



Illuminas
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TUNNEL VISION

RESEARCH DEBRIEF

Prepared for Transport Focus
Prepared for Keith Bailey

March 2018
Project number: 37089

By John Connaughton – CEO
john.connaughton@illuminas.com
T: +44 (0)20 7909 0935
M: +44 (0)7946 277959

 illuminas.com

 [linkedin.com/company/illuminas](https://www.linkedin.com/company/illuminas)

 [@Illuminas](https://twitter.com/Illuminas)

The need for research

Tunnels are a familiar part of the road infrastructure, but little research has been conducted on passengers' and drivers' experience of using them or of their expectations of new tunnels

We have therefore conducted research into perceptions of tunnels with the aim of helping to inform tunnel design ahead of the building of any new tunnels or refurbishment of existing tunnels on the Strategic Road Network

The overall aim of the research is to understand how road tunnel design might best achieve an optimum user experience, particularly in relation to tunnels that may be longer than those most users experience in the UK



Research Objectives

The overall objective was to understand how road tunnel design might best achieve an optimum user experience, particularly in relation to tunnels that may be longer than those most users experience in the UK, and inform road tunnel designs for the future

- To create theories on ways to ease psychological difficulties that people might have using a road tunnel
- An opportunity to explore ideas relating to tunnel design (e.g. different colours, structures, patterns, lighting on inside of tunnel)

More specific goals of the research were:

To explore users' experiences of road tunnels in terms of likes, dislikes, areas of concern and suggested improvements

- Including detailed experiences of tunnel features

To compare and contrast the views of both drivers and their passengers, as well as those travelling for personal/leisure reasons or professionally

- Drilling down into different segments of journey purpose

To compare and contrast the views of car, van and truck drivers as well as motorcyclists and coach/bus drivers

- Ensuring different drivers are represented in the research

To consider the potential needs of disabled drivers/passengers and/or Blue Badge holders

- Ensuring range of disabilities are represented in the research

To begin to explore drivers' expectations of a future context where electric and/or driverless vehicles are commonplace on the SRN

- Focusing on advanced technologies

Explore the views of UK road users who have experiences of road tunnels in other countries

- Utilising drivers' experiences in other countries where tunnels are more prevalent than in the UK

Methodology – in total we spoke to 205 respondents about road tunnels

In order to gain as much insight as possible from a qualitative approach, there were three stages of research, consisting of six components

1

Literature review



- A review of the current literature relating to road tunnels
- Literature included a worldwide scope of studies on tunnels

12 x 30 minute accompanied tunnel journeys

- Consisting of journeys in tunnels in Liverpool, London and Newcastle with drivers and passengers

12 x 30 minute self-directed tunnel journeys

- Consisting of journeys through road tunnels mainly in the London area

2

9 x 1.5 hr mini-focus groups



- Structured as below:
 - 2 x Liverpool
 - 2 x Basingstoke
 - 2 x London
 - 2 x Sheffield
 - 1 x Guildford
- *Target of eight respondents per group*

24 x depth interviews

- Consisting of:
- 8 depths with disabled drivers and passengers
 - 8 depths with motorcyclists
 - 5 depths with HGV drivers
 - 3 depths with coach drivers

3

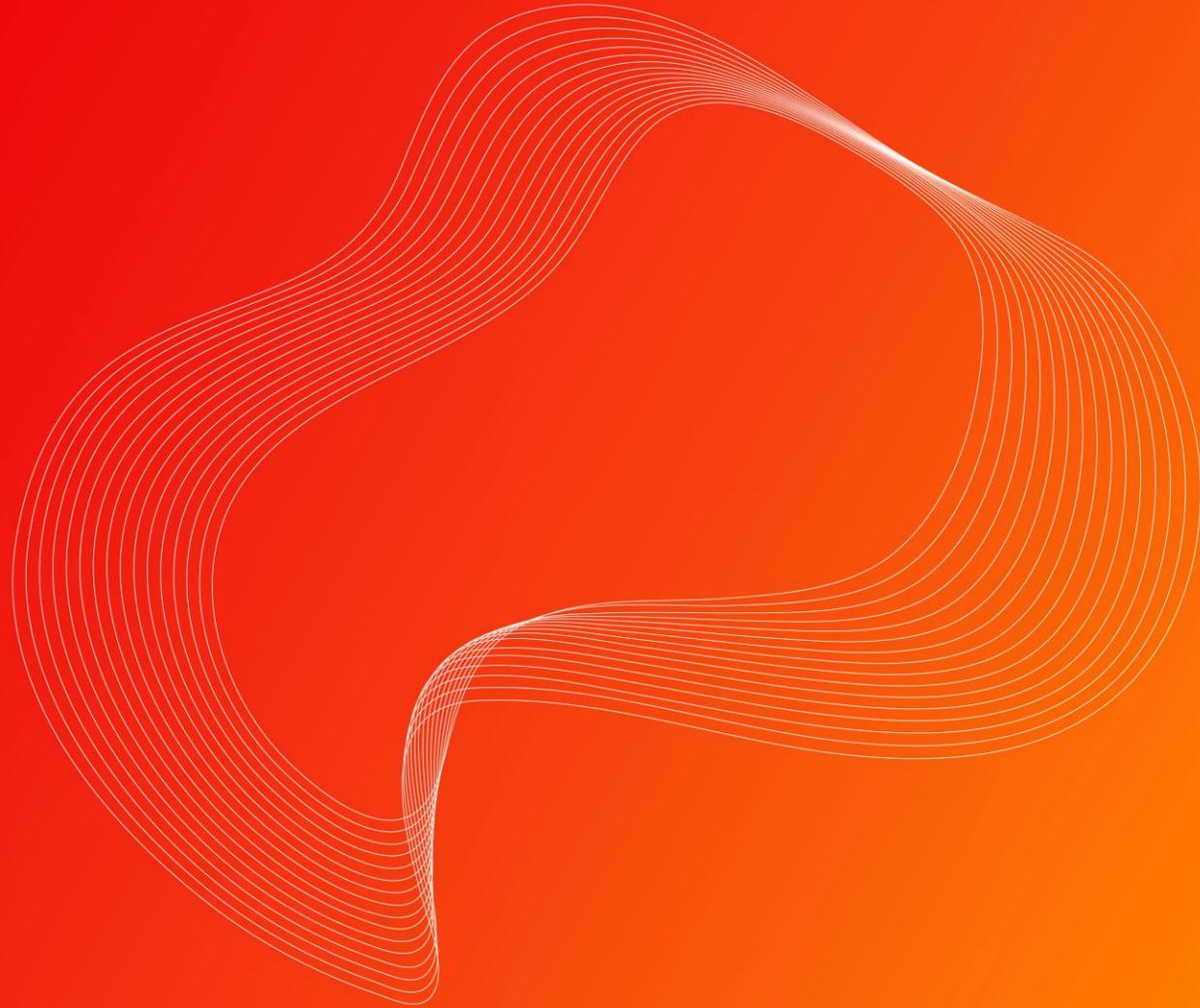
Tunnel exit intercepts



- Consisting of:
 - 2 days interviewing at Chamonix ski resort
 - 1 day interviewing at Pralognan La Vanoise
 - Total of 60 respondents

European tunnel experience

- Consisting of:
 - 25 respondents undertaking a Dashcam experience of travelling through road tunnels in Europe



Executive Summary

Executive summary

Travelling through road tunnels in the UK is for most drivers a low salience issue

Few drivers have any top of mind anxieties or issues about using tunnels

Tunnels tend to be seen as either an ‘unavoidable’ part of the route or the ‘least worst’ option when compared to alternatives

In addition, road users’ perceptions of road tunnels are often coloured by the specific road tunnel they use most often

Nonetheless, there is a broad consensus that the experience of travelling through a road tunnel can be an uncomfortable one

And when prompted to think about road tunnels in more detail, users do have views on, and concerns about, various tunnel features and can suggest improvements to them. Issues identified include:

- The shape of the tunnel (arched v.s. square), bends, width, traffic all going in the same direction v.s. two-way traffic, lighting, noise, behaviour of other road users, tunnel age and condition, tunnel closures etc.

However, in the context of the relatively short tunnels currently found in the UK, road users tend to post-rationalise any concerns about tunnels and simply accept them as part of their journey

Once their preferences with regards to those features are discussed, road users develop ideas of how tunnels could be designed in the future

- These preferences tend to hinge on tunnel length, journey type (travelling for work or leisure) and the environment surrounding the tunnel

Road users’ main preference is for two different types of road tunnel

1. A tunnel that is unlike a tunnel (for shorter road tunnels)

- What is essentially a motorway or an ‘A’ road ‘with a roof’

2. A tunnel that is distinctive and different from the open road (longer road tunnels)

- Takes inspiration from road tunnels abroad
- Incorporates innovative features, whilst remaining light, wide and high enough to negate a claustrophobic feel

And reactions to the possibility of longer road tunnels in the UK are ambivalent, with many considering the benefits of faster journey times as trumping any concerns about user experience during their tunnel travel



Key takeouts

Road tunnels are a low salience road feature

Road users tend to raise other, more 'everyday', road features before focusing on road tunnels

- Roundabouts, junctions and complex road layouts

Once road tunnels are focused on...

Very few road users are overtly **positive**, but nor are they overtly **negative**

- Instead they are seen as 'part of the journey'
- Or a 'novelty' especially when travelling abroad

I mean, it's just a tunnel. It needs to get me from A to B, if it does that – great. I can see that sometimes things could go wrong but if I want to get there quickly, then I will.
Leisure – Liverpool

Tunnels only become a salient issue for road users when they are confronted with a 'poor quality' road tunnel on a regular basis

- Specifically, older road tunnels in London (Blackwall and Rotherhithe)

Road users' perceptions of road tunnels in general are likely to be coloured by their use of road tunnels they use most often:

| Perception of road tunnels | Example of tunnels used |
|----------------------------|-------------------------|
| More positive | Hindhead |
| Indifferent | Queensway (Liverpool) |
| More negative | Rotherhithe, Blackwall |

- Although there are nuances in feelings about specific tunnels, a consensus is often quickly reached regarding its quality



When road users consider the many different features of a road tunnel, concerns about using them are raised and then later post-rationalised

Road users spontaneously raise many of the road tunnel features, behaviours and potential incidences below:



Once these issues are discussed, road users' awareness of issues relating to road tunnels are heightened and concerns emerge

Main concerns relate to:

- The potential of breaking down in a road tunnel or being stuck in a traffic jam
- The fear of a major incident such as a fire
- Other tunnel users' driving inappropriately
- The quality, quantity and type of lighting

Everyday issues that road users face on 'normal roads' are feared and heightened when travelling through a road tunnel

However, once processed in the context of their journeys, road users are still happy to travel through a road tunnel

- And typically do not consider even the shortest of diversions to avoid a road tunnel

Road tunnel users see some features as desirable for *all* types of road tunnel

Twin bore

- A consensus that bidirectional tunnels are more dangerous and difficult to drive through than a twin bore tunnel

Clear signage and information upon entering and leaving a road tunnel

- Some concerns and confusion about rules and regulations: speed limits, lane adherence, overtaking etc.

For me, time is money. If I need to get somewhere on time I need to overtake.

Business/ professional – Sheffield

If you overtook me in a tunnel I'd get out and knock you out.

