



Tunnel vision:

road users' experiences and
expectations of tunnels

December 2018



Foreword



It's important that new tunnels on the strategic road network are designed with users in mind. Transport Focus is pleased to have worked with Highways England on this research looking at what road users like or dislike about tunnels and how to ensure future road tunnels improve on those we currently have.

Transport Focus represents the interests of all users of the motorways and major 'A' roads managed by Highways England, whether they are a private motorist going to work or on holiday, or a business moving goods around the country on a lorry. Several projects and proposals to expand capacity on Highways England's network are likely to incorporate a tunnel, including the A303 at Stonehenge, the Lower Thames Crossing and a potential new route across the Pennines between Sheffield and Manchester.

Transport Focus is pleased to have worked with Highways England to carry out this research. We are keen to make sure that any new tunnels are designed with users in mind. What do road users like and dislike about tunnels? How could they be better than those we currently have? We also wanted to make sure this insight guided the refurbishment of existing tunnels on England's roads.

If the Sheffield to Manchester proposal is taken forward, it will potentially involve a

tunnel that is much longer than any currently experienced in the United Kingdom. This is something we specifically wanted to consider from a road user perspective. How are the issues different? What would Highways England need to take into account to deliver the best possible user experience in a very long tunnel?

Whatever their length, tunnels by their very nature create a different environment from the open road. This research captures the views of tunnel users, whether they are driving or a passenger, and whether in a car, lorry or on a motorcycle. Based on this insight, Transport Focus has made a number of recommendations about how the experience could be improved. We encourage Highways England to take these on board as plans are developed for new tunnels and for improvements to existing ones.

Anthony Smith

Chief Executive, Transport Focus





Foreword

These are exciting times for Highways England as proposed new tunnels at A303 Stonehenge and Lower Thames Crossing will double the length of tunnels on England's Strategic Road Network.

Tunnels are rare structures that are not, for many drivers, a regular experience. Safety systems are a particular characteristic of tunnels and it is important that we understand our customers' perspectives on safety and tunnel environments. This report contributes to that understanding.

The Transport Focus customer report looks at driver experiences of both Highways England's tunnels and others in the United Kingdom and Europe. We will use the themes identified as we move forward with these new tunnel schemes to

ensure we create a safe and relaxed experience for our customers.

We are drawing on the best international engineering and human factors expertise when reviewing our standards and educating drivers around the safe use of tunnels – and we will incorporate these useful recommendations into that body of work.

Mike Wilson

Chief Highways Engineer, Highways England



Key findings

Driving through tunnels is not an issue that most road users give a second thought to. Those we spoke to were neither overtly negative nor positive about tunnels. They are seen as a necessary part of the journey and the time saving provided far outweighs alternative routes. That said, the research¹ highlights where Highways England should concentrate its efforts to allay concerns and achieve improvements to the user experience. Ultimately, driving through a tunnel should be as intuitive as possible.

Among the concerns that emerged when users paused to consider them are:

- lack of clarity about the 'rules' when driving in a tunnel, for example, whether you can or cannot overtake, the speed limit and how much room should you leave behind the vehicle in front
- uncertainty about what to do in an emergency, including whether there is a safe place to stop if you break down.

In addition, lorry drivers, motorcyclists and those with a disability mentioned specific issues that affect them.

When it came to what road users wanted to see in new tunnels, the issues raised included:

- clear information on the approach to and in the tunnel
- good lighting
- decent ventilation.

It is worth noting that road users viewed short and long tunnels differently. Short tunnels should feel no different to a normal motorway – almost a non-experience, described by some of those we spoke to as a 'motorway with a roof on it'. Whereas users felt longer tunnels should be distinctive and different from the open road, with driving through them being an 'experience' in its own right. Many took inspiration from longer tunnels found abroad, which were felt to be well lit, wide, and high enough to avoid feeling claustrophobic.

