

Climate Change Adaptation Plan for Transport 2010-2012

Enhancing resilience to climate change



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We would appreciate feedback on this plan. Your views can influence its delivery and feed into future adaptation planning. Feedback should be sent to: climatechangeadaptation@dft.gsi.gov.uk

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Foreword



It is in all of our interests to ensure that our transport infrastructure can cope with the very worst that the weather throws at it. Events in recent months, including the floods in Cumbria and the heavy snowfall across much of the country in December and January, have given a dramatic illustration of the consequences that extreme weather events can have on people's lives and on the UK's economy.

Scientific evidence suggests that in the decades ahead we are likely to experience a greater frequency of extreme weather events and a general increase in temperatures and precipitation. This could have a number of implications for the way in which we design, build, maintain and operate our roads, railways, ports and airports. It also has implications for the ways in which we develop policies and manage our Departmental assets, such as our estates. It is anticipated that building in resilience to climate change at the outset will be more cost effective than dealing with the consequences as they arise. This plan explains how the Department for Transport is addressing this challenge by embedding the consideration of long-term climate related risks into our decision making processes.

The plan includes a number of new commitments which we will be taking forward over the next two years and which we will be reporting on regularly. Together with the Department's Carbon Reduction Delivery Plan, which is also being published today, the plan is a key part of the Department's response to addressing the impacts of climate change in the transport sector.

A handwritten signature in black ink, appearing to read 'Sadiq Khan'. The signature is fluid and cursive, with a large initial 'S'.

Sadiq Khan
Minister of State for Transport

Executive summary

The climate change challenge

Climate change is an ongoing natural process and we have always experienced extremes in weather. However, human activities have increased global greenhouse gas emissions over recent decades changing the balance of atmospheric gases which is accelerating this natural process.

Latest scientific research tells us that the UK is likely to experience an increase in extreme weather events, hotter, drier summers and warmer, wetter winters. Recent extreme weather events illustrate what these changes may bring and demonstrate their wide reaching implications. We need to act collectively now if we are to avoid or reduce the worst impacts of a changing climate and take advantage of new opportunities.

For the Department for Transport (DfT) adapting the UK's transport system to climate change is an important part of delivering transport that works both now and in the future and continues to support national economic competitiveness and growth.

The need for action

The UK's legislative framework sets the agenda for domestic action to adapt to the projected impacts of climate change. For DfT this means meeting its strategic aim 'transport that works for everyone' through planning, designing, maintaining and operating a transport system that is resilient to future change.

Transport networks can be affected by the weather and we recognise that the projected changes may increase the frequency of potentially disruptive events. These impacts could have social and economic costs so we are aiming to identify and manage the risks at an early stage through the development of adaptive measures and the provision of contingency plans for unexpected events.

Managing the risks to transport

The aim of this plan is to embed the consideration of climate change risk into the Department's decision making processes. This will help ensure climate resilience is routinely factored into investment decisions and policy developments across all transport policy areas.

Our first priority is to improve our understanding of how the predicted changes could impact upon each transport mode. We aim to build our evidence base and begin quantifying the risks to assist in the decision making process for determining mitigating action and the appropriate levels of investment.

The Department's adaptation team will continue to develop communication links with key policy areas, Executive Agencies, Non-Departmental Public Bodies, local and regional Government and other public and private sector organisations. By providing leadership on the issue we aim to build greater capacity and capability to take positive action.

How this plan will work

This first adaptation plan highlights what has been done to date to understand and manage climate change related risk and describes the actions we will take over the next two years. Successful delivery will rely on the concerted efforts of staff across the whole DfT family. Delivery will be coordinated by the Department's adaptation team and self assessments of progress will be carried out each year. At the end of the two years a final report will be submitted to the Ministerial Sub-Committee on Environment and Energy in spring 2012.

1. Introduction

- 1.1** Adapting the UK's transport system to the projected impacts of climate change is an essential part of building, maintaining and operating a transport system which continues to support national economic competitiveness and growth. This Departmental Adaptation Plan sets out how this challenge is being addressed across the DfT and its agencies.

Background

- 1.2** An increase in global greenhouse gas (GHG) emissions over recent decades means we are already likely to experience a certain level of climate change. Preparing the UK through adaptation will help reduce the adverse consequences and allow us to take advantage of new opportunities.
- 1.3** The need for adaptation was highlighted in the Stern Review (October 2006)¹ which takes a comprehensive look at the economics of climate change. The review found that as people and organisations become aware of the climate changing they will adapt their behaviour to reduce costs and take advantage of benefits. The Department accepts Stern's message that early action can be more cost effective than dealing with the consequences as they arise and recognises the need to be proactive in managing the risks.
- 1.4** We have always experienced extreme weather events such as heat waves and heavy rainfall. These events and their consequences have started to be recognised as illustrations of what we may increasingly experience in future. The UK needs to take action to adapt infrastructures and lifestyles to build stronger resilience to change.
- 1.5** This first Departmental Adaptation Plan (DAP) illustrates our progress to date and the actions (Annexes E, F, G) we need to take to develop our skills, knowledge and evidence base. It sets out what the Department will do to embed, over the next two years, adaptation in both the public and private transport sectors by providing leadership, policy, guidance and support to help inform future decision making.

¹ <http://www.occ.gov.uk/activities/stern.htm>

2. Climate change – the need for action

2.1 Climate change is internationally recognised as one of the greatest challenges facing the world today. To prevent the acceleration of climate change, international action is required to reduce GHG emissions (mitigation). The Department outlined its strategy for reducing transport's GHG emissions in *Low Carbon Transport: A Greener Future* (July 2009)² as part of the Government's *Low Carbon Transition Plan* (July 2009)³. We are publishing, alongside this document, a *Transport Carbon Reduction Delivery Plan*, setting out our plans in more detail (2.10).



2.2 To reduce transport's vulnerability to the potential impacts of climate change we need to adapt and build in greater resilience. Our climate can have a fundamental impact on the UK's social and economic development so we need measures to increase resilience to adverse changes. It will not always be quick, easy or without cost, but setting a framework for action will help identify costs and benefits from the outset and inform prioritisation and decision making.

Transport's perspective

2.3 The DfT's strategic aim 'transport that works for everyone' means providing a transport system that balances economic, environmental and social considerations. The ultimate aim of this DAP is to ensure delivery of this aim through a UK transport system that continues to operate effectively because its infrastructure and operations have been planned, designed and maintained to be resilient to future climate change.

2.4 Transport systems can be affected by the weather so it is likely that the projected climatic changes will increase the frequency of potentially disruptive events such as flooding. The impacts on transport may be felt across the whole of the country with potential economic and social costs. The Department aims to manage the risks through the ongoing provision of contingency plans for unexpected short term events and developing adaptation measures to deal with projected long term change.

² <http://www.dft.gov.uk/pgr/sustainable/carbonreduction/>

³ http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

2.5 The Department provides leadership across all transport sectors to achieve its objectives. It works closely with the Devolved Administrations, regional and local Government and private sector organisations to build partnerships for the delivery of effective transport services. It is these partnerships that will be essential to the successful delivery of our adaptation aims.

Setting the context

2.6 The Department has used the Stern Review on the economics of climate change⁴ and the Eddington Transport Study⁵ to develop its approach to strategic transport planning. In 2007 *Towards a Sustainable Transport System*⁶ (TaSTS) was published and in 2008 the Department's strategic objectives (table 1) were set out in *Delivering a Sustainable Transport System*⁷ (DaSTS).

Table 1: DfT Departmental Strategic Objectives (DSOs)

DSO	Title	Aim	Risk to DSO delivery
DSO 1	Support the economy	To support national economic competitiveness and growth by delivering reliable and efficient transport networks.	Transport disruption can have significant negative economic impact.
DSO 2	Reduce carbon emissions	To reduce transport's emissions of carbon dioxide and other greenhouse gases with the desired outcome of avoiding dangerous climate change.	Increased resilience may require additional resources e.g. air conditioning in vehicles which increases CO ₂ . Adverse weather may influence mode choice away from walking, public transport etc.
DSO 3	Promote safety, security and health	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.	Weather events causing hazardous conditions and accelerated degradation of assets may increase safety risk to travellers and staff.
DSO 4	Promote equality of opportunity	To promote greater equality of opportunity for all citizens with the desired outcome of achieving a fairer society.	The impacts of climate change are unlikely to be distributed equally.
DSO 5	Improve quality of life	To improve quality of life for transport users and non-transport users and to promote a healthy natural environment.	Impacts on traveller comfort and weather related barriers to mode choice.

⁴ http://www.hm-treasury.gov.uk/stern_review_report.htm

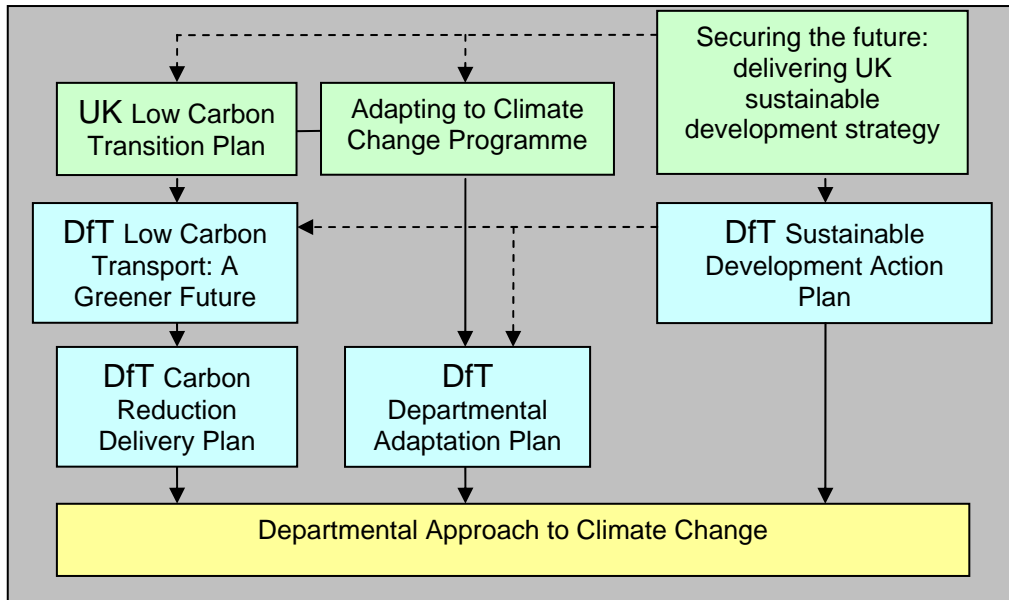
⁵ <http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/>

⁶ <http://www.dft.gov.uk/about/strategy/transportstrategy/tasts/>

⁷ <http://www.dft.gov.uk/about/strategy/transportstrategy/dasts/>

2.7 The challenge of adaptation sits mainly under DSO 1 'supporting the economy'. However, the Department is working to safeguard all objectives from the direct and indirect implications of climate change. We are therefore, considering climate change implications for all DSOs through a suite of plans that will operate alongside each other (figure 1) to ensure the Department is mitigating, adapting and delivering sustainable transport.

Figure 1: DfT's approach to climate change



Sustainable Development Action Plan

2.8 The Government sustainable development strategy *Securing the Future*⁸ (2005) requires all Departments and their agencies to publish Sustainable Development Action Plans (SDAPs) highlighting their contributions to the sustainability of the UK.

2.9 The DfT's latest SDAP⁹ (2009) incorporates policy, people, procurement and operations. Adaptation is linked to the sustainability agenda and both plans aim to demonstrate the five sustainability principles which are closely aligned to the DSOs:

- Living within environmental limits
- Ensuring a strong, healthy, and just society
- Achieving a sustainable economy
- Promoting good governance
- Using sound science responsibly

⁸ <http://www.defra.gov.uk/sustainable/government/publications/uk-strategy/>

⁹ www.dft.gov.uk/about/howthedftworks/sda/

Carbon Reduction Delivery Plan

2.10 The DfT's *Transport Carbon Reduction Delivery Plan*, details the actions we plan to take to deliver the Department's *Low Carbon Transport: A Greener Future* strategy. It explains:

- How we will measure progress towards reducing GHG emissions in the transport sector
- What DfT is doing to contribute to emissions reductions in other sectors
- How DfT is reducing its estate emissions and how progress is measured
- How future reporting of progress in the transport sector will be measured

Legislation and cross-Government initiatives

2.11 Departmental Adaptation Plans are a reporting mechanism for Government Departments of which sixteen are producing these plans. Public sector organisations and statutory undertakers will report under a power created by the Climate Change Act 2008 and local Government will report via National Indicator 188 Adapting to Climate Change¹⁰.

