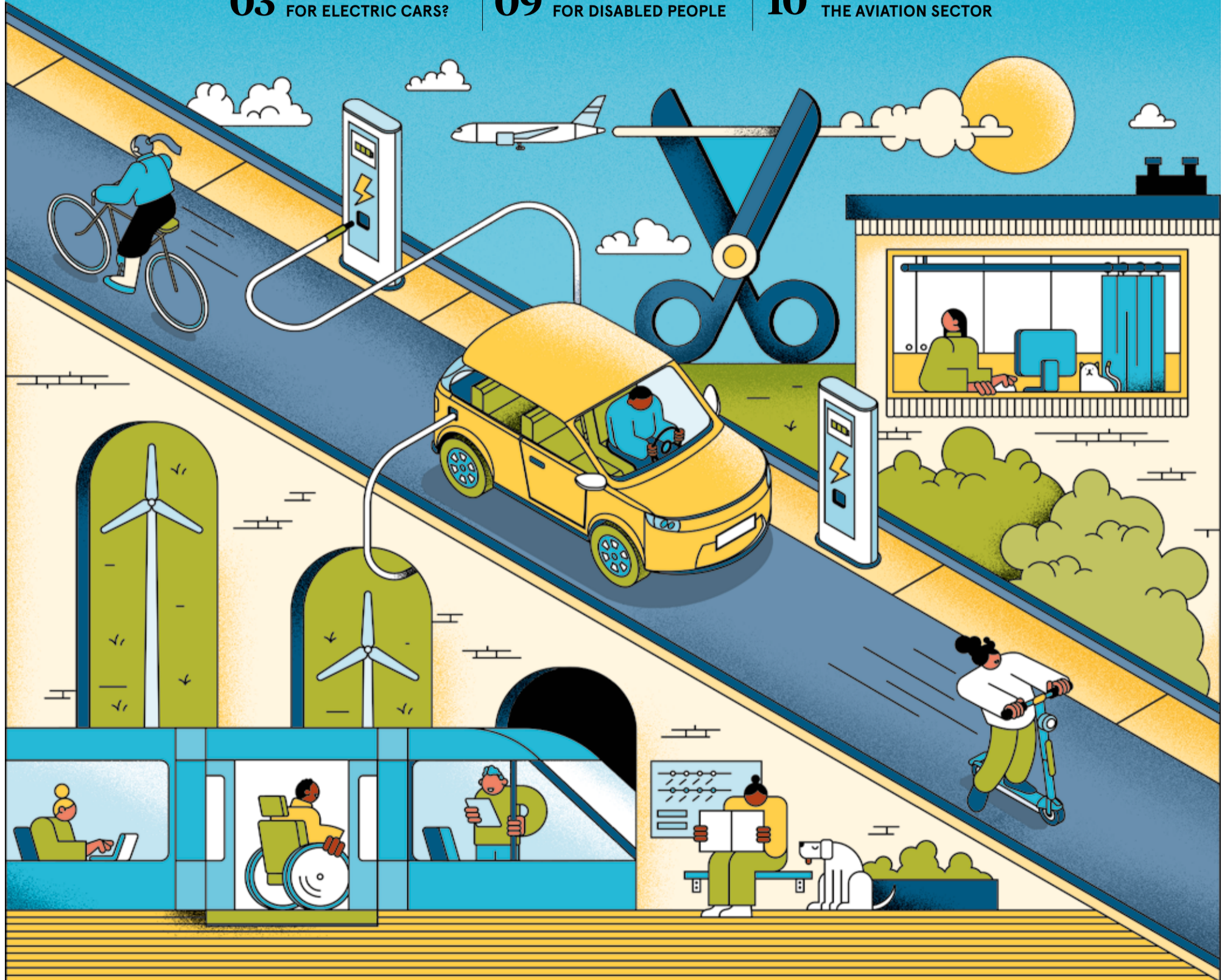


FUTURE OF TRANSPORT & MOBILITY

03 ARE MECHANICS READY FOR ELECTRIC CARS?

09 IMPROVING TRAVEL FOR DISABLED PEOPLE

10 DECARBONISATION IN THE AVIATION SECTOR



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FUTURE OF TRANSPORT & MOBILITY

Distributed in
THE TIMES

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SKILLS

Electric vehicles pose challenge for automotive repairs

As more British drivers switch to electric vehicles, are garages and mechanics ready for the change?

