NATIONAL AUDIT OFFICE

# Tackling congestion by making better use of England's motorways and trunk roads

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# EXECUTIVE SUMMARY

**1** Road traffic congestion frustrates people's travel plans and daily lives. The Highways Agency (the Agency), which is responsible for managing England's strategic network of motorways and trunk roads, has estimated that congestion on the network costs industry and commerce £3 billion a year. Tackling road congestion is a primary objective of the government's *10 Year Plan for Transport*. The government aims to stabilise congestion at 2000 levels by 2010. Yet, neither the Department for Transport (the Department) nor the Highways Agency has comprehensive and reliable data about congestion across the whole of the motorway and trunk road network. The Department is developing new measures to assess traffic delays, their severity and the reliability of journey times. It is committed to having a new set of targets in place by July 2005, including targets for specific roads as well as for the country as a whole, and has awarded a contract to a private sector firm to collect traffic information in support of these targets.

**2** The latest available data show that, nationally, congestion levels at certain times of the day improved between 1998 and 2003. Average traffic speeds in the morning peak and to a lesser extent in the off-peak period, for example, rose over the period. They were still lower, however, than they were in 1995. Average traffic speeds, for example, fell by up to six per cent (four miles per hour) depending on the time of day between 1995 and 2003. Speeds have fallen as the volume of traffic has continued to grow – up by 14 per cent on all roads between 1995 and 2002. Around seven per cent of the network suffers heavy congestion at peak times, while a further 13 per cent of the network suffers heavy congestion on at least half the days of the year. The Transport Research Laboratory has estimated that weight of traffic accounts for some 65 per cent of congestion, while accidents and incidents account for 25 per cent, and road works account for 10 per cent.

**3** The government is seeking to tackle congestion through a combination of measures intended to increase the capacity, and improve the management, of the network. Measures include new road building and improvement schemes. The Department recently published a report[1] on the feasibility of charging road users for general access to the road network to reduce congestion. Yet, these schemes will take time to deliver. Action is needed in the near term to deal with immediate problems on key routes and at congestion blackspots on the network.

**4** The Highways Agency has a programme of work, known as the *Making Better Use (MBU)* programme, intended to bring quick relief from congestion on England's motorway and trunk road network. It spends over £200 million a year on the programme, mostly installing technology on the network or carrying out small scale construction schemes known as Local Network Management Schemes, which include altering the lay out of road junctions and motorway slip roads, introducing free flow lanes at roundabouts and improving junctions between trunk roads and motorways. Since 1998-99, the Agency has spent almost £1.1 billion on the *MBU* programme. Further, in June 2003 the government announced that the Agency would develop its remit beyond building and maintaining the road network and take on greater responsibility for managing traffic as the network operator.

1 Feasibility Study of Road Pricing in the UK: Department for Transport, July 2004.

Expenditure on the key constituent parts of the MBU programme, 2003-04

| Main elements | Description | Expenditure (£million) |
|---|---|---|
| Technology projects | Systems that support monitoring and operational activities on the network, including: an automated incident detection and warning system, CCTV cameras, a national traffic control centre, and more advanced road side message signs. | 107 |
| Local Network Management Schemes | Small scale construction projects costing less than £5 million, aimed at delivering locally targeted improvements quickly including 'pinch point' improvements such as improving layouts of lanes and junctions and signalling at junctions. | 106 |
| Research and development | Researching and developing new approaches to traffic management and the management information systems necessary to support the Agency's work. | 16[1] |
| Information technology projects | Information systems to support the programme. | 13[1] |
| Total | | 242 |

*Source: National Audit Office summary of Highways Agency data*

NOTE

1 Expenditure on research and development and business information systems is for the benefit of the Highways Agency as a whole, and not directly or exclusively on measures to tackle road congestion or improve safety.

**5** Generally, we found that Local Network Management Schemes have been built to time and budget, while a programme of over 90 schemes at priority action sites designed to bring in improvements quickly is on schedule. Many road user organisations, including the Freight Transport Association, the Intelligent Transport Society (United Kingdom), the Confederation of British Industry, National Express, the Road Haulage Association and the Automobile Association Motoring Trust welcome these types of schemes. In light of these findings, therefore, this report focuses on other measures at the Agency's disposal involving the use of technology to help tackle congestion caused by the weight of traffic, changing driver behaviour and dealing with shocks to the network that cause congestion.