2.12 As well as producing our DAP, DfT is working within Government's Adapting to Climate Change Programme¹¹ (ACC) to meet the Climate Change Act requirements and deliver on the domestic adaptation agenda.

The Climate Change Act¹²

2.13 The Climate Change Act 2008 establishes a statutory framework for domestic adaptation¹³ (figure 2).

Figure 2: Climate Change Act requirements for adaptation

- Undertake a UK climate change risk assessment every five years
- Provide statutory guidance on how to undertake a climate risk assessment
- Put in place a national adaptation programme and review it every five years to address the most pressing climate change risks to England
- Government is to use its Reporting Power to require public authorities and statutory undertakers to report on their assessment of climate risks and what they are doing to address them
- Publish a strategy within a year of the Act outlining how the new

¹⁰ <http://www.lga.gov.uk/lga/core/page.do?pageld=1382860>

¹¹ <http://www.defra.gov.uk/environment/climate/adaptation/index.htm>

¹² http://www.opsi.gov.uk/acts/acts2008/ukpga_20080027_en_1

¹³ <http://www.defra.gov.uk/environment/climate/legislation/adaptation.htm>

power will be used and identify priority organisations covered by it

- Create an Adaptation Sub-Committee of the Committee on Climate Change to oversee progress on the Adapting to Climate Change Programme and advise on the risk assessment

National Climate Change Risk Assessment

2.14 The Climate Change Risk Assessment (CCRA) will be carried out every five years from 2012 and will help the transport sector by providing additional data to enhance decisions about levels of risk and adaptation options. It will use the UK Climate Projections 2009 and in future may use information from the Reporting Power and DAPs.

Climate Change Act Reporting Power¹⁴

2.15 The Government's power to ask public sector organisations and statutory undertakers¹⁵ to report on adaptation will allow DfT to learn directly from transport operators. First Directions were issued in March 2010 giving Reporting Authorities (figure 3) deadlines to submit their reports (between July 2010 and September 2011).

Figure 3: Transport organisations listed as Reporting Authorities

Statutory Reporting Authorities

- Office of Rail Regulation
- Network Rail
- Eurotunnel
- Civil Aviation Authority
- NATS Holding Ltd (provider of national air traffic services)
- Strategic Airport Operators (UK)
- Harbour Authorities (England and Wales)
- Trinity House
- Northern Lighthouse Board

Invited Reporting Authorities:

- Highways Agency
- Maritime and Coastguard Agency

2.16 DfT has a key role to play, especially because we need to be aware of the risks, issues and barriers the sector faces. We will work closely with relevant transport sector organisations through:

- Encouraging and supporting the delivery of the reports

¹⁴ <http://www.defra.gov.uk/environment/climate/legislation/reporting.htm>

¹⁵ The Climate Change Act defines statutory undertakers as bodies identified in the Town and Country Planning Act. http://www.opsi.gov.uk/acts/acts1990/UKpga_19900008_en_1.htm

- Analysing reports, highlighting lessons for Government and areas for possible intervention
- Summarising sector findings including risks and adaptation measures

2.17 Reporting Authorities will use the Reporting Power to look specifically at their sector and DfT will use its DAP to assess and manage risks to the transport system as a whole creating a feedback loop for future planning.

Action 1 Engage with transport stakeholders identified as Reporting Authorities to provide support and guidance through production of their reports. Assist the Adapting to Climate Change Programme team in reviewing the reports and reflect priority actions in DfT's future DAPs.

National Adaptation Programme¹⁶

2.18 The National Adaptation Programme will begin in 2012 with the aim of bringing together work led by Government and the wider public sector. DfT will contribute its work on adaptation to help drive forward and coordinate future action.

Adaptation Sub-Committee¹⁷

2.19 The Adaptation Sub-Committee (ASC) was established in 2009 as a sub-committee of the Committee on Climate Change (CCC)¹⁸. The DfT will be able to use the ASC to provide expert advice, analysis and scrutiny of its adaptation programme. ASC's role is to:

- Support the preparation of the UK Climate Change Risk Assessment
- Support the implementation of Government's Adaptation Programme
- Respond to requests from the national authorities of England, Wales, Scotland and Northern Ireland for advice on adaptation

Adaptation Indicators

2.20 The ACC programme is working across Whitehall to develop process and outcome based indicators for adaption. DfT is involved in this project and will contribute indicators from the DAP as they are developed.

Action 2 Devise indicators to measure progress against DAP actions. Provide evidence to Defra for the national adaptation indicator set.

Infrastructure and Adaptation Project

2.21 DfT chairs this cross-Departmental project (2009-11) and is involved in sub-groups looking at the long term resilience of new and existing UK infrastructure in the transport, water and energy sectors.

¹⁶ <http://www.defra.gov.uk/environment/climate/programme/index.htm>

¹⁷ <http://www.theccc.org.uk/about-the-ccc/adaptation-sub-committee>

¹⁸ <http://www.theccc.org.uk/>

2.22 These sectors have been identified as being critical to the operation and economic development of the UK. The project will help the DfT take early adaptation action to minimise potential disruption and cost to the UK economy.

Assumptions

2.23 Assumptions have been made in the production of this plan to assist in determining the levels of risk posed by climate change and propose actions to take. These are categorised below.

Climate change

2.24 We use the latest climate projections from the UK Climate Impacts Programme (UKCIP)¹⁹ - *UK Climate Projections 2009* (UKCP09)²⁰ as a key reference for describing potential climatic changes. These include projections for change in temperature, precipitation and sea level. The headline changes are: warmer, wetter winters, hotter, drier summers and rising sea levels.

Timescale

2.25 UKCIP uses time horizons which go to the end of the century in 30 year periods: 2020s, 2050s and 2080s, and we will use these as appropriate.

Emissions scenarios

2.26 We use the Intergovernmental Panel on Climate Change (IPCC)²¹ *Special Report on Emissions Scenarios* (SRES)²² which gives a high level summary of three possible global emissions pathways (high, medium, low). The pathways represent projections of GHG emissions and are influenced by the degree to which the world remains reliant on carbon intensive activities. UKCIP uses these as an influencing factor in determining how the climate may change over the next century. When using the projections the user decides which pathway to follow based on the level of risk they are willing to accept. The three pathways are:

- High Worst case scenario - no action taken to reduce global GHG emissions - greatest degree of climate change
- Medium Central estimate - limited action taken to reduce global GHG emissions - limited degree of climate change
- Low Best case scenario - action taken to reduce global GHG emissions - avoiding dangerous climate change

¹⁹ <http://www.ukcip.org.uk/>

²⁰ <http://ukclimateprojections.defra.gov.uk/>

Funded by Defra, DECC and the Devolved Administrations. Produced by a consortium of organisations - UK Climate Impacts Programme, Met Office Hadley Centre, British Atmospheric Data Centre, Environment Agency, Tyndall Centre, MCCIP, Proudman Oceanographic Laboratory, Newcastle University, University of East Anglia http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=250&Itemid=287

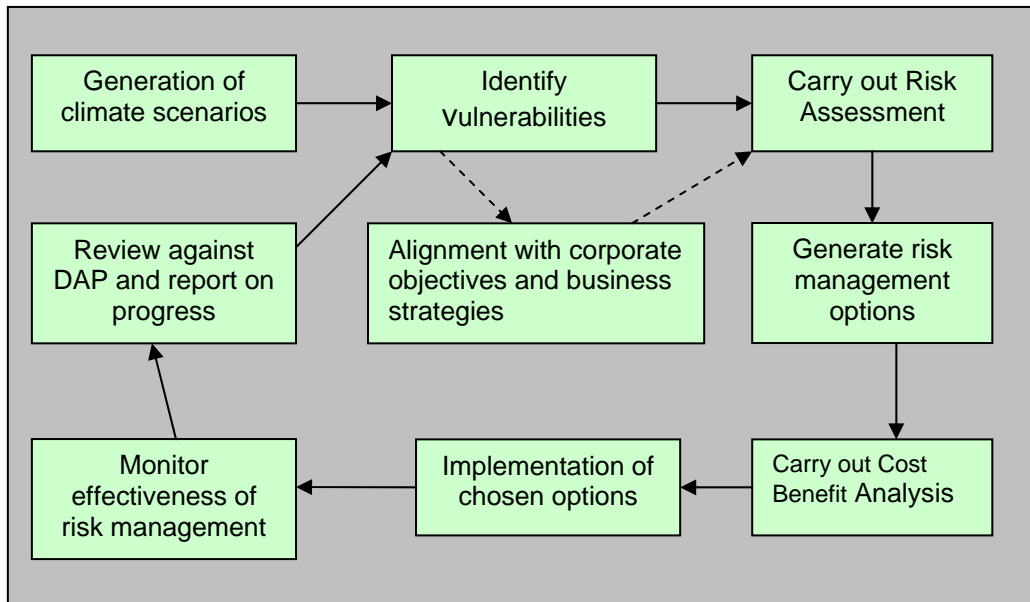
²¹ <http://www.ipcc.ch/index.htm>

²² http://www.grida.no/publications/other/ipcc_sr/?src=/climate/ipcc/emission/

Outcomes

- 2.27** This plan sets out actions to ensure that by 2012, the consideration of climate change risk has been embedded across the Department and its decision making processes (figure 4).

Figure 4: DfT's strategic approach to adaptation planning



- 2.28** This means that the potential impacts of a changing climate will be routinely factored into the DfT's investment decisions, policy development, guidance, design, construction, maintenance and operations. Effectively managing these risks at an early stage should result in reduced costs over the lifetime of decisions with benefits for the UK's economy and transport users.
- 2.29** To do this we need to improve our understanding of how the predicted changes could impact on policy areas and the delivery of our DSOs. Delivering our actions will allow us to build our evidence base and begin quantifying the potential impacts. This will provide a stronger case for informing adaptation actions and judging the appropriate levels of investment.

Implementation, governance and delivery

- 2.30** DfT's adaptation team (paragraph 4.3) will oversee the implementation of this DAP and encourage the delivery of its actions. Progress will be reported internally to the Carbon Reduction Delivery Group (paragraph 4.5) and will be raised at the Departmental Board when appropriate.
- 2.31** Delivery of actions will be managed within relevant policy areas and progress reported at quarterly Departmental adaptation steering group meetings.

- 2.32** We will produce a progress report in March 2011 and a final report in March 2012 which will help formulate the next, five year plan (2012 - 2017).
- 2.33** Our annual reports will go to Cabinet through ED(EE)²³ Committee and will be updated on the ACC and DfT websites. Updates will comprise a self-assessment of progress against actions and deliverables including a refresh of actions where new priorities have been identified.

Risks to transport

- 2.34** DfT needs to develop a robust approach to managing the potential impacts of climate change and reduce the risks they may pose to the UK's transport system.
- 2.35** Climate risks can originate from direct impacts such as flooding which may cause business continuity issues; indirect impacts such as an increased demand for air conditioning which may lead to changes in service delivery; short term impacts such as landslides and long term impacts such as changes in tourism patterns. We will consider the following criteria when determining the nature and importance of risks:
- Uncertainty in climate change projections
 - Rate of change including the time horizon for effects to become material and the activity/asset time horizon being examined
 - Existing knowledge of performance and resilience to weather events
 - Extent of an impact
 - Severity of an impact
- 2.36** DfT already has recommended processes for risk assessment and management. We will aim to incorporate the consideration of climate change risks as a requirement within these processes through relevant DfT guidance.

Action 3: Embed climate change risks into standard DfT risk assessment processes.

²³ <http://www.cabinetoffice.gov.uk/secretariats/committees/edee.aspx>

Threats and vulnerabilities

2.37 In 2009 the latest *UK Climate Projections* (UKCP09) were published. The projections use the Met Office Hadley Centre's²⁴ climate modelling to determine climate scenarios for the UK during the 21st century. They can be used to determine the effects on transport down to 25km² which highlights regional variability. The key findings are listed in table 2.

