Winter Resilience Review

The Resilience of England's Transport Systems in December 2010

An Independent Audit by David Quarmby CBE

December 2010

Department for Transport
Great Minster House
76 Marsham Street
London SW1P 4DR
Telephone 0300 330 3000
Website www.dft.gov.uk

ISBN 978 1 84864 116 7

Cover photo – Britain in snow, 3rd December 2010
Image courtesy of NEODAAS, Satellite Receiving Station, University of Dundee

Contents

Executive Summary and Recommendations

1. On 1st December, I was asked by the Transport Secretary to carry out an urgent audit of how well the highway authorities and transport operators in England have been coping with the unexpectedly early and severe spell of winter weather, having regard also to the Review into winter resilience carried out by the Panel I led earlier this year and our Recommendations[1].

2. The period under review is Wednesday 24th November to Thursday 9th December. I well recognise that this report is being published while in the middle of a further and colder period of severe weather. I believe the issues I have identified are equally relevant, although in the first period the aviation sector was not tested or disrupted (except at Gatwick Airport) in the way it is now. I also recognise that the road salt situation has developed, with significant further use in the 10 days since I last had good data on supply and use.

3. I understand the frustrations of the many people and organisations caught up in the effects of the winter weather affecting England – I myself suffered a fruitless day trying and failing to reach the south coast by train from my home in London. I can sympathise with those whose first reaction is "why does this country come to a standstill at the first signs of snow?", as well as those who think that every other country manages these things better than we do. And inevitably the cry goes up "where are the gritters?". I hope to throw some lights on these points as well in this short report, and perhaps deal with some of the misconceptions and urban myths. As well as assessing how well these things are managed by our local authorities, government agencies and transport operators, this audit also looks at how communities and the public at large can play more of a part in keeping things going when winter descends.

4. During the course of this Audit, I have established that pretty well all the Recommendations we made in our main Review that could been implemented by now have been, and that others with longer timescales are generally in process.

The weather

5. Winter arrived early this year (24th November) – and after the weekend spread to the rest of England, with temperatures below freezing and widespread light snow. However there were some extraordinarily localised, intense and sustained snow falls in the north east, parts of eastern and central England and the home counties south of London – intensities not seen since 1965. It was these which caused particular problems and delays on the transport networks in those areas.

6. The Met Office gave 'early indications of the onset of a cold spell from late November' at the end of October, but detailed forecasts of snow were not possible until a few days before the first precipitation. The amounts of snow were generally well captured, although in some areas were considerably underestimated by some weather forecast providers.

7. Britain's weather is notoriously volatile and challenging to predict, particularly at longer lead-times. While forecasts of weather and temperature are now pretty accurate up to 5 days ahead at very

1 The Resilience of England's Transport Systems in Winter; Interim (July 2010) and Final (October 2010) Reports; http://transportwinterresilience.independent.gov.uk/

local levels (and widely used and valued), weather assessments up to 15 and 30 days become less detailed, and seasonal and longer term forecasts can only currently be provided for the UK with limited confidence.

8. Entering the third successive experience of significantly sub-zero temperatures and substantial (if localised) winter snowfall – and with the further episode of very low temperatures and further snowfall we can be forgiven for wondering whether there is in fact a trend, or some evidence of "clustering" of severe winters. The Met Office advice to our main Review earlier this year was that severe winters have only a 1 in 20 chance, that the weather in any one winter is virtually independent (statistically speaking) of weather in preceding winters, and that this incidence is slowly declining due to global warming; however, one important effect of global warming is that more snow is possible when severe weather events do occur.

9. I specifically sought further advice from the Met Office as part of this Audit, to explore whether these views about the probability and the incidence of severe winters had changed. I understand that the Met Office did thoroughly review this question, but they have confirmed their previous assessment and advice. This audit identifies some opportunities to spend more and to invest more in England's winter resilience. But the worthwhileness of such projects depends crucially on the probability of severe, disruptive winters reoccurring. The scientific advice from the Met Office is that this is still a low chance (there have been 8 comparable spells to this current period in the past 50 years). Policy decisions will have to be taken if and when such proposals come up for decision by central or local government, recognising the benefits that can arise but also the risk of limited or no value when winters are average or mild.

10. With the same issues in mind, the Transport Secretary approached the Government's Chief Scientific Adviser, Professor Sir John Beddington, who initiated a more general investigation by the Met Office into seasonal and long term forecasting capability. A report was delivered last week; Professor Beddington advises me that the Met Office will shortly be able to make seasonal forecasts (i.e. up to 3 months ahead) with more confidence, and that this will be incorporated into operational forecasting during 2011. But for longer term forecasting – what is called decadal – while there are advances in understanding the factors driving natural variability, work is still in progress, which depends on sufficient resources becoming available to support the computing capacity required.

Getting about locally

11. Most of England suffered low temperatures and modest snowfall at the end of November and the first week or so of December. Local highway authorities (LHAs) were in a good state of readiness for this unexpectedly early winter episode; the usual road gritting operations were triggered, and the evidence available to me suggests that these were generally effective, with traffic and movement on the treated networks largely unaffected.

12. However the areas that experienced high and sustained levels of snowfall during this period were put under early pressure with substantial demands for snow clearance and assistance to stranded travellers and isolated communities, alongside trying to keep their road users and communities well informed about the availability of the network and what was being done to address the challenges.

13. Based on my conversations with highway authorities and others in all the main affected areas, my sense is that the operational response was generally managed well. In some areas the snowfall was

underestimated, and the operational response in gritting and snow ploughing had to be adjusted as the weather impact became clear.

14. There are no silver bullets. It is clear that good performance by LHAs on the ground, successfully managing the expectations of their stakeholders, and involving their communities depends on getting all the key elements of winter service right, and with delivering them to high standards. This is about:

- effective and inclusive planning – consulting widely on networks to be treated; putting in place adequate supplementary snow clearing capability (meeting the specific needs and geography of the area); having a strategy for footways and cycleways and establishing how it will be delivered; and integrating winter service into the resilience/emergency planning mechanisms in their areas;
- pro-active community engagement supported by strong leadership – engaging lower tier authorities in footway clearance and other tasks; town and parish councils and communities in promoting self help, publication of the Snow Code, salt bins for treating local areas, etc;
- comprehensive information and communications to stakeholders and the public at large – with good advice, education and information about treatment plans, coupled with real-time information about conditions and activities; proactive engagement with local media; through websites use of twitter and other social media;
- high operational standards supported by professional commitment and delivery – adopting best practice in salt utilisation and conservation and gritting operations; assured salt supply and stocking arrangements; training, and effective operational coordination with emergency services and other service providers.

15. There needs to be a more widespread communication of best practice and encouragement of those authorities for whom the opportunity remains to raise their game. Meanwhile it is up to LHAs and their communities to do the best job they can, given the unpredictability and volatility of our weather, and the resources the nation believes are affordable to deal with winter. The vast majority of local authorities were already doing many of the things we recommended in our main Review, and I have been heartened by the response of many of those for whom the Recommendations provided an opportunity to improve their performance.

16. We identified in our main Review a significant opportunity to improve salt utilisation by reducing spread rates, which would ease pressure on salt supply and improve resilience of the supply chain. I have identified in this audit a continuing wide variation in spread rates, and a reluctance among the higher users to make changes without authoritative evidence-backed advice. In our main Review, we recommended how this might be provided (including bringing the National Winter Service Research Group (NWSRG) under the wing of the UK Roads Liaison Group). We recognised at the time that this would take a little time to bring about. However it is now clear that this early winter and the likelihood of high demand for salt over the whole winter create an urgent demand for the release to the whole highways community of research and advice previously available only to subscribing members of NWSRG. My recommendation on this matter is made just as I hear the Government has published its intentions to do just this (letter 15 December from Norman Baker MP to local authorities).

The Strategic Road Network

17. The operation and maintenance of the strategic road network in England – the motorways and trunk roads – are the responsibility of the HA.

18. The HA through its contractors work to high specifications and standards of response for providing winter resilience on the strategic network, and actual delivery has been excellent in recent times. Even more than on the busier local authority roads, operational demands both on winter service contractors, and on the traffic operations staff, become immediate and intense when significant snow falls , especially where normal traffic flows are high (for example on the M25).

19. The highly localised and intense snowfalls described above impacted on various sections of the strategic road network – in particular the south east corner of the M25 (together with adjacent sections of M20 and M26), the M25/M23 junction area, the Dartford Bridge and parts of the A13, and isolated sections of M1 and A1; and triggered the anticipated closure of the A66 and A628 over Woodhead Pass. In certain areas, particularly south Essex and west Kent, the weather forecast had significantly underestimated the amount of snowfall, and this will have influenced the nature of the initial response.

20. Some of the problems arise because of unwise or careless driving by vehicles, not taking full account of the surface conditions. This also puts a premium on the quality, relevance and timeliness of information available to road users. Even with this, one wonders whether some people are making sensible decisions about whether to make the journey at all. Meanwhile the HA must continue to develops its information services – its website for journey planning and briefing on road conditions, and variable message signs, i-phone apps and other digital communications for in-journey advice. With this information, road users have an obligation to use these services to brief themselves about the conditions they will face and where possible for making decisions en route.

21. The HA have provided me with details of seven significant incidents or unplanned road closures over the several days of intense snowfall. Many of these illustrate the consequences of vehicles – both cars and heavy lorries – skidding or losing traction on the carriageways, and the ways in which small incidents can quickly turn into major traffic blockages which can delay people and goods for several hours at a time. They also illustrate the challenges of keeping carriageways free under intense and continuous snowfall, and the risks for drivers in those conditions.

22. Questions have to be asked for these incidents: had the surface been properly treated in accordance with the required standards? Was the operational response by the winter teams timely and effective enough in the circumstances? Was there effective coordination between police, HA officers, adjacent LHAs and winter contractors to manage the traffic consequences of these incidents? Were drivers making poor judgements and decisions in the conditions they were facing?

23. In this audit, given the time and the data available I have not been able to make these judgements – and some of the incidents are complex in their causes and consequences. The crucial point, however, is the presence of an effective process of review, including a proportionate but forensic assessment of exactly what happened and who did what, involving the various parties in a cooperative exercise, and revealing whether there are any lessons for the future.

24. I know from our main Review earlier this year that the HA is an effective 'learning' organisation. Nevertheless, given the importance of the strategic road network to our economy, I believe the HA should demonstrate how they do this, , by being asked to prepare for the Transport Secretary a

comprehensive review, including lessons learned, of the most serious incident during this period. This was at Junction 3 of the M25 on 30th November, where due to the cumulative effect of some unrelated incidents, the roundabout at J3 linking the M25 with the M20, A20, local roads and a motorway works depot, "locked up" for several hours, with widespread effects on traffic and delays on the motorway, trunk and local road networks in the vicinity.

Salt

25. The substantial early use of salt this season – by 6/7th December some 30-45% of demand that the whole of a severe winter would generate – has raised major concerns among the LHAs I spoke to about sustaining the supply of salt for the rest of winter – whether severe or not. Although I have not been close to the regular reporting of salt stocks and supplies since mid-December, I know that there will have been substantial further use in the period since then, and that the issues I was aware of will have intensified.

26. Suppliers have been under pressure this year to fulfil highway authorities' pre-season stocking orders, because of the low level of stocks with which the sector exited last winter, and the record levels of pre-season stockholdings targeted by LHAs. This has meant some delays in completing pre-season orders, and that suppliers' own stockholdings have been very low.

27. Knowing of the pressure on supplies, and against possibilities of another severe winter, we recommended in our main Review earlier this year that Government should task the HA, on behalf of the highways community, to acquire a strategic reserve of up to a quarter of a million tonnes of salt. We also recommended that Government should put in place a comprehensive monitoring system for salt stocks and use across the country, to enable the market to operate more effectively, and to give advance warning of any potential problems in supply.

28. Government accepted these Recommendations on the day of publication of our Interim Report. Two thirds of the strategic reserve is now in place, with the balance due in the next few weeks. The new monitoring system has greatly confidence among all the organisations that the state of stocks, supply and use is now known and can be acted on. For example, this has informed decisions by Government during week beginning 13 December to acquire further strategic stocks, and to initiate the first allocations from the national strategic reserve. This has now been published to all local authorities, together with further advice about salt conservation – including the intention to release this week (week beginning 20 December) specific authoritative advice about spread rates which will enable LHAs to take appropriate measures to conserve salt stocks.

29. This action is timely and appropriate, and should also generate some confidence among highway authorities that the potential issues of salt supply are being addressed effectively. It is of course the first time the new mechanisms and information has been used 'in anger' and is earlier than anticipated. In the end, though, these tools and the transparency they bring can only support the task in hand; as the winter weather continues, government, the whole highways community and the supply industry will need to consider carefully how the challenges of maintaining adequate supply should best be addressed. The Recommendations we made in our main Review about salt supply have all been implemented so far to the extent possible within the time available, and the provision of authoritative advice on salt spread rates – a further Recommendation from my Panel – has been brought forward.

Railways

30. Much of the rail network was largely unaffected by the severe winter weather during the period under review (24th November to 9th December), though there was some limited impact on services in the north of England and on the east side of the country. Train services south of the Thames were particularly badly disrupted for specific days, from a combination of heavy snowfall and the vulnerability of the third rail system of current collection on these networks.

31. While there have been major advances in the systems which manage the planning and implementation of contingency timetables, this was the first time they were used 'in anger' and there were some teething problems and glitches which affected their effective use this time. The requirement for sign-off by 1700 the previous day for implementing contingency timetables is not normally an issue, but under conditions of weather uncertainty the inflexibility can be a problem and requires labour-intensive work-arounds.

32. Arrangements for the early deployment of anti-icing vehicles on the third rail network can be difficult, because of their use also for autumn leaf duties with different equipment mounted. There needs to be a thorough review of the equipment needed for these duties, given the risks (crystallised this year) of conflicting requirements, and whether the quantity of equipment needs to be increased – given the vulnerability of the networks.