Business/ professional – Sheffield

- Funnelling traffic through tolled tunnels (Merseyside) can be particularly problematic

Sufficient number of refuge areas and/ or evacuation points required in case of emergency

Integrated Wi-Fi and phone signal points

- Enabling information and contact in emergency situations and counteracting any monotony by having media (e.g. music) to engage with

Tunnel to be kept in good condition with regular maintenance

- If tunnel closes for any period of time, information to be disseminated by radio or signage outside of tunnel or on road leading up to tunnel



When thinking about tunnels being built in the future, road users think the optimum tunnel design is different for short and long road tunnels

1. For shorter tunnels, the preference is for as little as possible to change between the 'open road' and the tunnel

'Putting a roof on the road' is the phrase typically employed by road users to describe this sort of tunnel

- Number of lanes to remain the same
- Sensory changes such as lighting, noise and smell to be limited
- Speed limits not to alter dramatically

One example viewed by road tunnel users in our focus groups was Hatfield Road Tunnel



Features of this road tunnel users liked were:

- Wide
- Three lanes
- Height
- Well lit
- Twin bore

2. Users see the need to make longer tunnel journeys 'an event' changing the road experience quite dramatically, but with ample preparation and guidance for the road user

Designed to be an 'experience or an event' with the right information and intuitive guidance for road users to safely and easily make their journeys

- Artificial lighting to take into account the need for road users to adjust from natural lighting
- Number of lanes and speed limit to be clearly articulated via signage
- Emergency features to be evident
- Requirement for sophisticated traffic control systems and surveillance

One example viewed by road tunnel users in our focus groups was the Laerdal Road Tunnel (Norway)



Features of this road tunnel users liked were:

- Varied lighting
- Little traffic/ well managed
- 'Natural' walls
- Caverns

How do driving behaviours change when going through a road tunnel?

Most drivers notice a change in their driving behaviour when they enter a tunnel

- This can be forced upon them by certain rules (e.g. speed restrictions)
- Or can be done out of habit (an often unconscious behaviour)
- Or both

However, there are differences in opinion about *how* their driving changes

With some saying they become more conscious of their driving and therefore drive more cautiously

- More rational decisions, slower driving and heightened awareness of other traffic

Whereas others say that they become more nervous

- Feel they might be more likely to cause an accident, swerve in the road
- Some drive faster to leave tunnel quickly

The more 'tunnel-like', the more likely driving behaviour is to change

- Drivers using road tunnels such as Hatfield are less likely to report changes in driving behaviour



It is rare that a road tunnel is avoided, even by those that lack confidence driving through them

Typically, a road tunnel exists to make a journey from A to B as quick as possible

Drivers recognise this and will use the tunnel as long as it saves them time

The only exception to this is for those that are not confident driving through tunnels and are NOT under time pressure

- These drivers may seek alternative routes
- This is not necessarily just drivers that are tunnel-phobic, but also drivers that find alternative routes a more pleasant experience

Going through Rotherhithe is the quickest way for me to see my boyfriend, but if I can avoid it and go through the City, I will even though that takes longer.

Leisure – London

When considering road tunnels in comparison to other types of infrastructure, others can be preferred

- If crossing a river, drivers often prefer the option of a bridge, if available
- For example, some drivers in Liverpool will take a very long detour to cross the Mersey using Runcorn Bridge rather than the Mersey tunnels
- And travelling across the Thames in London often presents drivers with feasible options between bridge and tunnel
- Some drivers would take a longer route through mountainous terrain rather than go through a tunnel
- Weather can be an exceptional reason to use a tunnel

Nonetheless, it is important to note that the vast majority of drivers will always travel through a road tunnel even if it only marginally saves time





Road tunnel features in detail

Issues related to road layout are closely tied to road rules and the (lack of) road tunnel information needed



Tunnel entrance and exit

Road tunnel approach must be simple and clear with concise information

- Too little information leaves road tunnel users uninformed on key information: speed limits, safety procedures, tunnel length
- But too much information confuses drivers, again leaving them uninformed of speed limits, safety procedures, road rules etc.

Road users would like the option to turn-off before entering the tunnel

- Either to avoid having to go through tunnel, or if the tunnel is closed

The aesthetics of the 'tunnel mouth' seen to be needed to blend in with surrounding environment



Refuge areas

Not top of mind or often spontaneously mentioned as road tunnel feature

- Very limited awareness of refuge areas, some references to Smart Motorways
- When prompted, seen as a 'must have' for future/ longer tunnels
- Refuge areas to be as frequent as possible due to many concerns over no hard shoulder

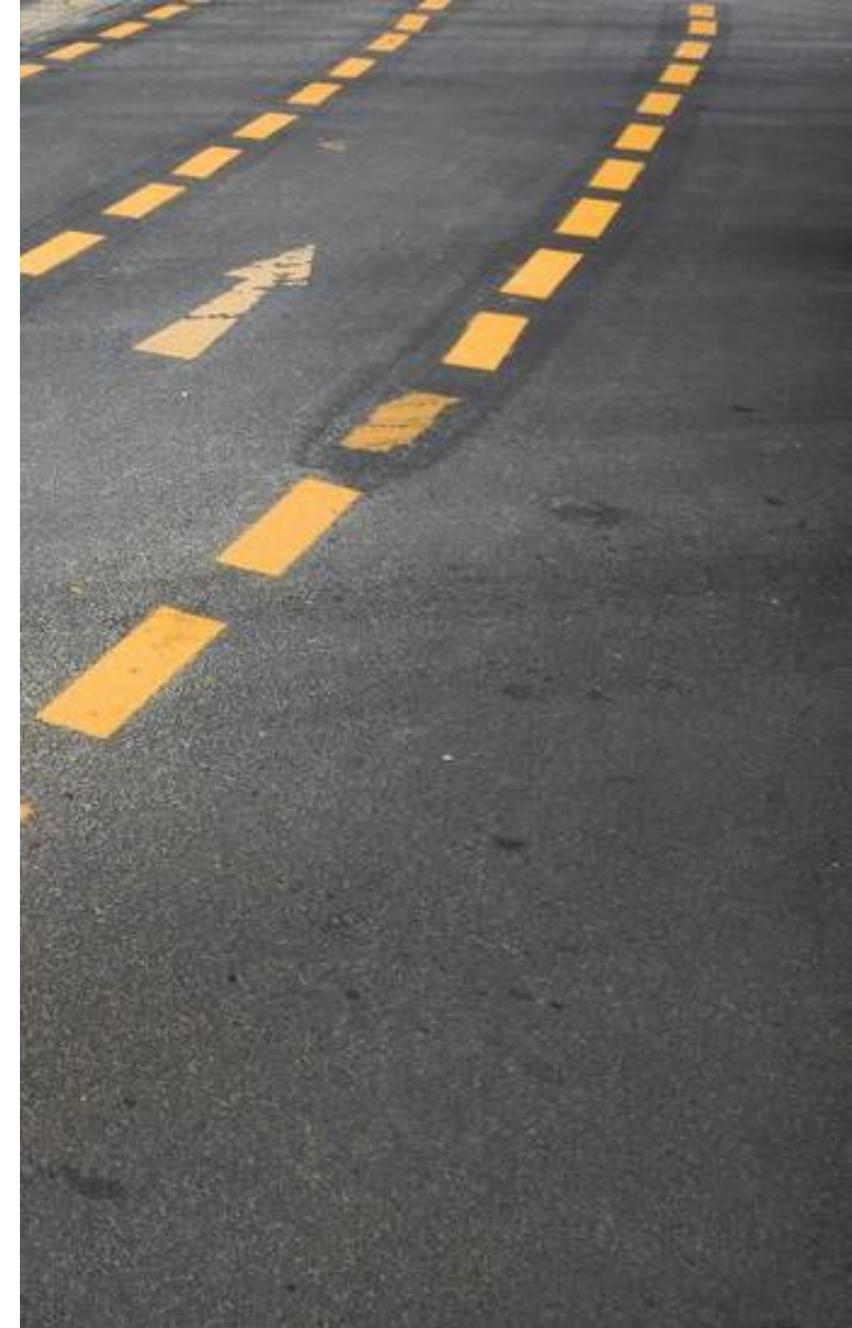


Lane structure

Drivers overwhelmingly prefer twin-bore road tunnels

- No preference over number of lanes

Confusion over lane changing rules is commonplace



Drivers enjoy as much space inside a road tunnel as they can get and are seeking clarity on the rules of a road tunnel



Spacing of vehicles

In general, drivers would like traffic to be spaced further apart inside road tunnels

- Drivers feel safer if more space is given between them and other vehicles
- Space is often felt to be at a premium for drivers that find road tunnels claustrophobic
- Larger vehicles are of concern for those driving in smaller vehicles, again adding to feelings of enclosure
- Traffic also felt to become quickly congested inside road tunnels

Drivers' behaviour often changes when entering a tunnel, becoming either:

- More cautious, or...
- More anxious and irrational

(see slide 12)



Tunnel rules of the road

Many drivers are unaware of the rules inside road tunnels, including:

- Overtaking
- Lights on or off
- Speed

Drivers want clarity on the rules and are seeking out communications when entering the road tunnel for this

- A lack of road tunnel rules can lead to drivers feeling anxious, unsure of their own driving behaviour etc.

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 – London



Traffic control

- Most aware of surveillance (albeit vaguely)
- Many expect it as part of the tunnel experience and welcome the safety benefits



Toll roads

Drivers would, of course, rather not pay toll charges for using a road tunnel

- However, if the road tunnel is seen as time-saving and of good quality (such as the new Tyne tunnel), drivers rationalise this
- The extent to which a payment system is convenient and quick has a big impact on a driver's journey into the tunnel
- The Tyne tunnel is seen as best practice as it has an automatic electronic device that regular tunnel users can purchase

The condition and experience of a road tunnel is most strongly dependent on the age of the road tunnel

Drivers often associate old road tunnels with poor condition and experience

- Examples of this are Rotherhithe and Blackwall tunnel

Poor condition often refers to:

- Dirty tunnel walls
- Cracks in tunnel wall
- Poor lighting
- Faded road markings
- Tight and cramped conditions



Road surface

Road surface is a low salience issue, but when prompted road users think that road surface inside tunnels is better than outside tunnels

- Road users notice change in surface when entering tunnel
- Often seen as somewhat smoother