Table 2: Headline findings from the UKCP09 Climate Projections

Using high, medium and low emissions pathways UKCP09 projects the UK will expect to see the following climatic changes:

Increased Summer Temperatures		
High	Medium	Low
South East England +4.9°C in 2080s	South East England +1.6°C in 2020s; +2.3°C in 2040s; +3.9°C in 2080s	South East England +3.0 in 2080s
Decreased summer precipitation		
High	Medium	Low
South West England -29% in 2080s	South West England -7% in 2020s; -13% in 2040s; -23% in 2080s	South West England -15% in 2080s
Increased winter precipitation		
High	Medium	Low
North West England +26% in 2080's	North West England +6% in 2020s; +10% in 2040s; +16% in 2080s	North West England +15% in 2080's
Rising Sea Levels		
High	Medium	Low
London +43cm by 2080s	London +18cm by 2040s; +36cm by 2080s	London +31cm by 2080s

2.38 Using UKCP09 and the previous 2002²⁵ scenarios we have determined potential risks facing transport (table 3). This is not an exhaustive list as there could be other changes and impacts. Further research by mode will be encouraged as part of the DAP to determine specific risks, their severity and likelihood of occurrence.

²⁴ <http://www.metoffice.gov.uk/climatechange/science/projections/>

²⁵ http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=161&Itemid=291

Table 3: Key climate risks for DfT

Climate Changes	Potential implications for transport	Sector
Increased temperature	Deformation of road & airport runway asphalt. Hardcore underpinning cracking. Rail tracks buckling. Passenger discomfort. Risk to passenger and workers' safety. Changes in seasonal demand for transport. Changes in travel patterns e.g. tourism. Effects on aircraft operations.	Road Rail Aviation Government
Increased rainfall	Flood damage to road, rail, airport Infrastructure e.g. foundations, surfaces. Increased run off from adjacent land. Reduced stability of soft estate. Standing water reducing safety e.g. on roads, airport runways. Reduced visibility. Increased demand for car use. Increased operational support required. Rising water tables flooding underground networks. Risks to passenger and workers' safety.	Road Rail Aviation Government
Rising sea levels, increased coastal erosion and flooding	Permanent asset loss at coastal sites. Periodic flooding of coastal infrastructure e.g. ports, roads, rail. Restricted access to ports. Threat to port operation. Risk to workers' safety.	Maritime Rail Road Government
Increase in extreme weather - storms and storm surges	High winds blow down trees, rail power lines, impede aircraft operations. Operational constraints at exposed locations e.g. bridges for high sided vehicles, ports, airports. Flooding at coast inundating coastal infrastructure and port operations.	Road Rail Aviation Maritime Government
Combined extremes in weather	Damage to power supply from electrical storms, storms, floods. Asset failure due to long, hot, dry periods followed by intense rain causing flash floods. Rising sea levels, increased storms and storm surges damaging coastal infrastructure.	All

Climate change challenges

- 2.39** The challenges of adapting to a changing climate cannot be considered in isolation. They should be routine considerations, factored into DfT's day to day decision making processes rather than discrete risks to be managed independently.

Uncertainties

- 2.40** Decisions have to be taken in the face of uncertainties. These exist in the climate change projections as a result of the uncertainty in climate models and in future GHG emissions. There is also uncertainty in the way changes in climate will affect the activities of the Department, the delivery of its policies, performance of its assets and the expectations and behaviours of transport users and stakeholders.
- 2.41** These uncertainties should not inhibit decision making but do need to be understood, accepted and taken into account. The UKCP09 adoption of probability analysis within the climate change projections will assist in risk consideration and decision making.

Adaptation in new work streams

- 2.42** The Department accepts that climate change is a real issue for the future. We recognise the important challenge of managing potential risks and considering adaptation measures in all new major policy, strategy, guidance, investment and build projects from the outset. This will help present a more cost effective solution than dealing with the consequences as they arise. The challenge is getting this thinking embedded consistently within our decision making processes.

Adapting existing policy and projects

- 2.43** Another key, and perhaps more difficult, challenge is adapting existing policy, strategy, guidance and infrastructure. This is especially difficult if the options for managing a risk are geographically constrained or require significant additional investment. Some risks can be addressed through routine renewal and updated procedures when repairs or replacements are made so long as the risks they are likely to be exposed to during their life time are considered.
- 2.44** Other transport challenges facing existing infrastructure include the historic legacy of the lines of transport networks, the pace of surrounding land use change and the capacity of the supporting infrastructure to cope e.g. drainage and issues associated with changes in catchment characteristics since they were originally built.

What to adapt

2.45 An important stage in the adaptation process is determining what and when to adapt. Maintaining the integrity of the whole transport system in light of the potential increases in physical stresses is a potentially huge challenge. We need to understand what critical infrastructure is and what needs to be adapted first. We need to prioritise action and investment. It is important that the degree of resilience provided is proportionate to the degree of threat i.e. it would be inappropriate to provide the same level of climate resilience across the whole transport system.

Human response

2.46 The impacts of climate change are unlikely to be restricted to the physical environment. Climate change is also likely to make the Department's consideration of future transport demands more difficult to predict as it may influence public demand and expectations, consumer choices and behaviours. This is where we need to check public understanding and acceptance of climate change issues in order to identify 'soft' adaptation measures that respond to the level of public acceptance of risk.

2.47 Changes in the climate may alter tourism patterns, for example, hotter, drier summers causing an increase in UK tourism placing greater seasonal demand on transport. It is also possible that global migration patterns may change which will need to be taken into account in planning transport systems. However, the direct cause and effect relationships between climate change and migration are difficult to establish. The factors motivating any decision to migrate are complex and difficult to forecast. The Department of Energy and Climate Change and the Home Office are sponsoring a Foresight²⁶ project in the Government Office for Science to look at global migration due to environmental change. This will provide DfT with a better understanding of the long term impacts on migration and the challenges and opportunities it could bring to transport and how we might address them.

Design Life of infrastructure

2.48 Transport infrastructure is typically built with very long life spans, sometimes 120 years or more. Construction costs are usually significant with renewal and maintenance costs generally very high. Much transport infrastructure is operated by the private sector so investment is generally led by business cases for profit. This makes 'selling' adaptation difficult because it may not have immediate benefit or profitability. Most transport infrastructure is built using a long design life based on a historical understanding of weather stresses. Retrofitting existing infrastructure before the end of its design life may prove costly.

²⁶ <http://www.foresight.gov.uk/OurWork/ActiveProjects/EnvironmentalMigration/Migration.asp>

Opportunities and benefits

2.49 It is easy to identify the negative impacts of climate change, the risks and uncertainties, threats and vulnerabilities. If unplanned for, these are the implications most likely to cause disruption to the economy and society. However, there could also be opportunities and benefits from changes in our climate. Possible changes in tourism may bring greater economic and social prosperity, longer growing seasons and changes in agricultural patterns may bring benefits to food security. We will seek to identify such opportunities through the lifetime of this DAP.

Adaptation options

2.50 Table 4 lists some of the generic adaptation options that we could adopt to manage or avoid climate risks. Before deciding on options to take it will be necessary to determine the level of acceptable risk for the particular policy, asset or operation. In some circumstances the cost of adaptation may be too high and alternatives strategies may have to be developed to manage the consequences.

Table 4: Generic adaptation options

Option	Examples of action to take
Business as usual	Minimum action to maintain a safe and serviceable network. May include contingency plans, monitoring changes and routine asset repairs and/or replacements.
Future proof designs	Updating design requirements including technical standards and specifications to provide additional capacity and/or functionality in the event of gradual climatic change or ad hoc weather events. The designs could be for new assets, renewals or improvements.
Retro-fit solutions	Modifications to existing assets and/or activities outside the normal renewal cycle. Determine where (all sites or high risk sites) and when (now or at a certain threshold) it needs to be actioned.
Develop contingency plans	Pre-planned responses for when/if climate change risks are realised so immediate effects can be managed. Could be an option to use in the period before other measures are implemented or for when no other mitigation measures have been identified.
Update operating procedures	Update existing operating procedures to take account of the impacts of climate change e.g. procedures for working in high temperatures.
Research	Research to identify vulnerabilities of different transport sectors, determine probable risks, identify adaptation options or reduce uncertainty to determining preferred adaptation action.
Monitor	Monitor the rate of climate change and/or subsequent effects on specific transport mode assets or operations to help determine the most appropriate adaptation measures and identify indicators of change and threshold “triggers” for action.

2.51 It is important to examine the full range of options that could be used to manage risks before choosing an appropriate management intervention. Key elements to consider:

- Costs of interventions
- Timescales, including life of the asset/policy and return periods on investments
- Resource implications of options against the scale of the risk
- Scale of potential impacts and the affects on people, businesses and communities
- Investments in assets, changes in operational practices and a need to be subjected to cost benefit analysis

2.52 This DAP will be used to ensure the issues raised above are given appropriate consideration across DfT and its Executive Agencies. DfT's climate change adaptation team will encourage officials across DfT to consider these options when developing policy.

2.53 While the Government has responsibilities across the transport sector, much of the infrastructure is owned and managed by the private sector or Executive Agencies. In general, DfT will provide a policy response to identified risks through strategies, guidance and impact assessments. The private sector is responsible for putting management and operational responses in place to deal with the risks and take advantage of benefits and opportunities.

3. Policy priorities

- 3.1** This plan will guide how the DfT coordinates its leadership activities in support of adapting the transport sector as a whole to the potential impacts of climate change. This chapter examines the central policy areas of the Department and then looks at adaptation work in the Department's Executive Agencies and Non-Departmental Public Bodies.
- 3.2** We recognise that there are uncertainties around the degree of climate change that might occur and the type and severity of impacts. The majority of actions proposed in this plan take account of this uncertainty by aiming to develop sector knowledge and processes for identifying risks and vulnerabilities to build a solid evidence base for future adaptation planning.

Central Department policy areas

Rail

- 3.3** DfT works closely with Network Rail, including funding their adaptation research via the Rail Safety and Standards Board (RSSB). Network Rail is aware of the importance of adaptation and is carrying out research in areas such as track specification and drainage.



- 3.4** Current research is examining the effects of rising sea levels and increases in storms on coastal rail lines, e.g. South West Mainline via Dawlish Warren (see case study p.24).
- 3.5** DfT is utilising research from a Rail Research UK study on the impact of temperature change on the railway. DfT will use the findings to stimulate development of adaptation measures to build future resilience.
- 3.6** DfT support and funding helped the Technical Strategy Advisory Group for the UK Railways conclude a technology roadmap which includes an application on adapting to extreme climates. DfT will use the roadmap and prioritisation of adaptation to help implement adaptation measures.

- 3.7** DfT supported and funded RSSB in publishing their Foresight studies on sustainable development which identifies long term planning and provides tools and techniques for the rail industry to determine potential future strategies.

Action 4 Fund research via RSSB to quantify the costs and benefits of climate change and identify appropriate adaptation measures for the rail network.

Action 5 Ask RSSB to assess how passenger comfort and safety may be increasingly threatened on trains during hot weather in the event of train failure and to compare this with other safety risks on the railway.

- 3.8** DfT's Rail Division is working with the rail industry and Highways Agency to look at improving drainage systems including the use of Sustainable Urban Drainage Systems (SUDS) to be more resilient to increased rainfall. Management of the 'soft estate' (verges, embankments and un-trafficked paved areas) could be adapted to increase drainage capacity, reduce runoff, prevent flooding and landslides. The Pitt Review (paragraph 3.38 and case study p.31) is being used to learn lessons and determine how we might deal with future major flood risks and events.

- 3.9** DfT, Network Rail and RSSB are intending to part-fund a project to explore some of the issues for the rail sector identified in the Engineering and Physical Sciences Research Council work on developing future resilient transport networks²⁷.

Case Study: Impact of climate change on the railway

The effects of climate change and in particular, sea level rise, are likely to increase the severity of wave, tide and wind effects on coastal and estuarine defences. It is important to measure such impacts on railway coastal infrastructure so informed management decisions can be made. RSSB worked with Network Rail and the Environment Agency to investigate these impacts in the Dawlish area. Their report²⁸ makes recommendations which are now being used to help identify infrastructure that is vulnerable to extreme weather and will assist the development of engineering strategies to deal with the effects of climate change.