Sam Haddad

Electric vehicles are powering ahead in the UK, fuelled by government support and consumer interest. But what will the changing market mean for the automotive repair sector?

EVs have much in their favour. Their environmental benefits are well known, while upfront purchase costs are set to tumble in the next few years as battery tech improves. The sector also has official backing, with the government announcing last November that petrol and diesel cars will no longer be sold in the country after 2030. Research by the energy watchdog Ofgem has found that 25% of British consumers are planning to buy an electric car in the next five years.

But for garages and mechanics, there's a great deal to consider. EVs have an electric motor instead of an internal combustion engine, which means they have far fewer moving parts that can go wrong. That's great news for consumers, as EVs cost at least 30% less to service and maintain, according to research by data company KeeResources.

But this puts a whole chunk of income at risk for the automotive repair industry, says Professor Peter Wells, director of the Centre for Automotive Industry Research at Cardiff Business School. Although motorists must still put their car through an annual MoT test, it's easier for an EV to pass, he says.

"You're doing away with the oil change, the filter change and exhaust changes. You're not worrying about emissions, so that takes away a big part of the problem. But it also takes away a big part of the revenue potential for the garages."

When batteries do fail, they can be difficult to repair. Mechanics need specialist training, given the voltages involved, although Wells notes that it's more a different type of risk than an increased danger.

"Petrol and diesel vehicles also come with risks, especially of fire and fumes, which are extremely toxic. It's more a change of risk," he says.

Training for mechanics takes place in-house at manufacturers or at technical colleges, such as Coleg Cambria in Wrexham, an EV centre

of excellence, which has its own battery simulator so trainees can learn safely without risking shocks.

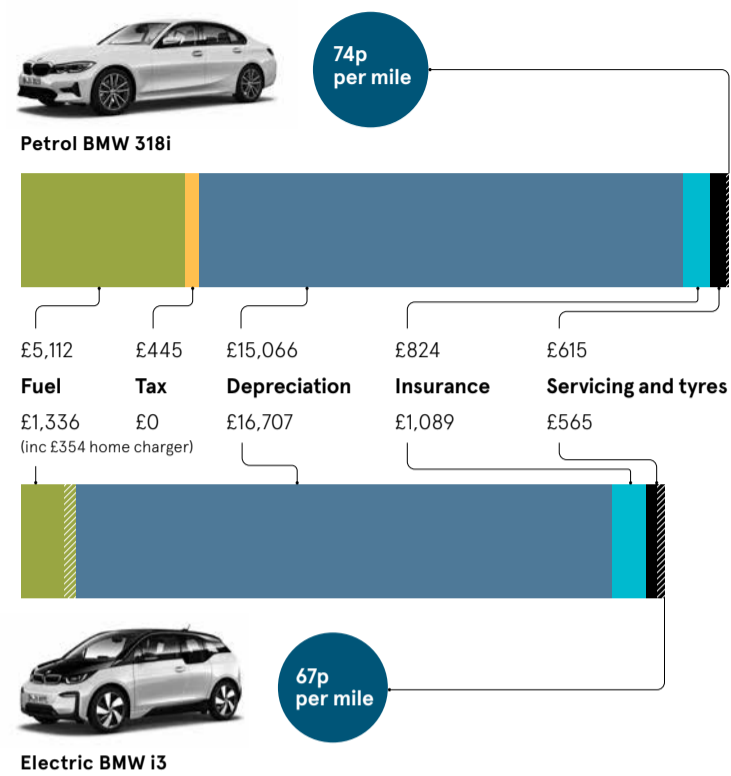
But according to the RAC, only 5% of the UK's 200,000 mechanics are qualified to work on electric cars. "We're definitely behind the curve," says Wells, noting that mechanics require several courses to get up to speed. "There's not enough of these around, especially given that brands such as Vauxhall are saying that their entire fleet will be electric by 2028. We haven't got long."

And it's not only about training mechanics; working on EVs also requires specialist tools and equipment. "You've got to be able to drop these battery packs out and they are big, heavy pieces of kit – much more so than an engine," Wells says.

So will garages focus on EVs alone or upskill for the growing sector while offering their traditional services? A bit of both, says Wells. Petrol and diesel cars will still be around, "although the big debate is for how long. We're already seeing specialist electric used-car sales. I'd expect to see more of that on the servicing side".

ARE EVs THE CHEAPER CHOICE?

