective, strategic and workable recommendations to support DfT in improving capacity and/or capability in the above areas.

Ownership

3. The review will be jointly owned by the Government Chief Scientific Advisor (GCSA) and the DfT Permanent Secretary.

Project Scope

4. Scope will be guided by the GO-Science analytical framework, covering the end-to-end evidence process, but tailored to DfT's needs at the detailed level.
5. The focus of the review will be on SE evidence, but there will be liaison with the other analytical professions and evidence streams where appropriate – for example when considering how SE evidence has been considered alongside other evidence sources in a particular business area.
6. Final scoping will be determined by the expert panel and GO-Science, in consultation with DfT. Broadly the scope will cover:
7. Content:
 - A strategic overview of the existing end-to-end processes, guidelines, mechanisms and skills contributing to DfT's capability and capacity to use SE evidence effectively. Areas addressed will include:
 - Influence of the Departmental CSA on strategy and priority setting
 - How the science and innovation strategy links to departmental objectives
 - The procurement and management of evidence
 - The interface between policy making and evidence
 - Exploration of how the above translates in practice, by a "fitness-for-purpose" assessment of two to four significant policy areas/ areas of DfT business. These areas will be finalised in the first phase of the project, with input from the appointed expert panel, but possible areas for review are:
 - Transport Security
 - Road safety
 - Climate change policies (for example Low Emission Transport and/or adaptation)

- Behaviours and behaviour change (perhaps across all transport issues or specific topics such as sustainable travel choices)
- Agency and RSSB⁴⁹ interfaces (HA, MCA and the RSSB all use SE skills and expertise extensively)

8. Information sources:

- Documentation – published and unpublished, classified and non-classified
- Current research programmes
- Interviews with DfT officials (to include CSA and other HoP)
- Interviews with selected external DfT stakeholders

9. Exclusions:

- The review will not cover the DfT agencies. However, it may explore how interactions with and/or the organisation of agencies impacts on DfT's capabilities.
- Review of the evidence-base informing Heathrow decision-making is not included. The Permanent Secretary of DfT has already agreed that the GCSA will be consulted on the environmental compliance arrangements for Heathrow once these have been developed in readiness for public consultation, but before consultation begins.

Process

10. The GO-Science SEA team will manage the DfT review, working with a nominated DfT contact – Mike Crompton.

11. An expert panel of three to five members will be appointed by the SEA team. The panel will contribute significantly to the fine project scoping, evidence gathering, analysis and recommendation formulation.

12. The project will begin at the start of November and will complete in 3 months, excluding two weeks for the Christmas break.

13. Planned timescales and work schedule:

- Initiation phase (approx. two weeks)
Includes: agreeing fine scope and interview schedule, DfT contact arranging interviews, mile-stone meetings – SEA/CSA, GCSA/DfT Permanent Secretary, GCSA/expert panel/DfT/SEA team briefing meeting.
- Evidence and analysis phase (approx eight weeks)
Includes: interviews, analysis of data collected, review for gaps in data, filling gaps in evidence, recommendation development
- Report phase (approx four weeks)
Includes: report written by SEA team/expert panel, sign off meeting with GCSA, expert panel, DfT and SEA team.

⁴⁹ Rail Safety & Standards Board

Outputs

14. A report which comments on the findings of the review and sets out the review recommendations and the evidence that has led to them.

Follow up

15. DfT will issue a formal response to the report three months after its publication. This will include views on the report recommendations, and plans for addressing them.

16. Twelve months after DfT's official response to the SEA review, the GCSA will discuss progress with the DfT CSA and write to the DfT Permanent Secretary regarding progress.

Annex 3: Summary of case studies

The case studies were conducted as part of the review process to help build a picture of how the Department uses SE evidence in 'real life' policy areas. The chosen case studies are listed below, along with the panel's rationale for selecting these case studies. Summaries of case studies cover the top level points only, and not every detail covered during the interviews. The format of these evidence sessions consisted of a presentation by the policy teams followed by discussion between the policy team and panel.

