

Sector Perspective

- In the UK, road and rail meet over 90% of transport needs, with 500 billion motor vehicle kilometres travelled in 2009 and 1.3 billion rail journeys completed in 2009/10. Overall, the transport sector is worth around £100 billion/year.¹
- Responsibility for transport policy at UK Government level rests with the Department for Transport (DfT). Some areas of transport infrastructure management are devolved: for example, Transport Scotland, the Welsh Government and the Northern Ireland Executive operate and manage the main road networks in those countries.
- A major challenge facing this sector is changing demand for different forms of transport, resulting from population growth, changes in work patterns and shifts in social attitudes. Technological change will be key in shaping the transport networks of tomorrow, while the need to cut carbon emissions is a primary pressure on an industry that accounts for a quarter of all emissions produced by the UK.
- Day-to-day weather conditions and longer-term climate affect all types of transport, with weather-related disruption most often caused by wind, rain, snow and ice. Most of the potential risks posed by climate change (e.g. heavier rainfall and higher temperatures) essentially represent a shift in the magnitude, duration and/or frequency of weather conditions that the sector already has to deal with.
- Because transport networks are closely interlinked, climate-related disruption affecting one form of transport can have knock-on effects on others. Similarly, the overall level of risk facing the sector may be intensified by its interdependencies with other sectors (e.g. energy where potential interruptions to supply can disrupt rail, road, port and airport networks and operations). Such potential impacts, in turn, increase risks for businesses.

¹ 2008 figure.



Transport

Climate change is projected to result in changes to temperature, rainfall patterns and sea levels, as detailed in the UK Climate Projections (UKCP09) analysis. For the transport sector, potential benefits include warmer winters, which may reduce transport disruption caused by snow and ice, while potential risks include an increase in flooding.

The Climate Change Risk Assessment (CCRA) has completed an assessment of a range of impacts for which this sector may need to prepare. Some of the key points from this assessment are summarised here.

The results presented here do not take account of changes in society (e.g. population growth, economic growth and developments in new technologies); nor do they take account of responses to climate risks (e.g. future or planned Government policies or private adaptation investment plans).

Focus on... Floods

Transport infrastructure may face an increased risk from river and tidal flooding. The length of road and railway liable to flooding may increase significantly and, for infrastructure already located in floodplains, flooding may also occur more frequently, leading to more travel disruption and delays.

In 2007, widespread flooding of major and minor roads caused disruption estimated to have cost £100 million, largely borne by road users. By the 2080s, if no action is taken, this level of cost may be incurred almost annually, due either to a one-off event or multiple events similar to the floods of 2007.

Confidence

- H** Length of road at significant likelihood of flooding:² between 13,000 km and 18,000 km by the 2050s, rising to between 14,000 km and 19,000 km by the 2080s (current figure: 12,000 km).
- H** Length of railway at significant likelihood of flooding: between 2000 km and 2900 km by the 2050s, rising to between 2300 km and 3100 km by the 2080s (current figure: 2000 km).

The assessment of flood risk for the CCRA has assumed that there are no changes in existing flood and coastal erosion risk management measures; the analysis takes account of current flood defences and protection against coastal erosion, but does not include any future changes as a result of adaptation policies or deterioration of existing flood defences and coastal protection measures. The figures here apply to river and tidal flooding in England and Wales only.

Focus on... Landslides

The length of roads currently under some kind of threat from landslides in the UK is in excess of 1000 km. Although over the next 40 years the length of road at risk is projected to remain similar to current levels, there may be some increase in risk after the 2050s.

Several factors contribute to this threat, including underlying geology, soil type, soil moisture and the intensity, frequency and quantity of rainfall. The risk increases, for instance, when dry periods are followed by storms or intense downpours. Although the road networks in certain parts of the UK currently have very few areas exposed to potential landslides, a higher percentage of Scotland's road network is at risk.



Focus on... Heat Damage to Roads

While the risk may be less significant than that posed by flooding, warmer summers may cause more road surfaces to deform. This may be a particular problem on local roads, as these have lower surface specifications than motorways and trunk roads. The heatwave of 2003, for instance, led to a significant repair bill for local authorities.