## Main conclusions

**6** We found that the Agency is improving the information it gives to motorists, as a priority in its strategy for tackling congestion, and is strengthening its ability to deal with the effects of incidents and accidents on the network. Yet, with congestion a pressing problem on much of the strategic road network, we concluded that the Agency:

- has been too risk averse in introducing or testing out measures more readily used abroad, and is behind some of its overseas counterparts in adopting technologies to tackle congestion caused by the weight of traffic on England's motorways and trunk roads;
- has managed its trials of some measures poorly, contributing to their inconclusive results;
- has not installed the most appropriate technology on the most congested motorways resulting in significant disparities between regions of the country; and
- needs to be better prepared for events that cause congestion.

## The Agency is behind some overseas counterparts in adopting technologies to tackle congestion caused by weight of traffic

7 Highways authorities in The Netherlands and Germany have for many years been using a range of measures to tackle congestion caused by the weight of traffic on their roads. In contrast, the Highways Agency in England has concentrated on hard engineering solutions to tackle congestion, such as building new roads and widening existing ones. It has been running its *MBU* programme since 1998 and, although annual expenditure on the programme has grown since then from £114 million to £213 million in 2003-04, road maintenance and large road building projects still account for around 85 per cent of the Agency's annual total spending on roads.

8 During the 1990s, the government's emphasis was on building new roads, maintaining the existing ones and improving road safety. The Agency did not have a target to reduce congestion until the government established one in its *10 Year Plan for Transport* in 2000, alongside its target for reducing road casualties. Since then, tackling congestion has become a high priority for the government, as congestion levels have remained high. Since the *MBU* programme started in 1998, however, the Agency has continued to concentrate much of its technology projects on improving road safety and the management of incidents, although fewer accidents also help to reduce the incidence of congestion. Between 1994 and 2003, the number of people killed or seriously injured on England's motorways and trunk roads fell from 4,991 to 4,223.

## The Agency has been too risk averse in introducing or testing out measures more readily used abroad

9 The Agency has been slow to introduce new kinds of measures, despite their widespread adoption and reported beneficial impacts in other countries. It has adopted four measures used elsewhere - Tidal Flow, Dedicated Lanes, Ramp Metering and Variable Speed Limits - but only to a very limited extent. The Agency considers that measures used in other countries would operate differently in England and has not been convinced as to the rigour and quality of assessments of measures used abroad.

### Measures adopted in other countries to tackle congestion

**Tidal Flow** involves reversing the direction of traffic in one lane or more on a motorway or trunk road to cope with peaks in traffic volumes. Signals above the carriageway indicate which lanes are in use and the direction of traffic in those lanes. This measure can only be used where it is safe to do so, usually without the traffic being segregated by cones or temporary barriers. It therefore differs from contra-flow, used at roadworks, where lanes might be separated by cones or temporary crash barriers. Tidal flow has been used since the 1970s.

**Dedicated Lanes** are restricted for use by a specific type of vehicle, such as buses or heavy goods vehicles and can be used on both motorways and trunk roads. High Occupancy Vehicle (HOV) lanes are a form of dedicated lane, intended for vehicles carrying more than one passenger to encourage, for example, commuter car-share schemes. HOV lanes have been widely adopted in the United States since they were introduced in the 1970s.

**Ramp Metering** involves using traffic signals, similar to traffic lights, to control the rate at which vehicles join a motorway from a slip road. Ramp Metering originated in the United States, where it has been used extensively since the 1970s, while the authorities in The Netherlands and Germany have used Ramp Metering since 1989 and 1995, respectively.

**Variable Speed Limits** involve adjusting speed limits on motorways depending on traffic volumes in order to improve traffic flow, reduce the number of accidents and thereby reduce congestion. Normal speed limits apply when traffic is free flowing. Speed limits are reduced when traffic volumes reach a predetermined level, with signals above the carriageway indicating either advisory or mandatory speed limits. The authorities in The Netherlands and Germany have used Variable Speed Limits since the 1980s and 1990s, respectively.

**Hard Shoulder Running** involves temporarily opening the hard shoulder on motorways to traffic during peak periods. Signals above the carriageway indicate when the hard shoulder is open. The authorities in The Netherlands and Germany have used Hard Shoulder Running since 1996 and 1999, respectively.