²⁷ <http://gow.epsrc.ac.uk/ViewGrant.aspx?GrantRef=EP/G060894/1>

²⁸ http://www.rssb.co.uk/pdf/reports/research/T643_rpt_final.pdf

Aviation

- 3.10** The aviation sector is largely privately owned and operated. The industry is regulated by the Civil Aviation Authority (CAA) with the policy framework set by the DfT.
- 3.11** The DfT's Aviation Directorate is responsible for the formulation and delivery of UK aviation policy which covers safety, environment, airports, airspace, consumers and regulation. *The Future of Air Transport White Paper*²⁹ 2003 provides a strategic policy framework for the sustainable development of air transport in the UK. Internationally DfT works with the International Civil Aviation Organisation (ICAO), European Civil Aviation Conference (ECAC) and the European Commission and Eurocontrol³⁰.
- 3.12** The Planning Act 2008³¹ makes provision for the Government to produce National Policy Statements (NPS) on nationally significant infrastructure. DfT will prepare a draft NPS on airports for consultation in 2011 (paragraph 4.6) which will have regard to adapting to climate change.
- 3.13** In December 2009 DfT published a consultation on proposals to update the regulatory framework for aviation including proposals to give the CAA a new environmental objective underpinned by guidance setting out the Government's environmental priorities. The CAA, NATS (provider of national air traffic services) and major strategic airports³² are required to report on their climate change risk assessments and adaptation actions under the Climate Change Act (paragraph 2.16).

Action 6 Approach aviation industry organisations (e.g. Airport Operators Association) to establish what, if any, research has been carried out on climate change adaptation.

Action 7 Draft an Airports National Policy Statement that meets the Planning Act 2008 requirement to have regard to adaptation.

Action 8 Develop a new environmental objective within the CAA's future legislative framework. Consider the case for environmental guidance to cover adaptation issues and the fit with the Defra reporting requirement on the CAA under the Climate Change Act.

²⁹ <http://www.dft.gov.uk/about/strategy/whitepapers/air/>

³⁰ The European organisation for the safety of air navigation. The aim is to ensure that all European flights are safe, punctual and that it will not cost too much for the consumer or the planet.

³¹ http://www.opsi.gov.uk/acts/acts2008/ukpga_20080029_en_1

³² These are the seven strategic airports in England identified in DfT's *Delivering a Sustainable Transport System* 2008, and the strategic airports in Scotland, Wales and Northern Ireland.

Regional and Local Transport

- 3.14** DfT works closely with regional and local stakeholders including regional and local Government, delivery partners and third sector bodies. In an increasingly devolved area DfT's role is to support best practice and incentivise delivery through joint working with these partners.
- 3.15** In July 2009 DfT published *Local Transport Plan Guidance*³³ to help local transport authorities to deliver the third round of Local Transport Plans. DfT emphasises the importance of tackling climate change and recommends that local authorities put in place measures to improve resilience of local transport to the impacts of climate change such as flooding and its effects on the deterioration of roads.
- 3.16** Climate change adaptation is already an important issue for many regional and local partners, for example the Alliance Partnership of Derbyshire, Leicestershire and Nottinghamshire County Councils Which contracted Scott Wilson to assess the effects of climate change on highway policies and standards to better inform future network planning.
- 3.17** Of 152 local authorities, 56 have selected National Indicator 188 – Adapting to Climate Change³⁴, as a priority in their Local Area Agreement. This demonstrates the level of support and commitment at the local level for taking action to address climate change adaptation.
- 3.18** Over the next two years DfT will provide each region with funding to enable them to carry out studies on regional challenges. This is an opportunity for the regions to develop intellectual capital on strategic priorities. The DfT has approved a regional study from the East of England on Resilience and Adaptation to consider where there is potential for climate change to affect transport networks and examine the long term mitigation options against these potential impacts.

Action 9 Keep the East of England DaSTs study on resilience and climate change adaptation under close review to better understand impacts on regional transport networks.

- 3.19** In 2009 DfT contributed to a Defra sponsored conference managed by the Transport Planning Society for local transport planners. Climate change adaptation was discussed and a guidance document³⁵ produced. DfT will use this guidance and best practice sharing to support regional and local partners in adapting to climate change.

³³ <http://www.dft.gov.uk/pgr/regional/ltp/guidance/localtransportplans/>

³⁴ <http://www.lga.gov.uk/lga/aio/1382855>

³⁵ http://www.tps.org.uk/files/Main/Library/2009/local_transport_adapting_to_climate_change_briefing.pdf

Regional and Local Authority Major Transport Schemes

- 3.20** The DfT provides funding and guidance³⁶ to local authorities via Regional Funding Allocation for transport proposals over £5million. This is identified as a route to promoting adaptation in transport investments.
- 3.21** The guidance is to be refreshed and published in spring 2010 with a plan to include advice on adaptation. This will raise awareness among local scheme promoters, encouraging them to consider adaptation and resilience when developing local transport.

Action 10 Update DfT *Guidance for local authorities seeking Government funding for major transport schemes* to recommend they take account of climate change adaptation and resilience when planning new transport schemes in their local area.

Road Maintenance

- 3.22** The role of DfT's highway maintenance branch is to manage policy on local roads, bridges and street lighting. It covers local authority highways maintenance capital funding. It manages DfT's research into highways engineering and is the Department's sponsor for the UK Roads Liaison Group and the UK Roads, Bridges and Lighting Board.
- 3.23** DfT does not prescribe how local authorities manage their highways but has influence through working with stakeholders to produce guidance. Current guidance relevant to adaption includes *The effects of climate change on highway pavements and how to minimise them*³⁷ and *Maintaining Pavements in a Changing Climate*³⁸.

Action 11 Work with the UK Roads Liaison Group to update their suite of good practice highway maintenance guidance to reflect climate change adaptation guidance and consider whether specific climate change adaptation chapters should be added. As part of this process consider what research and what professional engineering support is required.

Action 12 Examine how to disseminate emerging knowledge such as that established by the East Midlands Three County Council's Alliance Partnership and any relevant work from the Department's support for regional champions to promote the adoption of Transport Asset Management Planning.

³⁶ <http://www.dft.gov.uk/pgr/regional/ltp/major/majorschemeguide/>

³⁷ http://www.trl.co.uk/online_store/reports_publications/trl_reports/cat_sustainability/report_the_effects_of_climate_change_on_highway_pavements.htm

³⁸ http://www.trl.co.uk/online_store/reports_publications/trl_reports/cat_sustainability/report_the_effects_of_climate_change_on_highway_pavements.htm

Traffic Management

- 3.24** The Traffic Management Act 2004³⁹ placed a network management duty on local traffic authorities in England to do all that is reasonably practicable to manage the network effectively to keep traffic moving. To meet the duty, authorities should establish contingency plans for dealing promptly and effectively with unplanned events such as extremes in weather. This will become increasingly important as we experience more unpredictable and extreme weather. DfT will help ensure risks associated with climate change are recognised as part of the long term process.
- 3.25** DfT's Traffic Management Division issues guidance for local authorities that includes advice on residential street layout, furniture, signs and signals. Whilst the Division is responsible for relevant regulations e.g. The Traffic Signs Regulations and General Directions, local highway authorities are responsible for design standards, management and operation of their roads.

Ports

- 3.26** UK ports are largely privately owned and operated. DfT plays an important role in encouraging and facilitating investment in the sustainable port expansion of port capacity to meet long term demands, sustain economic growth and improve productivity through a reliable and efficient network.



- 3.27** DfT does not subsidise port development and our regulatory role is limited. However, we will use opportunities to ensure ports are aware of the risks from climate change and how they might impact on the long term productivity of the port and wider economic development.
- 3.28** Climate change is one of a range of contingency matters which ports respond to alongside events such as extreme weather (high winds and floods). Ports rely on local transport and operate emergency procedures with local authorities, transport operators and emergency services.
- 3.29** Ports can build on these resilience measures to ensure adaptation responses meet the commercial demands of the port. Partnerships can be developed to ensure adaptation options are adopted across modes.

Action 13 Examine existing contingency plans for access to ports and start dialogue with the relevant sectors.

- 3.30** DfT will liaise with and learn from ports (table 5) that will report on adaptation under the Climate Change Act Reporting Power.

³⁹ http://www.uk-legislation.hmso.gov.uk/acts/acts2004/ukpga_20040018_en_1

Table 5: Ports listed as Reporting Authorities under the Climate Change Act Reporting Power

Ports	Tonnage in Millions - 2008
Bristol	11.5
Dover	24.3
Felixstowe	25.0
Grimsby/Immingham	65.2
Hull	12.2
Liverpool	32.2
Medway	15.0
Milford Haven	35.9
Port of London	53.0
Southampton	41.0
Tees & Hartlepool	45.4

Case study: Port of Workington, Cumbria

In November 2009 Cumbria received a month’s rainfall in 48 hours. The municipally owned Port of Workington faced major problems when around 120,000 metric tonnes of boulders, rocks, trees and silt were flushed in to the port via the River Derwent.

The port had to close because the debris blocked ship’s approaches, collapse a quay, the harbour bridge and tidal harbour and communications were damaged.



The Harbour Master made early contact with DfT Ports Division and provided daily reports. DfT, Defra, the Marine and Fisheries Agency, Highways Agency, DCLG, Cumbria County Council, contractors, insurers and emergency services were all involved in the recovery process.

This quick and coordinated response meant that key operational functions were maintained, danger areas identified and cordoned off. Engineers inspected structures and dredging specialists conducted surveys of the navigation channel and approaches to ensure they could be restored to the correct depths and re-opened as soon as possible.

By 22 December the commercial port had re-opened to shipping along with the tidal harbour. The port remained operational for cargo handling and fully accessible by road from the north and rail from north and south. Following intensive dredging the port was fully open again on 14 January 2010.

Shipping

- 3.31** Shipping is an international industry that is largely privately owned and operated. In the UK it is regulated by the Maritime and Coastguard Agency. The UK is a member of the International Maritime Organization (IMO) which is responsible for developing and maintaining international standards for the shipping industry.
- 3.32** The main concern around climate change for the shipping industry is the expected increase in frequency of extreme weather events. The sector may find that current safety standards and operating procedures are inadequate to deal with these increasingly extreme weather conditions.
- 3.33** To support the sector, DfT has begun to identify the risks that the shipping industry could face (table 3). Over the next two years we intend to work with the industry and the Maritime and Coastguard Agency to explore whether current processes and standards are adequate or whether they will need to be revised to cope with a changing climate.

Action 14 Work with industry and the Maritime and Coastguard Agency to identify whether the greater frequency of extreme weather events is likely to seriously impact the shipping industry, such that current processes and standards might need revising. By the end of 2011 the Department will take a view on whether further work is necessary to assess these impacts in detail.

Maritime Aids to Navigation

- 3.34** The General Lighthouse Authorities (GLAs) of England, Wales, Scotland and Ireland have statutory responsibility to provide maritime aids to navigation around the coasts of the UK and Ireland, including the Isle of Man and Channel Islands.
- 3.35** Through reporting processes the GLAs implement risk assessments of navigation aids that take account of all factors relevant to the effects of climate change such as coastal erosion, shifting navigational channels and the need to re-route ships to take account of changing climatic conditions and their effect on the natural maritime environment.
- 3.36** In recognition of their significant role to navigation and vulnerability to climate impacts such as sea level rise and extreme weather the GLAs for England, Wales and Scotland have been listed as Reporting Authorities under the Climate Change Act Reporting Power (figure 5).

Transport Securities and Contingencies (TRANSEC)

- 3.37** TRANSEC Directorate manages DfT's relationship with the Cabinet Office regarding Government's work on civil contingency planning. The aim is to ensure that the Department and the transport industry are effectively prepared for, able to respond to and recover from, emergencies such as those resulting from natural hazards.

- 3.38** DfT's participation in the Cabinet Office National Risk Assessment and contingency planning processes is important in ensuring that policy responses to emergency scenarios comply with the requirements of the Civil Contingencies Act 2004⁴⁰ and the delivery of the Government's response to the recommendations of the Pitt Review.
- 3.39** The Department aims to meet the challenges from natural hazards and other severe events such as terrorism over the next decade through effective delivery of a secure and resilient transport system.
- 3.40** As security regulator for regulated transport industries⁴¹ TRANSEC devises, reviews and enforces security measures that take account of the nature and magnitude of current threats. Responsibility for delivery and payment of security measures rests with the regulated industries.
- 3.41** Regulated measures are based on vulnerabilities relevant to infrastructure and facilities at the time they come into force. It could be that vulnerability changes as a result of adaptation to climate change. Any such change in vulnerability will need to be taken into account in reviewing security measures.

Action 15 Assess modal entries in the 2010 DfT Adaptation Plan in order to establish their implications for current security regimes.