Wi-Fi and internet signal

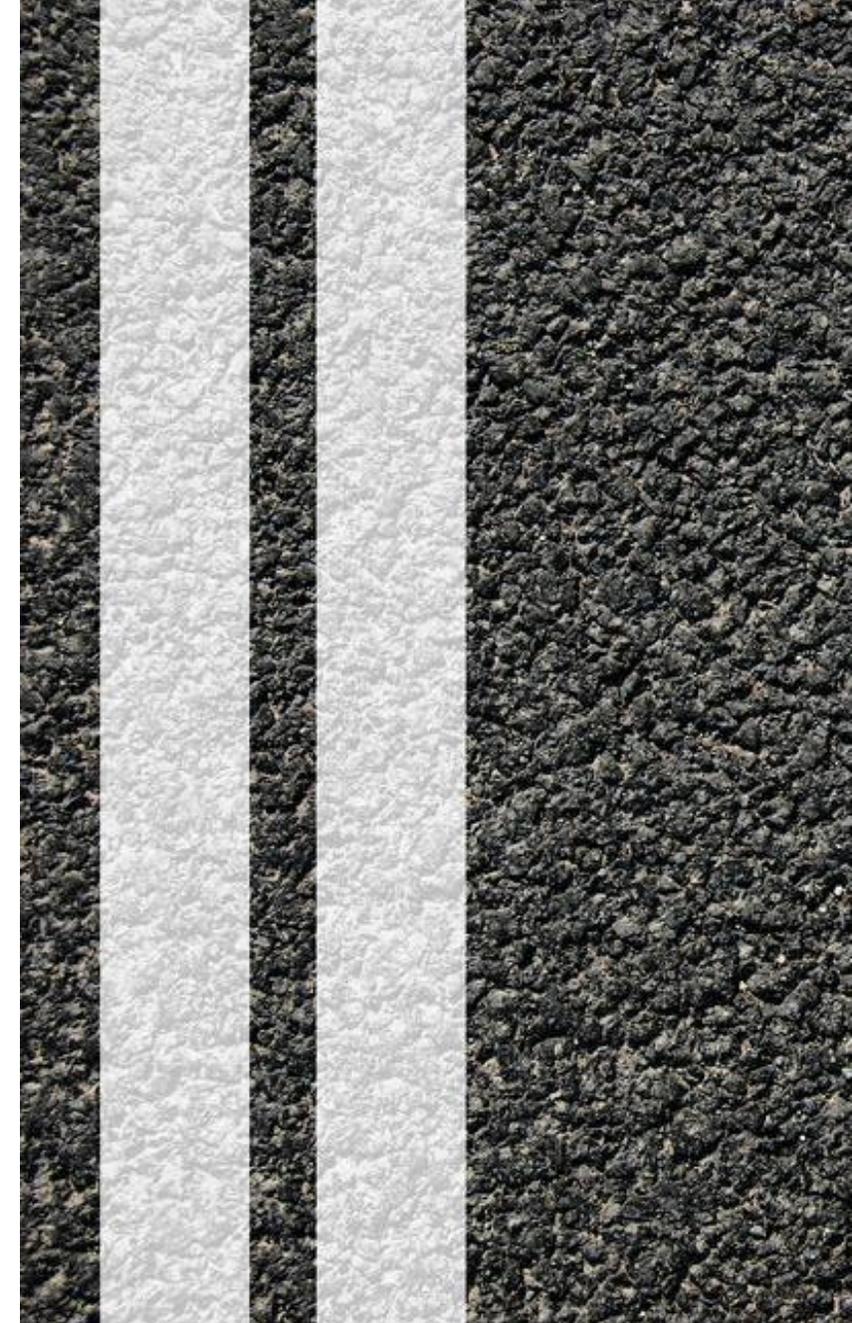
For most road users, Wi-Fi and internet only become high salience when emergency or breakdown occurs

- Younger people also expect to 'stay on the grid' throughout their journey
- Concerns also raised if in tunnel for long periods (either a long tunnel or stuck in traffic)
- Wi-Fi and phone signal points are now expected



Aesthetics

- Important for tunnel to blend in with its surroundings and not be a blot on the landscape
- Relevant to both city and rural tunnels



The sense that is most strongly affected in a road tunnel is sight

Although air quality, noise, and even the feel of the car do change somewhat, it is **visual surroundings** that trigger most changes in a driver's experience



Lighting

The level and type of lighting in a road tunnel is the most common road tunnel feature cited as changing the sensory experience

Lighting can impact the look and feel of a road tunnel

- There is not one level and type of lighting that drivers prefer

But drivers are often agreed on what impact they would prefer the lighting to have:

- Road tunnel to look as wide and open as possible
- Other road users, road tunnel features, emergency exits, information and signage to be visible

There is a balance as to the level of lighting:

- Too many lights are seen to give off a 'disco-light' affect that can be distracting
- Whereas too few lights can leave drivers feeling unsafe in a dark and dingy environment

I know some lads who actually drive through the Hindhead to make a noise. They love it!
Business – Guildford

It's like a disco light effect. You go through and suddenly you're hit by it.
Leisure – European Traveller



Air quality

- Many avoid driving through tunnel with window down
- The 'smog' seen to be a particular issue when stuck in traffic



Noise

- Noise a low salience issue
- Some users purposefully drive in tunnels as a pastime to hear the 'revs' of their engines



Feel

- Low salience
- Road users can often feel a change in road surface, which is perceived as smoother

Many drivers do not actively worry about potential threats to their safety inside road tunnels...

But when prompted, the threat of fire stands out as the biggest fear...



Fire

- But many felt detached from this ever becoming reality

Instead, the biggest concerns revolved around what drivers would do in case of a fire

- Many unaware of evacuation plans etc.
- Some recollections of the Mont Blanc fire

It is felt that engineers have learned from previous events

- Fires are expected to be less likely
- Fire is expected to be kept more under control
- Evacuation procedures are expected to be more effective

Fires are anticipated to be a bigger issue in longer tunnels



Terrorism

- Many do not consider the threat posed by terrorism in tunnels
- Some road users theorised that a road tunnel would be a 'perfect target' for terrorism
- Most post-rationalise this fear 'if it happens, it happens' and for both fire and terrorism there is an assumption that 'the authorities' will have plans in place



Weather conditions

- Experiences mainly related to the changing of weather from inside to outside of the tunnel
- Glare from the sun upon exiting
- Snow and rain residue upon entering can make the surface slippery when not expected to be



The psychological challenges of anxiety and monotony are top of mind issues for a minority of drivers



Anxiety

Anxiety about travelling through road tunnels was not an issue for the majority of road users:

- But for those that do feel anxious, some will not be able to say exactly what they do not like but only refer to a more generalised feeling of distress
- This is often referred to as feelings of ‘enclosure’ and darkness
- That said, there is a significant minority that discusses claustrophobia as being a problem
- Nonetheless, very rarely is this enough to deter travel through a tunnel, with even claustrophobic drivers choosing to take a tunnel over a longer route

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

Intercept – France



Monotony

- Monotony in tunnels is seen by some to be potentially dangerous
- Monotony can induce tiredness and unsafe/inattentive driving
- Certain solutions to monotony (e.g. bright lighting, ‘mountain halls’ with sunrise effects in Norway’s Laerdal tunnel and plastic trees as seen in the Zhongnanshan tunnel in China) are seen by some as too distracting but by others as a welcome relief, although there was limited actual experience of these creative solutions amongst our respondents
- Monotony is often discussed in relation to its antithesis – distraction
- Solutions to monotony that involve ‘distractions’ can be seen as creating another problem



Emergency situations in road tunnels are seldom anticipated, but thoughts of them prompt fear and confusion over how to act



Tunnel closure

- Tunnel closure was an issue experienced by many road tunnel users
- The extent to which road users are notified in advance varies by different road tunnel (for example those using Hindhead are well informed)



Breakdown

- The prospect of breaking down in a road tunnel is daunting
- This is seen as far more likely for HGV and professional drivers
- Issues that are otherwise seen as manageable (e.g. poor air quality) become a far more salient issue in this scenario



Crisis behaviour

- It is hard for road users to predict their behaviour in crisis situations
- Nonetheless, many would wait in their car for information



Evacuation

- Very few road users are aware of any road tunnel evacuation procedures
- Road users would expect the control centre to direct and deal with the issue
- Some road tunnel users do not expect the need to take action themselves
- **Again, it is assumed that 'the authorities' will have plans to deal with emergencies**





Coach and HGV drivers

HGV and coach drivers are the driver types that are least likely to avoid road tunnels

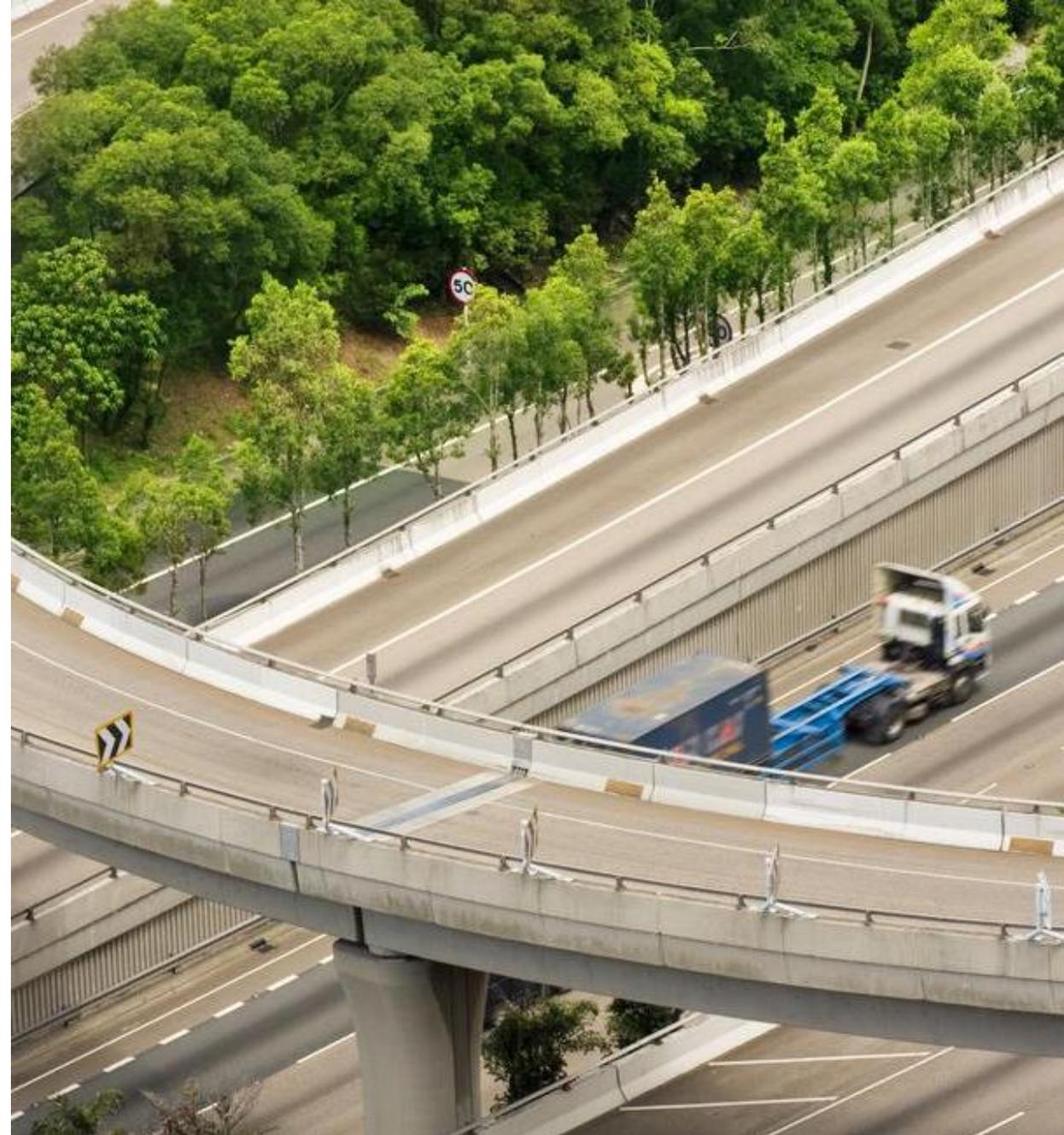
HGV and coach drivers use road tunnels to get to their destination at the time they need to

- A tunnel is more than often the quickest means of getting from A to B
- For many, saving time is paramount as they have deadlines to meet
- Even if a longer tunnel is perceived as daunting, HGV/coach drivers prefer to use it if it saves them time
- Travelling through a longer road tunnel abroad adds enjoyment to, and breaks up, the working day, especially if the tunnel is new to the driver
- It is important for HGV drivers to know how long the tunnel is before they commit to driving through it – this is because they may be close to their driving hours limit

Road tunnels hold lower salience for HGV and coach drivers

- Seen as another part of the journey
- Many have driven in more challenging circumstances than road tunnels (inner city one way streets often cited)
- They recognise that as part of their job, they are expected to be confident when travelling through a road tunnel

The prospect of longer road tunnels does not disturb HGV and coach drivers
But there are some issues they would like to see ironed out...