**Dynamic Lanes** involve using lights similar to cats' eyes set in the surface of the road to alter the number and width of lanes on a motorway, usually in order to increase the capacity of the road. For example, three lanes of normal width could be changed into four narrower lanes to accommodate more vehicles. Dynamic lanes are a new measure, currently under trial in The Netherlands and Germany.

*Source: Highways authorities in The Netherlands, Germany and the United States*

**10** The Agency has put in place Dedicated Bus Lanes on four stretches of road, including a section of the M4 motorway. Despite the reported success of this scheme in particular, and of Dedicated Lanes in the United States, the Agency has not actively pursued the adoption and wider take up of Dedicated Lanes in England because of considerable opposition from motorists and sections of the media when the M4 bus lane opened in 1999. In July 2004, however, the Department announced that the Agency would be carrying out a motorway trial of High Occupancy Vehicle lanes, a form of dedicated lane, although the Agency has yet to agree with the Department a timetable for implementing them.

**11** The highways authority in The Netherlands has used Hard Shoulder Running since 1996, while in Germany successful trials in 1999-2000 led to the wider introduction of Hard Shoulder Running in 2002. By comparison, the Agency does not use Hard Shoulder Running on any of its motorways or trunk roads. The Agency told us that there have for many years been safety concerns, including amongst the police, about how emergency vehicles would arrive at accident sites if Hard Shoulder Running were adopted. Highways authorities in The Netherlands and Germany have addressed safety concerns by introducing reduced speed limits, providing frequent refuge areas for use in an emergency during Hard Shoulder Running, and installing CCTV cameras to scan the hard shoulder before it is opened to traffic and detect any accidents and incidents that might require the lane to remain closed. Research in The Netherlands and Germany found that accident rates have fallen where such measures have been implemented. There have therefore been no insurmountable obstacles to addressing safety concerns associated with the introduction of Hard Shoulder Running. The Agency has recently embarked on a trial of Hard Shoulder Running, in which it will be applying safety features above and beyond those that have been in place for many years in The Netherlands and Germany.

**12** The Agency has run, and is still running, a small number of trials of various measures to identify the characteristics and conditions where a measure is effective at a particular trial site and to make a business case for adopting that measure elsewhere. Yet the very small number of trials has limited the Agency's ability to find trial sites with the right characteristics and conditions for success. The Agency is conscious of the need to control the risks to safety that might be associated with running trials of particular measures. In our view, it needs to adopt a more expansive approach to risk management, more in proportion with the risks involved. Better managed risk taking would involve carrying out more trials at more sites to increase their chances of success, whilst also managing any safety risks involved.

## The Agency has managed two of its three trials poorly, contributing to inconclusive results

**13** The Agency has not issued any guidance on identifying, designing and delivering trials, nor established any standards on how long trials should take or how much they should cost. We found that some trials were not managed well. Managers were too focused on ensuring that the technology worked, for example, and did not give sufficient consideration to the trials' overall aim of developing a business case.

**14** The Agency has over-spent its budgets for its trials of Ramp Metering and Variable Speed Limits by 80 per cent (£3.2 million) and 12 per cent (£1.2 million) respectively. The initial results of the one year trial of Variable Speed Limits indicated savings in journey times, smoother flowing traffic and a fall in the number of accidents. On the basis of these findings, the Agency converted the trial into a permanent facility in 1997. Variable Speed Limits have generally been popular with road users who have reported perceived benefits, including less congestion and less stressful journeys. Yet the Agency could not prove a business case to use the measure elsewhere. Conditions at the site of the Variable Speed Limits trial were not stable before or during the trial, or in the period of extended monitoring that followed it. Traffic volumes changed and the Agency introduced new technology and new lighting and widened the motorway at both ends of the trial site, preventing it from establishing properly controlled and reliable "before and after" data to assess the measure's impact. Without reliable data, the Agency could not prove a business case to use the measure elsewhere. As a result, in 2002 the Agency extended the Variable Speed Limits trial, at a further budgeted cost of £3.9 million, to cover an additional eight kilometres of the M25, where conditions were expected to be more stable, in order to collect sufficient before and after data to prepare a business case. The Freight Transport Association told us that they were frustrated that the success of Variable Speed Limits has not led to their greater use.

