

Specification Document – Single Points of Failure

Introduction

The Secretary of State for Transport commissioned a [Review of the Resilience of the Transport Network to Extreme Weather](#) (July 2014). Led by Richard Brown, the Review assessed the resilience of roads, railways, ports and airports to extreme weather, including flooding (pluvial, fluvial, coastal and groundwater), storms, high winds and extreme heat. The [Government's response](#) was published in November.

Purpose

A question which has arisen during the course of the Review is that of whether there are “single points of failure” in our strategic transport networks. This arose particularly in the South West in the winter of 2013-14, where the region was at times perceived to be at threat of being “cut-off” from extreme weather causing significant and simultaneous flooding to major road and rail routes.

A rigorous approach is needed to determine the points/routes which represent potential single points of failure on the strategic transport network, and the consequences of their failure. The strategic transport network in the context of such a study can be deemed to consist of the Strategic Road Network, the Trunk Road Network and the UK rail network. It should also consider those routes that serve wider economic needs, e.g. key energy supply routes, or mainline commuter routes.

Background of Requirement

The Department wishes to procure a piece of analysis to better understand the ‘single-points’ question. The project should seek to:

- Identify the key locations of risk from single and multiple weather/climate threats including flooding (pluvial, fluvial, coastal and groundwater), storms, high winds, extreme heat and ice/snow on the Strategic Road Network, the Trunk Road Network and the UK rail network. (Ice and snow was not within the scope of the review itself but is to be included in the proposed project).
- Assess the availability and/or suitability of alternative transport routes; including dependency on other key infrastructures and their networks.
- Determine the key economic activities the routes support, indicating the extent of socio-economic impacts of failure.

In meeting these objectives, the project will deliver a detailed analysis of the vulnerabilities and consequences of single point failures on the nation's strategic transport network, considering also the vulnerabilities of the devolved networks where failure might compromise cross-border movement. On a national scale, the project may wish to collate evidence and prioritise failure points based on both the probability of failure and the strategic importance of the route (Figure 1); enabling decisions on resilience improvements to be made based on a more strategic view. It is hoped the report will provide the foundation upon which future work can be built, for example, forecasting future failures, establishing the wider economic impacts of increased disruptions, and the interdependencies of failures with other sectors.

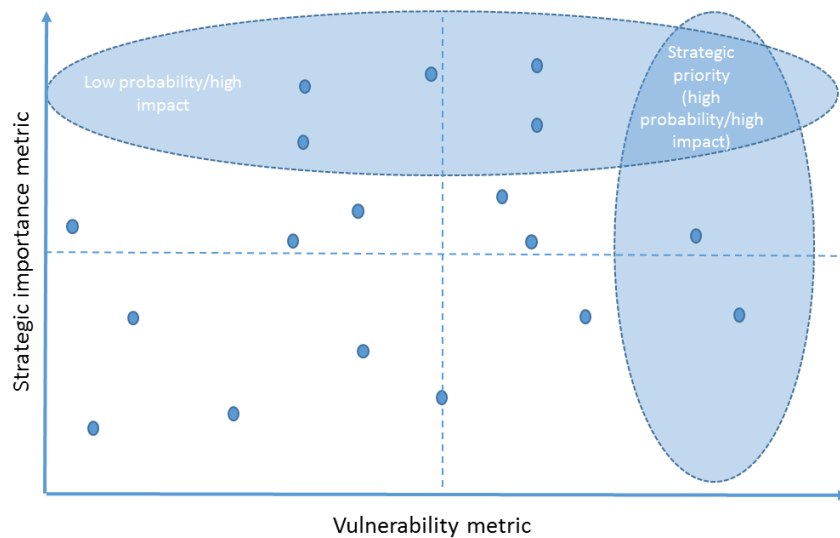


Figure 1: Schematic of analysis of strategic transport network. Blue dots represent areas and/or specific sites of vulnerability defined as single points of failure. Vulnerability metrics can be determined by joint probability analysis; the strategic importance metric would initially include intensity of use (passenger flows and value/tonnage freight carried) as a place holder for future input from wider on-going research.

Scope and Requirement

The project focus is the failure of the strategic transport network due to extreme weather events, and specifically responds to recommendation 4 of the Transport Resilience Review (2014):

The DfT should work with researchers, the devolved administrations and the transport industry to further consider whether there are potential 'single points of failure' in the strategic transport networks, which leave parts of the country at risk of having vital economic and social links severed.