"The new tunnel is square. It's clear now. It used to be all traffic, even coming out of the tunnel. You're now out onto the A19 and away..."

Commuter, Newcastle



¹ This summary report is based on research conducted by Illuminas in January/February 2018 for Transport Focus in partnership with Highways England. The research agency's full presentation is available on our website at: <https://www.transportfocus.org.uk/research-publications/publications/tunnel-vision-road-users-experiences-expectations-tunnels/>.

Objectives and methodology

The objective of this research has been to provide user input into future road tunnel design so that those tasked with designing, building and operating roads infrastructure understand what those who will be driving through tunnels wish to experience. The research set out to highlight likes, dislikes, concerns and ambitions to improve the experience. As new tunnels may be longer than those currently existing in this country, this research also looks at the experience of travelling in longer tunnels found overseas.

It includes insight from a number of different types of road user:

- car drivers/passengers
- van drivers
- heavy goods vehicle (HGV) drivers
- coach/bus drivers and passengers
- motorcyclists
- drivers/passengers with disabilities.

Literature review

Our initial step was to conduct a literature review² of what has been written previously in this country and worldwide about road tunnels. This review sought to find academic and other work relating to road users' expectations and experiences when using tunnels. This was used to inform the next stages of the research.

Survey research

Qualitative research was conducted with users in this country and abroad as follows:

12 x 30-minute accompanied tunnel journeys

- Liverpool, Newcastle and London
- drivers and passengers.

12 x 30-minute self-directed tunnel journeys

- mainly drivers in the London area.

9 x 90-minute mini-focus groups

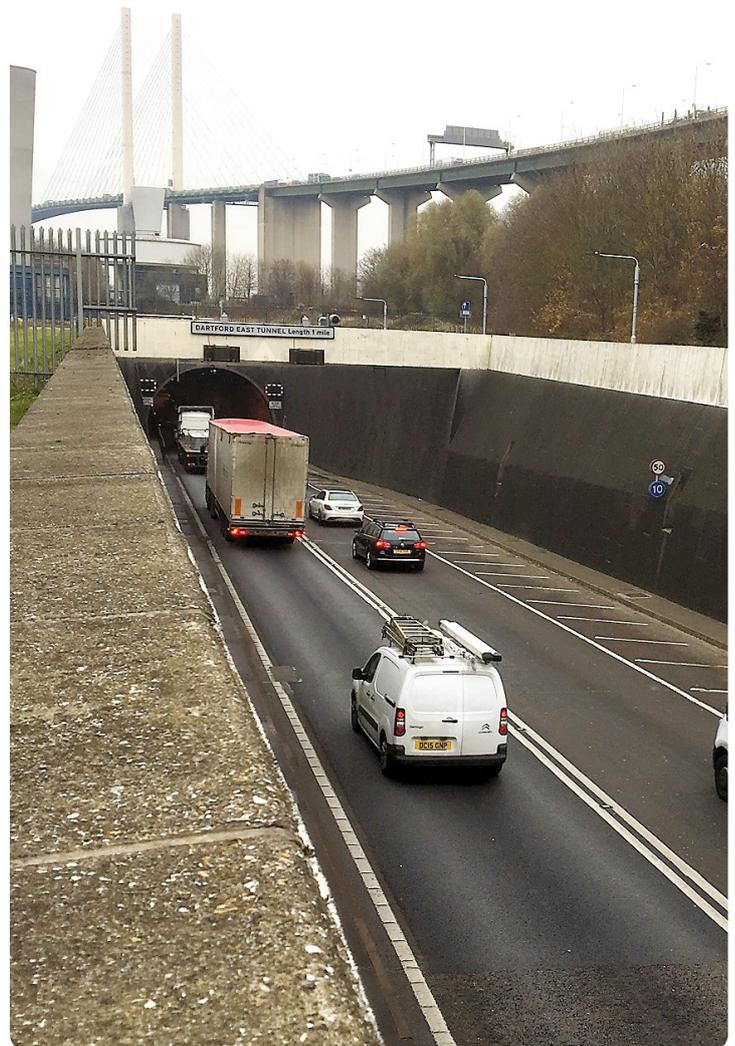
- 2 in Liverpool
- 2 in Basingstoke
- 2 in London
- 2 in Sheffield
- 1 in Guildford.