33. The lack of adequate – or at times any – information to passengers on the south-of-the-Thames services was probably the biggest issue of this whole episode; it was mirrored to a much less serious degree elsewhere on the network. Passenger Focus happened to publish at this time a major report on the experience during this past year of 1,000 passengers affected by disruption on the railway: it graphically encapsulates the frustrations and the sense that the train companies are really not on top of keeping passengers in the picture or appearing to care – both technically and culturally. This report should be required reading throughout the rail industry for all management, supervisory and other staff in touch with passengers.

34. I am clear that there is too much reliance on electronic systems for passenger information, which – even if they are fully accurate and working – do not have the flexibility to advise passengers what is going on during disruption or to show that anyone cares. The industry must put in place – and properly resource – back-up information processes and methods of communicating with passengers which do not depend on the full functioning of all the electronic systems, and which embody the necessary flexibility to convey the relevant information and advice. And there has to be a cultural recognition and acceptance that these back-up processes are an integral part of running the railway for the benefit of passengers.

35. The time has come to consider seriously the conversion of the third rail network to a more weather-resilient system of providing traction power for trains on this network. Possible methods include side or underneath contact with the third rail (common in continental Europe, and on the DLR) – which should not require significant changes to the DC power distribution network nor to the trains themselves – or conversion to 25kV overhead. Network Rail should lead a strategic review of the alternative technologies, including the migration method, and prepare a preferred proposal with business case for consideration by government.

Aviation

36. Only Gatwick airport in England was severely affected by the winter weather during the period under review (24th November to 9th December), another consequence of the highly localised intense snowfall over this period. Gatwick's readiness for winter was enhanced by a number of actions taken following last winter, including £600,000 invested in additional equipment, but the airport closed for 48 hours from Tuesday evening (30th November), with passenger traffic restarting at 06:00 on Friday morning.

37. About a foot of snow fell continuously within a 48 hour period, more intense even than last year (which was the worst for 30 years). 150,000 tonnes of snow was cleared from the operational areas of the airport, using the airport's own snow fleet of 45 vehicles supplemented with a further 40 contractor vehicles such as dumper trucks hired in. 150,000 litres of de-icing products were used.

38. The inevitable inconvenience for passengers already at the airport was mitigated by practical measures such as beds, free food and other supplies and facilities, additional staff to assist and some retailers staying open 24 hours. Staff and passenger movements were also affected by the disruption to the rail network serving Gatwick.

39. Comparisons with the resources available to airports in other countries which suffer heavy snowfall regularly every winter may be interesting but are no guide to what is economical or sensible for the UK, given the relative infrequency of snow events as serious as this. Whether or not there s a case for substantial more investment in snow clearance capability at Gatwick or at any other airport in England depends on the view taken of the prospects for severe winters in the future; and with the impact of the further episode of winter weather over the weekend 18/19th December as I finalise this report it will be understandable that the pressure for further equipment and resources will grow. Individual airports will continue to make their own decisions on this matter, and will have to come to their own view about the business case and the wider issues which such severe disruption gives rise to.

40. The aviation sector has good processes of review and learning lessons for the future, and many changes and improvements to snow plans were made following last winter, which were reflected in the main Review we carried out earlier in the year. The same processes will be taking place after this winter. Meanwhile we should acknowledge that there will be delays and impacts like this when such severe snow events happen, and we should expect our airports and airlines to respond energetically, competently and professionally within the resources available – having particular regard to the need to keep current and prospective passengers well informed, and properly cared for if they are caught by the disruption.

Recommendations

Weather and transport

Recommendation 1: In spite of the continuing advice from the Met Office that severe winter weather continues to have a low probability of occurrence, and that there appears to be no evidence to support 'clustering' of severe winters, government should recognise that there are opportunities for additional resources to be committed to winter resilience in England – in highways, railways and aviation – but that the quantified benefits and the business case will necessarily reflect this weather assessment.

Local Highway Authorities

Recommendation 2: Local highway authorities should be commended for their readiness and response during the recent period of severe winter weather; at the same time they should note the elements that drive good performance in the delivery of winter service (particularly in snow conditions), in the provision of good information, in the management of public expectations, and in engaging the public and should review their own plans and operations accordingly against best practice.

Recommendation 3: Government, working with the UK Roads Liaison Group and the National Winter Service Research Group, should take the lead in making urgently available the research and evidence that will underpin decisions by highway authorities to make more economical use of salt and its derivatives (this is now in hand).

Highways Agency

Recommendation 4: That the Highways Agency, in collaboration with other agencies as appropriate, should demonstrate the value and effectiveness of their processes of review, analysis and learning lessons after major incidents, by preparing such a report for the Transport Secretary of the major incident at the M25 Junction 3 on 30th November 2010.

Railways

Recommendation 5: Network Rail and the relevant train companies operating south of the Thames should conduct a thorough review of the actual operational experience of this period of severe winter weather; in particular Network Rail should review the nature and amount of equipment needed to fulfil anti-icing duties (in addition to autumn duties) taking account of risks and operational needs, as well as the availability of winter resilience resources generally (such as snow clearance) across the network.

Recommendation 6: The rail industry should continue the development and improvement of the systems for managing contingency timetables and for supporting, feeding and making more resilient the downstream information systems for passengers, having particular regard to the effectiveness of work-arounds needed when circumstances require.

Recommendation 7: The rail industry should develop and implement resilient and flexible methods of providing pre-journey and real-time information to passengers alongside and largely independent of the main customer information systems, deploying appropriate technologies and resources; Network Rail and the train companies should also embrace the cultural need to ensure such arrangements attract appropriate priority, resourcing and recognition.

Recommendation 8: The rail industry should conduct a strategic review of technical alternatives to the third rail/top contact system, for the network south of the Thames, and prepare an evaluation and business case for consideration by the Government.

David Quarmby CBE
December 2010

1. Introduction

1.1 Earlier this year, a Review of the Winter Resilience of England's Transport Systems was carried out by a Panel which I led, with the Interim and Final Reports published in July and October 2010 [2].

1.2 On Wednesday 1st December I was asked by the Secretary of State to carry out an urgent audit of how well the highway authorities in England and the railway and aviation sectors were coping with the unexpectedly early and severe spell of severe weather, having regard also to the Recommendations arising from our Review.

1.3 Given the extent of disruption experienced across the different transport systems from Wednesday 24th November onwards, and the concerns and complaints being expressed by many travellers through the media about the lack of information, the key questions are this: are the highway authorities and transport providers doing all they should, and is the travelling public receiving appropriate travel information in a timely and accurate fashion. I am also interested in how far they are fulfilling the promises on these matters made to my Panel during the main Winter Resilience Review, and – where practical in the timescale – have they implemented the Recommendations we made?

1.4 And given the circumstances of this particular severe winter episode, to what extent is what we have been experiencing inevitable – given the degree of investment Britain makes in winter service and resilience? Should the nation invest more in winter resilience? And can people and communities be more involved in playing their part to ensure our quality of life is better sustained and our economy more resilient in severe weather?

1.5 The period of review for this Audit is 24th November to 9th December and the main evidence-gathering took place during this time. I am very aware that there has been a further episode of severe sub-zero temperatures and snowfall since then. I believe the issues I have identified are equally relevant, although in the first period the aviation sector was not tested or disrupted (except at Gatwick Airport) in the way it is now. I also recognise that the road salt situation has developed, with significant further use in the 10 days since I last had good data on supply and use.

The Approach

1.6 This is a quick audit, intended to be completed in two weeks. Given the timescale, it is in the nature of an overview rather than a comprehensive analysis, and I have concentrated on the key issues that I believe are significant.

1.7 My evidence comes from two main sources: first, from in-depth telephone conferences with:

a) 15 county highway authorities, including those most badly affected by snowfall;

b) The Highways Agency (HA) (which is responsible for the strategic road network of motorways and trunk roads in England);

c) Four train operating companies (including the three most badly affected south of the Thames);

d) Network Rail, and

2 The Resilience of England's Transport Systems in Winter; Interim (July 2010) and Final (October 2010) Reports; http://transportwinterresilience.independent.gov.uk/

e) Transport for London.

1.8 Second, I sought assistance from Passenger Focus to monitor the quality of information available to rail and bus passengers across England. I have also had their recent major report on rail passengers' attitudes to delays and disruption, which fortuitously was published as I started this Audit. Information available from a large number of local authority websites about winter service and advice has been analysed. I have obtained network-wide performance data for the railways during the period of severe weather, from England's main airports and from the HA. I have also monitored the media over this period and had a number of unsolicited contributions from other organisations and members of the public. I am grateful to all of those who gave their time to provide information and to discuss their experiences with me.

1.9 I am also grateful to Lloyd Miles, who as a former member of the support team for the main Winter Resilience Review was deployed to provide invaluable support to me for this audit.

2. The weather

2.1 Winter conditions arrived early this year and were severe. The extreme cold and the extent of snowfall in Scotland and the north-east from Wednesday 24th November, and the following week in parts of eastern and central England, was unusual but not unprecedented. What was particularly unusual was its early onset.

2.2 On Tuesday 30th November, Wednesday 1st December and Thursday 2nd December low temperatures and light snowfalls spread over much of England, but with unusually intense and sustained amounts of snowfall over eastern and parts of central England, and the home counties south of London. The high snow precipitation was localised in pockets in the north-east, North Yorkshire, Lincolnshire, south Essex and the North Downs from Kent through to West Sussex. The two maps at the end of this chapter show lying snow on 2nd December and 7th December to illustrate the highly localised, but intense pattern of snowfall.

2.3 Temperatures eased from Friday over the weekend of 4/5th December, with thawing in many places; but temperatures tumbled again on Monday 6th December and were initially sustained close to zero or substantially below in most areas. Later in the week temperatures rose again, with widespread thawing. Since then, and as this report goes to press, there are severe temperatures and further snowfall over the weekend of 18/19th December.

2.4 The Met Office gave 'early indications of the onset of a cold spell from late November' at the end of October, but detailed forecasts of snow were provided just a few days before the first precipitation. This is no criticism of the Met Office, which is one of the three leading weather and climate science organisations in the world. The truth is that Britain's weather is notoriously volatile and challenging to predict, particularly at longer lead-times. While forecasts of weather and temperature are now pretty accurate up to 5 days ahead at very local levels (and widely used and valued), weather assessments up to 15 and 30 days become less detailed, and seasonal and longer term forecasts can only currently be provided for the UK with limited confidence.

2.5 In the remainder of this audit, I examine the impact of these severe weather events on the different transport systems and on their passengers and users. I then consider and assess the operational responses by the highway authorities and transport operators.

2.6 But we also have a critical interest in the likely incidence of severe winters in the future, because this necessarily informs long term decisions whether to invest more in winter resilience – whether in equipment for highways, railways or aviation, or in revenue spending on intensive anti-icing or snow clearing operations. Such an assessment would also guide strategic decisions such as those relating to the production capacity, stockholding strategies and supply chain for road salt.

2.7 For our main Review[3] earlier this year, we sought advice from the Met Office on what could be said about longer term trends in weather and the incidence of severe winters, in the context of climate forecasting and the implications of climate change. What we understood is that:

- The probability of the next winter being severe is virtually unrelated to the fact of just having experienced two severe winters, and is still about 1 in 20;

3 Weather Forecasting and Climate Change, Chapter 12, Interim Report, The Resilience of England's Transport Systems in Winter (http://transportwinterresilience.independent.gov.uk/)

- the effect of climate change is to gradually but steadily reduce the probability of severe winters in the UK;
- however when severe winters come they could still be extreme – in terms of snowfall, winds and storms, though not necessarily in relation temperature.

2.8 However, entering the third successive experience of significantly sub-zero temperatures and substantial (if localised) winter snowfall, we can be forgiven for wondering whether the Met Office interpretation of weather and climate trends is still reasonable. As part of this audit, I asked the Met Office to revisit the advice given to my Panel earlier in the year. I also asked for any evidence to support the concept of 'clustering' of severe winters, and whether climate trends would support the likelihood of greater snowfall in the future at any particular temperature band.

2.9 The considered response was: no change to the advice, and it remains safer to assume that there is statistical independence between one year's weather and the next, with the probability of 1 in 20 with evidence showing this reducing over the next century. So far as snowfall goes, the advice is "that on average the intensity of the heaviest snow events in the UK will reduce with a warming climate, but there are some predictions of future climate which show more intense snowfall in heavy events, indicating that these are possible and cannot be excluded from consideration of future conditions". This is consistent with the advice that climate change in general increases the volatility of UK weather and the occurrence of extreme events, even though the trends show on average a reducing frequency.

2.10 With similar questions in mind, the Transport Secretary approached the Government's Chief Scientific Adviser, Professor Sir John Beddington, who has initiated a more general investigation by the Met Office into emerging seasonal and longer term forecasting capability. A report was delivered on 15th December; Professor Beddington advises me that significant progress is being made by the Met Office in being able to make seasonal projections with more confidence, certainly up to one month and potentially up to three months in advance, and could be incorporated into operational forecasting by winter 2011/12, given sufficient computing resource. And there are ongoing advances in understanding the factors which drive natural variability, such as 'blocking' anticyclones, and of Britain's weather over longer timescales, but these will have to compete for sufficient resources (particularly computing capacity) with other priorities. Such developments would be relevant to advice about other severe weather events across all seasons.

2.11 This audit identifies some opportunities to spend or invest more in England's winter resilience. But the worthwhileness of such projects depends crucially on the probability of severe winters reoccurring. The scientific advice is that this is still a low chance. Policy decisions will have to be taken if and when such proposals come up for decision by central or local government, recognising the benefits that can arise but also the risk of limited or no value when winters are average or mild.

Recommendations

Recommendation 1: In spite of the continuing advice from the Met Office that severe winter weather continues to have a low probability of occurrence, and that there appears to be no evidence to support 'clustering' of severe winters, government should recognise that there are opportunities for additional resources to be committed to winter resilience in England – in highways, railways and aviation – but that the quantified benefits and the business case will necessarily reflect this weather assessment.