The costs of running an electric car compared with those of a petrol equivalent, based on three years of ownership and an annual mileage of 12,000



Thatcham Research and Kee Resources, 2021

When it comes to breakdowns, EVs can suffer from many of the same problems that afflict any car, says Sarah Winward-Kotecha, the RAC's director of electric vehicles. These include punctured tyres and other wheel-related problems, or running down the 12V battery by leaving the lights on. These low-level problems can be sorted at the roadside under the RAC's regular membership; you don't need specialist EV cover.

"But it is important for drivers to realise that, unlike a conventionally powered car, you can't just tow an EV, or a hybrid for that matter. It needs to be lifted, often with all wheels off the ground," she says. Normally, that would mean waiting for a flatbed truck, although the RAC is fitting more of its patrol vans with a so-called all-wheels-up system, which can recover most EVs.

Thousands of drivers still manage to run out of petrol and diesel every year. Could EVs suffer a similar problem, frequently running out of charge? It's too early to say, according to Winward-Kotecha.

"What we do know is that, sadly, some drivers are reaching public charge points and discovering that they're out of order and they don't have enough charge left to get to a working one," she says, noting that drivers have also experienced problems charging their vehicles at home over night.

The RAC is planning to offer EV chargers in about 20% of its patrol vans next year. It has also started an EV leasing scheme and partnered with British Gas to provide a new electricity tariff for EV drivers.

EVs still represent only a tiny fraction of the company's 2 million-plus call-outs each year. While it's too soon to know for sure whether they break down less, it certainly doesn't appear they're prone to more problems. "With a lot fewer moving parts

“Brands such as Vauxhall are saying that their entire fleet will be electric by 2028. We haven't got long

than the drivetrain of a conventionally fuelled vehicle, we'd expect fewer mechanical breakdowns, but it's too early to say this with confidence," Winward-Kotecha says.

The EV revolution will be a learning experience for vehicle owners. For example, one of the challenges of buying a used EV is knowing how the battery has been treated. If something goes wrong with it, drivers could face replacement costs of about £5,000, according to Wells.

"These are quite tricky issues to explain to consumers. This will be an interesting challenge for the warranty companies," he says. "I can imagine that there will be lots of disputes, as there is no way for the consumer to know what the life of that battery has been like."

Manufacturers will have this data to hand, as they collect such information each time their EVs are used. But it's unclear whether they will share this with owners or use it to encourage drivers to stick with their service network, rather than using independent garages.

It's clear, then, that this sector, from garages to used-car websites, will need to adjust to the EV age. As Wells says: "The whole industry is going to have to change." ●



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COMMUTING

Transport planners plot route through the unknown

The pandemic has turned the commute on its head and raised difficult questions about the future for transport modelling

Peter Crush

With millions of employees furloughed or working at home, Covid-19 has thrown commuter travel into disarray. But its longer-term impact could be even more profound, upending planning assumptions for years to come.

Last summer, Leeds station, the busiest railway hub in northern England, was given six years to boost its capacity or risk "failing". In 2016, there were warnings that London's Tube network was set to become "inoperable" within 15 years. What now for such forecasts as we emerge from the pandemic? It's still unclear – so much so that the Department for Transport has created what it calls an uncertainty toolkit to aid the planning process.

As planners try to predict demand, what do they know? And, just as crucially, what *don't* they know?

The council has just published a transport plan to 2036, predicting the end of rush hour. Smith says he envisages that hybrid working will contribute to a 25% reduction in car journeys around the city, with commuters choosing buses, trains or cycles when they do travel.

Ewan Moore, client development director at Bristol marketing agency Unlimited, is embracing this new reality. Since his company adopted hybrid working, he has commuted by bicycle. "Bristol is a safe city to cycle in and is getting better all the time," Moore says. "Bike lanes give me confidence when cycling at peak times or even at night."

2 Town and city centres are changing

Predictions of the demise of the high street predate Covid, but this process is likely to be accelerated by hybrid working. Westfield, for example, is reviewing whether future footfall would be enough to sustain its planned £1.4bn shopping centre in Croydon.

Existing retail outlets could suffer from a fall in commuter numbers. For instance, Pret a Manger has announced 2,800 job cuts and the closure of 30 sites after reporting a 60% decline in trade.

Transport planners are trying to encourage more work and leisure trips by reimagining cities as greener and healthier spaces. Last summer, for instance, Liverpool City Council pedestrianised Bold Street and Castle Street, as well as adding outside dining and trialling the hire of e-scooters with Voi Technology.