24 x depth interviews

- 8 x disabled drivers and passengers
- 8 x motorcyclists
- 5 x HGV drivers
- 3 x coach drivers.

Interviews with motorists using tunnels in Europe (60 intercepts in total)

- two days intercepting motorists at Chamonix ski resort (France) – close to the Mont Blanc road tunnel
- one day of intercepts at Pralognan La Vanoise (France)
- dash-mounted cameras placed in selected road users' vehicles to record their journey through a road tunnel in Europe.



² The literature review report can be found on our website at: <https://www.transportfocus.org.uk/research-publications/publications/tunnel-vision-road-users-experiences-expectations-tunnels/>.

Detailed findings

Whether to use a road tunnel or not

Existing road tunnels in England tend to be short compared with many found in Europe and beyond. Most tunnels exist to enable quick and easy passage under or through hills, mountains or stretches of water. We found that road users see these tunnels as a necessary feature of the road, and in some instances an unavoidable option, or perhaps, the 'least bad' option, compared to alternative routes.

Few road users give a second thought to driving through a tunnel and accept this as simply part of their journey. However, prompting users to think more deeply about tunnels brings up several issues that they view negatively, and which make their journey a less comfortable experience. Issues such as breaking down in a tunnel, other drivers' behaviour, understanding the driving rules/laws in tunnels, information provision, lighting and air quality were highlighted.

That said, when road users rationalise the situation and/or are confronted with alternative routes that may take only a little longer, they readily accept the benefits of using the tunnel and are happy to travel through it. We also found that road users have faith in 'the authorities' (that is those who build, maintain and manage tunnels) to have considered all the issues raised and to have addressed their concerns.

The exception to this is a small number of drivers who may look to find alternative routes; this may be because of claustrophobia or simply because they are not under any time pressure (for example, those on holiday) and may be actively seeking out alternative routes as offering more pleasant scenery. Overall, it appears that few road users are overtly negative, or indeed positive, about using tunnels.

Understandably, few of the road users we spoke to had knowledge of every tunnel in England. Instead they tended to have greater knowledge and experience of specific tunnels in their local area or which they use on regular journeys.

We found that satisfaction when driving through specific tunnels can be linked to the age, design and overall quality of a tunnel: for example, newer tunnels such as Hindhead on the A3 in Surrey attract more positive comments. On the other hand, those that have been in use for several years (for example, the Mersey tunnels) generally lead to indifference, whilst those tunnels that are much older (for example, Rotherhithe and Blackwall in London) are viewed more negatively.

Driver behaviour in tunnels

As on any major road, a significant issue is road user behaviour – both an individual's own and that of others. Different sizes and classes of vehicles, drivers with varying levels of confidence and experience, and the simple fact of using a high-speed road, are all issues drivers have to contend with. The addition of a tunnel can add to this mix with different rules, procedures and potential hazards.

"I just don't really know certain things, like what I'm meant to do. I thought maybe they might have told me in my driving test? But no I don't think so. Can you overtake in a tunnel? Sometimes you have to turn your lights on?"

Leisure driver, London

We found that most drivers acknowledge a change in their behaviour when driving in a road tunnel. This can be down to obvious instruction (for example, speed limits or the use of headlights) or can be as a result of being more cautious in a confined space. Some users may drive more quickly through tunnels if they are anxious to get through as soon as possible, particularly if they have concerns about the age or design of the tunnel.

This research shows that many road users anticipate changes to the 'rules of the road' when driving through tunnels, but they are unsure what these are. Specifically, the areas of confusion tend to be:

- speed limits
- changing lanes
- overtaking
- how large a gap to leave between the vehicle in front
- whether to use lights, and which lights to use
- what to do in an emergency
- what to do if their vehicle breaks down
- ability to stop and rest in a tunnel (especially a longer one).