Some issues that are encountered by all road tunnel users have a more significant impact on HGV and coach drivers' journeys

Traffic jams are particularly frustrating

- Similarly to professionals/commuters, HGV and coach drivers are frustrated with any delay to their journey
- HGV drivers may have scheduled delivery slots and coach drivers have set drop off/pick up times; as such, any delay may inhibit drivers from meeting their schedules
- Radio broadcasts warning of delay therefore particularly useful to these road users
- Some drivers choose to work only night shifts to avoid the traffic approaching London tunnels during daytime

I just work nights because I know there'll be no traffic in London then, Rotherhithe tunnel is a nightmare during the day.

HGV Driver – London

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

Coach Driver – France

Signage

- Signage indicating tunnel length, especially on longer tunnels, particularly important for coach drivers sticking to schedules
- Coach/HGV drivers can drive for only a certain number of hours before needing to take a break; thus need to know length of tunnel in advance to allow sufficient swap over time

Passengers

- During the day, passengers are awake and talking amongst themselves
- At night, passengers are asleep and by consequence **journey requires further concentration**
- Being stuck in a traffic jam inside a road tunnel, especially a long one could be stressful if passengers are children/particularly anxious about being stuck inside

Monotony

- When passengers are asleep and feels more monotonous for the coach driver
- Also additional pressure for the coach driver who has a vehicle full of passengers
- Temperature warmer inside a road tunnel in a coach than a car, so driver has to concentrate harder
- Thus coach drivers more likely to welcome solutions to counteract monotony e.g. artificial lighting

Speed limits

- Coach/HGV maximum speed is slower than other vehicles; other drivers, especially abroad, therefore often overtake

Everyone is asleep, its just me awake, there's no scenery, its dark and there's nothing to look at apart from this semi circle of concrete.

Coach driver – France

HGV and coach drivers recognise that space is a precious commodity in road tunnels

Width of lanes

- Lanes feel narrower for drivers travelling by coach/HGV as the vehicle has less space either side of it than a car
- Coach/HGV may need to partially drive on the other lane when making sharp bends and curves; can be problematic in tunnels where there is oncoming traffic
- Thus driving in tunnels with two way traffic can be more challenging
- Wide footpaths also preferred by these drivers – gives driver additional space between themselves and the tunnel wall

Sometimes on a sharp bend you've got to nick a bit of the other lane and if you have other vehicles coming towards you it can be tricky.

Coach Driver – France

Confined space

- As vehicle is larger in size, driver is **more aware** of the confined space of the tunnel, particularly in those with fewer lanes
- This feeling is enhanced when stuck in a traffic jam
- Driver sits higher up in a HGV/coach than a car so is naturally closer to the tunnel's ceiling, adding to the feeling of confinement
- Good lighting on tunnel walls and floor allows driver to clearly see the road markings of the lane and identify where the wall is

Even though you have more space inside the vehicle, you've got more passengers and you're just closer to the walls and ceiling.

Coach Driver – Italy

Height restrictions

- There is a need for these drivers to plan their journey to ensure vehicle will be permitted through the height restrictions of tunnel
- Greater need to plan route when abroad if area is unfamiliar to the driver
- Sat navs help to inform driver of any height restrictions, but drivers do not solely rely on them due to previous experience of sat nav inaccuracy

You've always got to check the height restrictions, especially if you haven't used the tunnel before.

HGV Driver – London

It can be an issue yeah. But you usually know where and where you can't go as a driver.

HGV Driver – Liverpool



Motorcyclists

Being exposed to the elements, motorcyclists are more likely to have issues with air quality, road surface, noise and traffic flow

Road users notice the fumes inside the road tunnel more on a motorcycle than in a car

- Many motorcyclists do not have the option to close off air flow from the tunnel, although some do have these modifications in their helmet
- Thus good fume extraction particularly crucial

Good road surface

- Bumps/etc more felt by bike than car
- Come across pot holes infrequently but when they do, bigger issue on bike
- Reduce speed if oil spillage on road from cars, motorbike can swerve

However, issues other drivers face e.g. narrow lanes not a problem for motorcyclists

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 have a number of issues when standing in stationary traffic

- Reduces visibility for motorcyclist if cars leave engines on because fumes become thick and cloud inside of the tunnel
- Motorcyclists used to filtering, which is understood to be not permitted in a tunnel
- Not only due to safety but also to avoid receiving disapproving looks from other tunnel users
- If really needed to, driver is confident they could turn around on a bike if traffic jam was bad/go through middle

You get these helmets, and yes they have this ventilation switch. You can turn it on and off. So if I go into a tunnel I can just turn it on and it filters the air. But to be honest, I don't always remember to turn it on!
Motorcyclist – London

Noise of other traffic is louder on bike

- Motorcyclists may wear earplugs to limit noise on road
- Sounds are heightened in road tunnel, especially for motorcyclist
- Nonetheless, motorcyclists often expect noise on the road

Tolls

- Don't have to pay tolls on motorbike in some tunnels in the UK (e.g. Dartford)

Well yeah, I means the noise is loud, but then to be honest, the noise is always loud.
Motorcyclist – London

Like motorists, motorcyclists have strong concerns about breaking down inside a road tunnel

Traffic being closers together gives motorcyclists feeling of being more at risk of collision

- Don't have the walls of a car to protect them
- Likely to be unable to pick up bike if it falls over and move it to refuge area as too heavy

Key concerns about lack of hard shoulder

- Not only concerned for own personal safety of where to stand, but also of where to position bike
- Unsure of procedures/lack of communications

Obviously some car drivers fly through because they are in their steel box with air bags!

Motorcyclist – Liverpool

Lights from other tunnel users

- Car drivers tend to put headlights or even high beam on in tunnel, despite signage to only use dipped headlights
- This blinds / dazzles motorcyclist who is more affected by the bright lighting than car user
- Rider has to wear sunglasses (dangerous if has to stop driving at one point to put on)

Motorcyclists feel that car drivers often don't see them approaching

- Have to be on toes at all times when on a bike, and even more so inside a road tunnel where there's no room for error

I was once stuck for 20 minutes and some cars don't switch their engines off and the tunnels fills up with smoke.

Motorcyclist – London





Disabled users
of road
tunnels...

Road tunnels are part of a wider empowering experience of driving, but many require more information than is currently available

Disabled drivers are likely to know if they will encounter a road tunnel on their journey

- Greater propensity to plan and prepare journeys
- Some plan meticulously, particularly those with cognitive impairments

Disabled drivers do not have any overt top of mind concerns regarding road tunnels

- Fits into a positive wider view on driving often providing independence, particularly for those with mobility impairments
- For some with anxiety, driving is recognised as being crucial to their lives but journeys ‘out of comfort zone’ can be intimidating

And... if a road tunnel is not in the scope of regular journeys they are making...

- The prospect of a road tunnel can be anxiety inducing

Traffic jams can be particularly problematic for those that are prone to ‘seize up’

- For those with certain impairments, sitting in the same position can cause discomfort

A lack of information can be disconcerting

- Not knowing the ‘rules’ of the road tunnel can make drivers feel anxious

This is of particular concern for those with cognitive impairments such as anxiety

- Not knowing safety procedures, speed limits, rules about headlights etc. can leave those that are already unsure about driving in a state of anxiety
- Some drivers with certain cognitive impairments (e.g. ADHD) find Sat Navs to be especially enabling, the prospect of these not working in a long road tunnel is concerning

Sensory experiences in road tunnels can be difficult for those with hearing impairments

- Background noise is often difficult for those with hearing impairments as important audio information can be drowned out

So if I have to go out of what I call ‘my zone’, that’s my comfort zone, then I have problems. I mean if I use the tunnel everyday then it would be fine, it’s in my comfort zone. If it’s not in my zone, then we’ve got problems. I wouldn’t go anywhere near it.

Cognitive Impairment – Leeds

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

When disaster strikes.... disabled drivers may be at a loss

Disabled tunnel users have heightened concerns around what would happen in the event of a breakdown

- Disabled users with mobility difficulties have particular concerns about breaking down inside a road tunnel because exiting a vehicle can be difficult
- Similarly to other road users, disabled drivers have a limited awareness of breakdown procedures
- Limited information can make these situations particularly distressing for some; for instance if cognitive or hearing impairment
- Wheelchairs, crutches and other assistive equipment can take time to unload from car and assemble

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

Mobility Impairment – London

The prospect of breaking down or having an accident in a road tunnel brings up some very difficult emotions, particularly for those with mobility impairments

- Disabled drivers and passengers envisage a potential road accident or disaster, thinking about how events would unfold...
- It becomes clear that compared to those without mobility impairments, their chances of survival in an emergency would be limited
- This inequality is hard for disabled drivers to come to terms with
- Drivers with anxiety can view disastrous situations with unusual calmness, saying that they 'always assume the worst anyway' and give examples of being very calm and rational in difficult circumstances

Disabled drivers can be at a loss of how emergency services or tunnel designers could deal with emergency situations, but a few things come to mind...

- More regular refuge areas or emergency exits
- Staff on hand to assist disabled drivers needing to leave the tunnel
- Fold out wheelchairs inside the road tunnel for those with mobility impairments
- Knowing safety procedures in advance

Listen, it would be difficult for anyone I think. But I suppose if I did breakdown... in the tunnel. It just would take me ages to get out. I can't move as quickly as others. If I had my son with me as well. That would be it, really scary.

Mobility Impairment – Newcastle



‘In the moment’
research findings

Locations of accompanied and self-directed journeys

What is an accompanied drive?

- A researcher met drivers at nearby retail parks either side of a road tunnel and sat in the passenger seat observing and interviewing the driver as they made their journey

What is a self directed journey?