Case Study: The Pitt Review

Following the 2007 floods Sir Michael Pitt conducted an independent review to appraise flood risk management. He made recommendations and identified six themes:



1. Knowing when and where it will flood
2. Improved planning and reducing the risk of flooding and its impact
3. Being rescued and cared for in an emergency
4. Maintaining power and water supplies and protecting essential services
5. Better advice and helping people to protect their families and homes
6. Staying healthy and speeding up recovery.

DfT has already begun action to help manage flood risk impacts and has taken this further in response to the Pitt Review.

The Highways Agency (HA) has already identified motorways and trunk roads vulnerable to flooding and has recruited emergency planning managers. The HA launched the National Flood Register in 2009 and is undertaking schemes to provide better emergency access to motorways. The

⁴⁰ http://www.opsi.gov.uk/acts/acts2004/ukpga_20040036_en_1

⁴¹ Specifically aviation, maritime, rail, light rail, Channel Tunnel and transport of dangerous goods, and the international transport of cargo and catering.

HA responded to the Pitt Review by working through Local Resilience Forums to further consider motorway and trunk road vulnerability. As a result they are improving their Emergency Customer Welfare Strategy to provide delivery of basic emergency welfare to stranded motorists.

The Ports National Policy Statement Appraisal of Sustainability has used the Pitt Review through referencing its lessons learnt which should be used when discussing future development of port related infrastructure.

Executive Agencies

- 3.42** The Department has seven Executive Agencies (Annex C) which are central to delivering the Government's transport priorities and services and DfT's DSOs.
- 3.43** Alongside the development of this DAP, work has begun to start dialogue with the agencies about embedding adaptation within their policies and operations. The Highways Agency and Maritime and Coastguard Agency are already advanced in this work and have volunteered to report to Parliament via the Climate Change Act Reporting Power. DfT's other agencies have less obvious links to adaptation so it has not yet been identified as a strategic priority. However, the Department's adaptation team will engage with them to discuss adaptation issues and share progress on the DAP.

Strategic Road Network - Highways Agency (HA)⁴²

- 3.44** The HA aims to support DfT's objective 'transport that works for everyone' through their aim of 'safe roads, reliable journeys, informed travellers'. The HA also has an international role in building good relations and sharing expertise with overseas road administrations.



- 3.45** In January 2010 the HA published its Adaptation Strategy⁴³ which presents a risk assessment to enable all areas of HA business to examine climate risks. The 2002 climate projections were used to inform the strategy so it will now be updated using the 2009 data (UKCP09). Amongst other things it recommends amending road specifications so they are more resilient to the expected impacts of climate change.

⁴² <http://www.highways.gov.uk>

⁴³ <http://www.highways.gov.uk/aboutus/24180.aspx>

Action 16 Ensure all areas of HA business have considered the possible risks of a changing climate. Use the latest climate science from the UK Climate Impacts Programme to further inform adaptation work and contribute to internal guidance to ensure that the changing climate is factored into new HA advice, technical standards and specifications.

Action 17 Revise the climate modelling projections used in the adaptation strategy using the latest science from the UK Climate Impacts Programme to determine risks, implications and inform selection of adaptation measures.

- 3.46** The HA is a member of the European research collaboration ERA-NET Road⁴⁴ which will deliver a portfolio of climate change projects (Road Owners Getting to Grips with Climate Change) including risk management, storm water prevention, pavement performance and an index to assess adaptation requirements.
- 3.47** Flooding is a high priority for the HA so it is looking to improve drainage systems across the network, working with DfT's Rail Division and Network Rail on Sustainable Urban Drainage Systems (SUDS) (paragraph 3.8).
- 3.48** Despite not having a legal requirement to report to Parliament the HA has volunteered to produce an adaptation report under the Climate Change Act Reporting Power. An invitation was sent in February 2010 and the HA has up to 22 months to produce its report.
- 3.49** Effective operation of the road network is influenced by driver behaviour. To help drivers HA provides seasonal driving guidance, such as winter driving advice⁴⁵ which recommends how to drive in fog, snow, ice and rain and what to carry in your vehicle. With the onset of more extreme weather it is important the HA keeps drivers aware of their responsibilities through up to date advice.

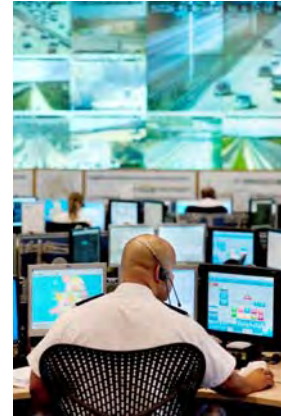
Action 18 Ensure there are regular revisions of the seasonal driving advice and use the climate scenarios to determine how driving behaviour might change in the future and what HA will need to do to ensure continued safety on their network.

⁴⁴ <http://www.eranetroad.org/>

⁴⁵ <http://www.highways.gov.uk/knowledge/2244.aspx>

Case Study: Highways Agency Severe Weather Plan

The Highways Agency has a Severe Weather Plan in place with all its Service Providers. There are direct links to the Met Office through the National Traffic Control Centre at Quinton to anticipate severe weather and the potential of flooding. Regional Traffic Control Centres and the Traffic Officer service together with the emergency services provide the capability to put in place plans to deal operationally with specific severe weather threats.



Service Providers provide the necessary expertise to examine and inspect particular parts of the Agency's infrastructure – bridges, pavements, drainage, earthworks and ancillary facilities and equipment. Risk and resilience planning is undertaken and communicated into wider Government initiatives; this is coupled with scenario planning to develop appropriate contingency measures.

Maritime and Coastguard Agency (MCA)⁴⁶

- 3.50** The MCA delivers and implements the Government's maritime safety strategy through their aim 'safer lives, safer ships, cleaner seas'.
- 3.51** The MCA has started to develop its high level adaptation plan which recognises the challenges presented by the anticipated impacts of climate change. The aim is to describe what the MCA is doing to respond to the challenges so it can continue to provide its core services.
- 3.52** The MCA adaptation to climate change team will meet regularly to develop its plan, review progress and offer assurances and recommendations to the Executive Board and Senior Management Team.
- 3.53** Despite not having a legal requirement to report to Parliament the MCA has volunteered to produce an adaptation report under the Climate Change Act Reporting Power. An invitation was sent in February 2010 and the MCA has up to 22 months to respond.
- 3.54** The MCA will use this opportunity to ensure climate change is taken into account in planning processes, including Business (and Business Continuity) Plans. The MCA needs to ensure its infrastructure will allow



⁴⁶ <http://www.mcga.gov.uk>

co-ordination of emergency responses and that safety checks can be carried out on ships. The MCA will examine the potential for increased demand on the volunteer Coastguard Rescue Service inland in response to extreme weather events such as the support it provided during the 2007 floods (see case study).

Action 19 Ensure Business Continuity and Business Plans take account of adaptation. Ensure estate requirements for the future organisation of the Coastguard take account of climate change. Clarify the role of the Coastguard Rescue Service in supporting emergency responses to extreme weather inland.

Case study: Volunteer Coastguard Rescue Service

The Volunteer Coastguard Rescue Service and the Coastguard Search and Rescue helicopters provided practical support in the exceptional weather events of 2005 when there was flooding in Carlisle, in 2007 when parts of Gloucester flooded and in 2009 when there were floods in Cumbria. They also provided support around the UK during the January 2010 snow and ice events. Coastguard Co-ordination centres also provided communications to support response to these extreme weather events.



They also provided support around the UK during the January 2010 snow and ice events. Coastguard Co-ordination centres also provided communications to support response to these extreme weather events.

Non-Departmental Public Bodies

3.55 Non-Departmental Public Bodies (NDPBs) (Annex D) are not an integral part of DfT but the Department sponsors them for their delivery in specific transport areas and Ministers are responsible to Parliament for their activities as summarised in DfT's Annual Report⁴⁷.

3.56 Some of these NDPBs will report on adaptation under the Climate Change Act's Reporting Power (paragraph 2.15). In all cases DfT's adaptation team will ensure that sponsor teams within DfT raise the profile of adaptation issues with the organisations for which they are responsible.

Action 20 EPD to liaise with the DfT's Agencies and NDPBs to work on adapting to climate change. Invite representatives to the Departmental steering group and ensure they contribute to progress DfT's adaptation work.

⁴⁷ <http://www.dft.gov.uk/about/publications/apr/ar2009/>

4. Capacity and capability

- 4.1** In spring 2009 the National Audit Office (NAO) carried out a review⁴⁸ for the Environmental Audit Committee (EAC) on central Government's work on domestic climate change adaptation. The results were published in July with DfT presenting a positive picture of adaptation actions already under way (figure 5).

Figure 5: Key points from DfT's first adaptation self-assessment

- Work has begun to identify potential risks to DfT's objectives as it is recognised that the reliability and efficient operation of transport may be vulnerable to climate change
- Action is being taken to mitigate the impacts of some identified risks e.g. increased temperatures on roads and rail
- Good awareness and understanding of the need for leadership, policy, strategy, people, partnerships and processes for adaptation e.g. establishment of an internal adaptation steering group
- Highways Agency is producing an Adaptation Strategy
- DfT is working closely with the rail industry on their adaptation work
- DfT is encouraging local authorities to consider climate risks in transport planning through Local Transport Planning Guidance
- Rail Division and Highways Agency working closely with Network Rail on drainage issues

- 4.2** DfT's Environment Directorate is working to ensure successful delivery of the Department's objectives through developing our capability and capacity to identify, assess and manage risks from climate change. Using the NAO survey criteria we have looked at recent activity and identified actions for the next two years to ensure DfT is better placed to embed adaptation in policy and decision making processes.

Leadership

- 4.3** DfT's climate change work is led by the Environment and International Directorate (ENI) and managed by the Environment Policy and Delivery Division (EPD). EPD has built strong leadership for adaptation through allocation of ENI's Director as Senior Owner and through establishment of an internal adaptation team (table 6).

⁴⁸ http://www.nao.org.uk/publications/0809/adapting_to_climate_change.aspx

Table 6: DfT's adaptation team

Role	Responsibility
Senior Owner: ENI Director	Senior responsibility for the DAP, adaptation champion within DfT and with external stakeholders.
Divisional Manager: EPD	Oversight and senior decision making.
Team Manager: EPD	Overall lead of the DAP. DfT representative at cross-Government working groups.
Project Manager: EPD	Coordination of evidence and drafting of the DAP. DfT representative at cross Government working groups.
Team Support: EPD	Evidence gathering and support for the DAP.

4.4 Responsibility for overall coordination of the action plan lies with the team manager who is supported by the adaptation working lead/project manager. Over the period of this DAP their aim is to strengthen the profile of adaptation within the Department by involving senior management and liaising with policy leads.

Action 21 Ensure DfT's Board is sufficiently aware of adaptation issues and risks and that formal ownership of these is taken by relevant senior officials.

4.5 DfT's Carbon Reduction Delivery Group manages the carbon reduction programme and provides advice on adaptation. It is chaired by the Senior Owner for adaptation and mitigation (ENI Director) and composed of key Directors with links to the DfT Board. The group will help ensure actions within the DAP are delivered through championing the adaptation agenda within their areas of responsibility.

Policy strategy

4.6 Some policy areas are working to embed adaptation in decision making through use of processes such as National Policy Statements (figure 7). The Highways Agency has published its adaptation strategy to ensure adaptation is taken into account across all areas of its business and the Maritime and Coastguard Agency is working to develop a strategy to embed adaptation as standard practice. Such activities will be promoted and encouraged.

Figure 7: DfT led National Policy Statements

National Policy Statements (NPS) are an important part of reforms to the planning system for major infrastructure introduced by the Planning Act 2008. The Act includes a duty on Ministers to ensure that the statements are drawn up with the objective of contributing to the achievement of sustainable development and to have regard to the desirability of mitigating and adapting to climate change.

The **Ports NPS**¹ recognises that climate change is already a reality and expects ports to fulfil adaptation requirements. Climate risks for ports are identified as rising sea levels, increasing temperatures, more severe weather

and higher winds. It is anticipated that these impacts will affect the safe operation of UK ports and their susceptibility to flooding.

The **National Networks NPS** will set the need for nationally significant infrastructure on the strategic road network, rail network and rail freight interchanges over a certain size. In line with DfT's DSOs the NPS will set out our objectives for sustainable development, mitigation and adaptation to climate change. The inclusion of adaptation will ensure that developments on national networks address, avoid, mitigate or compensate for the adverse impacts of climate change.