## The Agency is improving the information it gives to motorists

**15** Motorway and trunk road users told us that they were dissatisfied with the quality of on-road information provided to motorists. Information was not up-to-date and did not enable drivers to consider alternative routes when their existing routes or planned routes were congested. Drivers often want information before they join motorways but only a few sections of trunk roads are served by information signs. The Agency has made the provision of better information for road users a priority in its strategy for tackling congestion. It expects its new £160 million national Traffic Control Centre in Birmingham, allied with the implementation of new message signalling technology, to improve the quality of information it provides to drivers. The Centre was due to open and providing some services by March 2004, before becoming fully operational by the end of December 2004. It actually started operations five months early, in November 2003, but the Agency now does not expect it to be fully operational until July 2005. The Agency is also now recruiting to a new post of Director of Information, responsible for devising an information strategy and policy, and managing the provision of information to motorists.

## The Agency has not installed the most appropriate technology on the most congested roads

**16** A key problem affecting the quality of on-road information provided to motorists is the prevalence of old technology across the network. The Agency has installed its most sophisticated technology - the Motorway Incident Detection and Automatic Signalling (MIDAS) system and second and third generation electronic message signs - along the M1 and M6 and around the major conurbations in the North and Midlands, where there are some of the most congested motorways in England. It has not installed the systems on many equally heavily congested motorways in the South East, however, such as sections of the M25 and the radial motorway links connected to it, partly because of uncertainty over future widening works.

**17** In 2001, the Agency recognised that some of the most congested roads in the South East lacked any of the latest technologies warranted by the weight of traffic they carried each day. To address the disparity between the regions within the resources available, the Agency started to install some additional first generation electronic message signs to be followed at a later date by the more sophisticated third generation signs. This approach was not appropriate for motorways in the South East. We calculated that the approach would cost up to £64 million more than if the Agency installed the appropriate third generation signs progressively as resources allowed. The Agency has discontinued implementing first generation signs in the South East and now plans to implement third generation signs instead. It had already spent more than £16 million installing 39 first generation signs along some 43 kilometres of motorways in the South East. Most of the equipment can still be used when the Agency comes to implement third generation signs, although some £690,000 of expenditure to date would be abortive and the Agency will have to upgrade 23 of these signs, at an extra cost of some £2.4 million, in due course. The disparity in the provision of technology between regions will take several years to address because the Agency's resources are limited, there is a lead time in installing the technology and planned widening of the M25 might bring further delay.

## The Agency needs to be better prepared for events that cause congestion

**18** Major sporting and entertainment events can cause congestion on roads leading to and from venues. The Agency has no influence over the number, location or timing of events it has to deal with each year, nor the number of people or vehicles attending them. It prepares for those events it knows about, but in some cases has not been aware that events have been planned. In the case of a major one-off entertainment event, the Licensing Act 2003 requires promoters to apply to the local authority for a licence to hold the event. The Agency is not statutorily consulted in this process and the promoters of events do not routinely notify it after a licence for an event has been granted. The Agency has therefore been less well informed about, and less well prepared to deal with, the congestion caused by these events. During the preparation of the Licensing Act 2003 the Agency had not been aware of the opportunity to become a body which has to be consulted and is now considering making a case to become one. In the meantime, it continues to rely on informal arrangements between its area teams and local licensing authorities.

## The Agency is strengthening its ability to deal with the effects of incidents and accidents on the network

**19** Adverse weather conditions, especially in winter, can cause incidents and accidents leading to major congestion problems. After a breakdown of the Agency's winter maintenance procedures during a period of adverse weather conditions in January 2003, the Agency has taken a range of measures to reduce the risk of such incidents happening again. One of the key problems was the lack of strategically placed hardened central reservation crossovers or barriers that could be quickly dismantled to provide escape routes onto the opposite carriageway. The Agency has identified around 2,200 crossovers built for maintenance purposes and has installed additional demountable barriers or built new crossover points at a further six sites. A more systematic review is required of where such escape routes should be sited, however, based on an analysis of the strategic points around the network where traffic conditions and the history of incidents and accidents warrant crossovers to be built to relieve congestion following incidents and accidents.

**20** Major accidents can also cause significant congestion, and clearing roads after they have taken place can be a significant challenge. The Agency does not have any targets for clearing roads within a certain space of time after the emergency services have completed their work. It is taking over from the police many of their responsibilities for clearing motorways after incidents and accidents, establishing a uniformed motorway patrol service of its own. It expects the project to cost £73 million to set up, and have annual running costs of some £58 million. In return, the Agency has estimated that the measures will result in a 17 per cent reduction in motorway congestion caused by incidents, producing economic benefits valued at £67 million a year and releasing £20 million worth of police officers' time to their core activities of fighting crime. The Agency expects that, on average, its new measures will cut by five minutes the time taken to clear motorways after an incident lasting 45 minutes.