- Drivers make their own journeys independently, and then report back to researcher over the phone

Newcastle

2 accompanied drives and 4 self directed journeys were conducted through the Tyne Tunnel

Liverpool

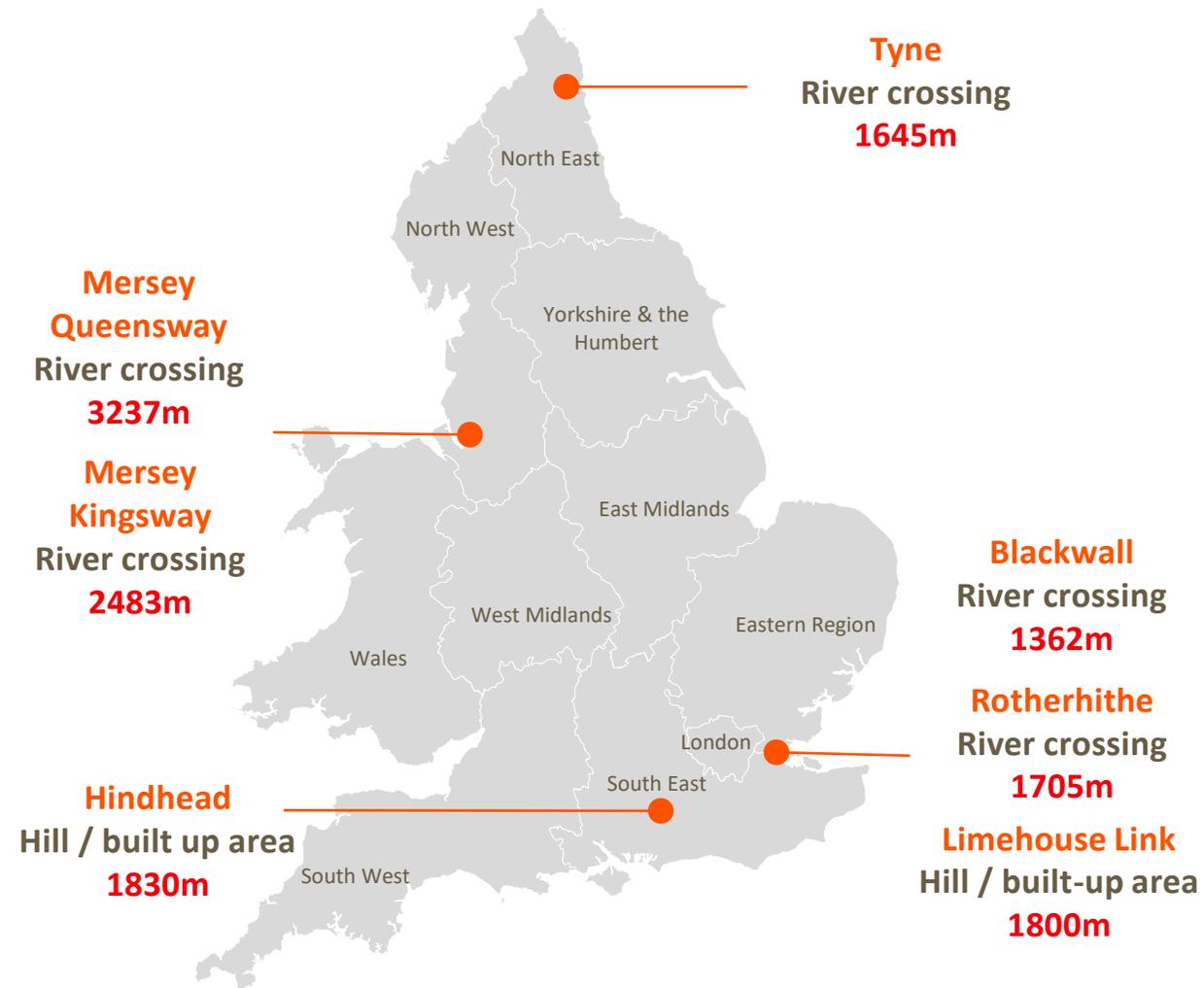
- 4 accompanied drives were conducted through:
- the Mersey Queensway Tunnel and the Mersey Kingsway Tunnel

London

- 2 accompanied drives and 8 self directed journeys were conducted through:
- Blackwall Tunnel, Rotherhithe Tunnel, Bell Common Tunnel, Limehouse Link Tunnel, Holmesdale Tunnel and Dartford Tunnel

Guildford

4 accompanied drives were conducted through Hindhead Tunnel



Why conduct 'in the moment' accompanied, as well as self-directed journeys?

An accompanied tunnel journey with a user allowed us to gain 'real time' feedback on tunnel experiences and perceptions

- It also provided the opportunity for an in depth understanding of the experience of using tunnels; with the ability to probe on areas not previously thought about by the users, or question certain aspects in real time

Having respondents take part in the research independently allowed us to get a 'real life' perspective, removing any effects the presence of a researcher may have

- This allowed the research to cover a broader spectrum of tunnel types and locations in different contexts

Both approaches allowed us to:

- Bring the research to life using video and images
- Understand first hand experiences from drivers, rather than a retrospective account
- Explore the direct feelings/emotions of drivers and passengers going through tunnels
- Collect 'real time' reactions to tunnel design/features, experiences and the process of before, during and after tunnel usage



Findings similar to unsensitised focus groups, but responses were more heightened and emotional

Cramped conditions

- Circular bore tunnels can feel enclosed (e.g. Rotherhithe/Mersey tunnel)
- This feeling is heightened when bends in a road tunnel exist

Drivers notice a lack of comms

- Lack of information regarding exits, how far through the tunnel they are, safety procedures, speed limits, road rules
- Frustrating not to know ‘correct way’ to use a road tunnel

It's quite cramped isn't it, the walls. They come in at you a bit.
Leisure – Liverpool

Thought of breaking down induces panic

- Drivers were asked, when in the tunnel, how they would respond to a breakdown
- This fills drivers with panic and confusion

The behaviour of other drivers

- Can irritate and cause confusion
- Some perceived to be going too fast, overtaking and having or not having lights on
 - Further highlights lack of awareness of ‘road tunnel rules’, which many think are necessary

You see that guy there. He's come across and overtaken me. If I'm going 30 he must be going more, 40 maybe. That can't be right can it?
Commuter – Liverpool

Relief upon exiting tunnel

- Drivers become more relaxed immediately upon exiting the road tunnel

I feel better being out. Relief. I don't like tunnels. I'm just out of it. But it's just the right length I think.
Leisure – Liverpool

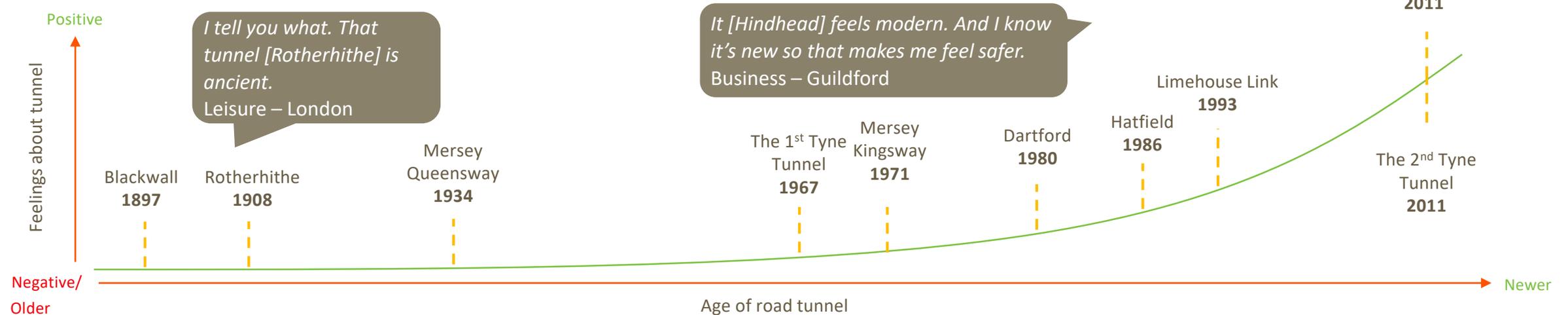
Oh I feel better now. See it's nice to be out, back into the sunshine.
Leisure – London



Many drivers considered the tunnel in the context of an improvement to infrastructure

The newer the road tunnel, the more positive the journey and feedback

- This was not only about the design of a road tunnel, but also recognising the improvements made to an overall journey



Why were feelings so positive towards newer road tunnels?

- Many new road tunnels have been built in areas of the SRN to bypass difficult terrain or reduce congestion (e.g. additional bore on the Tyne tunnel)
- Our drivers were aware (and could clearly remember) of the difficulties they had on journeys 'pre-tunnel'
- Therefore, road tunnel seen as saving a great deal of time, which is hugely valued, especially for commuters, some of which have gained up to 45 minutes a day of spare time



Older London road tunnels are unpopular with road users

Blackwall and Rotherhithe tunnel

Seen to be old, uncomfortable and barely fit for purpose

- Circular bore seen as too narrow, with bends inducing blind spots for road users
- Bidirectional tunnel (Rotherhithe) can put road users on edge

Many drivers unaware of any breakdown procedures or emergency exits

- Tunnel seen as too narrow to accommodate any broken down vehicles

Traffic going in and coming out of both tunnels seen as major issues

- And can be a reason for those specifically travelling across London to avoid the road tunnel and divert their route (e.g. a driver may plan on using Rotherhithe Tunnel to cross the river but face traffic at tunnel entrance, so the driver would use Tower Bridge instead)
- Also an issue at roundabout exiting Rotherhithe tunnel to the south

Some road users have issues actually finding the tunnel

- One way routes going into Rotherhithe leaves some drivers having to U-turn before they reach the tunnel



It's quite depressing... The walls are really dirty, it's really dark, it's not that well lit... it's dingy. It's not the greatest of tunnels.
Leisure – London



Whereas London's newer, and often shorter tunnels, are preferred

Holmesdale and Bell Common road tunnels

Thought of as easier to navigate and very short

- Often drivers do not even think of these tunnels as a major juncture in their journey
- Can instead be viewed as a marker of how far a driver is on their journey

Described as 'a roof on top of the motorway'

- Driving behaviour not felt to be adjusted when driving through

Many drivers still unaware of safety procedures

- Some concerns regarding number of HGVs

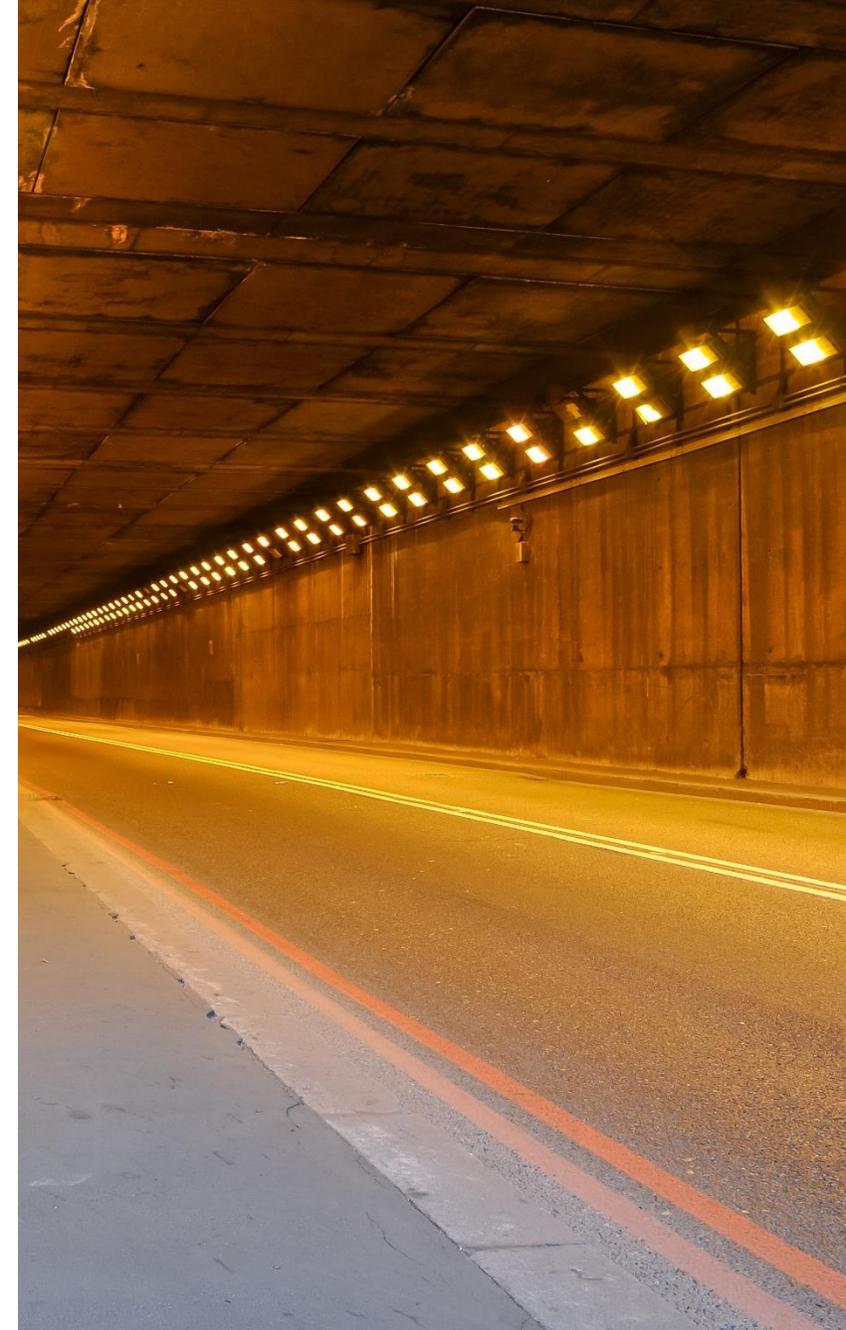
Yeah. I mean it's fine. The lighting is what I'd expect, and there's no real changes as I go through it. To be honest, half the time I don't even notice that I have been through it.