Liverpool resident Ioana Popova, who works centrally, has become a regular e-scooter user. She no longer needs to walk to work or catch a bus from the railway station. "Scooters are faster and more fun," she says.

THREE THINGS THEY KNOW

1 There will be more home working

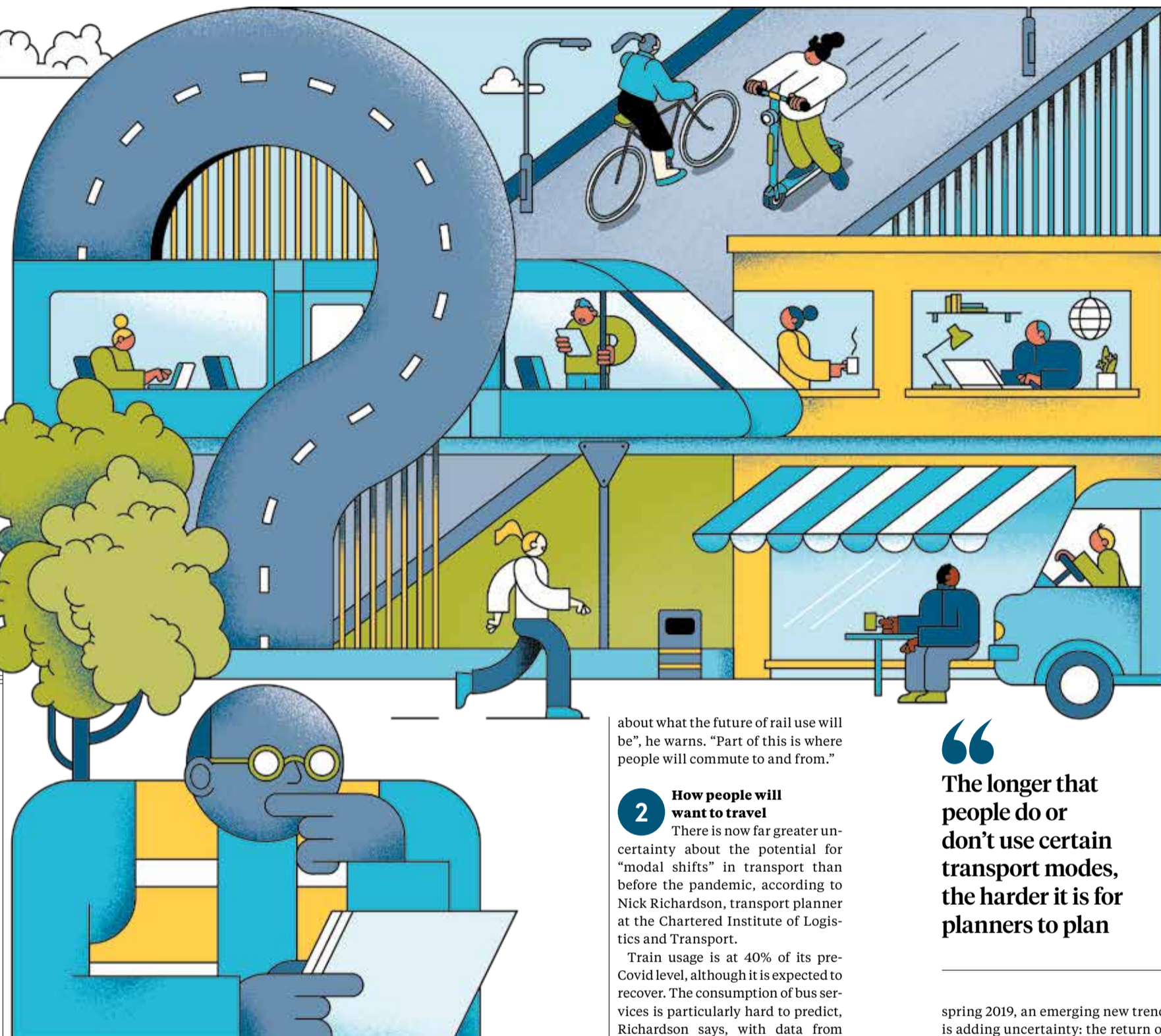
Only 5.7% of employees were working from home before the pandemic, according to the Wales Institute of Social and Economic Research and Data. Covid-19 has changed everything in this respect – and the effects could be lasting.