The Department for Transport acknowledge that interdependencies with other services (i.e. a critical network) will exist, however, the extent of these dependencies is beyond the scope of the project, and it is important that a detailed baseline understanding of single point failures on the STN is firstly established.

Included

- Clear definitions of the approach to assessing vulnerability, single points of failure, the strategic transport network, and a strategic importance metric.
- Identification and scoring of key routes and specific locations on the transport network in England at risk of single point failure from extreme weather.
- For key routes, specific details of the current network understanding of the risks and previous incidents from operators' 'resilience plans' should be obtained. From this evidence base, impacts of extreme weather on physical

structures, immediate services, and wider propagating effects should be determined. Also, with consultation from network operators and historical evidence, the suitability of diversionary routes should be assessed.

- Passenger and freight movements for routes should be established as an indication of the economic function of the route. A grading of 'importance' should be established. Key activities supported by the route, for example those that would be noted in a typical case for investment, should also be established.
- A report will be produced to present high level analysis of the network based on risk of incidents occurring and their consequence (see Figure 1 for an illustration), specific examples of priority areas i.e. high risk of failure, high consequence should be presented in more detail. Low risk high consequence areas should also be highlighted.

Excluded

- A full assessment of a critical network (i.e. recommendation 5). This is beyond the scope of recommendation 4 of the Transport Resilience Review (2014), although it is expected that previous and concurrent ITRC projects may elicit such information that will be of value to consider.
- Full economic appraisal or in-depth analysis and quantification of wider economic impacts or the strategic importance metric; this is beyond the scope of this project and is being dealt with in other responses and planned research.

Mandatory - essential requirements that must be met

- Timeline of key project milestones
- Extreme weather vulnerability analysis of the network
- Determination of key locations representing single points of failure
- Collection & collation of historical incidents
- Assessment of diversionary route options
- Collection & collation of evidence of strategic importance of at-risk routes
- A report on the findings that clearly identifies and assesses the impacts and consequences of single points of failure caused by extreme weather on the STN.

Desirable – requirements that whilst bringing benefits are not essential

- Identification of opportunities and/or reduction in risk from joint operator improvements.
- Indications of risks posed directly to the network from other infrastructure sectors

Expected contractor operations:

- Liaise with transport operators to gather sufficient information on past and current weather threats and impacts.
- Utilise existing analysis of infrastructure risks, interdependencies and hotspots.
- Engagement with national infrastructure owners and local resilience groups.

Implementation and Deliverables

The project should complete prior to winter 2015-2016. Project milestones should include the delivery of interim results and early conclusions and at least one other milestone. These milestones will be used to ensure project delivery in on track. Payments will be made upon successful delivery and acceptance of these milestones.

Documentation

Reports must be of a professional standard and contain sufficient information on the background and method to the work that they act as a standalone record, making sense if read in isolation.

Security Requirements

Due to the nature of the data collected, when collated the data must be stored with National Security Classification markings of OFFICIAL SENSITIVE.

Data provided by DfT or members of the transport industry may have additional COMMERCIAL caveats. In the absence of clear handling instructions specifying otherwise, such data should be stored as if it was OFFICIAL SENSITIVE.

The final report must be stored as no less than OFFICIAL SENSITIVE.

Material classified as OFFICIAL SENSITIVE stored electronically must be stored on standalone computers or local air-gapped networks with controlled access. It must not be sent electronically outside of the Government secure network. Paper copies and any unencrypted electronic storage must be locked away when not in use to prevent unauthorised access. Access to all classified material must be on a limited and controlled basis, by persons approved by the Authority.

The contractor must ensure they can demonstrate that it has in place the necessary security controls for handling the information generated by this project as described above. Failure to meet this requirement may determine their tender non-compliant.

In the event that the Contractor wishes to publish any results of the Project or the final report it shall first obtain the written consent of the Authority Contract Manager. The Contractor shall make requests for any such consent in writing to the Authority Contract Manager. The Contractor acknowledges that the Authority will take into account the views of the Government Funding Partners, as appropriate, and agrees that the Authority's decision on whether the material is suitable for publication shall be final. The Contractor acknowledges that the Authority may be obliged to seek the approval of Government Funding Partners to such publication and to allow them a period of at least 60 days to consider any request for publication.

Project Timetable

The delivery research outputs will be before winter 2015 which meets the DfT timescales of this work.