Business – London

Limehouse Link

Viewed far more favourably than the close-by Rotherhithe tunnel

- Wide and tall
- Twin-bore seen as a safe option



The Tyne tunnel is seen as having recently been transformed, and has moved from a very negative view to a positive one

Perceptions of the Tyne tunnel are now positive...

But when drivers spoke retrospectively of the issues with the tunnel before the introduction of its second bore (in 2011), it was major cause for concern

- Traffic leading up to the tunnel meant waiting times reached 30 minutes
- Traffic going through the tunnel was slow
- Tolling system seen as old fashioned and time consuming



The introduction of a second bore seen to transform not only the tunnel experience, but overall journeys and journey times

- Recently introduced electronic passes through tolling gates seen to be easy and efficient
- The emotional benefits of 'getting home that much earlier' from work, strongly put across by drivers
- Initial concerns about filtering traffic from toll booths into tunnel (due to lack of clear lanes) were found not to be an issue in practice

However, drivers were still not aware of any safety procedures

- Although reduced traffic congestion was pointed out as a safety benefit

*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*



The Mersey tunnels are seen to be important but not particularly up-to-date

There were few overtly negative or positive feelings about the Queensway and Kingsway tunnels

- Both tunnels seen as a mainstay of the local infrastructure
- Other options of crossing the Mersey (e.g. Runcorn bridge), although a significant detour, are sometimes preferred if time allows
- Drivers still refer to the Kingsway as 'the new one' and use this point of comparison between both tunnels to judge their respective qualities

Both tunnels are seen as somewhat old fashioned (particularly the Queensway)

- Dark, dirty white panelled walls gives the inside a 'run down' feel

Bidirectional traffic flow also felt to be off-putting when driving and gives 'crammed' feeling

- This is exacerbated by the long bends within the tunnel
- Individual lanes felt to be too narrow and close to the edge

Again, perceived lack of communications

- Drivers do not know what they would do in event of breakdown
- This causes some concern

I always feel as if I'm going across the lanes, I don't think there's ever enough room, I always feel as if I'm going to bump into the side....
Leisure – Liverpool

[Queensway] It's very curvy, very bendy, the other one seems more straightforward.
Leisure – Liverpool





The perspectives of drivers using tunnels abroad

Places around the world that our drivers have been through tunnels



We have captured experiences of drivers travelling through tunnels abroad by equipping holiday makers with dashcams and interviewing them as soon as possible after their foreign tunnel experience

- This has provided us with reaction to tunnels in foreign countries from English holiday makers
- We have ensured a mix of destinations (e.g. Norway, the Alps, the Netherlands, Australia)
- All drivers provided their own footage of driving through road tunnels abroad



Road tunnels abroad often seen as more innovative and higher quality than those in the UK

An assumption of greater quality and willingness to 'build big'

Larger and more 'experimental' forms of road infrastructure are **associated** more with roads **abroad**, with drivers often assuming that such structures would not be feasible in the UK

- Given reasons for this relate to cost and a lack of ambition towards infrastructure
- Drivers often associate tunnels more with travelling abroad, and suggest that there is a greater need for road tunnels abroad due to mountainous terrain

Often an assumption that the quality of materials used in road tunnels **abroad** are of a **higher standard**

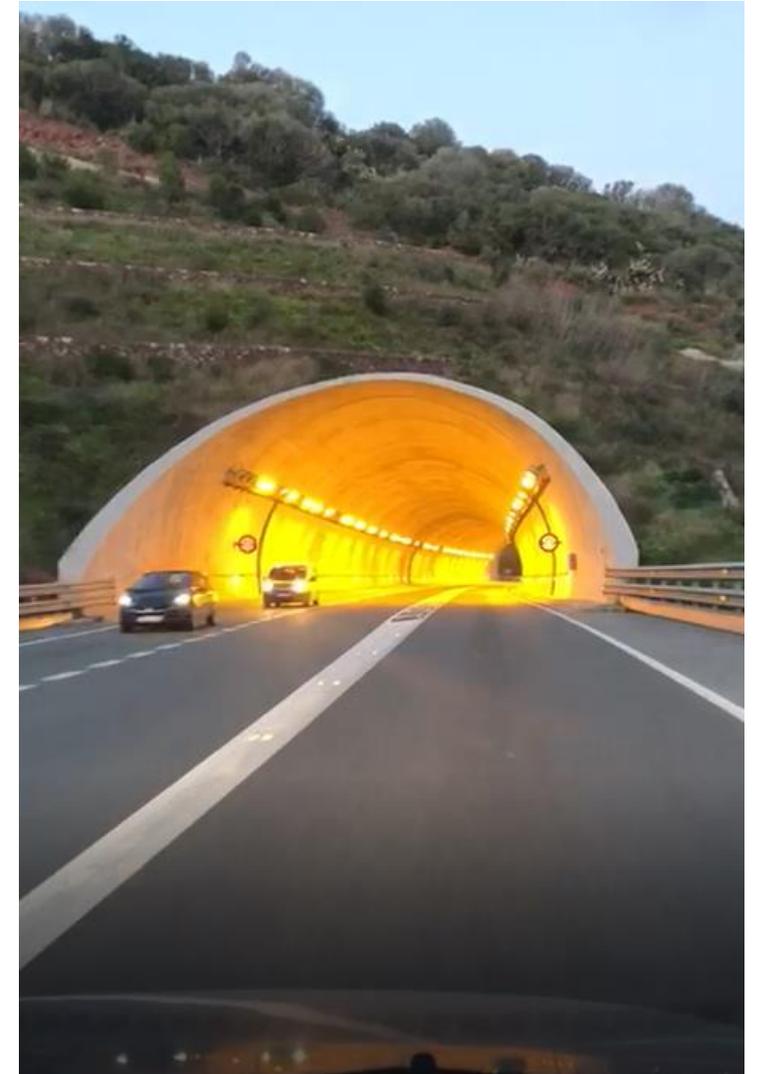
- Again, this judgement is based on a perception of more experienced and ambitious infrastructural engineers abroad

Many notice **less traffic** on the road and cite this as a reason for an **easier drive**, compared to using road tunnels in the UK

- Drivers notice chevrons inside road tunnels abroad

Mountainous **regions**, such as the Alps, seen as an area whereby tunnels are **expected**

- Therefore driving through them is less noticeable and less of an event than would be driving through a road tunnel in the UK



The sensory experience using road tunnels abroad is thought to be more pleasing



Lighting

- In newer, more modern tunnels abroad, lighting is very bright (seen as better compared to older poorly lit tunnels in the UK)
- Some tunnels abroad very gently change from light to dark so eyes don't struggle to adjust, can sometimes struggle in UK
- Some feel the lighting in longer tunnels abroad is in fact better than the street lighting
- Drivers describe perfect lighting as where you don't notice you have entered a tunnel



Aesthetics

- Scenery upon entering and exiting a road tunnel often seen as appealing and in character with local surroundings
- Tunnels seen to be part of the landscape



Air quality

- Big ventilation fans in longer tunnels to clear out the fumes



Signage in road tunnels is noted as something particularly better abroad, but perhaps due to length....

Approach

- If a long tunnel, abroad there are signs warning you of a tunnel approaching long before you see the tunnel (to give time to take an alternative route)
- In UK, unless you know the area, you may stumble across it with very little warning

Lighting

- Warning to turn your lights on abroad (helpful reminder in sunny conditions particularly)

Length

- Longer tunnels have signs telling you how long it is – necessary so you know how long through you are – would help if they also indicated the approx. time it takes to drive through

Speed limit

- Signs informing you to reduce speed when you approach tunnel and then increases back to original speed at the exit

Tourists

- Signage to make clear what lane you can drive on through bi-directional tunnels to help foreign drivers

I think its 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!

France

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

Mallorca

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

Austria

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.

Mallorca



Brits perceive the rules of the road tunnel abroad as being somewhat more lax, but choose to drive as safely as possible

Drivers acknowledge that speed limits in road tunnels are higher than in the UK, yet are still reduced compared to the outside road

- Drivers generally feel that the speed limit for a given tunnel is appropriate in that road tunnel
- Drivers feel that speed limits should depend on conditions of the road tunnel e.g. lighting, bend/straight
- Drivers feel they need to reduce their speed in a poorly lit tunnel more so than in a well lit tunnel, similarly a curved tunnel versus a straight tunnel

If it's well lit, straight, with wide lanes, there's no reason to reduce the speed, it's when it's really dark and bends and you can't see where you're going, that's when you need to slow down.

Austria

Overtaking abroad – a perception that rules of the road are more frequently broken in Europe

- Brits driving abroad understand overtaking is not allowed but acknowledge that it can happen nonetheless
- Many Brits choose not to do it themselves due to safety reasons
- Many drivers assume they may be overtaken whether on the outside road or inside a road tunnel in Europe, and the perception is that in the UK road rules are followed more rigorously

I was once driving through the road tunnel and someone overtook me whilst another car was coming in the opposite direction. That was a scary experience.

Turkey

You don't know what's coming round the corner, but you have to keep going at the same speed as it could be dangerous to slow down.

Sydney



Longer tunnels abroad bring up certain fears and concerns that would otherwise not surface in shorter tunnels in the UK

Fears in relation to longer tunnels

For some, not seeing the 'light at the end of the tunnel' **can worry** drivers/passengers and make them feel claustrophobic

- Hence straight shorter tunnels less daunting than one which bends/curves
- Not about where you are inside the tunnel / how near the exit you are
- Narrow footpaths / lanes – limited space between tunnel wall and the lane, and each lane – more claustrophobic in a longer tunnel, wouldn't be such a problem if only in it for a few seconds

Some respondents said markings informing you of how long is left would be useful, especially during an emergency

- Respondents acknowledge that a traffic jam would be more uncomfortable in a longer road tunnel

Respondents imagine the prospect of breaking down/something going wrong in a long road tunnel to be more daunting than a short tunnel

- Drivers admit to being more aware of the fumes etc. so would be less pleasant in longer tunnel

I'm pleased when I see the light at the end of the tunnel and I know I'm nearly out.
Andorra

It would be useful in an emergency if there were marking on the road telling you how much longer was left.
Norway

There isn't much space on the sides so how would you pull over if you broke down? I certainly wouldn't want to get out and walk.
Valencia



Those who are confident and experienced driving abroad are generally less anxious about long road tunnels

Drivers with years of experience of using tunnels abroad acknowledge why people may be concerned, but do not feel concerned themselves

- Such drivers have a greater awareness of refuge areas and escape routes via slip roads in the tunnels they use
- Unlike those who have not used longer tunnels, they believe they know what would happen in the event of an accident/emergency and are confident that appropriate safety measures are in place
- Also believe good lighting and good signage eliminates any reason to be anxious about length
- Some feel safer inside the road tunnel compared to driving on other roads in Europe e.g. perception that other drivers take greater care inside tunnels by slowing down

However, when considering breaking down / being stuck in a traffic jam, even frequent users of long tunnels worry if they would feel comfortable in that situation

- There is still a considerable gap in knowledge of frequent drivers as to emergency procedures in event of a disaster
- Although this is not top of mind, when probed, drivers become concerned about the issue

I would be fine. I've gotten used to it though I suppose. I've been through these tunnels out here in bad conditions so stuff back home wouldn't phase me.