Case study	Rationale
Climate change policy	Current high profile policy
Shared Space	Support for policy delivered by others
Rail electrification	An area where it is perceived there has been a change of policy

Case Study 1: Shared space policy

Shared space is a concept predominantly aimed at reducing the impact of motor traffic in places used by pedestrians. It has proved popular on the continent and is becoming increasingly so in the UK as a means of improving public spaces, such as high streets or town squares. Evidence presented in this case study considered the role of DfT in knowledge management in traffic management, as well as focusing in on Shared Space policy work. The format for the session was a short presentation by the DfT team on key issues, how they are addressing them, and forward plans.

The research budget for this division is approximately £1 million p/a, but this will vary from year to year. For the most part research is contracted, principally to large contractors such as TRL and Atkins.

DfT presentation

Knowledge management

Local Authorities (LAs) have devolved responsibility for traffic management planning and there is a high and rising demand for evidence on the best way to achieve outcomes with traffic management. If this is not met there is a risk of safety issues and/or wasted money. At present DfT play the dominant role in generating knowledge and issuing guidance, which is well used and respected by practitioners. For various reasons DfT now need to stimulate the sector to deliver and own the evidence-base, and it was clear that thoughtful and forward-thinking consideration was being given to this issue. In this context shared space guidance may be one of the last of its kind.

Shared space

Shared space has emerged as an area of interest because of safety concerns raised by specific user groups, particularly as more LAs consider this option. Objectives of individual schemes are not the DfT's focus - they are principally focused on transport outcomes and view objectives of particular schemes as a matter for the individual LAs who commission these schemes. Road safety statistics had not led to specific safety concerns on shared space schemes

although available data is limited. However, given the interest of Local Authorities and others in such schemes, DfT commissioned a research project to provide evidence for the debate. The first stage of this was an appraisal report aimed at establishing whether perceived benefits and disadvantages are supported by the available evidence. The report was also intended to look at safety issues, with the contractor studying safety, and the perception of safety, of all user groups in these environments. This was seen as a positive and constructive way to engage with the policy debate in an evidence-based manner.

The next planned stage is a study of the operational aspects of shared space in order to understand how the shared space affects the behaviour of pedestrians, cyclists and motorists. The aim is to follow this up with a manual for the design and provision of shared space.

At the time of the case study, the initial appraisal report had just been published. This concluded that there are possible benefits to these schemes and no evidence of safety issues (although it does set out that these conclusions are provisional, pending future research). The review panel feels that the conclusions on safety were presented more certainly than stated in the appraisal report during the interview, but how the appraisal report's findings influence the aforementioned 'pending research' will be a more reliable indicator of whether this is the case. For example, whether factors such as the influence of perception of safety on samples at shared space sites are explored. It will be important to ensure that the team have access to adequate social science expertise to act as an intelligent customer for this stage of the research project.

The review panel considered that the qualitative data collected as part of the appraisal report could have been designed to be more focused on forming conclusions around the safety concerns on specific disabled user groups, considering the stated aim of the appraisal related to safety.

Other key points

- Most work is contracted out and the team feels they have the skills to manage this effectively – i.e. be an intelligent customer
- The team has eleven traffic management engineers. This is about a third of the total team.
- No specific social science expertise but have worked with road safety social scientists.
- The team use academic outputs, but would like to engage on a deeper level with academia.
- When asked whether the appraisal report had been subjected to peer review, a sounding board of interested stakeholders and a project board was described. It is recognised that this approach will accrue benefits in the early engagement of stakeholders and those with 'user knowledge' such as LAs.
- It was, however, of concern to the Panel that this system was used to describe 'peer review', a term which has specific features in research.

However, it is recognised that this may have occurred as a result of different interpretations of the term.

Case Study 2: Carbon reduction

This case study focused principally on the 2009 DfT carbon reduction strategy and the analysis and use of evidence that underpinned this.