Damaged roads would need to be repaired, causing disruption to traffic, with repairs potentially postponed until temperatures fell enough for the new road surface to 'set'. In some cases, this might mean working at night when it is cooler.

Focus on... Rail Buckling

Warmer summers may increase rail temperatures, leading to a greater incidence of buckling. Currently, around 50 rail buckles occur each year in the Great Britain, generating a total bill (from repairs and delay costs) of nearly £1 million. In the 2003 heatwave, though, there were 137 rail buckles that incurred a total cost of around £2.5 million. London and north-west England may experience the biggest increase in disruption and delays due to rail buckling.

Confidence

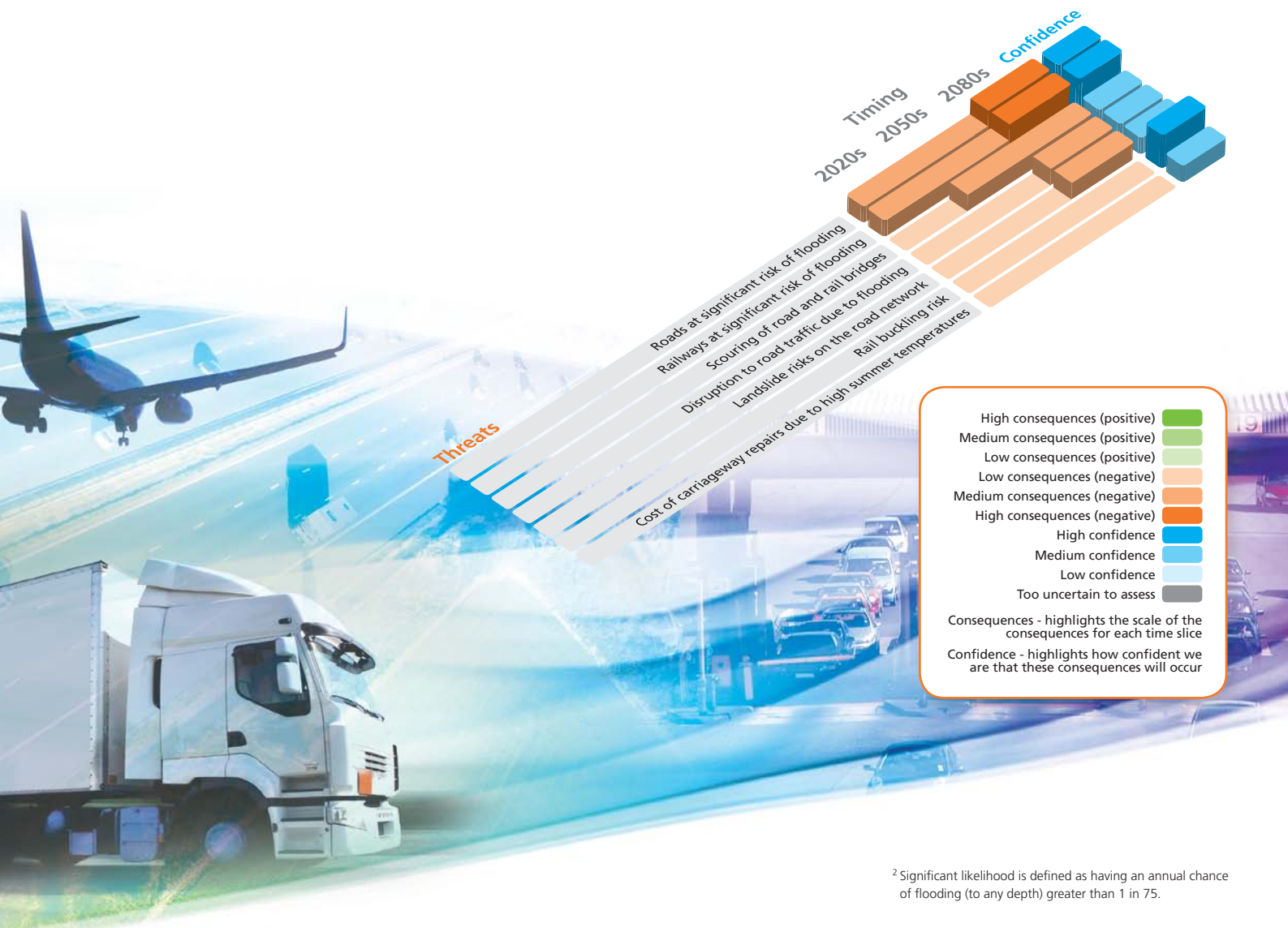


Average number of rail buckles per year: around 130 to 240 by the 2080s (current figure: around 50).