France



A range of tunnel design features were noticed by drivers abroad

Aesthetic features in tunnels can make the journey through more interesting as well as providing information

- Red and green graphics on the walls of an underwater tunnel in Norway show you when you are entering and leaving the submerged tunnel so you know where you are
- Helps drivers to contextualise their journey through the tunnel
- Art feature on tunnel entrance in Austria
- Pillars on side of wall in avalanche tunnel in Austria displaying scenery

Many respondents perceive these features as add on's / luxuries / features that make the tunnel experience more enjoyable. Whilst drivers say some of these features would make them feel safer, they are secondary to good signage, good lighting etc.

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].
Norway

When drivers were verbally prompted to think about aesthetic features (researchers gave examples of features inside the Laerdal tunnel), respondents refer to what they have seen in other road features

- Quiz questions in outback Australia with questions and answers every few kms to keep respondents engaged / break the monotony of the journey
- Brightly coloured lighting (similarly to Story Bridge, Brisbane) to make tunnel journey a more enjoyable experience

It was almost like a piece of art at the entrance, and it just made for a more positive and interesting experience, it became a talking point for those of us in the car.

Austria

It's open sided with pillars on the left hand side so you can see this unbelievable scenery.

Austria

It would be useful in the longer tunnels if the lighting changed throughout so you knew how far along you were.

France





Intercepts feedback

The intercept process

We conducted three days of intercepts

- Two days at Chamonix and one day at Pralognan La Vanoise



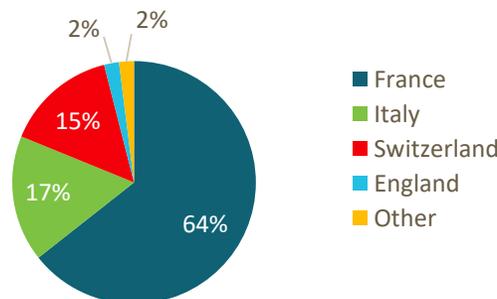
- Drivers were approached in these ski resorts shortly after having driven through nearby tunnels
- They were then asked a short semi-structured survey

Why conduct intercepts?

- This provides us with data from drivers having just been through a road tunnel abroad
- Provides us with the opportunity to collate small scale quantitative findings
- Although it should be noted that due to the relatively small sample size, results should be treated as indicative

A total of 60 drivers were interviewed

- None were local residents – all were tourists
- All drove through a road tunnel as part of their journey to the ski resort
- Tourists were mostly from France, with some from Italy, Switzerland and England

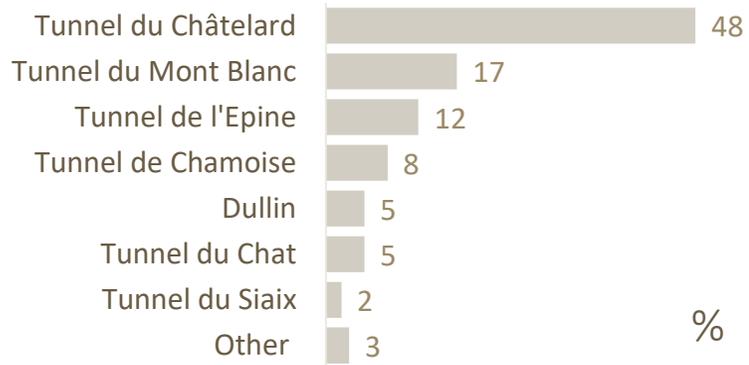


Base: (n=60)



Drivers used a range of road tunnels and mostly travelled by car

Drivers used a range of tunnels on their journeys to both ski-resorts



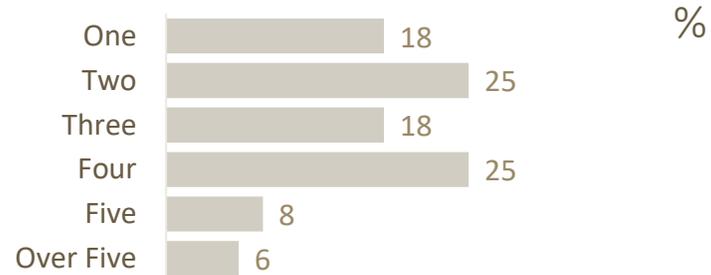
Base: (n=60)

Most drivers travelled by car



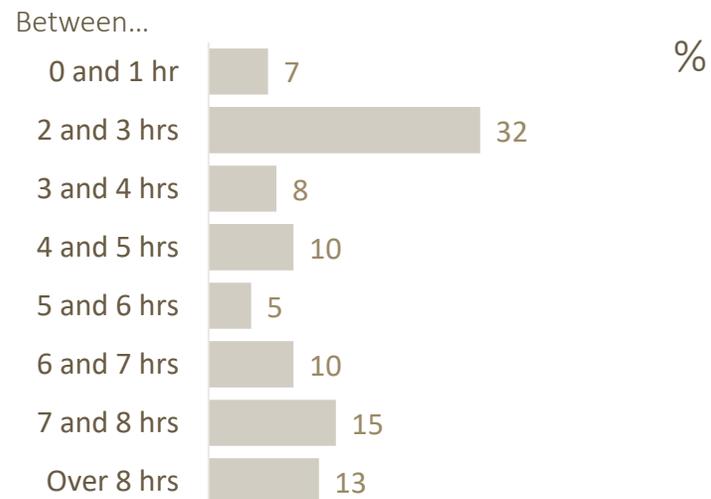
Base: (n=60)

The number of people in each vehicle varied



Base: (n=60)

A range of journey lengths were recorded for our drivers



Base: (n=60)



Although most drivers find the road tunnel experience easy, a significant proportion do not

Overall drivers found their journey through road tunnels easy, but still 20% found it difficult

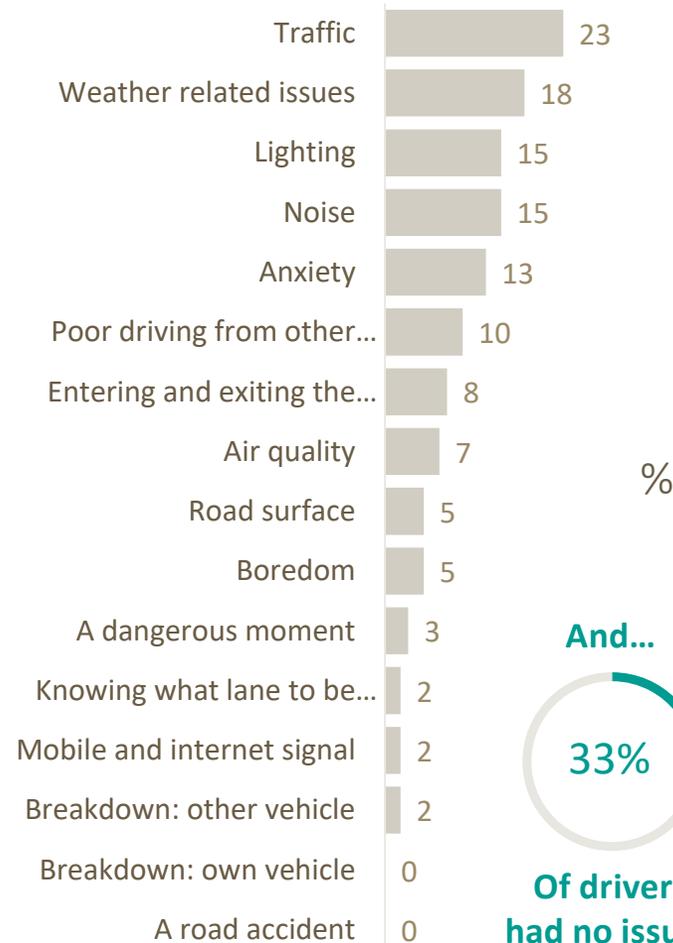


Base: (n=60)

In the Mont Blanc tunnel, we always think of the accident that happened there, and suddenly, we are a little stressed and we pay attention.
Intercept – France

I do not like tunnels, especially long ones like this one. I feel locked up.
Intercept – France

Drivers tended to have most issues with traffic



Base: (n=60)



Qualitative feedback from our survey shows that concerns raised are similar for both alpine and UK road tunnels

Concerns are similar to those in the UK, and poor lighting is a common complaint

Yes, once in France to Nice, I took an unlit tunnel. It's stressful.

French tunnels are sometimes poorly lit, like the one we took.

There is little or no space to park in case of problems.

It would be better if there were 2 tunnels because you have to be careful when you pass other trucks, it's not very wide.

There are complaints about other drivers – in particular around obeying the rules of the road

Cars drive too close and do not respect the safety distances. And some are going too fast.

The blue lights that define the distances between vehicles should be respected.

A driver swerved into me and I almost caused a pileup.

I do not like a traffic jam in a tunnel, it's stressful.

There are problems with generalised anxiety and concerns over evacuation procedures

We are underground, it's a little scary to imagine.

I am a little claustrophobic. I do not know if I could take a big tunnel like Mont Blanc or Frejus.

We must be able to have information quickly in case of danger and be able to evacuate if there is a problem.

Evacuation needs to be possible. We do not want to get stuck if there is a problem.