Figure 2.1: Snow depth on 2nd December 2010

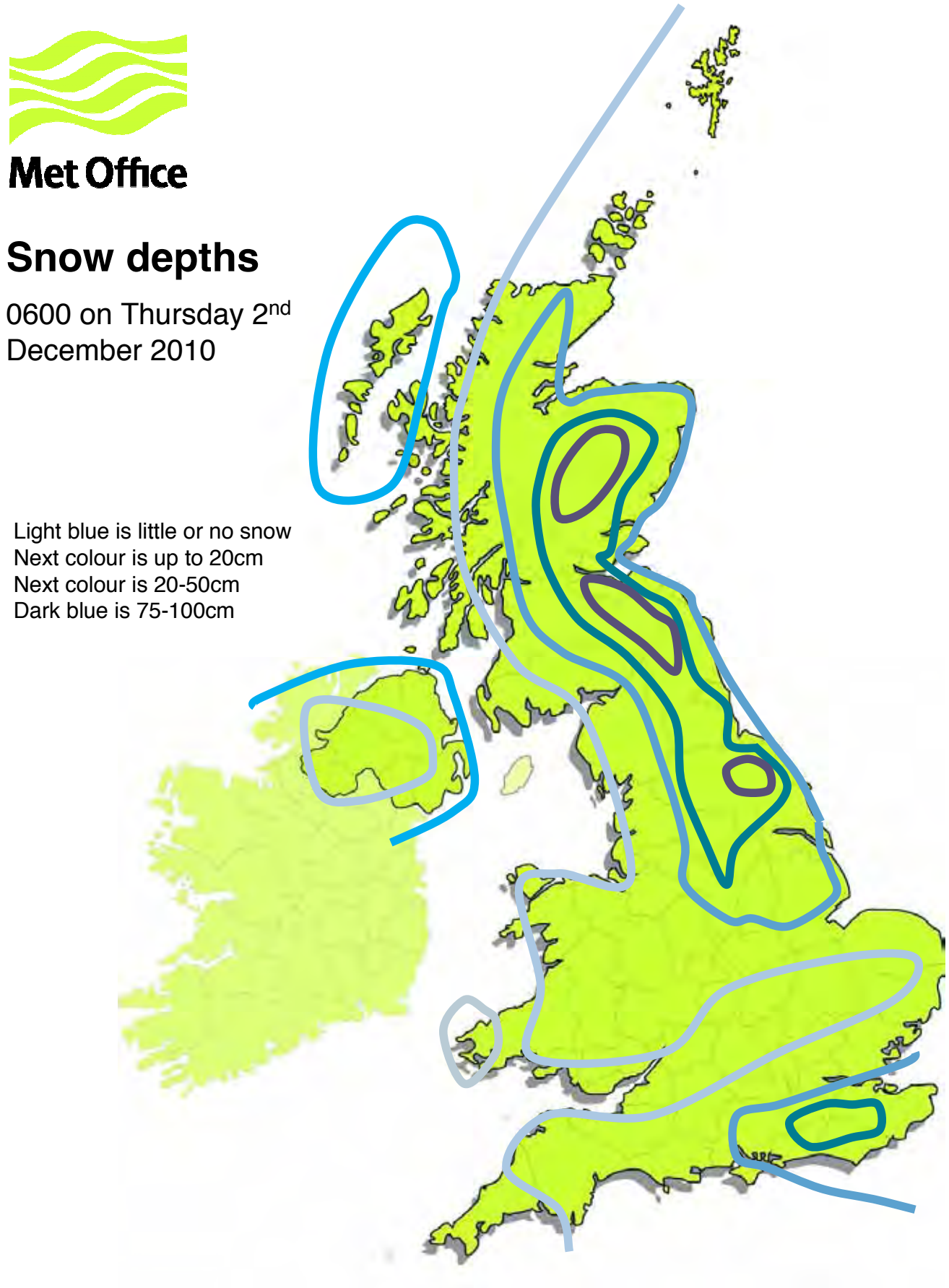

Image reproduced courtesy of the Met Office

Figure 2.2: Snow depth on 7th December 2010

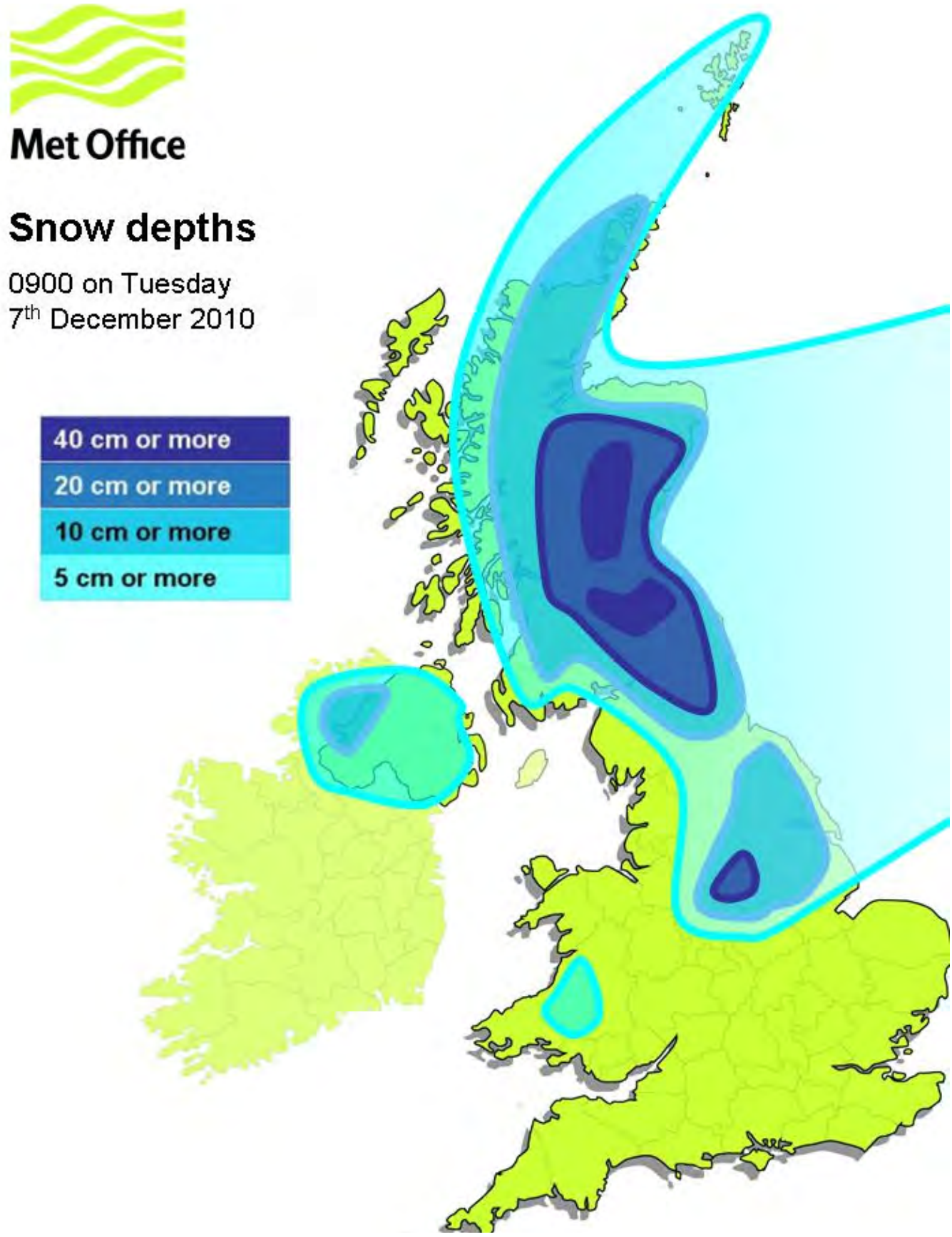

Image reproduced courtesy of the Met Office

3. Getting about locally

The weather impact on Local and Regional Roads

3.1 Over the period Wednesday 24th November to Friday 10th December, while temperatures have varied considerably from 5-6 oC to -10oC and lower, the variation between different areas of England has been small. So local highway authorities (LHAs) have been gritting roads across the country as part of normal precautionary treatment at very similar frequencies, mainly one or two 'runs' per day.

3.2 In stark contrast, the highly localised snowfalls caused significant disruption on the road networks in parts but not all of Northumberland, North Yorkshire, Lincolnshire, Essex, Kent and Sussex, and generally on high ground on the Pennine Range down to the Peak District. Snow precipitation of up to a foot on particular days led to drifts on roads on high ground up to several feet. Most of East Anglia was spared, as was central southern England and the south west.

Local Readiness

3.3 LHAs work to achieving a state of winter readiness in their own winter service operations by 1st November. This covers salt stocks, vehicles maintained, crews ready and trained, treatment networks published, and website updated. From the evidence I have received from the sample interviewed all seemed to be in a good state of readiness (the only practical point being that some had yet to complete the filling of local salt bins). I have no reason to believe this was not the case across other authorities.

3.4 Low temperatures requiring gritting activity occurred in some exposed areas even from late October, although not unexpected. Nevertheless, substantial snowfall before the end of November is very unusual, and with only a few days' notice this places particular operational pressures on LHAs; they aim to clear main routes first with gritter-mounted ploughs, and treat with salt several times a day; and depending on the conditions they will start to deploy additional contract snow clearing.

3.5 In early December, some LHAs still had to receive their full pre-season salt supplies. With an early start to gritting operations, and the suppliers under pressure, my interviews with LHAs revealed some understandable concern about the availability of salt over the coming few weeks. As we pointed out in our main Review earlier this year, the supply industry has indeed been under pressure since last winter to meet pre-season orders, due to there being very low stocks across the country on exiting last winter, coupled with the high pre-season stock targets set by local authorities for this winter. This was one of the reasons for our Recommendation in July for a national strategic reserve of salt, most of which is now in place and from which the first allocations will shortly be made by DfT.

3.6 Many authorities have reviewed their treatment networks during this year, and attention has been given to transport links, business parks and major installations, in line with our main Report Recommendations.

3.7 During this year several County authorities have greatly developed their level of engagement with District and Borough Councils – particularly in arrangements to treat footways and pedestrianised centres – and with Parish and Town Councils on the provision of and supplies for grit bins, briefings

about dealing with local roads and footpaths, and publicising the Government's Snow Code[4] to give the public simple advice and confidence about clearing their frontages. This degree of leadership and engagement reflects a strong response to our main Review Recommendations both about attention to footways and to community engagement.

3.8 This year has seen many authorities developing the quality, relevance, breadth and timeliness of information about winter service through their websites – not only about their gritting networks but weather forecasts, notice of road closures or other network difficulties, tweets about road conditions, real-time information about the deployment of gritters, and practical advice.

3.9 A few authorities have embedded their winter service planning and operations into the general resilience and emergency planning mechanisms, and are clearly benefitting from that, not only in terms of integrating effectively with police and fire and rescue services, but with wider business continuity planning in their areas. This was another Recommendation in our main Review

Performance on the ground

3.10 Although I have spoken with almost every county authority seriously affected by snow over this period, I have only sampled the vast majority of LHAs who were dealing with small amounts of snow and low temperatures, and as stated earlier I have not covered predominantly urban unitary authorities

3.11 My judgement is that in areas without significant snow, the normal gritting treatments have been generally effective, and traffic and movement on the treated networks has been largely unaffected.

3.12 In areas with major snowfalls, a few LHAs received forecasts which significantly underestimated the amount of snowfall. In some areas the continuing intensity of snow precipitation was greater than at any time since 1965. Many LHAs use private sector weather forecasters, who can provide a forecasting service at a more granular level to support operational decision-making. It is generally understood that while forecasting temperatures can now be done very accurately – and all LHAs recognise this – it can be more difficult to forecast the amounts of snow precipitation, even where the incidence of snow is known a few days ahead. Nevertheless, the Met Office have demonstrated to me that their own Severe Weather Warnings matched against observed snow levels well.

3.13 Understanding the amount of snowfall may well have influenced some operational decisions – for example the deployment of snow ploughs and of critical staff. Based on the evidence I have gathered, my judgement is that most authorities responded quickly and well to the unusual amount and persistence of snow. Inevitably, the concentration of resource to keep main roads clear will impact the timing of gritting on other parts of the network, and the public may not always be aware of that. In some areas it was impossible to avoid some main road closures.

3.14 The exact timing of the snowfall also dictates how effective the response can be – there were some examples in North Yorkshire and in the south and east of London where heavy snow stared during the middle of the day. Even with appropriate precautionary salting treatment of the roads, heavy traffic flows are immediately affected, incidents happen, congestion immediately builds up, and gritting and ploughing vehicles cannot get through.

4 The Snow Code resulted from a Recommendation to government in our main Review Interim Report in July that they should prepare and distribute such advice for the public and local authorities; The Snow Code was indeed published by government on 22nd October, the day of publication of our Final Report, http://www.direct.gov.uk/en/Nl1/Newsroom/DG_191868.

3.15 Where journeys involve the use of the strategic road network, for which the HA is responsible, critical, timely and well coordinated action is essential to prevent or at least mitigate the build up of congestion and the heightened risk of incidents.

3.16 There are areas where police and highway authority liaison, for example over road closures and access for gritting vehicles, can be improved. Those authorities such as Kent and Lincolnshire which had established explicit 'snow desk'-type coordination arrangements with police and emergency services – whether within the local emergency planning arrangements or separately – clearly achieved a real difference in the dynamic management of difficult and fast-changing conditions on the road network.

3.17 Hills on main roads are particularly vulnerable; many authorities concentrate gritting and ploughing resources on known trouble spots. However, vehicles of all types can and do get into trouble on such sections; articulated lorries jack-knifing was reported to me as an issue (and on the strategic road network as well), because of the particular disruption it can cause. Timely and accurate information about road conditions by LHAs and the HA can help drivers make responsible journey and routing decisions, and for commercial vehicle operators the Freight Transport Association's Traffic Information Service provides additional tailored advice.

3.18 The majority of authorities have an established network of farm and other service contracts which enables them to deploy additional snowploughs quickly and easily on secondary parts of their networks and critical minor roads, though a few were still reviewing their arrangements. Where LHAs provide their highway maintenance and winter services through term maintenance contractors, additional resources for ploughing or digging out snow can often be marshalled through their supply chains.