While many offices may be open again, McKinsey has found that 52% of workers globally want a hybrid working model. Likewise, research published by YouGov this April showed that 20% of Britons want to work permanently from home.

About 20% of Leicester's working population have office jobs, according to Andrew Smith, director of planning, transportation and economic development at Leicester City Council. "We sense that there'll be a shift to working in the office two to three days a week", he says.

2 Where people will choose to live

Hybrid or remote working means that many of us no longer



3 The shift to localism

Regardless of where hybrid workers choose to live, many travel experts envision a shift towards localism, with employers thinking holistically about commuting's impact on local amenities.

"The pre-Covid travel patterns we were all used to will change," says Andy Marchant, traffic adviser at TomTom. His company has found that, when firms in business parks cooperate to stagger their in-office working days, they reduce overall traffic levels and rush-hour delays.

Towns and cities are embracing localism, according to Marchant. They are offering "smarter", real-time information to travellers in areas such as car parking or charging facilities for electric cars.

THREE THINGS THEY STILL DON'T KNOW

1 Where people will choose to live

Hybrid or remote working means that many of us no longer

2 How people will want to travel

There is now far greater uncertainty about the potential for "modal shifts" in transport than before the pandemic, according to Nick Richardson, transport planner at the Chartered Institute of Logistics and Transport.

Train usage is at 40% of its pre-Covid level, although it is expected to recover. The consumption of bus services is particularly hard to predict, Richardson says, with data from the International Transport Forum suggesting that 40% of commuters never want to use them again. Yet buses must still be considered. "Any city resurgence plan must incorporate bus access, as unpredictability gives bus operators a reason not to provide services," he observes.

If towns and cities do aim for a greener future, cycling could be the big winner. But the future in this respect is also unclear. While figures show that cycling in London rose by between 7% and 22% to the end of March 2021 compared with

3 How towns and cities will respond

"City-centre management will be critical as the new normal unfolds – but it's not easy to plan," says Mike Waters, director of policy, strategy and innovation at Transport for West Midlands (TFWM). The rise in remote working means that town centres will suffer unless they attract people for both leisure and work, he adds.

TFWM recently started schemes that, it hopes, will encourage travel to towns and cities. This includes a car trade-in scheme, in which workers can scrap their vehicles and receive up to £3,000 in credits for use on public transport. Three months ago it also started trialling a "demand-responsive travel" programme, featuring Uber-style smart buses that can be hailed.

Environmental demands add a layer of uncertainty. The mayor of London, Sadiq Khan, wants 80% of journeys in the capital to be made on sustainable forms of transport by 2041, but declining bus and train usage is jeopardising this goal.

"Towns need people using them," says Alex Williams, TfL's director of city planning. Conurbations must think of the best uses for their streets, he adds.

Homeworking will lead not to less travel, but to more disparate travel, according to Williams. Indeed, towns could see an increase in their populations, as defunct space is turned into residential areas.

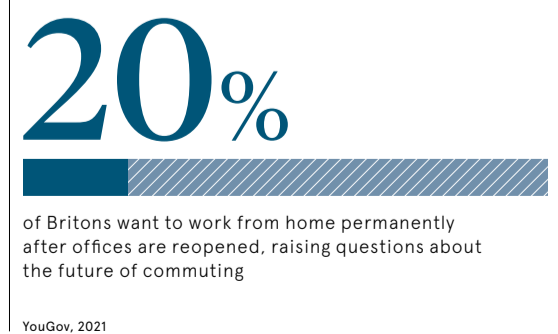
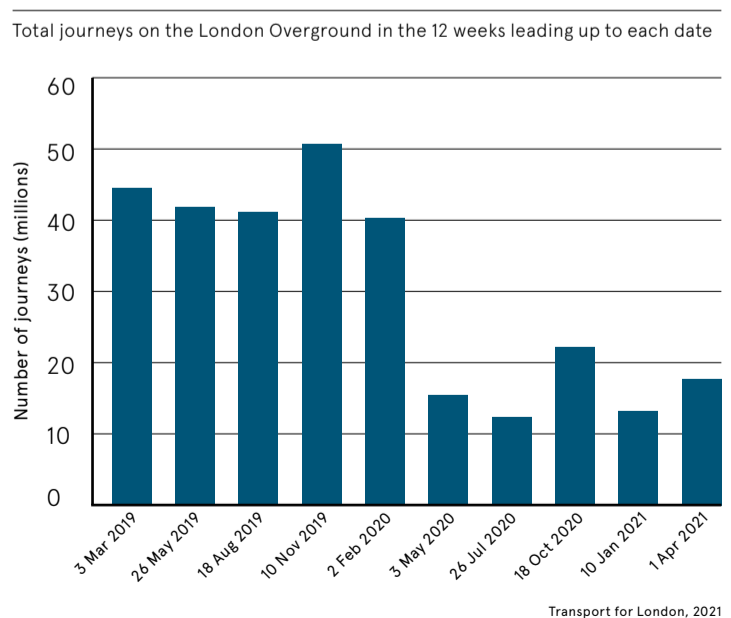
This, he notes, "could mean that small towns and cities will require more infrastructure investment".