**21** The project is a major challenge for the Agency. Few highways authorities in other countries have transferred police traffic management powers to civilian traffic officers. It has to recruit and train 1,500 new staff, nearly doubling the number of its employees from 1,800 to 3,300, procure and deploy 100 vehicles, establish a network of depots and offices for its new teams of traffic officers, and develop clearly defined joint working arrangements with the police. The Agency is carefully managing the associated risks, taking over police responsibilities in stages. It started an initial service in the Midlands in April 2004 and expects to have services available on the whole of the motorway network by September 2006.

**22** Traffic sometimes has to be diverted from the strategic road network on to local authority roads, or vice versa. Local roads do not always have the capacity to accommodate diverted motorway traffic. The police and the Agency generally try to avoid diverting traffic where this is the case. The Agency has formal procedures agreed with local authorities for putting diversions in place for some of its roads, though not all. In our survey of local authorities in 2003, local authorities considered that the Agency had a patchy record of working with them to identify and agree alternative routes to manage traffic. One third considered either that they did not have any pre-planned diversion routes agreed with the Agency or had diversion arrangements that did not work well. Some 40 per cent of local authorities who replied to our survey considered that unplanned diversions off motorways and trunk roads have caused disruption and congestion on local authority roads, because the diversions have not always taken account of the capacity of the local road network. As a result, local authorities have been reluctant to discuss alternative routes with the Agency. The Agency's Area Offices are now working with local authorities to identify potential diversions off main routes.


# RECOMMENDATIONS

### Exploiting more fully the measures at the Agency's disposal

i The Agency should adopt a more expansive approach to testing out the range of measures at its disposal, carrying out more trials at more sites to increase its chances of success, whilst managing the risks involved.

ii The Agency should improve the design, management and delivery of its trials of measures, along the lines suggested in this report.

iii Before implementing any new measures, the Agency should seek to convince users about the benefits they would bring to them, as a means of gaining public acceptance.

### Giving motorists the information they need

iv The Agency needs to improve the nature of the information it gives to motorists through its road-side signalling systems. It should provide information on:

- the length of traffic jams and how long it is expected to take to clear them;
- expected journey times to key locations; and
- what motorists should consider doing to minimise or avoid delay, including through the use of other alternative routes to help drivers bypass congestion.

v The Agency should provide relevant information to drivers as they approach junctions to join motorways, to allow them to consider other routes, as well as on the motorways themselves.

### Targeting the most appropriate technology at the most congested roads

vi Through its Technology Strategy Steering Group, the Agency should assess the scope to release resources from planned technology projects outside the south east, in order to help redress the regional disparity in the provision of technology, and put in place a clear plan of action for installing the appropriate technology by specified dates.




### Being better prepared for major events

vii The Agency should establish a database of major events that have an impact on motorway and trunk road traffic, containing information about numbers of people expected to attend, associated traffic volumes and roads affected, as well as about any measures taken and delays caused by previous events. The Agency should make the database available to staff in its regional and local offices, to allow them to learn lessons from each other and become better prepared for future events.

viii In consultation with the Department for Transport, the Agency should make the case to the Department for Culture, Media and Sport for the Agency to become a body which has to be consulted in the licensing of major events, to support its new traffic management responsibilities.

ix In the meantime, the Agency should establish formal agreements by which local authorities provide the Agency's relevant local and regional offices with complete, timely and accurate information about events that they have licensed, to allow Agency staff to prepare and plan for those events in consultation with all of the relevant parties.

### Being better at dealing with incidents and accidents

x The Agency should carry out a systematic review of where crossovers between carriageways should be sited around the network, and build such facilities into central reservations in order to allow vehicles to pass onto the opposite carriageway as a means of clearing roads more quickly after an incident or accident.

xi The Agency should set targets, dependent on the severity of incidents and accidents, for clearing a road after the emergency services have completed their work and released it to the Agency.

xii The Agency should agree pre-planned diversion routes with all English local authorities and Scottish and Welsh local authorities bordering England, to be activated where there is a major disruption on the motorway and trunk road network affecting local authority roads, and vice versa.