3.19 In spite of this, a considerable mileage of secondary and minor roads which are off the treated networks – in town suburbs and in rural areas – have seen significant accumulation of compacted snow and ice, some of which has persisted. This is largely due to the particular weather pattern experienced – substantial snowfall, followed by thawing and freezing in quick succession. These are difficult to treat, because the snow and ice binds to the untreated road surface; in rural areas the recommended treatment with a sand/salt mix, or just sand, can improve traction on the icy surface, but it seems there is little else that can be done until the thaw comes. In urban areas, sand or a mixed salt/sand treatment leave the problem of residual sand getting into drainage systems. I understand some alternative treatments for such situations are under investigation at this time.

3.20 In recognition of this, the rural authorities mostly ensure in planning their treated networks that they treat at least one access road to all but the smallest communities. The county highway authorities generally treat 20 – 45% of their total network as their priority network; many have secondary networks which are treated less intensively, which lift the total to nearer 50% of their total mileage. LHAs are often under pressure to extend their treatment networks; this incurs additional cost, uses more salt (at a time when more salt is already being used for footways and pedestrianised areas), and to some extent could give rise to diminishing returns in terms of the population benefitting – assuming that arrangements exist to address specific or urgent needs for access.

3.21 Nevertheless, the inconvenience of limited (or no) accessibility on untreated routes increases with the duration of the cold spell; it is not surprising that public pressure increases in these circumstances.

Key issues

Engaging lower tier authorities and the community

3.22 It is clear to me that energetic engagement of District and Borough Councils (in two-tier areas), of Parish and Town Councils, and of the community at large in dealing with severe winters can deliver real benefits as well as making them part of the solution (instead of just complaining to the LHA). There are several examples of good practice: formal agreements with District and Borough Councils over treating footways and sharing the cost, engaging parish and town councils through winter conferences, briefings, provision and/or filling of grit bins and 'hippo' bags of salt, offers of training, appointment of 'snow patrols' to alert the LHA, distribution of the Snow Code, hotline information on road conditions, and so on. I recognise that different forms of engagement may be needed in larger towns and cities.

3.23 While community self help and people assisting their neighbours has been a welcome and positive feature of media coverage in these two weeks, achieving systematic engagement of communities requires leadership and commitment from the local authority. West Sussex and Lincolnshire are two good examples of best practice in this regard.

Good information for road users and the public at large

3.24 People's travel experiences of the last two weeks – whether on the roads, railways or in the air – reinforce the paramount importance of timely, accurate and relevant information to travellers both for planning their travel and in-journey. It is clear from the experience of the LHAs I have spoken to that the better the information about what is planned by way of winter resilience, and about what is actually happening on the ground, the better the chance of managing people's expectations and enabling them to make informed decisions about their travel.

3.25 Major improvements have been made to local authority websites; many now have detailed weather forecasts, information about the gritting networks, the location of grit bins, self help advice to local communities, and links to other websites such as the Government's Snow Code, the HA and the Met Office. A number have introduced real-time information – such as the state of the roads and any closures, traffic cams, the current gritting operation and location of gritters; and some offer text and twitter signups for latest information. North Yorkshire County Council's website is a particularly good example.

3.26 Given the significant improvement in information being provided by local authorities, individual motorists, small businesses and employers ought to use it to make better informed and more responsible decisions about their own travel and the travel of their employees.

3.27 Finally, many people depend on buses to move around locally. At my request, Passenger Focus explored – on a sample basis – the quality and relevance of bus information available, particularly through Traveline and Transport Direct websites, and those of the principal bus companies. Generally, they found that there was good or reasonable information about disruption to individual services, in both urban and rural areas, though some websites were more readily navigated than others to find this information.

3.28 The apparent lack of knowledge and understanding among the public at large – and often shared by the media – about the realities of snow and ice on roads and pavements is understandable. These include the way in which salt or other materials can be used, and the expectations about what different types of treatment on roads and footways can be expected to achieve.

For example, road salt becomes ineffective below -8oC; deep snow cannot be cleared by salt but needs ploughing; traffic movement on a gritted road is beneficial in dispersing salt and making it effective; compacted snow and ice cannot easily be cleared; and so on.

3.29 In addition to the extensive information already put out about winter service arrangements, local authorities (and central Government) might take appropriate opportunities to educate the public and the media about the facts, how it all works and what can and cannot be achieved. Some local authority websites already do this, but there is still more scope to inform the public and media about winter services.

Salt utilisation

3.30 The resilience of salt supply and the supply chain was a major issue throughout our main Review, and our analysis and Recommendations feature strongly in the Interim and Final Reports. I return to the current salt supply situation in a later chapter in this report, but in this section I deal with the demand for and utilisation of salt by LHAs.

3.31 In our main Review we pointed to the opportunity which many highway authorities had identified, as a result of last winter's experience, to adopt more economical spread rates. We saw the use of reduced spread rates as a strategic response to the potential national shortfall of supply against demand under severe winter conditions. Accordingly we made a Recommendation for a more coordinated approach to research which would provide authoritative backing to such decisions by local authorities.

3.32 To address this, we recommended in the Interim Report that the valuable work of the National Winter Service Research Group (NWSRG) – researching and publishing reports on many aspects of winter treatment, including salt spread rates and the use of derivative materials – should be brought under the wing of the UK Roads Liaison Group (UKRLG) and made available to the whole highways community (rather than the one-third of authorities who are subscribing members to the NWSRG).

3.33 We appreciated that this was not going to be achieved overnight, and envisaged that the full benefit would arise in subsequent winters. In my telephone conferences with LHAs, I was reminded again of the wide variety of spread rates still in use for salt and its derivatives, and in many cases an understandable reluctance to depart from those without an authoritative basis for doing so.

3.34 However, given the amount of salt already used nationally this winter, I now believe there is an urgent national need to provide highway authorities with the appropriate advice sooner rather than later, and to enable them to take whatever sensible conservation measures are practical in the short timescale available.

3.35 The guidance published by the UKRLG in October, which was based on some urgent updating and reinforcing of good practice commissioned by DfT, gives important practical advice to LHAs about inter alia salt treatments and conservation[5], though no new advice on spread rates. For reduced spread rates to be introduced, an urgent arrangement is needed for NWSRG to release their material.

3.36 I have been advising DfT of my emerging findings during the course of this audit, and I was pleased to see the publication of a letter to local authorities from the Parliamentary Under Secretary of State for Transport on Wednesday 15th December, which drew attention to this UKRLG advice,

5 UKRLG's 'Well–maintained Highways; Code of Practice for Highway Maintenance Management, Section 13, Winter Service. http://www.ukroadsliaisongroup.org/pdfs/Well%20maintained%20highways%20January%202010.pdf

endorsed practical conservation measures and indicated that general publication of advice about spread rates drawn from the NWSRG's work would take place within a few days. This letter also announced that the first allocations from the national strategic reserve would be made shortly.

Should more be spent on winter resilience?

3.37 Our main Review[6] identified the economic and social cost to England of an average winter of some £1 billion; the cost of winter resilience for England's road networks averaged over a number of years is about £160 million, although in the last two winters it reached £180 million and £220 million respectively. As a theoretical exercise, we made a very rough estimate of what the benefit might be of a nominal increase of 50% in winter resilience expenditure – i.e. a further £80 million per annum. Assuming this was spent on treating a significantly higher proportion of the local road networks, extensive treatment of footways, pedestrian areas and cycleways, and more deployment of snow clearing equipment, the analysis suggested incremental benefits in the range £50 million to over £400 million, with a central estimate of £200 million.

3.38 In other words, according to this desktop exercise, the right sort of incremental expenditure could be expected to generate economic and social benefits well in excess of the additional costs.

3.39 These figures are at best only indicative, and do not necessarily support a generic case for increasing expenditure on winter resilience. In any case, the current pressures on local authorities would make it seem untenable. However, in our main Review we said that carefully targeted additional activity in particular areas could generate significant benefits – for example on snow clearance capability, on key pedestrian routes where footfall was high, or on treating more roads to improve access under severe snow conditions.

3.40 Crucially this equation depends on the likelihood of severe winters in the future. This issue is discussed further in the chapter on Weather, where I report that there is no evidence to change the advice given by the Met Office to my Review earlier in the year; the question of forecasting over long periods than is normally done now has also been taken up with the Met Office by the Government's Chief Scientifica Adviser, Professor John Beddington.

3.41 I do not wish to argue at this stage that there should be a targeted increase in winter resilience expenditure for highways. But the Government may wish to review this question in the light of any further advice emerging from Professor Beddington. Meanwhile it is important to note at this stage that none of the LHAs I spoke to reported pressure to reduce their spending on winter resilience in the light of the in-year cuts to local authority expenditure: the priority was to deliver the winter plan as approved by their Councils. There was acknowledgement in some cases of pressures in the budget process under way for 2011–2012, but no indication so far that winter service plans would be affected, beyond sensible housekeeping efficiencies. In any case, the increases in expenditures in the last two years compared with the average demonstrate that local authorities do indeed spend what it necessary to deal with the specific conditions of a particular winter.

London

3.42 I specifically included London in this audit because of the dependence of the national economy and the effective workings of Government on the ability of London to manage winter resilience for its millions of workers, and because London has in recent years learned some lessons and developed elements of good practice which have wider relevance.

6 Final Report, Chapter 12 The Economics of Winter Resilience.

3.43 London's economy depends heavily on the successful operation of the national rail network – especially the commuter services for south of the Thames, East Anglia and the Thames Valley – and the chapter on rail deals with the major problems on the 'third rail' commuter network.

3.44 In most other respects, the performance of the transport system is in the hands of Transport for London (TfL) and their contracted transport service providers, and the London Boroughs who are the highway authorities for all the local roads in London. The interface with the HA is also important, particularly regarding the M25 and its interaction with local and TfL roads. And parts of the new London Overground service use Network Rail tracks.

3.45 Significant snow fall affected south and south east London, and parts of east London. The evidence I have suggests that the strategic roads and those roads on the treated parts of the local network were kept reasonably clear throughout the worst days, with effective deployment of gritters and snowploughs by TfL, London Boroughs and their contractors. The intense levels of traffic on London's road networks place particular demands on the timeliness and urgency of the operational response, particularly for snow clearing and ploughing, to mitigate the risk of gritters getting caught in traffic congestion caused by the winter conditions. A good measure of road network availability is the statistics on bus operation, which show that on the worst snow days around 1% or less of London's bus service was cancelled or curtailed for weather related reasons.

3.46 Nevertheless, it is fair to observe that with the weather experienced up to Friday 10th December. London's arrangements have not yet been fully tested, compared with certain other areas.

3.47 There were some pockets of severe road congestion; the ones I have been advised of are associated with the M25 (J3-M20/A20, J7-M23 and J8-A217); I can make no observations about causality but I observe the high interaction and interdependence between the M25 and the local road network – which emphasises the quality of operational coordination in both traffic management and winter operations between TfL and the HA.

3.48 Like the 'third rail' commuter network London Underground trains utilise top-contact conductor rails (and two of them, not one) for traction power. And most of the so-called 'Underground' network is actually above ground and exposed to the elements. The limited geographical extent of the Underground network, and the high density of trains operating over the system enables London Underground to adopt winter mitigation strategies such as running 'ghost trains' through the night at 10 –15 minute intervals to keep conductor rails free of ice and snow. With many times the mileage of the Underground network, the commuter rail network could not see this intensity of of ghost train running.

3.49 A particular feature on the Underground is the strong commitment to passenger communication and briefing; on the TfL website, through the telephone enquiry services and particularly in-journey. 'Rainbow boards' giving line status at every station, extensive use of public address throughout the network to advise current conditions as a supplement to the electronic platform indicators, and helpful information by train drivers if services are delayed or halted, all add to the confidence passengers have about using the system. While recognising the differences in scale and resources, there are lessons to be learned and applied, particularly about information, for the national rail network.

3.50 Finally, taking advantage of the better and more coherent governance arrangements than anywhere else in the country, London embeds its winter service planning, operational response and coordination in the well established and experienced resilience and emergency planning arrangements for the capital; and London's economy and communities benefit considerably from the resilience which this brings.

The High-Performing Local Authority

3.51 Many improvements in providing and communicating about winter resilience have been achieved by local authorities during the year since the exigencies of last winter. The evidence suggests that many authorities are demonstrating leadership and best practice in many aspects of their winter service. And that doing this can make a real difference to the experiences of their communities, their road users and those who need to go out and about locally, when winter comes. It also makes a difference to the general sense of whether the various local authorities and bodies seem to be on top of the situation.

3.52 At the same time, the local authority can through its communications provide some basic facts and education about what can and cannot be achieved by different kinds of treatment and in different circumstances.

3.53 This audit demonstrates that there are many ways – some quite modest – in which a number of LHAs can raise their game and perform better, and be seen to be doing so by better managing expectations. Generally this does not mean increased expenditure. Rather, the evidence suggests it involves leadership by the Council, openness and outreach and consistent professional commitment and delivery.

3.54 The issues of best practice were covered in our main Review, but the evidence of my audit and the recent experience of severe weather would lead me to emphasise the following points.

3.55 A best practice LHA will:

- Planning;
  - Review and consult with stakeholders widely on the treated networks, including adjacent highway authorities, major installations, transport operators, health and educational facilities;
  - Put in place, according to its weather history, appropriate and worked-up plans for the deployment of sufficient snow clearance resource – farm contracts, plant contractors, maintenance contractor supply chains – with good geographical coverage of the vulnerable areas;
  - Adopt a strategy for footways and cycleways and confirm how it will be delivered;
  - Use the resilience and emergency planning mechanisms to put in place robust operational coordination arrangements, such as snow desks, involving the police and other emergency services.
- Community engagement;
  - Have clear arrangements with Districts and Borough Councils (in two-tier authority areas) for the delivery of certain local services such as footways clearance, grit bins etc and publicising and promoting self help, Snow Code etc;
  - Lead systematic engagement with parish and town councils and local communities to clarify and support ways in which they can be encouraged towards self help, including information, the Snow Code, training, briefing, and reporting back;
  - Manage expectations, about what can be done and what cannot.
-

- Information;
  - Have a pro-active information strategy for all stakeholders about winter resilience plans and operational delivery – using a comprehensive website, social media and other digital communications – including real-time information about activity and network status, links to other websites, etc;
  - Have a proactive and open relationship with local media.
- Operations;
  - Achieve operational excellence in responding to weather forecasts, getting enough salt out before the snow falls, getting ploughs out ahead of other traffic and mobilising all available support resources;
  - Achieve high levels of practical liaison and coordination across major delivery partners including police and other emergency services;
  - Manage salt utilisation and adopt best practice on methods, spread rates and materials;
  - Review and plan forward capacity for salt storage in line with Recommendations from our main Review[7].