about what the future of rail use will be", he warns. "Part of this is where people will commute to and from."

“The longer that people do or don't use certain transport modes, the harder it is for planners to plan”

spring 2019, an emerging new trend is adding uncertainty: the return of the car. Transport for London (TfL) data from June shows that the proportion of journeys walked, cycled or made on public transport over the calendar year fell from 63% to

COVID HAS HAD A BIG IMPACT ON PUBLIC TRANSPORT IN LONDON



Making EV charging smarter for everyone

How a new app is helping EV owners save money and optimising charging infrastructure across the UK

Savvy electric vehicle (EV) drivers are switching onto savings and boosting their green credentials thanks to a unique vehicle charging system.

Software specialists ev.energy have developed an app that opens up the cheapest charging times from the UK Grid to lower the energy bills of EV drivers and reduce strain on the UK's energy network.

The free cloud-based app automatically taps into the times when energy is at its cheapest while also offering vouchers as part of a suite of rewards for customers.

The UK company has developed sophisticated algorithms that track the price of energy which can fluctuate with demand surges and changing weather conditions.

"When you charge your EV really matters because the price of electricity is affected by weather dynamics such as wind and solar that generate power and can vary considerably," says William Goldsmith, head of commercial and grid services for ev.energy. "Our app is able to understand this shifting market and make sure your vehicle is being charged during the cheapest periods."

"All you do is tell us the car's battery size, your energy supplier and the

time you need your car charged by and the app takes care of the rest, delivering average annual savings of £200 for each driver as well as reducing their carbon emissions by 15%.

"It also helps regulate demand on the UK Grid which enables the UK to bring more renewable energy on stream."

ev.energy is enjoying rapid growth with more than 23,000 drivers using the smart platform, including 5% of Tesla owners who downloaded the app following early word-of-mouth recommendation.

The UK is closing in on having one million EVs on the road and they now account for 14.5% of new sales.

However, the buoyant EV sales market means a challenging increase of energy demand on the UK Grid, which could face an additional cost of £2.2 billion for upgrading existing overhead wires and cabling under the streets if smart charging is not adopted. The ev.energy app helps spread the load and minimise the need for costly infrastructure repairs and upgrades.

"It's an incredibly positive and exciting time for motorists as our technology is creating value for them and the UK Grid," adds Goldsmith. "The majority of drivers plug in from 6pm to 8am but only need between one to three hours of charging. The app ensures that charging takes place at the cheapest and greenest off-peak times rather than providing a surge of demand when everyone plugs in at the end of the day."

"We integrate with every utility supplier across the UK so it is easy to switch on the benefits from the app. But the best thing about it is that through our solution, EV charging is greener and cheaper for everyone."

ev.energy's team is full of power industry, technology and consulting expertise, leading them to winning the title of World's Best Energy Start-up 2019. This know-how has enabled them to take a unique view on a digital system that delivers efficiency and ease-of-use savings that is known as 'smart charging'.

"The app provides clear displays of charging session history to make it easy to track at-home and on-the-go charging in one place," says Goldsmith. "There are clear financial and CO2 emission benefits from using our smart charging system and it also helps balance the electricity grid."

"This is technology working for the individual who downloads the app, plugs in their EV and lets us do the rest. The app, which can be easily downloaded via the App store or Google play, is compatible with all leading EVs and energy suppliers."

"It is a simple, efficient way to make greener choices and save money at the same time."

