

# Targeted review of the resilience of the transport network to extreme weather events

## Terms of Reference

### Background

The winter of 2013/14 saw the UK affected severely by an exceptional run of winter storms, culminating in serious coastal damage and widespread, persistent flooding. Although no individual storm can be regarded as exceptional, the clustering and persistence of the storms was highly unusual and December through February were exceptionally wet. For southern England this was one of the most exceptional period of winter rainfall in at least 248 years. January and February saw severe gales along the south and west coasts. Peak wave periods were exceptionally long; each wave carried a lot of energy and inflicted significant damage on coastal infrastructure. Flow rates on rivers such as the Thames remained exceptionally high for longer than in any previous flood episode. Correspondingly, floodplain inundations were extensive.<sup>1</sup>

Our transport network has, on the whole, proved very resilient to the recent weather events. Resilience planners and operational teams have worked very hard in challenging circumstances to minimise service disruption to the travelling public. However, damage has been caused to some key assets, with disruption to service delivery. Ports have experienced storm surges; coastal rail infrastructure has been subject to prolonged exposure to damaging storms; overhead rail lines, exposed road structures and airports have been impacted by gales, and large numbers of local rural and urban roads have seen flooding. Despite the best efforts of our transport operators and maintenance contractors, it is clear that there is no room for complacency in managing resilience. The impact of the exceptional run of weather has brought into sharp focus the need to take stock of the vulnerabilities facing transport and the way in which we respond. Government must maintain a resilient transport network that enables public access to critical services such as health, education and employment whilst providing value for money for the taxpayer.

### Purpose of the study

The aim of this study is to identify practical measures to improve the resilience of our transport network to severe weather events in the short term, whilst also giving due consideration to longer term resilience of the nation's transport infrastructure. This will include plans looking to mitigate impacts from severe weather events; contingency planning to manage the effects; investigation of increased rates of asset degradation leading to reduced service life and performance, and adaptation of infrastructure to manage projected future risks. The review will build on the existing work of transport resilience practitioners and policy makers, and incorporate expert knowledge on climate modelling to recommend proportionate and value for money responses to future transport vulnerabilities.

### Governance

The review will be led by DfT Non-Executive Director Richard Brown who will be supported by independent experts:

- John Curley, representing rail
- Brian Smith, representing roads and local

A review team will be supplemented with resilience experts from the Highways Agency and Network Rail, and climate science expertise from the Met Office. DfT officials will provide

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<sup>1</sup> Content of paragraph informed by Met Office publication "The Recent Storms and Floods in the UK (Feb 2014)".

administrative, project management and analytical support. Aviation and ports/maritime will be closely consulted at each stage of the review.

The review outcomes formally recommended to the Secretary of State for Transport will only apply to English authorities, but will take account of the wider UK context. The Scottish, Welsh and Northern Irish administrations will be fully involved in the work of the review. It will be for Ministers of those administrations to decide what action is required in those countries.

### **Methodology**

**Operational performance** - The operational performance of all transport modes will be assessed against the 2013/14 winter storms and flooding to understand the key vulnerabilities.

**Lessons learned** - The recommendations of previous reviews will be assessed, to determine the extent to which recommendations have been written into resilience procedures and processes and how this has been implemented 'on the ground'.

The review will seek evidence from a range of stakeholders, including transport operators and providers; the local government community; major civil engineering practices; maintenance contractors; the freight and logistics sectors; passenger groups; weather forecasters and climate scientists. Evidence will be gathered through stakeholder workshops and calls for written evidence covering the full scope of the review. The evidence will be used to identify practical measures to improve the resilience of the UK's transport infrastructure and operations, presenting case studies and culminating in a package of recommendations.

### **Scope of the review**

1. **Transport modes** - all key modes within scope:
  - Road – Strategic road network (Highways Agency) and local roads (Local Highways Authorities).
  - Rail – The national rail network (Network Rail) and train operating companies
  - Aviation – Airports of economic and strategic importance
  - Maritime & Ports – Ports of economic and strategic importance
  - London – transport within the remit of Transport for London
2. **Extreme weather events and impacts**- Determining the key vulnerabilities of transport modes and assessing the impacts of extreme weather on the asset, operations and customers
  - Increase in maximum temperature - extreme summer temperatures
  - Increase in winter precipitation (light touch on snow due to Quarmby)
  - More extreme rainfall events – impacts on fluvial, pluvial and groundwater flooding, sink holes
  - Increased wind speed for worst gales - wind speed more frequently exceeding infrastructure operational limits
  - Sea level rise - higher frequency of extreme storm surges
  - Combinations of hazards, exposure and vulnerabilities leading to increased risks and severe impacts
3. **Economic analysis** - The costs and benefits of different approaches to resilience. Analysis to consider:
  - The political, commercial and consumer risk appetite for asset failure and service disruption

- Prioritisation of vulnerable assets for action
- The need for specifying resilience-specific performance criteria
- Long term asset vulnerability and the trigger points for retro-fits and changes to design standards
- Funding revised maintenance and renewals regimes; the cost of future-proofing assets against projected stresses, and the affordability of optimising Whole Life Cost

4. **Weather forecasting and climate modelling-** The quality, availability and application of short, medium, long-term and seasonal weather forecasting and climate projections

- The value of forecasts to current service delivery
- The contribution of weather forecasting to management of the 2013/14 storms and floods
- Investigation of the source of meteorological data used by different transport operators
- Additional resilience offered by bespoke forecasting services
- Availability and application of longer term climate projections
- Potential of climate modelling in advising transport resilience plans

5. **Communications and public expectations** – Integration of resilience and the customer experience

- How lessons and best practice are shared
- The value of resilience forums, panels and groups
- Regional equity of resilience provided to taxpayers
- Management of the public's expectations
- Case studies from international transport and infrastructure administrations
- Communication of risk across a range of hazards in a way the end-user understands