DfT plans to publish a draft **Airports NPS** in 2011. As with all NPSs it will be subject to an appraisal of sustainability, public consultation and parliamentary scrutiny. Ministers have committed to the Airports NPS being location specific so it will identify locations which the Government considers are suitable for nationally significant infrastructure development. Any future capacity growth supported by the NPS will be consistent with DfT's climate change goals.

- 4.7** The Department recognises that climate change needs to be embedded as one of the key drivers behind all policy making. This will allow risks to be managed from the outset and opportunities utilised for the benefit of the Department and its stakeholders.
- 4.8** To achieve this we will look at how we can use HMT's Green Book⁴⁹ supplementary guidance Accounting for the Effects of Climate Change⁵⁰ for assessing climate impacts in new policy strategies. We hope this will allow us to develop a means of identifying the costs and benefits of measures to address impacts on transport proposals and incorporate a methodology into the appraisal process.

People, skills and knowledge

- 4.9** Communication is fundamental to the development and delivery of the DAP so engaging with internal and external stakeholders (table 7) will be essential. Over the next two years EPD's adaptation team will engage with and bring together stakeholders to demonstrate leadership and raise awareness across the transport sector.

⁴⁹ http://www.hm-treasury.gov.uk/data_greenbook_index.htm

⁵⁰ http://www.hm-treasury.gov.uk/data_greenbook_supguidance.htm#Adaptation_to_Climate_Change

Table 7: DfT’s key stakeholders for delivering climate change adaptation

Sector	Stakeholders
DfT	Key policy areas e.g. road, rail, aviation, ports, shipping, regional and local Government, security
DfT Executive Agencies	Highways Agency, Maritime and Coastguard Agency, Vehicle Operator Services Agency, Driver and Vehicle Licensing Agency, Driving Standards Agency, Vehicle Certification Agency, Government Car Despatch Agency
DfT Non-Departmental Public Bodies and sponsored organisations	See annex D for list of DfT's NDPBs Regional Development Agencies
Other Government Departments	Key interdependencies e.g. with Defra, DECC, Home Office, Cabinet Office
Local Government	Local authorities and relevant bodies such as Local Highway Organisations
Devolved Administrations	Wales, Scotland and Northern Ireland
Private Sector	Businesses, communities, general public

4.10 EPD established a DfT adaptation steering group following enactment of the Climate Change Act. Made up of representatives from different policy areas and Executive Agencies the group helped shape this DAP and will aid delivery of adaptation action across the Department.

Action 22 Adaptation team to draw up a plan for engaging with stakeholders inside and outside the Department and its agencies.

4.11 EPD's adaptation team is responsible for disseminating adaptation knowledge, skills and best practice across the Department and associated industry bodies. This work began when EPD organised a conference and training event for the transport sector to present the 2009 Climate Projections (UKCP09).

4.12 Developing the right skills is an important element of adaptation, and is being considered alongside the requirements for low carbon skills. The skills for delivery of effective adaptation are likely to be relevant to all transport modes, and be specialisations or extensions of existing technical disciplines such as climate and environmental science, risk management, surveying, planning and engineering.

Action 23 Identify the Department’s knowledge of climate change risks and areas that have used tools such as UKCP09. Close any knowledge gaps by encouraging use of tools to identify risks and start the process of identifying adaptation options.

Working with the Devolved Administrations

- 4.13** Adapting to climate change is a devolved matter so it is the responsibility of Devolved Administrations to develop their own approach to adaptation. DfT's work will cover reserved matters of domestic transport policy. However, because transport sectors are both devolved and reserved some DfT adaptation actions will be implemented across some of the Devolved Administrations. DfT will work to ensure there is a combined and coherent approach to adapting transport across the UK.

Process

- 4.14** The Department aims to ensure that the risks associated with climate change are taken into account across all policy areas and embedded in consideration of investment proposals. The Department will use the National Risk Assessment and *National Risk Register*⁵¹ to enhance the protection of the transport element of the UK's Critical National Infrastructure from natural hazards.
- 4.15** The Department is exploring how best to use the various guidance documents being created around the issue of adapting to climate change. These include HMT's *Green Book Supplementary Guidance Accounting for the Effects of Climate Change*⁵² and the Office of Government Commerce's (OGC) forthcoming procurement guidance *Adapting Your Procurement*.
- 4.16** Integrated Transport Economics and Appraisal (ITEA) Division is the Department's lead for managing transport appraisal processes, transport modelling and providing advice for transport infrastructure investment proposals. ITEA produces business case guidance and the New Approach to Appraisal (NATA) guidance which should be seen as a requirement for all transport projects that require Government approval and used as best practice for other new infrastructure proposals. The guidance covers the economy, environment and social welfare issues which have to be incorporated in all proposals. We will consider how best to ensure adaptation is adequately considered in these processes.
- 4.17** Environmental issues are a key part of transport decision making and form a significant element of the NATA appraisal process. There is currently a lack of case studies that include adaptation which would be useful to ITEA to inform modelling and future guidance. Adaptation is an area that ITEA will examine further.

Action 24 Consider how we might revise ITEA's Uncertainty Guidance to include the impacts of climate change and the effects of possible adaptation measures on new transport infrastructure.

⁵¹ http://www.cabinetoffice.gov.uk/reports/national_risk_register.aspx

⁵² http://www.hm-treasury.gov.uk/data_greenbook_supguidance.htm#Adaptation_to_Climate_Change

Partnership

- 4.18** DfT works in partnerships with other Government Departments, Executive Agencies and private sector organisations for most policy areas. Examples of partnerships that have been established for adaptation include:
- Highways Agency and DfT regarding the HA adaptation strategy
 - Local authorities and DfT regarding guidance for transport planning
 - Network Rail, RSSB and the Office of the Rail Regulator (ORR) regarding DfT's support, funding and management of a forum to discuss adapting the rail network to climate change
 - DfT, the rail industry and Highways Agency regarding improved drainage systems for projected increases in rainfall (paragraph 3.8)
- 4.19** EPD will maintain these partnerships and start communications with the agencies and NDPBs who are not already working on adaptation. This DAP starts to identify links and common issues with other Government Departments (Chapter 6). There will be work to further define these and strengthen communications with the relevant Departments.
- 4.20** DfT already works closely with local Government. We are currently developing a Capability and Engagement Strategy to improve how we engage with local authorities, create a more consistent approach to how we work with them and enhance their transport capabilities. The adaptation team will utilise the results of this work to help build partnerships and this plan will help enhance this engagement.

Procurement

- 4.21** DfT delivers its procurement functions in line with the OGC's policy and guidance goals:
- Delivering value for money from third party spend
 - Delivering projects to time, quality and cost, realising benefits
 - Getting the best from Government estate
 - Delivering sustainable procurement and sustainable operations on the Government estate
 - Supporting the delivery of Government policy goals
 - Improving central Government capability in procurement, project and programme management and estates
- 4.22** DfT works closely with the OGC on areas of cross-Government interest such as collaboration to get the best deals. Government published the *UK Sustainable Procurement Action Plan*⁵³ (2007) which DfT is using to improve its own performance and capability.

⁵³ http://www.eauc.org.uk/uk_government_sustainable_procurement_action_plan

- 4.23** The Department has a *Sustainable Procurement Strategy*⁵⁴ documenting DfT's approach to addressing Government's sustainability targets and once published, will also make use of the new OGC guidance *Adapting Your Procurement*. How to use the public procurement process to ensure public buildings, infrastructure and assets will be fit for purpose in tomorrow's climate.
- 4.24** DfT will aim to understand which of its procurement areas are most vulnerable to the impacts of climate change and ensure these are appropriately addressed in its policy and procedures.
- 4.25** In 2000 the Carbon Disclosure Project⁵⁵ (CDP) was launched to collect and distribute information on greenhouse gas emissions and climate change strategies from organisations worldwide. DfT took part in CDP in 2009 as part of a collaborative venture, facilitated by OGC.

Action 25 Identify high impact areas, discuss potential action that procurement can take with stakeholders and ensure these are fully covered in existing sustainable procurement guidance.

Action 26 Ensure all Tier 1 suppliers in our high impact areas are invited to participate in the Carbon Disclosure Project.

⁵⁴ <http://www.dft.gov.uk/about/procurement/sustainable/>

⁵⁵ <https://www.cdproject.net/en-US/Pages/HomePage.aspx>

5. Adapting our estates

- 5.1** DfT and its agencies operate a wide and varied estate covering both administrative and operational facilities. Adaptation requirements will need to be considered across the whole estate to ensure we operate a safe working environment and maintain functionality of our assets.
- 5.2** Resilience of the operational estate will be covered under the relevant policy area's such as road, rail, ports, aviation, the HA and MCA.
- 5.3** Resilience of the administrative estate will be covered by the Department's central estate team. We will use the proposed Adaptation Indicator for the Government Estate - *Planning to Adapt to Climate Change* which has a scale for levels of achievement in preparing this part of our estate. We have initially assessed our position at level 0 - getting started.

The DfT estate

- 5.4** The DfT estate comprises about 90,000 assets of which the great majority relate to the operational highway and some 4,900 are British Rail Board Residuary (BRBR) assets. The main elements of our estate:
- **DfT Headquarters** - Great Minster House, Southside and 55 Victoria Street in London. Ashdown House and the Marine, Air and Rail Accident Investigation Branches outside London
 - **Civil Estate Offices** - Motoring and Freight Services (MFS) Group comprising DSA, DVLA, GCDA, VCA and VOSA. The HA, MCA, British Transport Police (BTP), Passenger Focus and GCDA
 - **Operational Estate** - Channel Tunnel Rail Link, International Maritime Organisation (IMO), MFS Group, HA, BTP and MCA
 - **Non-Operational Estate** - Channel Tunnel Rail Link, BRBR, HA, MCA and police

Action to date

- 5.5** In the past estate location has reflected the needs of customers e.g. DSA estate is spread across the country to offer a local service. The Department's forward planning in the MFS Group has identified shared locations for service delivery which involve the rationalisation of our estate.
- 5.6** The DfT is finalising a Geographical Information System (GIS) based estates management system which maps the location of all our land holdings and offers the potential for examining geographical risks associated with events such as flooding.

- 5.7** DfT is currently reviewing asset management at a strategic level to ensure capital investment and maintenance of core assets are considered together. As part of this process DfT will review the planning and preparedness for the impact of climate change on DfT property.

High level adaptation risks

- 5.8** We envisage key adaptation challenges relating to two main areas:
- Physical risks posed to the integrity of our estate and infrastructure from extremes in temperature, rainfall and sea level rise
 - Risks to people from the effects of extremes in weather either impeding communication routes or by affecting ambient temperatures causing distress or other associated safety hazards

Future action

- 5.9** Some specific challenges we will face are:
- How to provide ongoing adequate provision of climate control (e.g. cooling) in offices and buildings and do this in a low carbon way
 - Resilience to flooding and sea level rise in vulnerable locations
 - Ensuring appropriate access to isolated locations in severe weather. Some of the agencies have facilities located in particularly vulnerable or exposed locations such as the MCA but it is anticipated that these issues will be incorporated as part of their adaptation planning
- 5.10** For new properties DfT develops or leases we will consider the implications of climate change and make sure the risks from physical stress and to people are understood and appropriately mitigated.

Action 27 Ensure that all new major estates investments planned up to March 2012 factor in appropriate consideration for climate change.

- 5.11** We will be monitoring the joint ACC/OGC Adapting the Government estates project and await the outcome and recommendations. These will help us mainstream adaptation requirements, either through the revised SOGE framework or OGC's High Performing Property Programme.

Action 28 Issue guidance to DfT sponsored bodies requesting them to show how they will deal with the impacts of climate change on their estate and to incorporate climate change impacts on the DfT estate within the SOGE and Property Asset Management Plan returns.

Action 29 Use the DfT GIS estates management system to identify key areas of geographical vulnerability on the estate.