DfT Presentation

Scientific, engineering, social science and economic evidence were used to create this strategy, which sets out policy options for meeting a 14% reduction in carbon emissions from the transport sector by 2022. This strategy was published, alongside supporting evidence and an impact assessment and the reaction so far has been favourable.

A great deal of quality analysis underpins the strategy, including ground breaking research such as their 'carbon pathways' analysis, which aims to take a 'systems-based' approach to understanding issues. A baseline for projected carbon emissions was established, followed by a detailed analysis of different policy options to forecast their effect on these baseline emissions – the Department's National Transport Model (NTM) was used for a lot of this analysis, including through different scenarios to take account of areas of uncertainty. DfT officials recognise that this data is not perfect, but it is probably the best available. Transport Demand Models were also used to try to take account of 'knock on' effects of policy initiatives (for example forecasting associated behaviour changes).

The published strategy looks to 2022 in recognition of the carbon budget periods. The DfT team do not expect car technology to change significantly before 2050, particularly with respect of electric and hybrid vehicles, although market penetration of new technologies is difficult to gauge. The DfT team expressed concern that supporting a specific technology such as hydrogen would risk locking in unproven technology and jeopardising 2050 targets. Now working with DECC to assess what will need to happen to reach 2050 targets, and how this links to elements such as electricity generation.

Other key points:

- Deploy a number of methods to quality assure internal and external research, from formal boards, 'buddies' for research, and formal peer review, including at the specification stages and to assess the most suitable methodologies. It can be difficult to arrange external peer review around internal sensitive analysis.
- Good interaction between the analysts and policy advisors – team supports having specialists integrated into the team because enables cross fertilisation and challenge to best use of the evidence
- The team also draws on a large amount of external evidence, for example academia, consultants and the EU. They internalise the evidence to analyse where evidence gaps lie.
- To ensure SE is robust enough to stand up to challenge, they derive modelling assumptions from a number of sources both commissioned and external

- Work closely with other government departments on the carbon reduction agenda
- Recognise areas in common with other areas of the departments and ensure form links where required either formal or informal
- The balance of consultancy and in-house research will vary from area to area. It is important to maintain control of research and policy but sometimes will need external expertise which fits in with wider policy work
- Tend to use CSAU as well as external sources for 'generic' horizon scanning. Manage more specific horizon scanning themselves – for example the King Review, but not placed to do much speculative horizon scanning
- Engineers are embedded in the policy teams and have a technical as well as specialist role. They are pleased with the range of SE skills they have access to
- The policy team is supported by an analytical team of ten economists and a statistician, and also have six mechanical engineers. They also draw from transport modelling and social research teams.

Case Study 3: Rail electrification

The focus of this case study was the Department's rail electrification strategy - particularly focused around the 2009 *Britain's Transport Infrastructure: Rail Electrification* publication that set out plans for the next stage of rail electrification. This announced the electrification of the Great Western mainline and the Liverpool to Manchester line. It also announced work to assess the case for electrification of further lines, which was confirmed in the December 2009 pre-budget report. The timing of both of these schemes was largely driven by rolling stock issues.

DfT presentation

Rail Electrification was considered a priority for the outputs the Department wanted to achieve for Control Period 5 (CP5). In the context of concerns from industry around the lack of focus on electrification in CP4 as described in the Rail Strategy White Paper (2007). DfT agreed for Network Rail to take forward a Route Utilisation Study (RUS) on electrification in 2007. In parallel DfT began some complementary work of their own because they did not feel Network Rail were able to form a total 'systems view' and would therefore not be fully aware of upcoming rolling stock opportunities due to constraints on sharing sensitive commercial information.

As part of this, DfT worked with Network Rail to look at the possible benefits for electrification of certain routes as a proxy indicator for closer analysis. This used appraisal techniques to help make a decision but also considered wider aspects such as rolling stock and signalling considerations – and resulted in the line with the best 'appraisal business case' not being prioritised in this instance. This understanding also helped ensure optimum timing for the electrification of chosen routes.