3.56 In our main Review we observed that the mechanisms for disseminating best practice between local authorities could be better, and I re-emphasise the importance of using all possible options, including the LGA, the professional associations and the UKRLG, to capture and disseminate best practice.

Findings and Recommendations

3.57 LHAs were in a good state of readiness for this unexpectedly early winter episode, particularly in relation to gritting operations. Those who suffered high levels of snowfall were put under early pressure with substantial operational demands.

3.58 Generally, my sense is that they have managed well, though it is clear that good performance on the ground and managing expectations is about getting the all the key elements right and delivering them to a high standards: effective and inclusive planning; pro-active community engagement supported by strong leadership; comprehensive and rich communications to stakeholders and the public at large; and high operational standards supported by professional commitment and delivery.

3.59 The evidence suggests there are real opportunities (with the right leadership) to engage communities and individuals in playing their part in helping to deal with snow conditions – without resorting to the more 'dirigiste' approach found in some European countries where it appears more culturally acceptable.

3.60 Although not tested to the extent of some other local authorities, London has managed the recent spell of winter weather well; the various organisations work effectively in an established and disciplined resilience planning and operations regime; there are elements of good practice (for example passenger information on London Underground) which are applicable elsewhere.

3.61 There is scope for a more widespread communication of best practice and encouragement of those authorities for whom the opportunity remains to raise their game.

7 Final Report Chapter 10: The Salt Supply Chain and its Longer Term Resilience.

3.62 But there are no silver bullets. We need to recognise the unpredictability and volatile nature of weather in the UK, and the considerable uncertainties associated with the timing, severity, geographical extent and persistence of winter conditions – both as to temperature and snowfall. Given this, and the resources the nation believes are affordable, it is down to LHAs and their communities to do the best job they can.

3.63 Government should – and clearly does – provide the framework within which local authorities operate; it responded quickly and fully to the Recommendations we made in our main Review, and the fruits of that are clearly visible. The one ongoing role for which Government accepts responsibility (in addition to that for the HA) is to watch over the salt supply chain and to advise and initiate action to ensure that the appropriate needs of authorities on the ground for road salt can be met.

3.64 A desk exercise during our main Review demonstrated that there should be opportunities to target some additional expenditure on winter resilience if it was regarded as affordable, but I am not making any recommendations about this. In any case such a consideration would need to take into account any future advice on the confidence with which the likelihood of severe winter weather can be assessed.

Recommendations

Recommendation 2: Local highway authorities should be commended for their readiness and response during the recent period of severe winter weather; at the same time they should note the elements that drive good performance in the delivery of winter service (particularly in snow conditions), in the provision of good information, in the management of public expectations, and in engaging the public and should review their own plans and operations accordingly against best practice.

Recommendation 3: Government, working with the UK Roads Liaison Group and the National Winter Service Research Group, should take the lead in making urgently available the research and evidence that will underpin decisions by highway authorities to make more economical use of salt and its derivatives (this is now in hand).

4. The Strategic Road Network

The Weather Impact on Strategic Roads

4.1 The Highways Agency (HA) is responsible for the operation and maintenance of England's strategic network of motorways and trunk roads.

4.2 As with the local authority roads, the strategic network experienced low temperatures and relatively light snow over most of the country for the period of this review (Wednesday 24th November to Friday 10th December), and the standard salting and clearance operations proceeded in the normal way with no issues of network availability or traffic problems.

4.3 The highly localised and intense snowfalls described elsewhere impacted directly and indirectly on the operation of several parts of the network: the southeast corner of the M25 together with the adjacent sections of M20 and M26; the M25 around the M23 junction, a section of the A13 and the Dartford Bridge; the M1 between Chesterfield and Sheffield; isolated sections of the A1; and triggered the anticipated closure of the A66 between Newcastle and Carlisle and A628 over the Woodhead Pass.

The operational response

4.4 The HA, through its contractors, works to specifications of a high standard of response for the delivery of winter service. Even more than on the busier local authority roads, operational demands both on winter service contractors, and on the traffic operations staff, become immediate and intense when significant snow falls , especially where normal traffic flows are high (for example on the M25 and A13). Quick action by HA traffic officers and police is necessary to contain and mitigate the effects of initially small incidents, such as a minor collision or a skidding vehicle, or to manage traffic where intense snowfalls limit the number of lanes that can be kept open, or in congestion.

4.5 In certain cases – particularly south Essex and west Kent – the weather forecast available to the contractors seemed significantly to have underestimated the amount of snowfall, and this will have influenced the nature of the initial response.

The case of M25 Junction 3

4.6 Situations can develop so quickly it is difficult to identify the original cause, as I found in trying to comprehend the origins of the serious traffic delays around junction 3 of the M25 on Tuesday 30th November over a 12 hour period – probably the most serious event of this period. Joining the M25 with the A20 and M20, and local roads, the roundabout at J3 also provides access to a critical works depot which houses HA salt spreaders. The root causes of this roundabout locking up for several hours are difficult to unravel, although the complex sequence of events can be described. The movement of salt spreading vehicles was severely restricted; and the relatively steep gradients on the M20 access ramps caused some heavy lorries to slip or stall and block the ramps, preventing the release of traffic on the roundabout and blocking back on to the M20.

4.7 Meanwhile, nearby, a foreign HGV travelling (illegally) in lane 3 on the M20 lost traction and the consequences for vehicles on other lanes caused the M20 westbound to be closed for 2 hours while vehicle recovery and removal in difficult snow conditions was completed.

4.8 Undoubtedly the complexity of the junction (and its quick locking-up), the mutual impact of the unrelated events on the M25 and M20, the high traffic flows, the intense continuing snowfall and the dynamic and changing nature of the traffic problems, contributed to making it a complex and challenging situation to manage.

4.9 But inevitably questions need to be asked – had the appropriate precautionary gritting treatment been carried out (before the event) on the motorways, their access roads and on the associated local roads (responsibilities of Kent County Council and Transport for London (TfL))? Did the HA, TfL and Kent fulfil the appropriate traffic management response in a timely manner? Was the HA contractor response to this event timely and appropriate, when the snow first fell, as the incident developed, and as the hours passed by?

4.10 I know from our engagement with the HA during our main Review that these processes of analysis and review are well embedded in the way it does its business, and that the HA is an effective 'learning organisation'. Nevertheless, given the importance of the strategic road network to the functioning of the economy, and the way it interacts with other main roads and local networks, I believe the HA should demonstrate how they carry out these processes of review and learning. I have asked them to prepare for the Transport Secretary a comprehensive review, including lessons learned, of the incident at J3 of the M25, involving other agencies (such as the relevant police forces, TfL and Kent) as required, and recommend accordingly.

Managing winter conditions on the Strategic Road Network

4.11 The case of the M25-J3 illustrates again the high standards of operational response required on the strategic road network when large or unexpected precipitations of snow occur, due to the heavy traffic flows, the higher proportion of heavy goods vehicles (including foreign vehicles), and the interaction with local roads which can sometime cause backing up onto the motorway or vice versa. Some of these arrangements have been under stress when heavy snowfall has been continuous, and it is not always possible to maintain availability of all lanes on 3- and 4-lane motorways.

4.12 At the same time it is important to acknowledge that disruptions of this order are relatively infrequent, and in my view the HA and its contractors deliver a good standard of availability on the strategic road network.

4.13 The HA have provided me with details of seven significant incidents or unplanned road closures over the several days of intense snowfall (of which the M25-J3 is the most significant and prolonged). Many of these illustrate the consequences of vehicles – both cars and heavy lorries – skidding or losing traction on the carriageways, and the ways in which small incidents can quickly turn into major traffic blockages which can delay people and goods for several hours at a time. They also illustrate the challenges of keeping carriageways free under intense and continuous snowfall, and the risks for drivers in these conditions.

4.14 Some of the problems arise because of unwise or careless driving by vehicles, and not taking full account of the surface conditions. This also puts a premium on the quality, relevance and

timeliness of information available to road users. Even with this, one wonders whether some people are making sensible decisions about whether to make the journey at all. Meanwhile, the HA must continue to develops its information services – its website for journey planning and briefing on road conditions, and variable message signs, i-phone apps and other digital communications for in-journey advice. With this information, road users have an obligation to use these services to brief themselves about the conditions that they will face, and for making the decision to travel, and wherever possible making decisions en route.

Utilisation of salt

4.15 The HA was early to recognise that it was possible to reduce salt utilisation without compromising the effectiveness of carriageway treatment, including the adoption of pre-wetting as a technique. New standards and specifications for spread rates were issued in the summer. With the near universal adoption of pre-wet across the winter fleet, and advice to minimise marginal use, this has effected reductions in salt use that also contributed to the wider resilience of the salt supply chain.

Findings

4.16 The HA and its contractors have established since the 2008-09 winter a good and consistent record of delivering winter resilience on the strategic road network. Nevertheless, the recent winter episode has demonstrated how critically, in conditions of major and unexpected amounts of snowfall, the availability of the network depends on high standards of operational response, particularly where there are high ongoing levels of traffic flow. My judgement is that on the ground these high standards of response have generally been delivered, while recognising there are always lessons to learn from particularly complex incidents.

4.17 The HA network does not operate in isolation from the local and major roads which feed it; there are mutual interdependencies in both planning and operational response and it is important that these arrangements – particularly with TfL and the significant counties and unitaries – are sustained in good shape.

4.18 The HA has made major strides in information provision to road users, both for journey planning and en route; but there is more to do. Meanwhile, road users have an obligation to brief themselves about road conditions with the information available, and to make sensible decisions, for their benefit and that of other road users.

4.19 The return of a further period of extended low temperatures and snowfall raises for the HA, as it does for local highway authorities, whether there is a case for further investment in winter equipment and resilience. This too needs to be considered as a matter of risk management against the uncertainties around the ability to forecast the incidence of severe winter weather in the future.

Recommendation

Recommendation 4: That the Highways Agency, in collaboration with other agencies as appropriate, should demonstrate the value and effectiveness of their processes of review, analysis and learning lessons after major incidents, by preparing such a report for the Transport Secretary of the major incident at the M25 Junction 3 on 30th November 2010.

5. Railways

The Weather Impact on the railways in England

5.1 The most severe impacts during the period I was reviewing for this Audit were Sunday 28th November to Saturday 4th December. I fully appreciate that as this report is finalised we are into another episode of severe weather across much of the country. While the data and evidence I have acquired relates to the earlier period, most of the issues remain the same, although some aspects of performance are likely to have improved.

5.2 Most of the network was affected in early December by sub-zero temperatures and low precipitations of snow (up to 2 – 3 inches and some drifting); but it was the highly localised, very substantial snowfalls noted earlier in this report in the north east, limited parts of eastern England and across the home counties south of London that had the largest impact on rail operations.

5.3 Table 5.1 below, provided by the National Task Force[8], shows the percentage of standard service operated by train companies serving England over this period, and their punctuality.

Table 2.1: Trains run by operating company 28th November to 4th December

Train company	Number of trains (standard weekday)	% Standard Service run (net of extras & cancellations)	% Punctuality of trains run
Arriva Trains Wales	955	99	90
Merseyrail	599	97	91
London Midland	1,316	95	83
Virgin Trains	330	94	60
NXEA	1,821	93	74
First Great Western	1,560	93	84
Chiltern	337	92	89
c2c	354	85	62
Northern	2,525	85	70
CrossCountry	295	83	63
East Midlands Trains	473	81	66
South West Trains	1,665	81	74
Trans Pennine Express	294	78	55

8 National Task Force (NTF) brings together Network Rail and representatives of the Train and Freight Operating Companies, Office of Rail Regulation and the DfT to collectively report and coordinate action on operational delivery issues for the industry.

Train company	Number of trains (standard weekday)	% Standard Service run (net of extras & cancellations)	% Punctuality of trains run
London Overground	836	77	80
First Capital Connect	1,127	73	73
East Coast	136	68	45
First ScotRail	2,219	56	48
Southern	2,279	50	46
Southeastern	2,056	47	34
National average	**21,177**	**75**	**68**

5.4 For those not operating in or through areas hit by severe snowfalls, train companies provided a generally good service throughout the period, successfully managing a range of issues including ice damage to rolling stock, difficulties of staff access to some depots, freezing couplers and doors. Network Rail (NR) and train company (TOC) staff worked hard to maintain the availability of the network and the operation of services wherever possible.

5.5 While East Coast, Virgin West Coast, Cross Country and TransPennine Express run longer distance services through the north of England, Northern Rail provide local services across the whole of the north of England. Apart from the electric trains (with overhead power) serving the Aire Valley into Leeds, Northern's trains are diesel powered.

5.6 In the north east and parts of Yorkshire there were substantial snowfalls of 2 feet or more in a couple of days, with severe drifts. All the long distance operatos were affected to some extent; across their network Northern operated as normal a service as they could, given that a number of routes were blocked for some time. NR reported that all available snow-plough fitted locomotives available were in use although there seemed to be some resource shortages for ploughing snow in some areas – this may reflect the prioritisation associated with NR's Key Route Strategy

5.7 The other main areas of snowfall were east and south of London. C2C's and NXEA's services from the Essex coast into London were not seriously affected. But in contrast the three main train operators south of the Thames, whose electric services depend on the 'third rail' for power supply, were very badly affected by the deep snow and freezing temperatures, particularly on Tuesday 30th November, Wednesday 1st December and Thursday 2nd December. As well as Southeastern, Southern and South West Trains, the third rail network is also used by First Capital Connect for their services to south London and the Brighton Main Line, and within the last year by London Overground, whose trains now run through from the former East London Line on the 'Southern' system to West Croydon. Problems with power supply affected all these services to varying degrees.