“You can power the UK's first virtual EV Power Plant and get paid to do it”



For more information please visit www.ev.energy



¹ <https://insideevs.com/news/518277/uk-plug-in-car-sales-june2021/>
<https://ev.energy/news/ev-energy-named-worlds-best-energy-start-up-at-free-electrons-2019/>

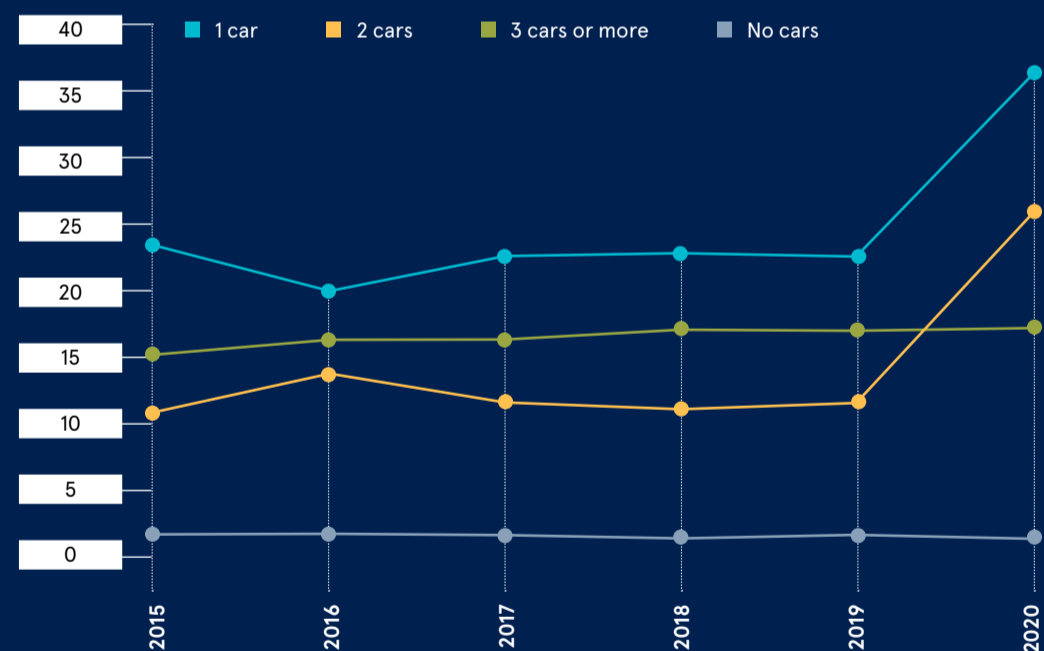
KING OF THE ROAD: THE CAR REIGNS SUPREME

Despite the ongoing campaign for sustainability and a plethora of public transport options, from hydrogen-powered buses to e-scooters, we Brits still love our cars. So, as car ownership increases and driving continues to be our favourite way to get to work, what options are there for the automobile lover who wants to be a little greener?

CAR OWNERSHIP CONTINUES TO RISE

Kantar Media, 2021

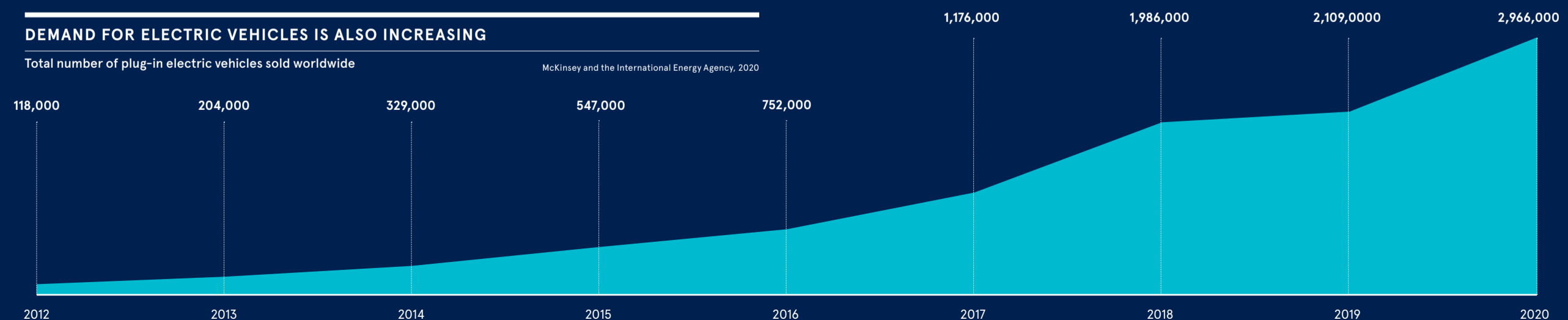
Number of British households that own the following number of cars (millions)