Focus on... Bridge Failures

Increased winter rainfall and higher river flows may potentially lead to more damage to road and rail bridges. In addition to scour (the washing away of foundations), bridges can be weakened during floods by impact from floating debris (such as motor vehicles) and the washing-out of loose masonry and 'fill' material resulting from poor bridge maintenance.

Currently, around one bridge amongst the UK's 155,000 bridges fails every year. Although modern bridges benefit from better design and better understanding of weather-related risks, the UK still has a large number of more vulnerable older masonry arch bridges. In general, pre-20th Century bridges are most at risk of failure. Some bridges currently classed as adequately protected against climate and weather-related risk may need to be reassessed with respect to future climate.



² Significant likelihood is defined as having an annual chance of flooding (to any depth) greater than 1 in 75.

The Challenge of Adaptation

Overall, awareness of climate change issues is high within the transport sector. Some adaptation measures have already been introduced and major infrastructure is being managed with future risks and extreme weather in mind. For example:

- The DfT's Climate Change Adaptation Plan for Transport recognises that adapting the UK's transport system to climate change is an important part of delivering infrastructure that works both now and in the future.
- Network Rail recognises climate change as an important factor in future planning and substantial research and other work is under way to make the rail system more resilient to climate impacts (e.g. by improving drainage systems and embankment stability).
- The Highways Agency has produced its own adaptation strategy and the DfT has provided local authorities with adaptation guidance on issues such as road surface maintenance.

Under the terms of the Climate Change Act 2008, 31 transport organisations have produced adaptation reports setting out how climate change may impact their business and what actions they have identified to manage the risks.

To aid adaptation to climate change, operators of transport networks will need robust weather forecasts if they are to maintain effective contingency plans. The design and maintenance of transport systems may also need to take gradual

climatic changes into account. Some infrastructure designed in the past may already be unable to cope with these changes. Another key part of the adaptation challenge is to get the public 'on board'. The low-carbon agenda may encourage changes in the way people travel and so may present opportunities to promote adaptation and increase awareness of its potential necessity.

Above all, adaptation will potentially require a sound combination of technological development and long-term planning. Further evidence may be needed to help understand how the sector will evolve. For example:

- Will electric and hybrid cars become the dominant form of transport in the UK?
- How would transport networks/infrastructure have to change in order to accommodate this?
- What would be the effect on climate-related risks if a substantial reduction in transport emissions were achieved by the middle of this century?

Where to Get Further Information

For copies of the CCRA Transport Sector Report, the CCRA Evidence Report and Devolved Administration Reports, please visit www.defra.gov.uk/environment/climate/government/

How the CCRA was conducted

The CCRA reviewed the evidence for more than 700 potential climate impacts on the UK economy, society and environment. Over 100 of these impacts across 11 sectors were taken forward for more detailed analysis, having been selected on the basis of likelihood, potential consequences and how urgently adaptation action may be needed to address them.

A plausible range of climate change scenarios was used in the analysis. Some aspects of socio-economic change (e.g. population growth) were also taken into consideration. Adaptation policies that are planned for the future were not considered, so that the underlying level of risk could first be compared across sectors.

The results presented here are based on the UKCP09 Medium emissions scenario for the 2020s (2010-2039) and the Low, Medium and High

emissions scenarios for the 2050s (2040-2069) and the 2080s (2070-2099). A range of climate projections representing lower, central and upper estimates were considered within each emissions scenario.

Risks are categorised as low, medium or high based on their economic, social and environmental consequences.

The CCRA findings are also categorised as having low, medium or high confidence. The level of confidence is the degree to which the findings are considered valid, based on the type, amount, quality and consistency of the evidence studied.

Further information on how the CCRA results should be interpreted is presented in the CCRA Evidence Report. www.defra.gov.uk/environment/climate/government/