5.8 As a result of major improvements made by NR and the TOCs to the planning and implementation of contingency timetables, and the associated customer information systems, rail passengers in most parts of the country benefitted from a more orderly introduction of contingency timetables, and from more coherent and joined-up customer information, than last winter.

5.9 In this chapter, I consider the state of readiness of the rail network, given the effort by the industry over recent years to address the most significant issues, and taking account of the Recommendations in our main Review.

5.10 The timescale of this audit makes it impossible to give a comprehensive picture of events and the operational result on the ground, nor to cover issues in any depth, or completely unravel the sometimes complicated sequence of cause and effect as situations developed. I can only give a general overview of the relative importance of the different elements, and point to key issues which require further attention and action. I will focus, inevitably, on the experience of the TOCS operating south of the Thames.

State of Readiness

5.11 In our main Review[9] we commended a number of developments being led by the NTF to improve railway performance and service to passengers during periods of winter disruption. These include integrating the complex systems necessary for the implementation of contingency timetables, improving the information to passengers at times of disruption, and ramping up the various actions and investigations to improve resilience of the third rail system of traction power supply. Our Recommendations included the adoption of more consistent criteria for planning and implementing contingency timetables, and strong support for the continuing work on the 'third rail' problem.

5.12 I received evidence from the rail industry via a report from the NTF, supplemented by in-depth telephone interviews with the MDs of the three south-of-the-Thames TOCS, the MD of Northern Rail, and the Director, Operations and Customer Services and other senior managers in NR. These confirm the progress made in the planning and decision-making criteria for contingency timetables (as recommended in our main Review), and the pre-loading and implementation of contingency timetables through the new Integrated Train Planning System (ITPS). However, the early start to this severe winter period meant that some contingency timetables had not been fully validated and stress-tested prior to use, though this may not have been critical.

5.13 Good progress has also been made in the systems integration which enable the distribution of contingency timetables to the very large number of downstream systems, including the vital customer information systems (CIS) – the web-based journey planners, live departure boards, National Rail Enquiry information and individual TOC websites (and the social media driven by these), and the station displays, platform CIS screens and other advice available to passengers once they have started their journeys.

5.14 On the 'third rail' network, trial installations have been made of conductor rail heating at known 'cold spots' on the network – 45 out of 50 sites in Kent were installed and commissioned before the cold weather started; the programme for Sussex (due for completion by 24th December) was delayed by the cold weather itself; the installations for South West Trains area due to start in January. Anti-icing capability on some service trains in Southeastern, mentioned in our Review, is due to start test running later this month, with rollout planned for February. A programme of testing a range of anti-icing materials is on trial with Birmingham University.

5.15 However, the fleet of special vehicles (called MPVs) were only partly available to take on anti-icing duties across the third rail network south of the Thames when the freezing temperatures and snow arrived on 30 November. These vehicles are also used to keep the track clear of leaves and their

9 Final Report Chapter 5 The Rail Sector

deposit during the autumn (a well-known problem), but they need a depot visit for conversion from autumn to winter duties, and the planned timetable normally sees the first MPVs available for de-icing duties around 10 December.

5.16 In fact there had been a request mid-November to convert the MPV fleet serving South Eastern's network – ahead of the normal schedule – in response to requests. It seems there was availability of anti-icing vehicles on this network, but not sufficiently on the other two networks, to address the weather impact in that fateful week.

Performance south of the Thames

5.17 Passengers using the south of the Thames rail networks suffered particularly badly on two or three days from the knock-on effects of snow and ice on the 'third rail' – affecting the implementation of contingency timetables, the actual service operation on the ground, and the availability of information to passengers about what was going on – together with other effects of severe weather on rolling stock, track infrastructure and service delivery.

5.18 There are some questions to answer about the delivery of planned measures to maintain traction power availability at the third rail – operation of anti-icing trains, use of 'ghost' trains, effectiveness of measures such as third rail heating; about rolling stock robustness and reliability; about the management and implementation of contingency timetables; the quality of operational response in real time; and the provision of passenger information.

5.19 For a combination of reasons, services on Southeastern were badly disrupted from Tuesday 30th November through to the weekend, with services on the Wednesday and Thursday particularly badly hit. It was the one TOC where – for reasons described later – passenger information on the Wednesday was virtually non-existent, and where available, usually inaccurate.

5.20 Southern's disruption started on the Wednesday and went through to the weekend. Serious disruption started on South West Trains on the Wednesday and was most severe on Thursday, only recovering at the weekend. Accurate passenger information was sparse and often inaccurate, partly due to the evolving operational situation during the day.

5.21 First Capital Connect services, which use parts of the same network as Southern and Southeastern were affected by snow conditions generally and third rail issues in particular, as was the London Overground service between New Cross Gate and West Croydon.

5.22 The weather was unexpectedly severe both as to temperature and snowfall for the time of year. In addition, the amount of snowfall seems to have been underestimated; Network Rail acquires forecasts and interprets and disseminates them through the industry to support operational decision-making; these forecasts are not obtained from the Met Office, whose Severe Weather Warnings issued 24 hours ahead on those two days seem to match the observed snow levels quite well. Some operational decisions would have been different.

The implementation of contingency timetables

5.23 Contingency timetables are implemented through a new suite of systems, driven by the Integrated Train Planning System (ITPS) which also feed the CIS. This new process should make for more consistent and reliable implementation of contingency timetables. But it imposes a timetable on making changes (17:00 the day before) which does not readily allow for a later response to be managed – for example unexpected levels of snowfall in the middle of the night. This is just what happened to Southeastern overnight Tuesday 30 November; the late decision to implement the

contingency timetable then requires changes to input manually at 'control level' and are heavily labour intensive. The critical point is that they do not directly feed back into the CIS.

5.24 In addition there were some glitches in the operation of this new system during that week – the first time it had been used "in anger" – which seriously affected the implementation of contingency timetables.

Maintaining availability of the network

5.25 As a result of the shortage of anti-icing trains, the normal coverage of the third rail network was not achieved, especially during the night of Tuesday 30th November and Wednesday 1st December. This contributed significantly to the inability to run trains, but it was not the only factor.

5.26 There are established plans for the running of 'ghost trains' (empty service trains running out of traffic) during the night and at times during the day, to help keep track clear of snow as well as the third rail. The evidence suggests that these generally operated to plan in all three TOCs, though with some curtailment where there was a risk of the train becoming stranded.

5.27 From Tuesday 23rd November onwards, evidence indicates that almost all snow clearance requests to NR's specialist fleet were fulfilled, mostly according to plan – and these included a substantial number of requests in the north east and Scotland as well as south of the Thames.

Rolling Stock

5.28 The modern Electrostar trains on southern and Southeastern have traction control systems which are vulnerable to the spiking of electric current associated with ice conditions on conductor rails. This has been recognised after the 2008-09 winter, and software modifications have now been fitted to trains in both TOC fleets. This provides more tolerance of supply variations, but there are some operational issues around its use which remain to be resolved.

The Passenger Experience

5.29 Passengers and their representatives have been understandably very vocal in complaining about the lack of any information for Southeastern's passengers in stations and on platforms on the Wednesday (for reasons explained above). Similar problems of poor passenger information were experienced on Southern and South West Trains. Even when contingency timetables were successfully introduced, there was difficulty of the customer information systems keeping up with the developing service situation during the few worst days.

5.30 This also made it impossible for other transport operators, especially TfL, to give any accurate information to passengers they were feeding onto the south London network. The Transport for London system – Underground, DLR, Overground, buses and Croydon Tram – has extensive links with the national rail network. This can be enormously frustrating in that travellers do not know what is happening or how long they have to wait, and cannot to make informed decisions about what to do.

5.31 There were a few examples of stranded trains, in conditions of such deep snow that emergency rescue was difficult and challenging to organise in a short space of time. This can be particularly distressing for passengers, and the NTF in its report to me has noted that this particular issue will be investigated again by ATOC and the relevant TOCs.

Information elsewhere on the network

5.32 At my request, Passenger Focus carried out spot checks during the first few days of December on the availability of information electronically and at stations across the rail network. Their survey report says that:

- The National Rail Enquiry (NRE) website appears to have coped well with high volumes:
- The NRE call centres appear to have provided good information but queuing times up to 12 minutes were common;
- Station displays and platform indicators across the country seem to have reflected the contingency timetable in operation (except for Southeastern as explained above), although they often did not reflect a developing situation during the day.

5.33 However:

- The on-line journey planner on the NRE website did not show correct information for some TOCs, and the on-line journey planners on TOC and third party websites often did not reflect contingency timetables in operation;
- Tickets continued to be on sale for trains that would not be running.

5.34 Much has been done since last winter to increase the capacity and resilience of the on-line systems for passenger information; the issues this time seem more about linking in with contingency timetables and the challenges of keeping up with operational situations developing during the day.

Key issues

Contingency timetables and the systems that drive them

5.35 As the NTF report acknowledges, the timetable planning system (ITPS) is "best suited to dealing with stable degraded situations where reasonable predictions can be made about the nature of the service than can be operated the following day". There is a practical limit to the extent to which the dynamic situation caused by unexpected weather can be effectively captured and acted on through the necessarily complex systems which link all the aspects of railway timetabling, operations and associated customer information. Yet at the operational level, the railway has to respond and deliver the best service it can in the circumstances.

5.36 In addition there were some glitches in the operation of the new system. The industry recognises that this winter was the first occasion in which the new ITPS has been used for real, and must sort out the inevitable teething problems of something which is functionally extremely powerful and fit for purpose.

5.37 At the same time, there have to be better ways of working round the limitations of the system, including the timetable it imposes on decision-making, when conditions require it.

Operational Performance

5.38 It is acknowledged that certain aspects of operational response were not delivered well; there are lessons to learn and changes to make – whether to processes, equipment, training, or even just operational leadership. But the industry has already shown that it is well capable of reviewing and

learning from experience, facing the facts and accepting the reality of what happened. Taking account of the more recent episode of severe weather as well, there will be plenty to learn when the post-winter review takes place, and the industry should be prepared to demonstrate what the lessons are and how changes will be made for the future.

5.39 The arrangements around the availability and deployment of anti-icing vehicles seem most unsatisfactory. There is also some history of unreliability of these vehicles. The planned change-over of MPVs from autumn (dealing with leaves) to winter mode (anti-icing) in mid-December is too late, especially compared with the highways community's commitment to winter readiness from 1 November. If there is a risk of anti-icing vehicles being required from mid- or late-November (as this year demonstrates there is) when there is still a risk of leaf deposit-clearing being needed, then a different solution has to be found. Whether an increased and partly specialised fleet is needed, or a capability of changing 'mode' much more quickly, Network Rail should stand back, recognise that these activities need properly resourcing, and consider how to meet this risk-based operational need rather more robustly.

5.40 Whatever prediction can be made about the future occurrence of severe winter weather, the evidence I have obtained suggests that the overall operational resources and equipment available for snow clearing, ice-clearing and anti-icing also needs to be revisited.

Information for passengers during disruption

5.41 The fact that this subject is taken very seriously by the rail industry, and is the subject of major projects under the leadership of NTF, is no comfort to rail passengers stranded on platforms with no information about what is going on. This really bad experience for passengers on the three TOCs came just as Passenger Focus published a major report on rail passengers' experiences, frustrations and concerns about poor information during disruption[10]. Based on views from a panel of 1,000 passengers who reported on actual disruption events, it gives vivid illustration of why the handling of disruption on the railway is the main driver of overall dissatisfaction in the regular National Passenger Survey – when most other aspects of train service score well. This Passenger Focus report should be required reading for all management and supervisory staff in every Train Operating Company and in Network Rail.

5.42 Whatever is done to improve the electronic systems for passenger information – and these are impressive and welcome – I believe there is a more fundamental point. There does not seem to be a cultural acceptance within the railway of the responsibility to constantly see a disruption situation from the viewpoint of the passengers, and to act accordingly to make the effort to keep passengers properly and constantly informed.

5.43 Within the railway there is too much reliance on the electronic systems – and an apparent feeling of helplessness when the systems are not functioning (for reasons discussed above) or when the scale of disruption is such that the pre-programmed information on the systems cannot convey what needs to be said to delayed and frustrated passengers. There just is not enough flexibility.

5.44 I am quite clear that the more complex the systems for providing information electronically and automatically to passengers, the more there needs to be separate, simple backup arrangements which will work independently. Many TOCs provide BlackBerry or equivalent devices to station and train staff, which are used all the year round for keeping operational staff and those in contact with passengers briefed about disruption and service changes, whatever the cause. These and similar arrangements have been shown to be valuable. But they do not wholly meet the need at smaller

10 Delays and Disruption: Rail passengers have their say.

stations where staffing is not continuous, or where booking office staff are busy attending to passengers specific queries or ticketing requirements. Nor can they easily deal with major disruptions where large numbers of people need to be informed and advised what to do.

5.45 Most stations have public address systems, and many can be used remotely from a control centre (this is called long-line PA), which can help advise passengers at unstaffed or partly staffed stations – or indeed at any station where large numbers of passengers need to be told what is going on. But I am not sure that these PA systems are effectively used today: I do not think either the procedures or the resources are in place to make effective use of what exists in times of emergency and disruption. Many TOCs are making use of the fast growing penetration of smartphones and other devices, and of social media such as Twitter and Facebookas well as websites, for pre-journey and in-journey information. But even these need to be properly resourced, and to be regarded within the railway as critical and important.

5.46 Whatever the right method, the TOCs must recognise and accept that virtually complete dependence on the railway's own electronic systems for keeping passengers informed in-journey during periods of disruption is just not acceptable. And the lack of any real alternative has been profoundly frustrating for very large numbers of passengers in the recent disruption. A thorough review is needed of ways in which available technologies and simple processes can be deployed to provide more robust, relevant and timely information for passengers both before they travel and in-journey during periods of disruption.