The road users we spoke to said that tunnels should be intuitive to use, and as much like driving on 'the open road' as possible. Where this is not the case, they want information on the approach to a tunnel to enable them

to deal with the issues above. However, any signage needs to provide road users with sufficient information, while not risking confusion by bombarding them with too much. Additionally, better education, communication and information before road users ever need to use a road tunnel could help.

Differences by driver type

Driving through road tunnels affects different drivers in different ways, with both positive and negative issues highlighted by this research.

Disabled road users

As a result of the need to manage their disability, disabled road users, whether drivers or passengers, tend to plan and prepare for their journeys more thoroughly than most road users. This means that they are more likely to know if they will encounter a tunnel on their intended route. This can be important for road users with anxiety: knowing there will be a tunnel on a specific route and then encountering it as planned can be a positive reassurance. On the other hand, coming across a tunnel that was not expected can add to the anxiety.

Lack of understanding of 'the rules' when driving through tunnels can also be problematic for disabled road users – particularly around breakdowns and other emergencies. Providing information on the approach to and inside a tunnel could help alleviate some of these concerns.

"If I were to breakdown, I would feel very vulnerable... If I'm stuck I can't get out of my car and use the emergency telephone."

Disabled driver, London

While in-car technology has the potential to help all road users, some disabled motorists told us that they find elements of in-car technology particularly enabling. For example, satellite navigation (sat nav) can be particularly helpful for users with Attention Deficit Hyperactivity Disorder (ADHD). However, if the sat nav stops working (through loss of signal) when driving through a tunnel, this can be a cause for concern.

Drivers and passengers with mobility impairments tend to have little actual difficulty using tunnels; their concerns

arise from thinking about what to do in an emergency situation or should their vehicle break down. These views are similar to those we found in our smart motorways research³.

Coupled with a general lack of awareness of what to do in these situations, the prospect of getting out of a vehicle in the confined space of a tunnel can be very worrying for disabled users. In particular, they worry about unloading and assembling equipment (such as wheelchairs or crutches) and/or finding and using an emergency refuge or means of escape.

"I suppose the scariest thing is that I don't know what I'd do."

Mobility impairment, London

We asked disabled road users what would help them to deal with such situations. Among the suggestions received were:

- regular emergency refuge areas, enabling road users to stop in the event of a problem
- regular and easily-identifiable emergency exits within the tunnel
- availability of staff to assist disabled users in the event of an emergency
- fold-out wheelchairs at emergency exits to assist those with mobility impairments
- advance knowledge of safety procedures.

In the research, several disabled users commented that some tunnels provide greater reassurance than others that staff are available to help in emergency situations, with response vehicles and/or control rooms visible close to tunnel entrances.



³ The report can be found at: <https://www.transportfocus.org.uk/research-publications/publications/getting-heart-smart-road-user-experiences-smart-motorways/>.

Motorcyclists

Motorcyclists can be more vulnerable than drivers of cars and larger vehicles. The confined space of a tunnel can mean that motorcyclists share less road space than usual, increasing their worries about the behaviour of other road users. Again, lack of knowledge about the correct rules when travelling through tunnels (for example, filtering or overtaking) can cause motorcyclists concern.

Other factors affect motorcyclists more than other types of road user. Noise and poor air quality are more acute when riding a motorcycle. In particular, where traffic is stationary in a tunnel, the build-up of fumes from idling engines can cause motorcyclists discomfort. Some motorcyclists told us about helmets with ventilation switches, however, not all motorcyclists have these. Therefore, tunnels should be designed with the highest levels of ventilation, for better health and comfort of all road users.

"You can actually taste the diesel and oil in Birkenhead tunnel so I just go as quickly as I can and get in and out."