6. Interdependencies

- 6.1** The Department recognises that transport is central to the overall resilience of many sectors. Weather events are unlikely to affect one sector in isolation so it is important we understand the interdependencies between sectors and address risks in a coordinated manner. Over the course of this DAP DfT will build on work started (table 8) to identify the complex links where impacts on one sector could affect another.
- 6.2** Critical infrastructure is often clustered in close proximity which can concentrate impacts and impede contingency plans and responses to extreme or ‘shock’ events, for example, Yorkshire and Humber which includes ports, power stations, oil refineries and pipelines. The 2009 floods in Cumbria highlighted the area's vulnerability when settlements, communications, roads, rail lines and a sea port were disrupted.
- 6.3** The Department needs to ensure that present and future policies recognise their interdependencies with other sectors and consider risks that may be exacerbated by climate change. For example, the drive for electric vehicles must take account of its reliance on electricity supply as must the rail network as it becomes increasingly electrified.
- 6.4** As sectors begin to implement adaptation measures there could be knock-on impacts for others, such as a change in agricultural practice next to a road or rail route that could affect the rate of water runoff onto adjacent road or rail estate. An increased use of air conditioning in vehicles could increase the potential escape of fluorinated gases (F-gases) which have a high global warming potential and could impact on emissions reduction/mitigation measures (see the DfT Carbon Reduction Delivery Plan for more detail on our policies to reduce these emissions). Joined up working is essential to ensure we deliver effective adaptation across all sectors.
- 6.5** Recognition of interdependencies also helps capitalise on opportunities such as tourism and the provision of appropriate transport to meet increased seasonal demand.

Table 8: Interdependencies by sectors

Climate impact on:	Implications	Dependencies or Interconnectivities
Transport sector	Failure or loss of transport networks means movement of goods, people and services in affected areas fail and may have wide spread implications. It may also reduce recovery time.	Energy - DECC Health - DH Education - DCSF Emergency services Prisons – MoJ Businesses - BIS Food & agriculture - Defra
Telecoms sector	Loss of services and networks causes breakdown of operating systems.	Transport – DfT Emergency services Health - DH
Energy sector	Loss of electricity will affect most modes of transport e.g. electrified trains, rail and road signals, electric cars.	Transport – DfT All others

6.6 Over the next two years DfT will continue to strengthen links with other Government Departments to ensure that adaptation action taken in one sector does not negatively impact on another or compromise the achievement of DSOs.

Action 30 Collect outputs from the Defra interdependencies workshop held in December 2009 and act upon specific recommendations for collaborative working with other Government Departments.

Action 31 Climate Change strategy team is to maintain effective working relationships with other key Government Departments and remain a proactive member of the ACC Domestic Adaptation Programme Board.

Annex A: Glossary

Adaptation to climate change	Adapting behaviours in all areas of our lives to respond to climatic change to protect against negative impacts and take advantage of benefits.
Adaptation - IPCC definition	“Any adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects which moderates, harms or exploits beneficial opportunities”.
Adaptive capacity	The ability to adjust to climate change risks (including variability and extremes).
Climate	Climate in a narrow sense is defined as the average weather or more rigorously, as its statistical description in terms of the mean and variability of surface variables such as temperature, precipitation and wind over a period of time. Climate in a wider sense is the state, including a statistical description, of the climate system (IPCC, 2007).
Climate Change	A change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural processes or to persistent human induced changes in the composition of the atmosphere or in land use.
Greenhouse Gases (GHG)	The most important greenhouse gases currently accumulating in the atmosphere as a result of human activities are carbon dioxide, methane, nitrous oxide, sulphur hexafluoride and two groups of industrial gases known as hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). These industrial gases are part of a longer list of greenhouse gases covered by the Kyoto Protocol which set commitments for developed countries to reduce greenhouse gas emissions for the period 2008 to 2012.
Hazard	A hazard is something with the potential to cause risk events and therefore, adverse consequences.
Local Area Agreement	Local Area Agreements (LAA) set out the priorities for a local area agreed between central Government and a local area (the Local Authority and Local Strategic Partnership) and other key partners at the local level. http://www.communities.gov.uk/localgovernment/performanceframeworkpartnerships/localareaagreements/
Mitigation	Taking action to tackle the causes of climate change, reducing concentrations of greenhouse gases in the atmosphere.
Risk	An event that is a possible but not certain outcome of a particular circumstance and is unwanted or has unwanted consequences. Risk is typically measured as a suitable combination (often the product) of a measure of likelihood and a measure of consequence.
Regional Development Agencies	First launched in 1999 with the aim of spreading economic prosperity and opportunity to everyone in the nine regions of England. http://www.englandsrdas.com/
Sustainable development	The aim of sustainable development is to enable all people throughout the world to satisfy their basic need and enjoy a better quality of life without compromising the quality of life of future generations. (http://www.defra.gov.uk/sustainable/government/what/index.htm)
Vulnerability	The extent to which an activity is susceptible to, or affected by, climate change including variability and extremes.
Weather	The conditions in the atmosphere and the air around us at a particular moment in time, including temperature, precipitation, sun, fog, clouds and wind.

Annex B: Abbreviations

ACC	Government's Adapting to Climate Change Programme
ASC	Adaptation Sub Committee (of the Committee on Climate Change)
BIS	Department for Business Innovation and Skills
BRBR	British Rail Board Residuary
CAA	Civil Aviation Authority
CCC	Committee on Climate Change
CCRA	Climate Change Risk Assessment
CLG	Communities and Local Government
CO	Cabinet Office
DAP	Departmental Adaptation Plan
DaSTS	<i>Delivering a Sustainable Transport System</i> (strategy published in 2008)
DCMS	Department for Culture, Media and Sport
DCLG	Department of Communities and Local Government
DCSF	Department for Children, Schools and Families
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DfID	Department for International Development
DfT	Department for Transport
DH	Department of Health
DSA	Driving Standards Agency
DSO	Departmental Strategic Objective
DVLA	Driver and Vehicle Licensing Agency
DWP	Department for Work and Pensions
EAC	Environmental Audit Committee
EPD	Environment Policy and Delivery (a division within DfT)
FCO	Foreign and Commonwealth Office
GLA	General Lighthouse Authority
GCDA	Government Car and Despatch Agency
GHG	Greenhouse Gases
GIS	Geographical Information System
HA	Highways Agency
HMT	H M Treasury
HO	Home Office
ICAO	International Civil Aviation Organisation
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
ITEA	Integrated Transport Economic and Appraisal (a division within DfT)
MCA	Marine and Coastguard Agency
MFS	Motoring and Freight Services (comprises 5 Executive Agencies and 3 DfT Directorates) http://www.dsa.gov.uk/Category.asp?cat=654
MoD	Ministry of Defence
MoJ	Ministry of Justice
NAO	National Audit Office
NATA	New Approach to Appraisal
NATS	Provider of air traffic control services
NDPBs	Non-Departmental Public Bodies

NGO	Non-Governmental Organisation
NPS	National Policy Statements
OGC	Office of Government Commerce
OGD	Other Government Department
ORR	Office of the Rail Regulator
PFI	Private Finance Initiative
RDA	Regional Development Agencies
RFA	Regional Funding Allocation
RSSB	Rail Safety and Standards Board
SDAP	Sustainable Development Action Plan
SOGE	Sustainable Operations on the Government Estate
TRANSEC	Transport Security and Contingencies Directorate
UKCIP	UK Climate Impacts Programme
UKCP	UK Climate Projections
VCA	Vehicle Certification Agency
VOSA	Vehicle Operating and Standards Agency

Annex C: DfT Executive Agencies

Highways Agency (HA)

<http://www.highways.gov.uk/default.aspx>

The HA is responsible for operating, maintaining and improving the strategic road network (motorways and trunk roads) in England on behalf of the Secretary of State for Transport. The HA has a major role to play in the delivery of the Government's Ten Year Plan for Transport. The HA manages traffic, tackles congestion, informs road users, improves safety and minimises adverse impacts on the environment.

Maritime and Coastguard Agency

<http://www.mcga.gov.uk/c4mca/mcga07-home>

The MCA is responsible, throughout the UK, for implementing the Government's maritime safety policy. This includes co-ordinating search and rescue at sea through Her Majesty's Coastguard and checking that ships meet UK and international safety rules. The Agency works to prevent the loss of lives at the coast and at sea, ensure that ships are safe and prevent coastal pollution.

Vehicle Operator Services Agency (VOSA)

<http://www.vosa.gov.uk>

VOSA has a wide range of responsibilities including working with Traffic Commissioners to improve road safety and the environment. They process lorry and bus licenses, register bus services, operate testing schemes for all vehicles including MOTs, enforce legislation for vehicle standards, driving hours and licensing requirements, provide training and advice for commercial operators and investigate accidents, defects and recalls.

Driver and Vehicle Licensing Agency (DVLA)

<http://www.dft.gov.uk/dvla>

DVLA is responsible for maintaining records of all drivers and vehicles entitled to travel on public roads. It is responsible for driver licensing, the collection of Vehicle Excise Duty and vehicle registration policy for Great Britain. DVLA contributes to Government policies and objectives, such as an improved environment and modernising customer focused services.

Driving Standards Agency (DSA)

<http://www.dsa.gov.uk>

The DSA is responsible for promoting road safety in Great Britain by improving driving standards, testing drivers and driving instructors. They contribute to the Government's target for reducing road casualties set in the road safety strategy Tomorrow's Roads – Safer for everyone.

Vehicle Certification Agency (VCA)

<http://www.vca.gov.uk>

The VCA is responsible for testing and certifying new vehicles and components against European and United Nations safety and environmental performance standards. VCA certifies manufacturers for meeting international quality, environmental and safety standards. They publish data on emissions, fuel consumption and noise helping the public decide which vehicles to buy and enables testing of vehicle emissions. This contributes information to the DfT and Inland Revenue for applying Vehicle Excise Duty linked to fuel consumption.

Government Car and Despatch Agency (GCDA)

<http://www.dft.gov.uk/gcda>

The GCDA is a non-profit making Agency which aims to be the first choice supplier of secure transport, distribution and mail services to Government, the wider public sector and other appropriate customers.

Annex D: Non-Departmental Public Bodies

British Transport Police Authority
Passenger Focus
Railway Heritage Committee
Renewable Fuels Agency
Commission for Integrated Transport
Disabled Persons Transport Advisory Committee
The Traffic Commissioners
Northern Lighthouse Board
Trinity House
Cycling England

For more information on the DfT's NDPBs please see the following pages on the Department's website:

<http://www.dft.gov.uk/about/publications/apr/ar2008/>

<http://www.dft.gov.uk/about/howthedftworks/ndpb/aboutthedftnondepartmentalpu1000>

Annex E: Policy Action Table

Ref.	Threats from climate change	Risks and implications	DSO	Planned action	Deliverables or success measures	Senior Owner	Dates / Milestones	Link to OGDs and stakeholders
1	Whole range of climate change threats - see table 3, page 18	Whole range of climate change implications - see table 3 page 18	1, 3, 4, 5	Engage with transport stakeholders identified as Reporting Authorities to provide support and guidance through production of their reports. Assist the ACC Programme team in reviewing the reports and reflect priority actions in DfT's future DAPs.	Production of transport sector reports that are fit for purpose and submitted to Parliament on time.	Leadership by the Environment Policy Division and support to Reporting Authorities by relevant policy areas	From March 2010 for up to 22 months depending on deadline given to each organisation	Transport Reporting Authorities. Defra.
2	Whole range of climate change threats - see table 3, page 18	Whole range of climate change implications - see table 3 page 18	All	Devise indicators to measure progress against DAP actions. Provide evidence to Defra for the national adaptation indicator set.	Production of DfT adaptation indicator set/performance measures.	Environment Policy Division Adaptation Team	July 2010	Defra
3	Whole range of climate change threats - see table 3, page 18	Whole range of climate change implications - see table 3 page 18	All	Embed climate change risks into standard DfT risk assessment processes.	Adaptation to climate change requirements are embedded in DfT's risk management processes.	Environment Policy Division Adaptation Team. DfT Risk Management Team	March 2011	Cabinet Office