5.47 But it is not just about systems and equipment – it is about a culture which places the task of keeping passengers in the picture and well briefed in times of disruption at the top of the list alongside actually running the railway – a culture which runs throughout the company, including train drivers, stations staff and supervisors as well as management. I know there are resource implications of this approach, but no TOC which is focussed on meeting passengers needs and driving its revenue line should need me to point this out, nor have difficulty giving the right priority to this task.

5.48 The example of London Underground – who are exemplary in giving information to passengers by a variety of methods, in normal times as well as in disruption – shows that it can be done, and passengers value it enormously. For them it has been a cultural as well as a technical and resource achievement. Britain's train companies must show they can do the same.

The Third Rail Network

5.49 Almost every time the country suffers a severe winter – and the not infrequent occasions when Kent particularly suffers snow or low temperatures – the vulnerability to severe weather of the third rail system for traction power is demonstrated yet again.

5.50 Over the years, and particularly in the last few winters, many approaches have been developed and implemented to mitigate these impacts. Our main Review devoted part of the rail sector chapter to an account of the range of measures that are currently in use and being further investigated, and they are referred to above. It is interesting to note, as mentioned in the earlier chapter covering London, that London Underground, whose network is actually predominantly above ground (and therefore vulnerable to winter conditions), deal with their dependence on top contact conductor rails (and two rails, not one) by running very frequent 'ghost trains' during the night over the vulnerable parts of their system: effective for them, but not practical given the very different geographical extent, network mileage and train fleets operated by the three southern TOCs.

5.51 With the experience of the third successive winter affecting the operation of these services, I believe the time has come to seriously investigate the costs and benefits of the replacement of the entire third rail top contact system with an alternative method of bringing traction power to the trains. Possible solutions include converting to side contact or underneath contact (like DLR and many metro systems in continental Europe), which still using DC traction would not involve replacement of trains or power supply. Or conversion to 25kV overhead lines, which would have wider ramifications for power distribution and for trains. No solution will be cheap, given the network mileage of the existing system.

5.52 I am therefore recommending that Network Rail, working with the relevant Train Operating Companies, should set up a project to consider and investigate the alternative methods, and the full implications including migration strategy, for a complete conversion of the south-of-the-Thames third rail network to a less vulnerable method of current collection. A full business case should be prepared and presented to government.

5.53 The programmes of work to mitigate the problems of the existing top-contact system should meanwhile continue.

Findings and Recommendations

5.54 Train services south of the Thames were particularly badly disrupted for specific days during the period under review (24th November to 9th December), from a combination of heavy snowfall and the vulnerability of the third rail system of current collection on these networks.

5.55 While there have been major advances in the systems which manage the planning and implementation of contingency timetables, this was the first time they were used 'in anger' and there were some teething problems and glitches which affected their effective use this time. The requirement for sign-off by 1700 the previous day for implementing contingency timetables is not normally an issue, but under conditions of weather uncertainty the inflexibility can be a problem and requires labour-intensive work-arounds.

5.56 Arrangements for the early deployment of anti-icing vehicles on the third rail network can be difficult, because of their use also for autumn leaf duties with different equipment mounted. There needs to be a thorough review of the equipment needed for these duties, given the risks (crystallised this year) of conflicting requirements, and whether the quantity of equipment needs to be increased – given the vulnerability of the networks.

5.57 The lack of adequate – or at times any – information to passengers on the south-of-the-Thames services was probably the biggest issue of this whole episode; it was mirrored to a much less serious degree elsewhere on the network. Passenger Focus happened to publish at this time a major report on the experience during this past year of 1,000 passengers affected by disruption on the railway: it graphically encapsulates the frustrations and the sense that the train companies are really not on top of keeping passengers in the picture or appearing to care – both technically and culturally. This report should be required reading throughout the rail industry for all management, supervisory and other staff in touch with passengers.

5.58 I am clear that there is too much reliance on electronic systems for passenger information, which – even if they are fully accurate and working – do not have the flexibility to advise passengers what is going on during disruption or to show that anyone cares. The industry must put in place – and properly resource – back-up information processes and methods of communicating with passengers which do not depend on the full functioning of all the electronic systems, and which embody the necessary flexibility to convey the relevant information and advice. And there has to

be a cultural recognition and acceptance that these back-up processes are an integral part of running the railway for the benefit of passengers.

5.59 The time has come to consider seriously the conversion of the third rail network to a more weather-resilient system of providing traction power for trains on this network. Possible methods include side or underneath contact with the third rail (common in continental Europe, and on the DLR) – which should not require significant changes to the DC power distribution network nor to the trains themselves – or conversion to 25kV overhead. Network Rail should lead a strategic review of the alternative technologies, including the migration method, and prepare a preferred proposal with business case for consideration by government.

Recommendations

Recommendation 5: Network Rail and the relevant train companies operating south of the Thames should conduct a thorough review of the actual operational experience of this period of severe winter weather; in particular Network Rail should review the nature and amount of equipment needed to fulfil anti-icing duties (in addition to autumn duties) taking account of risks and operational needs, as well as the availability of winter resilience resources generally (such as snow clearance) across the network.

Recommendation 6: The rail industry should continue the development and improvement of the systems for managing contingency timetables and for supporting, feeding and making more resilient the downstream information systems for passengers, having particular regard to the effectiveness of work-arounds needed when circumstances require.

Recommendation 7: The rail industry should develop and implementing resilient and flexible methods of providing pre-journey and real-time information to passengers alongside and largely independent of the main customer information systems, deploying appropriate technologies and resources; Network Rail and the train companies should also embrace the cultural need to ensure such arrangements attract appropriate priority, resourcing and recognition.

Recommendation 8: The rail industry should conduct a strategic review of technical alternatives to the third rail/top contact system, for the network south of the Thames, and prepare an evaluation and business case for consideration by the Government.

6. Aviation

6.1 The severe winter weather in the last week in November and the first week of December had a very varied impact on airports. A number were unaffected – London Luton and London Heathrow – and they had no operational closures. Other airports – Birmingham and London Stansted – did have very limited closures but these had no serious impact on services.

6.2 Three airports – London Gatwick, Glasgow and Edinburgh – all experienced exceptionally high levels of snow and subsequently suffered significant disruption. London Gatwick was closed for over two days from the evening of Tuesday 30th November, and did not reopen until the morning of Friday 3rd December. Edinburgh and Glasgow have both experienced a number of snow events and periods of closure over the last three weeks. These closures are detailed in the table opposite. The rest of this chapter concentrates on airports in England, and Gatwick in particular.

6.3 I am very aware that since the period under review (24 November to 9 December) there has been a further episode of severe low temperatures and considerable snowfall, and this time many airports as well a Gatwick have been severely impacted, together with the airlines using them. I recognise that the other airports were not tested during the period I am reporting.

London Gatwick

The weather impact

6.4 Last winter Gatwick experienced its heaviest snowfall for 30 years. But from Tuesday 30th November to Saturday 4th December 2010 the airport experienced even heavier, sustained snowfall, and over a shorter time period. While they implemented their snow plan, the extreme nature of the conditions caused the airport to close. The Airport closed at 21.33 on Tuesday 30th November when the first snow fell, and it then snowed continuously for the next 48 hours, to a depth of around 25 centimetres. The resources used by Gatwick during this time included:

- 100 staff worked around the clock;
- The airport's own snow fleet of 45 vehicles (including ploughs, tractors and anti-icing machines) was supplemented with a further 40 vehicles hired from contractors (including dumper trucks and front-loaders);
- 150,000 of snow was cleared from the operational areas of the airport;
- Nearly 150,000 litres of de-icing products were used;
- Over 27 miles of airport roads remained open through the event.

6.5 The airfield reopened for positioning aircraft at 20:00 on Thursday 2nd December and for passenger flights at 06:00 on Friday 3rd December. Aircraft movements were gradually increased and restrictions were removed by 06:00 on Saturday 4th December. In total the airport was closed for 46 hours and 34 minutes and around 1,200 flights were cancelled or delayed.

6.6 The consequential impact of Gatwick's closure on airlines and passenger services depends also on any closures or delays at other origin and destination airports, particularly in Europe, and the ability to divert flights to other UK airports. Evidence suggests that many other European airports were subject to closure and delay at this time (see Appendix A on Experiences in Europe).

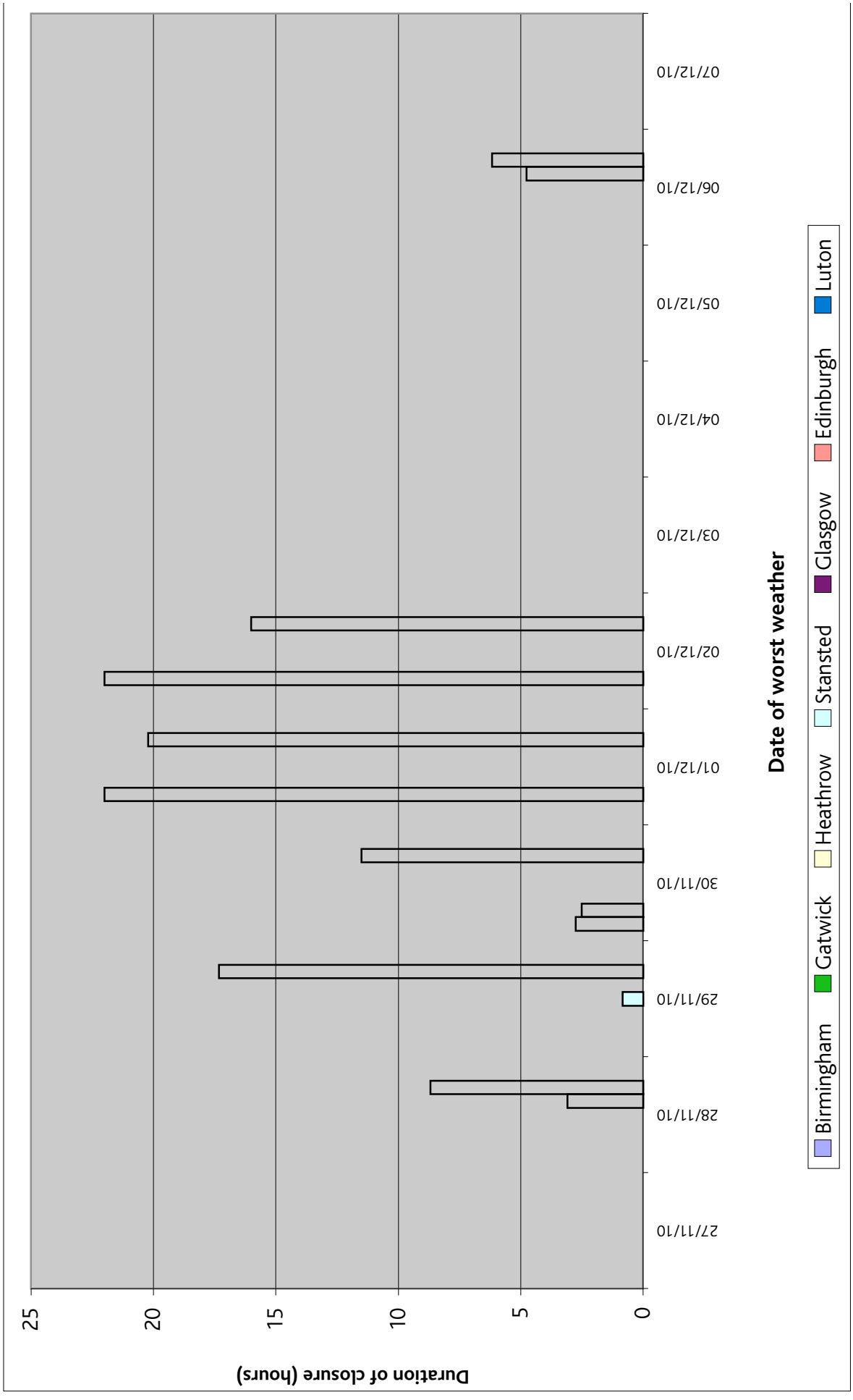

Figure 6.1: Runway closures from 27th November to 7th December 2010 (data supplied by airports)

Gatwick's readiness

6.7 Gatwick's plan for dealing with snow and ice is reviewed and agreed annually with airlines, business partners and the emergency services. Significant learning from last winter has been incorporated, and this was enhanced with visits to other airports, including Oslo. This led to an investment of £600,000 in additional equipment for this year, and following recent events they have advised this audit that they will be undertaking a further review of their Snow Plan, including further investment in equipment.

Informing and supporting passengers

6.8 A key priory for Gatwick were those stranded at the airport and communicating through a range of channels the latest information to passengers. Gatwick has advised that a critical decision was taken to close the airport for the whole day on Wednesday 1st December. This enabled a clear message to be communicated to passengers directly and via the airlines, especially those at, or planning to travel to, the airport.

6.9 Our main Review earlier in the year noted, both in the aviation and rail chapters, the value of early decisive action by airlines on flight cancellations and revised schedules in response to developing weather conditions. This does provide some certainty for everyone's planning – if the decision itself is unwelcome.

6.10 In Gatwick's case, as a result of this decision, the majority of passengers scheduled to travel did not attempt to reach the airport. A small number remained (mainly foreign nationals), and the airport took measures to assist them, including:

- A reception centre with 150 beds and cots;
- Free food, bottled water, blankets, mattresses, showers and washing facilities and internet access;
- Additional staff were deployed to assist passengers with general enquiries;
- Stores such as Boots and catering outlets remained open 24 hours.

6.11 The airport used a range of channels to communicate with passengers including national and regional print and broadcast media, multi-lingual leaflets, terminal information screens, its website (which included an online enquiry service) and Twitter, where Gatwick's 'followers' increased from 3,500 to more than 10,000.