Motorcyclist, Liverpool

Motorcyclists also told us that they would like to see hard shoulders or emergency refuge areas in tunnels. If a motorcycle breaks down, riders are concerned about finding a safe place for them and their motorbike away from other traffic.



Lorry and coach drivers

Drivers of heavy goods vehicles and coaches told us that tunnels are a necessary feature of their journeys and, with them often being the quickest means of getting to their destination, are seen as preferable to other routes. As professional drivers, they see tunnels as an expected part of the road network and, compared with other situations they may encounter, are taken in their stride. As well as obvious time savings, tunnels provide some positives for professional drivers by adding a different feature to their usual working day and can be enjoyable to drive through.

Satellite navigation may be used to obtain details of height restrictions on the road network, but due to inaccuracies it is not generally relied upon and may even be forbidden by some employers. Therefore, lorry drivers require clear information about height restriction on the approach to a tunnel.

Driving larger vehicles in more confined spaces can be challenging. Drivers told us that they feel that lane widths can be narrower in older tunnels. This can lead to an increased sense of confinement (both for them and other road users), as these types of vehicle are closer to the walls and ceiling of a tunnel. Tunnels that lack good lighting can add to these issues, making it harder for drivers to see walls and road markings.

"I'm always happy when I leave a tunnel. I am a little claustrophobic."

Intercept interview, France

Additionally, tunnels that have sharp bends can require larger vehicles to encroach on another lane, including those intended for overtaking or oncoming traffic, and can feel as unsafe when this occurs.

We found that lorry drivers take more care over journey planning, utilising the most efficient route to their destination, to ensure that delivery schedules are met. Drivers must also adhere to driving hours rules and must be able to stop and rest. Tunnels are a factor in this as drivers must be able to stop prior to or after a tunnel and not in it. Longer tunnels exacerbate this issue so timely, helpful information on tunnel length, traffic conditions and estimated travel time are essential.

"We need to know how long the tunnel is in case we need to change drivers before we go in."

Coach driver, France

Road users' basic needs

This research identifies a number of basic needs that road users have from any tunnel:

- Good lighting, enabling the walls and road surface to be easily seen at any time of the day or night.
- Adequate width, allowing room for all types of vehicles to manoeuvre and to remain 'in lane' at higher speeds.
- Adequate height, allowing the highest of vehicles to feel safe without compromising safety (or the feeling of safety). This also reduces/avoids the feeling of claustrophobia.
- Twin bore tunnels, allowing multiple lanes in one direction only, avoiding two-way traffic in the same tunnel.
- Clearly marked emergency doors that are easy to spot from anywhere within the tunnel.
- Clear speed limit information that is repeated throughout the tunnel.
- Clear instructions about overtaking/changing lanes.
- A high level of maintenance to be obvious to road users in the tunnel. Our research revealed that this is more relevant for older tunnels, however a very high standard of repair is expected from road users on all motorways and major 'A' roads.

Shorter tunnels

While there was no specific agreement as to what constitutes a short or a long tunnel, in relatively short ones road users expect to see very little difference to driving on a 'normal' road, with the same amount of road space, lanes or speed limits. They describe this type of tunnel as 'a road with a roof on it' and they look for very little difference in the way they need to drive.

Longer tunnels

Road users want longer road tunnels to be distinctive and different from the normal road, using a number of innovative features that they may have seen abroad and which may help them use the tunnel. They mention features such as:

- tunnel entrances that complement the surrounding environment
- appropriate lighting at the entry and exit of tunnels to help one's eyes adjust to the contrasting lighting conditions
- interior wall graphics to show where the tunnel goes underwater, helping to contextualise journeys
- artwork/scenery images on tunnel walls
- brightly lit 'halls' to break up longer journeys
- quiz questions to tackle monotony issues (as experienced by one motorist in Australia).

"One of the tunnels in Norway I've travelled through... goes through the water, and it shows you the water level increasing and decreasing in terms of graphics shown on the bricks [inside the tunnel]."