4	Increased temperatures, rainfall and frequency of damaging wind (if data available)	Reduced asset condition & network availability &/or functionality.	1, 3, 4	Fund research via RSSB to quantify the costs and benefits of climate change and identify appropriate adaptation measures for the rail network.	Research provides sufficient evidence to enable DfT to include appropriate adaptation measures in the rail High Level Outputs Specification 2014-2019. Research confirms assets that will not be impacted by climate change.	Rail Division	Contract let by RSSB - April 2010 Interim report to steering group - Jan. 2011 Consider appropriate amount of adaptation funding for Network Rail works in HLOS - 2014-2019 HLOS2 adaptation works complete - March 2019	Network Rail. ORR. RSSB. Met Office (for wind data)
5	Increased temperatures, rainfall and frequency of damaging wind (if data available)	Increasing safety risks to passengers.	3, 4, 5	Ask RSSB to assess how passenger comfort and safety may be increasingly threatened on trains during hot weather in the event of train failure and to compare this with other safety risks on the railway.	Presentation of quantified risks to passengers from increased temperatures. Quantified risk compared to other existing and predicted safety risks to passengers to establish priority. Risk management actions assigned.	Rail Division	Ask RSSB to assess this risk - April 2010 Confirm RSSB assessment of this risk - July 2010 Assess need for further research - Dec. 2010	RSSB
6	Reduced effectiveness of existing business planning	Increased business planning and management costs inc. research, project, programme and risk management	1	Approach aviation industry organisations (e.g. Airport Operators Association - AOA) to establish what, if any, research has been carried out on climate change adaptation.	Establish clear picture of climate change adaptation research undertaken by aviation industry from AOA's advice along with details of future research or planned actions, including meeting Defra requirements.	Aviation Directorate	June 2010	Airport Organisations e.g. AOA

7	Reduced effectiveness of existing business planning	Increased business planning and management costs inc. research, project, programme and risk management	1	Draft an Airports National Policy Statement that meets the Planning Act 2008 requirement to have regard to adaptation.	Adaptation text incorporated in aviation NPS (and next Air Transport White Paper progress report) with view to getting airport operators to acknowledge and take actions to mitigate affects of climate changes on airport operations.	Aviation Directorate	2011	CLG
8	Reduced effectiveness of existing business planning	Increased business plan & management costs inc. research, project, programme & risk management	1	Develop a new environmental objective within the CAA's future legislative framework. Consider the case for environmental guidance to cover adaptation issues and the fit with the Defra reporting requirement on CAA under the Climate Change Act.	CAA's adaptation role adequately covered by an environmental objective, guidance on the objective and adaptation reporting requirement under Climate Change Act.	Aviation Directorate	Consultation included environmental objective Dec 09. Civil Aviation Bill expected 2010-11. Adaptation report to Parliament in 2011.	CAA. Defra
9	Reduced effectiveness of existing business planning	Increased business planning and management costs inc. research, project, programme and risk management	1	Keep the East of England DaSTs study on resilience and climate change adaptation under close review to better understand impacts on regional transport networks.	Production of a DaSTS report that effectively examines climate change issues. Regular reports to DfT.	Regional and Local Transport Division	March 2012	East of England Region
10	Increased temperatures, rainfall, coastal erosion and flooding.	Increased costs to build and maintain a safe, serviceable network.	1	Update DfT's <i>Guidance for local authorities seeking Government Funding for Major Transport Schemes</i> to recommend they take account of climate change adaptation and resilience when planning new, major transport schemes in their local area.	Updated guidance to be published.	Regional and Local Authority Major Transport Schemes Division	By March 2010	Local authorities

11	All expected climate change threats could impact on roads - see table 3 page 20	Road deformation, seasonal changes in use of local roads, flooded roads, risks to passenger safety and comfort.	1, 3, 4, 5	Work with the UK Roads Liaison Group to update their suite of good practice highway maintenance guidance to reflect climate change adaptation guidance and consider whether specific climate change adaptation chapters should be added. As part of this process consider what research and what professional engineering support is required.	Dialogue between stakeholders undertaken and production of guidance is desirable.	Road Maintenance Division	August 2010 and February 2011 (if action possible)	CSS. UK Roads Liaison Group. UKCIP
12	All expected climate change threats could impact on roads - see table 3 page 20	Road deformation, seasonal changes in use of local roads, flooded roads, risks to passenger safety and comfort.	1, 3, 4, 5	Examine how to disseminate emerging knowledge such as that established by the East Midlands Three County Council's Alliance Partnership & any relevant work from the Department's support for regional champions to promote the adoption of Transport Asset Management Planning.	Dialogue with stakeholders to learn lessons from adaptation work already underway and determine means of sharing good practice.	Road Maintenance Division	August 2010	Local authorities. CSS. UK Roads Liaison Group. UKCIP.
13	Increased rainfall, rising sea levels - floods, increased erosion or permanent inundation	Permanent asset loss, periodic floods, restricted access, threat to operations and health and safety of workers.	2	Examine existing contingency plans for access to ports and start dialogue with the relevant sectors.	Contingency plans in place and on-going dialogue to develop resilience to climate events. Encourage ports to adopt environmental strategies.	Ports Division	March 2011	Ports. Defra. local authorities. Highways Agency. Network Rail.
14	Increased extreme weather events e.g. storms and storm surges	Increased cost to maintain safe shipping operations, risk to worker's safety, increased business planning and management	1, 3, 4	Work with industry and the Maritime and Coastguard Agency to identify whether the greater frequency of extreme weather events is likely to seriously impact the shipping industry, such that current processes and standards may	An assessment of the impacts a changing climate might have on the operations of the shipping industry around the UK.	Shipping Division	Assessment by December 2010	Shipping organisations. e.g. British Chamber of Shipping, MCA

		costs		need revising. By the end of 2011 the Department will take a view on whether further work is necessary to assess these impacts in detail.				
15	All expected climate change threats could impact UK security measures - table 3 page 20.	Changes to existing security regimes.	1, 2, 5	Assess modal entries in the 2010 DfT Adaptation Plan in order to establish their implications for current security regimes.	Assessment of impacts on transport security in relation to UK transport infrastructures (e.g. ports and airports) and how adaptation measures may also impact on security measures.	Transport Security Directorate (TRANSEC)	Complete assessment by March 2011	Cabinet Office
16	Increased temperatures, rainfall and extreme weather events. Reduced effectiveness of existing business planning.	Reduced asset condition, network availability and/or functionality, reduced stability of 'soft estate', increased cost to maintain safe network, business planning, management, research, project, programme and risk management	1, 3, 4	Ensure all areas of HA business have considered the possible risks of a changing climate. Use the latest climate science from the UK Climate Impacts Programme to further inform adaptation work and contribute to internal guidance to ensure that the changing climate is factored into new HA advice, technical standards and specifications.	Action plan(s) for managing the risks of a changing climate recording risk and action/intervention. Identify and ensure consideration of all priority risks.	Highways Agency	March 2012	DfT
17	As HA risk 16 above	As HA risk 16 above	1, 3, 4, 5	Revise the climate modelling projections used in the adaptation strategy using the latest science from the UK Climate Impacts Programme to determine risks, implications and inform selection of adaptation measures.	Publish updated Highways Agency Adaptation Strategy and Framework to reflect the UKCP09 probabilistic climate change forecasts.	Highways Agency	March 2011	DfT. UKCIP

18	As HA risks 16 and 17 above	As HA risks 16 and 17 above	1, 3, 4, 5	Ensure there are regular revisions of the seasonal driving advice and use the climate scenarios to determine how driving behaviour might change in the future and what HA will need to do to ensure continued safety on their network.	Seasonal driving guides have been published annually for years. 'Think Ahead, Move Ahead' travel plan advice is in 2nd edition. Success measure is positive feedback on this advice and trusted information to road users.	Highways Agency	March 2012	DfT and stakeholders represented on the Highways Agency's Road User Committee
19	Rising sea levels, increased extreme weather events e.g. storms and storm surges	Unable to provide 24 hour maritime emergency response. Greater demand on Coastguard Rescue Service to respond to extreme events	1, 2, 3	Ensure Business Continuity and Business Plans take account of adaptation. Ensure estate requirements for the future organisation of the Coastguard take account of climate change. Clarify the role of the Coastguard Rescue Service in supporting responses to extreme weather events inland.	Evidence that Plans have taken account of climate change predictions. Clearer statement of policy in terms of Coastguard Rescue Service roles in extreme weather events.	Maritime and Coastguard Agency	March 2012	DfT. Civil Contingencies Secretariat
20	Operations of Executive Agencies could be affected by most climate change impacts.	Damage to infrastructure reducing operational capacity of the Agencies functions.	1, 3, 4, 5	EPD to liaise with the DfT's Agencies and NDPBs to work on adapting to climate change. Invite representatives to the Departmental steering group and ensure they contribute to progress DfT's adaptation work.	Attendance of Agency representatives at the quarterly steering group. Evidence that there has been some work carried out on adaptation e.g. Agency adaptation action plans.	Environment Policy Division Adaption Team	Quarterly from March 2010 to March 2012	DfT Executive Agencies. NDPBs

Annex F: Capacity and Capability Action Table

Ref.	Gap/Weakness	Action	Senior Owner	Deliverable(s) or Success Measure(s)	Dates / Milestones
Leadership					
21	Lack of Board level buy-in and awareness of the adaptation issue	Ensure the DfT's Board is sufficiently aware of adaptation issues and risks and that formal ownership of these is taken by relevant senior officials.	Environment Policy Division Adaptation Team	Adaptation on the Board Agenda and listed on the DfT risk register.	Progress check - March 2011
People, Skills and Knowledge					
22	Absence of leadership on adaptation	Adaptation team to draw up a plan for engaging with key stakeholders inside and outside the Department and its agencies.	Environment Policy Division Adaptation Team	Communications plan.	July 2010
23	Lack of understanding of the Department's use of climate change tools	Identify the Departments knowledge of climate change risks and areas that have used tools such as UKCP09. Close any knowledge gaps by encouraging use of tools to identify risks and start the process of identifying adaptation options.	Environment Policy Division Adaptation Team	Database detailing policy areas, agencies & NDPB use of climate change tools.	July 2010
Process					
24	Lack of specific analysis of climate change impacts on new transport proposals	Consider how we might revise ITEA's Uncertainty Guidance to include the impacts of climate change and the effects of possible adaptation measures on new transport infrastructure	ITEA Division	Revised guidance with climate change included as an element for consideration.	Review progress in September 2010

Procurement					
25	Lack of understanding on how climate change will affect DfT's suppliers	Identify high impact areas, discuss potential action that procurement can take with stakeholders and ensure these are fully covered in existing sustainable procurement guidance.	DfT Procurement Division	Adaptation and climate change considerations included in DfT procurement guidance.	2010 - 2011
26	Lack of understanding on how climate change will affect DfT's suppliers	Ensure all Tier 1 suppliers in our high impact areas are invited to participate in the Carbon Disclosure Project.	DfT Procurement Division	Carbon Disclosure Project to cover all our high impact areas.	2011 - 2012
Interdependencies					
30	No record of specific interdependencies related to climate change adaptation	Collect outputs from the Defra interdependencies workshop held in December 2009 and act upon specific recommendations for collaborative working with other Government Departments	Environment Policy Division Adaptation Team	A record of DfT's key interdependencies and communications with these to be included within the communications plan.	September 2010
31	Weak on-going dialogue across all stakeholders regarding all relevant climate change and adaptation issues	Climate change strategy team is to maintain effective working relationships with other key Government Departments and remain a proactive member of the ACC Programme Board	Environment Policy Division Adaptation Team	Establishment of new working relationships and continued attendance at all cross-Government working groups, steering groups etc.	Review progress at the adaptation steering group every quarter

Annex G: Estates Action Table

Ref.	Gap/Weakness	Action	Senior Owner	Deliverables or Success Measures	Dates / Milestones
27	No climate change risk specific criteria formally included in major estates decision making process.	Ensure that all new major estates investments planned up to March 2012 factor in appropriate consideration for climate change.	Director of Estates and Facilities Division	List all new major DfT estate investments that have considered climate change including actions taken and decisions made.	On-going to March 2012
28	Lack of formal requirement to carry out climate change risk assessments on the Government estate.	Issue guidance to DfT sponsored bodies requesting them to show how they will deal with the impacts of climate change on their estate and to incorporate climate change impacts on the DfT estate within the SOGE and Property Asset Management Plan returns.	Director of Estates and Facilities Division	Guidance distributed to all relevant parties based on Defra and OGC estates adaptation guidance. Evidence of understanding and use to be collected from annual SOGE returns.	Guidance - June 2010. Evidence gathered from SOGE returns - April 2011 and 2012.
29	No single system has been used to map location specific vulnerability to climate change linked factors such as flooding.	Use the DfT GIS estates management system to identify key areas of geographical vulnerability on the estate	Director of Estates and Facilities Division	Additional layers added to DfT estates GIS system e.g. the Environment Agency flood maps and used to determine vulnerable locations.	GIS system - March 2011. Vulnerable locations report - June 2011