Links to other transport services

6.12 Disruption to the transport network, and rail services in particular, was a significant issue for Gatwick during the snow event. Its rail station is the busiest airport station in the UK, with some 12 million journeys each year and is a critical route to the airport with 30% of air passengers travelling to and from Gatwick by train, as well as staff and 'meeters and greeters'. While the severe nature of the conditions meant a certain amount of disruption was inevitable, this continued for some time after the airport had reopened and the strategic and local road networks were operational. This impacted both passengers' journeys to and from the airport but also the ability of staff to travel to work. This had an impact on the airports' ability to return to a full operating schedule and led to significant overcrowding at the train station.

Other airports

6.13 Although de-icing products for other airports in England were not significantly affected by this severe winter event, I have sought information from a few airports about readiness and the response to points made about aviation in our main Review earlier in the year.

London Heathrow

6.14 A number of improvements have been undertaken since last winter at Heathrow. These include a new agreement for staff to be available on call which has ensured that higher levels of internal resource are available to manage snow events; improved communication through NATs and Airline Operators regarding decisions and actions taken (i.e. anti-icing, when, how and why). This was done through a collaborative decision making process to ensure actions were aligned and understood.

6.15 More equipment resources than last year, including a new 7.5 tonne gritter and 4 x 500 litre trailer de-icers, and delivery of a 10,000 litre liquid sprayer due this month.

6.16 The Panel's Final Report advised that further consideration should be given to 'pan de-icing facilities' where aircraft are cleared of snow and ice away from their stands, normally on the approach to the runway. This was based on a trial for British Airways aircraft at Heathrow last winter, and it is noted that this trial has been extended to two locations at this year.

6.17 Improvements to temperature sensing equipment across the airport, ultimately providing more accurate weather forecasts.

6.18 Our main Review Final Report also noted that stocks of de-icer were severely stretched last winter[11] but that the industry was intending to increase stocks. BAA has advised that storage capacity at Heathrow is now circa 400,000 litres following an increase during last winter season. An electronic online stock recording system is being completed – which will update hourly to show stock levels, stock added and stock used.

London Stansted

6.19 Stansted took additional flights due to other airports being closed, and lost some for the same reason; but overall they had an increase in movements. There have been no airport operational issues arising from the weather; as there was much less snowfall in that part of East Anglia.

6.20 Their only issue has been delays in receiving glycol de-icing product orders due to demand and issues with haulage and road infrastructure in the North. Again this issue had been noted in the main Review Final Report.

Key Issues and Findings

6.21 Following the publication of the Review's Final Report in October, it appears that many of the operators in the aviation sector have reviewed their winter plans and service delivery. Snow plans have been reviewed, stocks of de-icing material have been increased, and additional equipment and vehicles to support de-icing and snow clearance have been acquired. However I have no

11 The Resilience of England's Transport Systems in Winter: An Independent Review. Final Report, October 2010, Chapter 9, paragraphs 9.15 to 9.20.

evidence on the quality of their operational response to the severe weather which has hit other airports in addition to Gatwick in the last few days before publication of this report.

6.22 The two-day closure at Gatwick was severely inconvenient for many passengers. My judgement from the evidence available to me is that, given the unusually intense snowfall during these two days and the huge amounts of snow to be cleared, the Gatwick team made appropriate operational decisions, handled passengers as well as they could in the circumstances, and delivered a highly competent and professional job of clearing the snow and ice and making the airport ready for service again.

6.23 The amount of resources made available for winter resilience must reflect the probability of severe winter, and particularly the intensity of snowfall. Comparisons with other airports, such as Chicago O'Hare with huge resources but deep snowfall regularly every winter, are interesting but they do not indicate what we can reasonably expect airports to provide in this country.

6.24 Whether or not there is a case for substantial more investment in snow clearance capability at Gatwick or at any other airport in England depends on the view taken of the prospects for severe winters in the future; and with the impact of the further episode of winter weather over the weekend 18/19 December as I finalise this report it will be understandable that the pressure for further equipment and resources will grow. Individual airports will continue to make their own decisions on this matter, and will have to come to their own view about the business case and the wider issues which such severe disruption gives rise to.

6.25 The aviation sector has good processes of review and learning lessons for the future, and many changes and improvements to snow plans were made following last winter, which were reflected in the main Review we carried out earlier in the year. The same processes will be taking place after this winter. Meanwhile we should acknowledge that there will be delays and impacts like this when such severe snow events happen, and we should expect our airports and airlines to respond energetically, competently and professionally within the resources available – having particular regard to the need to keep current and prospective passengers well informed, and properly cared for if they are caught by the disruption.

Appendix A: Experiences in Europe and winter tyres

A.1 During the time available for the audit it was not possible to undertake a full survey of how Europe had coped with the severe weather. I did however obtain anecdotal evidence from the UK embassies in the Netherlands and Germany.

A.2 I have also looked at the issue of tyres for vehicles in winter weather as this has been raised during the audit.

The Netherlands

A.3 The Netherlands experienced severe winter weather for a fortnight until 7/8th December. Temperatures were well below average, remaining below 0oC during the day and significantly lower during the night.

A.4 Despite these freezing temperatures, the transport system coped reasonably well due to the relatively small amount of snowfall with only a couple of centimetres of localised snowfall (in contrast to the more significant snowfall last winter). On Friday 3rd and Saturday 4th December the country experienced significant snowfall of up to 10 centimetres and this led to more severe transport problems.

Roads

A.5 Initially, gritting was effective with all routes remaining open, but Monday 29th November saw the busiest evening rush hour ever in terms of the length of traffic queues. This was largely put down to drivers being over cautious in the freezing temperatures and driving too slowly.

A.6 When the severe snow hit on Saturday 4th December severe delays and tailbacks on the roads appeared, although the impact was smaller than probably would have been the case on a weekday. One major road in the north was closed for several hours due to severe ice, but no other major events were reported.

A.7 Road salt is generally in very good supply, the Government made provisions for extra supplies following the problems experienced last winter and the gritting operations are considered to have been more effective.

Rail

A.8 On 4th December the rail system came under severe pressure and many services were cancelled, mainly due to frozen points and electrical problems. The management of Dutch Railways (NS) was widely criticised for failing to learn the lessons of last winter. There was particular criticism of the failure to keep points working at busy junctions and questions were asked about why trains were often unable to operate in snow. Electric Sprinter trains and the latest double-decker trains appeared to cope very badly, while poor information for customers was highlighted as a major concern.

Aviation

A.9 Amsterdam Schiphol airport remained open, though many flights from were cancelled or delayed due to snow and then thick fog, but it appeared to cope better than the rail system.

Media and other issues

A.10 The freezing weather was headline news but until Saturday 4th December the general view was that the Netherlands was coping quite well. The evening rush hour on 29th November inevitably made the headlines.

A.11 When problems emerged on 4th December due to the snow (especially relating to rail travel), the media was quick to focus on the apparent chaos with plenty of interviews with disgruntled travellers. The Government was also unusually critical of Dutch Railways and the rail infrastructure company.

A.12 Notably there appears to have been no significant effect on other infrastructure, and schools have remained open throughout.

Germany

A.13 Germany saw major snowfall, sleet and freezing temperatures from the beginning of December. The lowest reported temperature was minus 17oC in Saxony on Thursday 2nd December, while snowfall of around 40 cm was reported in parts of Northern Germany on 30th November. While there was a brief respite as temperatures rose slightly, most areas saw further snowfall during the week commencing 5th December. As a result there was widespread transport disruption.

A.14 Winter resilience is the responsibility of each of the 16 Länder in Germany, though the Federal Transport Ministry does play a coordinating role. In addition, responsibilities are often split along transport modes – with Deutsche Bahn (DB) responsible for its own winter plan. There was little change to Länder plans following the last winter, focusing mainly on increasing grit storage capacities at a very local level. The consequent disruption appears to have been caused, despite the weather forecasts, by the suddenness, intensity and duration of the winter weather conditions.

Roads

A.15 Initially road traffic kept flowing, but as conditions deteriorated there were hundreds of accidents on motorways. 1,200 accidents were reported by the police control centre in North-Rhine Westphalia for a 24 hour period, incidents on the A2 motorway (one of the main route running between the Ruhr area and Berlin) led to tailbacks of up to 28 kilometres, and 5 hours of tailbacks on the A3 between Cologne and Frankfurt. There were also problems on smaller roads in mountain regions, such as road closures.

Rail

A.16 Problems were reported on many stretches of the national DB network. For example, on the night of Wednesday 30th November around 200 ICE passengers were stranded in Frankfurt Central Station, and had to spend the night on the train due to a lack of hotel rooms. DB reported snow and snowdrifts of up to 50 centimetres around Nuremburg in Bavaria, leading to delays and cancellations, and several line closures due to fallen trees.

A.17 Local transport on parts of the Berlin S-Bahn network, a subsidiary of DB, was also much reduced and suspended over a period of 10 days due to frozen points and carriage doors – particularly for services in outlying suburbs.

Air

A.18 Both Frankfurt and Munich airports were closed for periods on Wednesday 1st and Thursday 2nd December following the initial snowfall, with up to 300 flights cancelled from Frankfurt on Tuesday 30th November and 250 flights cancelled from Munich Airport on 1st December. On Thursday 9th December, 1 in 4 flights from Frankfurt were cancelled (approx. 340). Berlin's Tegel and Schönefeld Airports suffered from a lack of anti-freeze agent, leading to the cancellation of 350 out of 700 flights, and problems ran on to the next day.

Media

A.19 Most of the reporting has been factual, but some commentators have been scathing on the problems for rail passengers. The S-Bahn in Berlin has been heavily criticised, with the local press making much of the fact that whilst the network in Munich is longer and the area has seen much more snow, it still ran relatively smoothly. It also faced severe criticism from their Transport Minister.

Other infrastructure

A.20 There were some school closures following the initial snowfall. Electricity supplies have also been disrupted, with 30 towns and villages in Thuringia losing power. However, retail business report that sales figures for the weekend of 4/5th December were higher than for the same weekend last year, despite the weather.

Winter Tyres

A.21 The subject of suitable tyres for vehicles in severe winter weather has been raised by the media and the public in response to problems experienced on the roads. *The Road Vehicles (Construction and Use) Regulations 1986* requires that tyres should not be used unless they are fit for the use for which the vehicle is being put or if they might in any way damage the surface of the road. There are four options for vehicles to change their tyres in winter conditions:

- Winter tyres. These operate best at temperatures below 7°C and wear may be higher than standard tyres if used in warmer conditions. They are made of a softer rubber compound which retains its flexibility in cold weather, and the tread pattern is also optimised. This may include having more "biting" edges to give better grip and wider gaps to help performance in snow.
- Studded tyres. These are for use in for extreme conditions such as deep snow and thick ice.
- Snow chains. These can be used if snow or ice is encountered during a journey provided they are removed when conditions improve since, as with studded tyres, they are likely to damage the road.
- Snow socks. A textile fabric is placed around the tyre to improve grip on snow and ice. They tend to be easier to fit than snow chains but may not be as effective in all conditions. They are also less likely to damage the road, but should still be removed when conditions improve as they will wear rapidly and will not perform as well in normal conditions.

A.22 Any decision for a motorist to change their tyres will depend upon driving conditions and types of journeys undertaken, so motorists who expect to drive in areas where conditions are persistently cold or where snow and ice is present for long periods may find it helpful to change their tyres in the winter.

A.23 The Department for Transport advises that it does not believe there is a strong case for legislation requiring winter tyres to be fitted, but consumers can still choose to fit them. Their view is that typically motorists in England will find that that the standard tyres fitted to their vehicle have a tread pattern and tyre compound that ensures good performance in a wide range of conditions and they can be used throughout the year. Issues such as the costs of purchasing, storing and changing tyres at set times each year would need to be balanced against the possible benefits, and that many vehicles in the south of the country would only experience the necessary conditions to gain from these tyres on a few occasions each year.

A European perspective

A.24 In Germany national winter tyre regulations came into force on Saturday 4th December with fines for non-compliance doubled from previous years at €40. But despite much forewarning both as to the new rule and the weather forecast, it was reported that many car dealers had shortages, which led to severe price inflation.

A.25 In the Netherlands I was advised that many more drivers have voluntarily fitted winter tyres to their cars this year as awareness of their benefits has increased dramatically. They are not compulsory, but unofficial figures suggest that over a third of drivers now have them.

Appendix B: Contributions to the audit

I would like to record my thanks and appreciation to those individuals and organisations who took the time to share their knowledge, experience and insights with me. This was often at short notice, and during an extremely busy time. They included:

Aviation

London Gatwick Airport

BAA

Local Authorities

ADEPT (Association of Directors of Environment, Economy, Planning and Transport)

Local Government Association

Buckinghamshire County Council

Cambridgeshire County Council

Derbyshire County Council

Devon County Council

Dorset County Council

Essex County Council

Kent County Council

Lincolnshire County Council

Norfolk County Council

Northumberland County Council

North Yorkshire County Council

Staffordshire County Council

Suffolk County Council

Surrey County Council

Transport for London

West Sussex County Council

Rail

National Task Force (incorporating Network Rail and the Association of Train Operating Companies)

Northern Rail

Southeastern

Southern

South West Trains

Roads

Freight Transport Association

Highways Agency

Road Haulage Association

Others

Department for Transport (Roads, Rail and Aviation)

London Travelwatch

Met Office

Passenger Focus

Appendix C: Acronyms

ATOC	Association of Train Operating Companies
CIS	Customer Information System
DB	Deutsche Bahn (German rail operator)
DC	Direct Current
DfT	Department for Transport
DLR	Docklands Light Railway
HA	Highways Agency
ITPS	Integrated Train planning System
kV	kilovolt
LGA	Local Government Association
LHA	Local highway authority
MD	Managing Director
MPV	Multi – purpose vehicle
NATS	National Air Traffic Services
NR	Network Rail
NRE(S)	National Rail Enquiry (System)
NTF	National Task Force
NWSRG	National Winter Service Research Group (previously the National Salt Spreading Research Group (NSSRG))
NXEA	National Express East Anglia train operator
TfL	Transport for London
TOC	Train Operating Company
UKRLG	United Kingdom Roads Liaison Group