The prospect of longer UK road tunnels

Overall, drivers are in favour of longer road tunnels and welcome improvements to journey times

After considering any negative facets regarding road tunnels (e.g. fire threats, monotony, lack of information etc.), drivers still unequivocally support the building of road tunnels

- Viewed as an improvement to general infrastructure

Often, existing routes are seen as congested and not fit for purpose

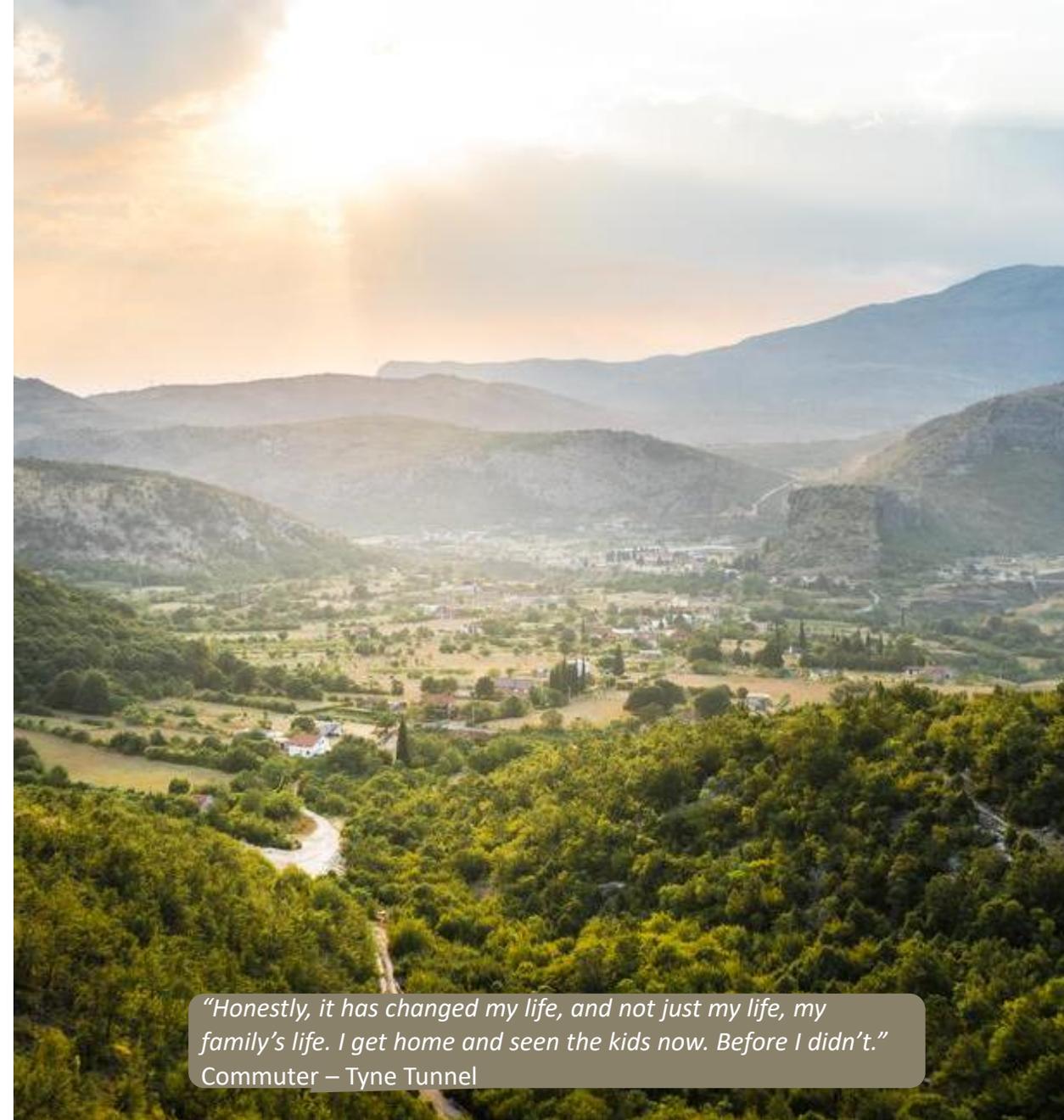
- For example, Snake Pass (A57 crossing the Pennines) is seen as overly congested and unable to carry the traffic

Drivers also recognise that ‘short cuts’ can be made through the land

- For example, the Hindhead Road Tunnel is now considered a major success for the area as drivers can traverse what was a difficult and congested route through the middle of Hindhead village
- Environmental benefits seen by local people

In other cases, the introduction of road tunnels has been seen to considerably improve the lives of regular commuters by reducing journey times

- For example, the building of the second bore of the Tyne tunnel has saved some drivers up to one hour every day in time waiting in traffic



“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

Nonetheless, there is a perception that 'the British' cannot 'do' infrastructure

Many British drivers feel that...

- Either our engineers and planners do not have the ability to achieve high quality and large-scale road networks
- And that there is an unwillingness to spend money on such projects
- And if we are willing and able to begin large infrastructure projects, there is a perception that they will never be finished and that their generation will never see the benefits of new road tunnels

For those that frequently travel in Europe...

- There is a confidence that engineering feats can be replicated in the UK (e.g. The Laerdal Tunnel in Norway)
- An attitude of 'if they can do it, why can't we?'

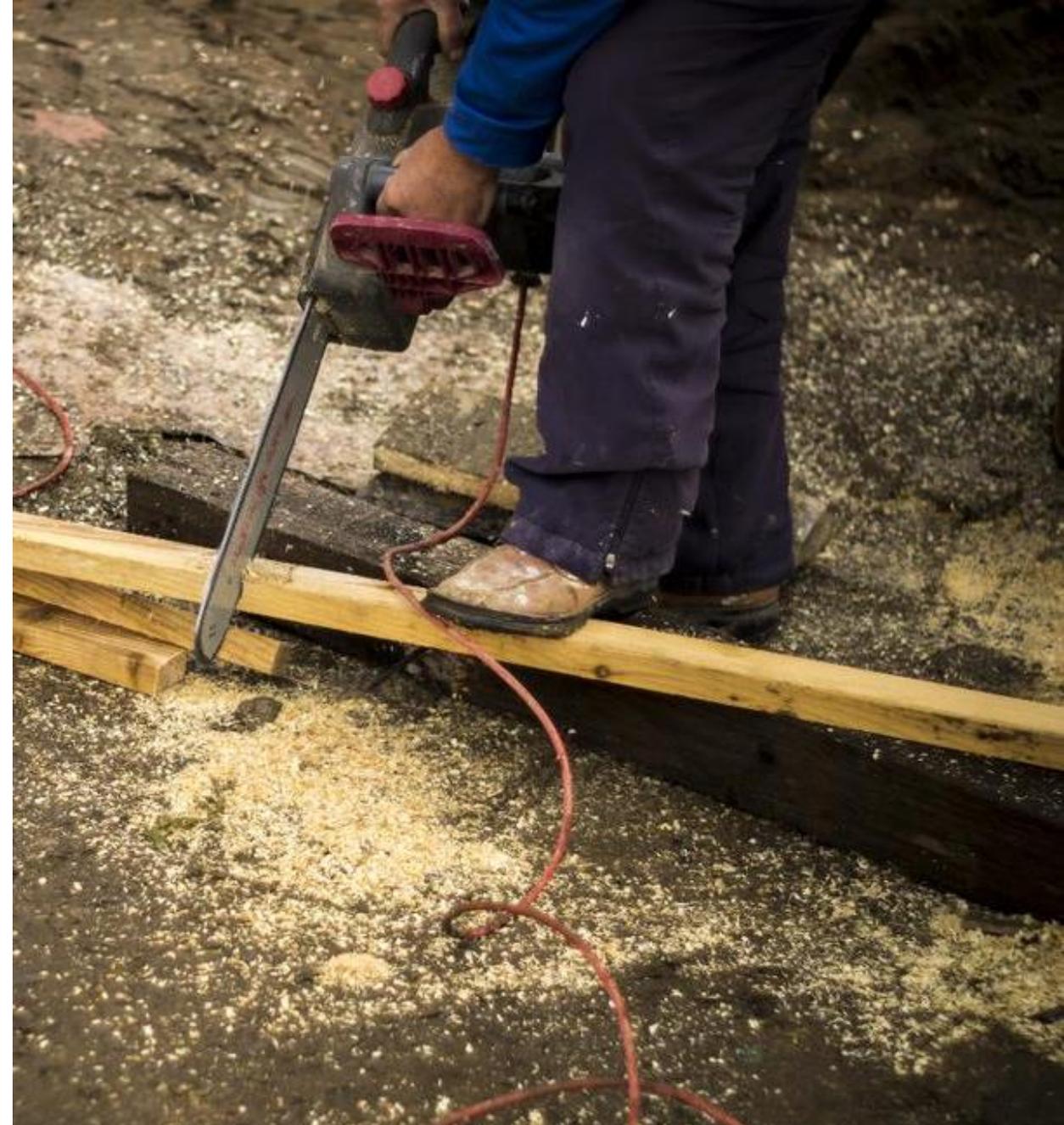
After drivers are informed that there *is a possibility* that longer road tunnels will be built in the UK...

Drivers become excited and outline a number of hypothesised benefits:

- Benefits to local business
- Faster journey times
- Conserving natural landscapes (keeping away from fumes)
- Safety concerns rationalised – 'assume' authorities have appropriate measures

Drivers do have stipulations regarding the building of longer road tunnels

- The key one being, adequate (and ample) information about said tunnel



Road tunnels are seen as a suitable place for imagined driverless vehicles

Although driverless vehicles do not feel imminent, for some, tunnels are seen as the ideal environment for such a vehicle

- The monotonous nature of a tunnel makes for uninteresting driving which drivers may be happy to relinquish to a machine
- The shape of a tunnel is seen to be ideal for a machine because it is a segregated and guided environment
- Any dangers caused by lighting changes or monotony are not seen to be dangers for an automatic vehicle
- A driverless vehicle could be more sensitive to potential or developing hazards – or in fact linked up to the control room for live incident information
- Extra safety precautions/information relating to tunnel safety could be in-built to the machines to ensure that any incidents/evacuations in tunnels are handled as efficiently as possible

It seems like the best place for it to be honest. I'm worried about malfunctions and the car crashing into another car or veering off the road. But I suppose if it's just in a tunnel then it can't go anywhere.

Leisure – Sheffield





Summary

According to road tunnel users, what makes a road tunnel 'well designed'?

DRIVERS AND PASSENGERS WANT TO FEEL:

Safe

Relaxed

Informed

Stimulated

Connected and contactable

Within the law

THEREFORE ROAD TUNNEL DESIGN CAN
CENTRE AROUND FOUR KEY CRITERIA:

Information and communications

- Clear signage and information upon entering tunnel (including length of tunnel and distance until end of tunnel)
- Knowledge of emergency and breakdown procedures
- Sufficient number of refuge areas/ emergency and evacuation points
- Integrated Wi-Fi and phone signal points

Physical design

- Twin-bore, straight, well lit, unidirectional tunnels
- Modern (not old) road tunnels

Maintenance and appearance

- Regular maintenance and good condition
- Well kept appearance

However, optimum design is different for
long and short road tunnels

- For shorter road tunnels, users do not want to see any major changes from the 'open road'
- For longer road tunnels, users want a more 'tunnel like' experience, whereby lighting and speed changes with ample information for drivers and passengers

Executive summary

Travelling through road tunnels in the UK is for most drivers a low salience issue

Few drivers have any top of mind anxieties or issues about using tunnels

Tunnels tend to be seen as either an ‘unavoidable’ part of the route or the ‘least worst’ option when compared to alternatives

In addition, road users’ perceptions of road tunnels are often coloured by the specific road tunnel they use most often

Nonetheless, there is a broad consensus that the experience of travelling through a road tunnel can be an uncomfortable one

And when prompted to think about road tunnels in more detail, users do have views on, and concerns about, various tunnel features and can suggest improvements to them. Issues identified include:

- The shape of the tunnel (arched v.s. square), bends, width, traffic all going in the same direction v.s. two-way traffic, lighting, noise, behaviour of other road users, tunnel age and condition, tunnel closures etc.

However, in the context of the relatively short tunnels currently found in the UK, road users tend to post-rationalise any concerns about tunnels and simply accept them as part of their journey

Once their preferences with regards to those features are discussed, road users develop ideas of how tunnels could be designed in the future

- These preferences tend to hinge on tunnel length, journey type (travelling for work or leisure) and the environment surrounding the tunnel

Road users’ main preference is for two different types of road tunnel

1. A tunnel that is unlike a tunnel (for shorter road tunnels)

- What is essentially a motorway or an ‘A’ road ‘with a roof’

2. A tunnel that is distinctive and different from the open road (longer road tunnels)

- Takes inspiration from road tunnels abroad
- Incorporates innovative features, whilst remaining light, wide and high enough to negate a claustrophobic feel

And reactions to the possibility of longer road tunnels in the UK are ambivalent, with many considering the benefits of faster journey times as trumping any concerns about user experience during their tunnel travel