Road user's experience, Norway

The prospect of longer road tunnels in England

The road users we spoke to did not raise any concerns about proposed new tunnels (including Trans-Pennine, Lower Thames and the A303 at Stonehenge) being potentially much longer than current tunnels. The time savings, increased road capacity and expected improvements to journey reliability were seen to outweigh any concerns.

Even where time savings made by using tunnels appear to be relatively modest, road users tell us that this alone is enough to persuade them to use the tunnel. The main exception is road users who have more time (for example, those on holiday) where exploring an area of natural beauty may attract them to a non-tunnel alternative.

"Honestly, it has changed my life, and not just my life, my family's life. I get home and seen the kids now. Before I didn't."

Commuter, Tyne Tunnel

However, raising the subject of longer tunnels does bring up a number of issues that road users think should be considered in their design. These include:

- real-time information prior to a long tunnel showing its length, current transit time, and overall traffic conditions
- progress information within the tunnel to help alleviate monotony and assist drivers in judging how long they have left to travel in the tunnel
- innovative lighting changes and design features within the tunnel: again, to break up any feeling of monotony in a longer tunnel

- plenty of warning on approach to a tunnel, with provision of a suitable point where drivers can turn around and/or rest areas for lorry drivers needing to stop beforehand to comply with driving hours rules.

"There's a sign reminding you to turn your lights off and another sign telling you the speed goes back up to 100."

Road user's experience, Mallorca

"There's a nice green arrow there and a big red cross there so there's no confusion over which side of the tunnel you should drive on."

Road user's experience, Mallorca

"I think it's so important there's a sign to tell you the tunnel's length way before you get to it, you know, some people may not want to drive through a 20km tunnel!"

Road user's experience, France

"You've got wide emergency exits in case there are any accidents, they are well signposted and well lit."

Road user's experience, Austria



Transport Focus recommendations

Transport Focus makes the following recommendations to Highways England in light of this joint research:

- Highways England should ensure that tunnels are designed, built and operated with the road user in mind. The views of a wide range of users should be included as input to decision-making from the earliest stage. This same principle should be applied when planning upgrades to existing tunnels and must include infrastructure, environment, aesthetics, signage and safety. Doing so should lead to increased levels of user satisfaction.
- Highways England should ensure that the specific needs of different road users are considered when building new or upgrading existing tunnels, specifically:
 - disabled road users need accessible, wheelchair-friendly emergency provision, with a combination of staff, technology and monitoring systems deployed in the event of an emergency
 - lorry drivers need easy access to reliable, timely information about tunnel length, traffic conditions and estimated travel time to allow them to plan rest stops.
- Road users expect driving in tunnels to be intuitive and as much like driving on the 'open road' as possible. Consequently, Highways England should do more to help road users drive safely and confidently in tunnels. The focus must be on eliminating confusion around key issues such as speed limits, changing lanes, overtaking,

keeping a safe distance between vehicles, stopping rules, and what to do in an emergency. Two areas merit specific attention:

- explore options to increase awareness and understanding among potential tunnel users about how to use them (both when learning to drive and through communication with existing drivers)
- ensure signage (both on the approach and inside tunnels) is useful, easy to understand and displayed frequently enough, while not being overwhelming.
- Road users value the reassurance provided by a hard shoulder and would ideally like this to be provided in tunnels. Where no hard shoulder is provided, Highways England should ensure adequate provision is made for breakdowns and emergencies and that this is communicated clearly to road users, including those with disabilities.
- Highways England should ensure that tunnels are well-maintained (including road surface, cleanliness and lighting) and that the environment meets high standards for ventilation and air quality for the safety, health and comfort of users. This should include measures to manage emissions when traffic comes to a stop.
- In designing longer tunnels, Highways England and the designers and engineers it engages should learn from experience in other countries, in particular with regard to measures designed to address monotony and boredom and helping lorry drivers to conform to driving hours regulations.



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