There are 'rules' for business cases and they attempt to capture non-economic benefits as well as economic ones, and there is guidance on this.

However, the primary driver in this case is running the railways in a more economically efficient way and other possible benefits (for example carbon reduction in some cases) are peripheral to the main driver.

Looking to the Future

Once a certain proportion of the railway is electrified it stops being economic to electrify the rest. The DfT team are involved in consideration of the best solution for the railway this applies to. This includes investigation into reducing the costs of electrification, as well as considering options like bi-mode trains, which have both diesel engines and electric traction, because end to end journeys are desirable for users.

The technical solution to electrification (the 'what') is well understood. The 'how' of how elements come together is less well understood, and DfT is engaged in benchmarking work with key stakeholders to understand this, and risks, more fully.

Other key points:

- Work with key industry stakeholders to build an idea of where technology is going. Cannot predict but helps ensure flexibility in planning.
- A team research manager is responsible for developing a rail industry research strategy that sets out methods of delivering research across industry; most research is delivered through industry via the Rail Safety and Standards Board (RSSB). DfT grant approximately £10 million a year and research is overseen by an industry-led group. DfT do maintain some direction, however, for example they took the view that research was not strategic enough so ring-fenced some for this type of 'longer term' work.
- RSSB manage research on a day to day basis and DfT manage this and have been taking steps to improve it, for example asking for more detailed quarterly reports, evaluating benefits of research, and asking for business cases for core work.
- The DfT team also manage a small amount of direct research funding for applied questions or when not research appropriate for industry to manage. Use stakeholder or client review rather than peer review because of difficulty finding suitable peers from a small 'pool'.
- Both members of the team spoken to had a relevant background in rail engineering, and 'real life' experience. The director of the unit is on secondment from industry and also has extensive expertise. Feel it is important to have these relevant skills, and that engineers need support to understand the policy context.
- Engineers do not have the same structure as other professions. This may be a gap even though they don't feel any less influential for this.

Annex 4: Acronyms

B-ERS	Board Level Evidence and Research Strategy
CBRN	Chemical, biological, radiological, and nuclear.
CfIT	Commission for Integrated Transport
CP5	Control Period 5
CSA	Chief Scientific Advisor
CSAU	Chief Scientific Advisor's Unit
CST	Council for Science and Technology
DaSTS	Delivering a Sustainable Transport System
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DpTAC	The Disabled Persons Transport Advisory Committee
EPSRC	Engineering and Physical Sciences Research Council
ESRC	Economic and Social Research Council
EVs	Electric Vehicles
GCSA	Government Chief Scientific Advisor
GSR	Government Social Research
HA	Highways Agency
HoP	Heads of Profession
HOSDB	Home Office Scientific Development Branch
HR	Human Resources
LA	Local Authority
MCA	Maritime and Coastguard Agency
NATA	New Approach to Transport Analysis'
NDPBs	Agencies and Non-Departmental Public Bodies
NERC	Natural Environment Research Council
NTM	National Transport Model
PHEVs	Plug-in Hybrid Electric Vehicles
PSA	Public Service Agreements
RCEP	Royal Commission on Environmental Pollution
RPMs	Research Programme Managers
RPN	Research Programme Network
RSSB	Rail and Safety and Standards Board
RUS	Route Utilisation Study
SAC	Science Advisory Council
SDC	Sustainable Development Commission
SE	Science and Engineering
SEA	Science and Engineering Assurance
SSC	Strategy Sub-Committee
TAE	Transport Analysis and Economic
TaSTS	Towards a Sustainable Transport System'
TfL	Transport for London
TOR	Terms of Reference
TRL	Transport Research Laboratory
U-ERS	Unit-Level Research Strategies
UKTRC	UK Transport Research Centre