DEMAND FOR ELECTRIC VEHICLES IS ALSO INCREASING

Total number of plug-in electric vehicles sold worldwide

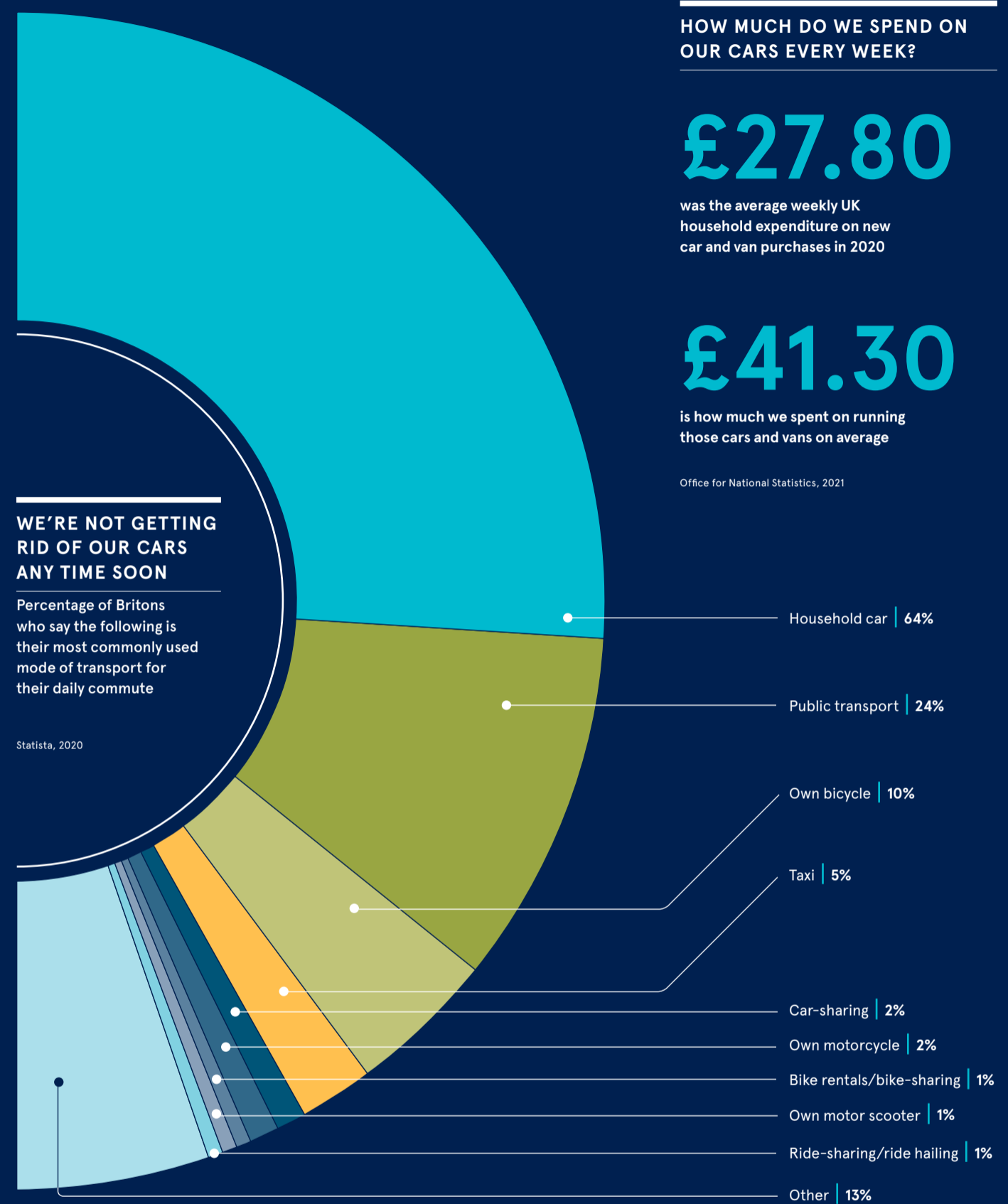
McKinsey and the International Energy Agency, 2020



WE'RE NOT GETTING RID OF OUR CARS ANY TIME SOON

Percentage of Britons who say the following is their most commonly used mode of transport for their daily commute

Statista, 2020



HOW MUCH DO WE SPEND ON OUR CARS EVERY WEEK?

£27.80

was the average weekly UK household expenditure on new car and van purchases in 2020

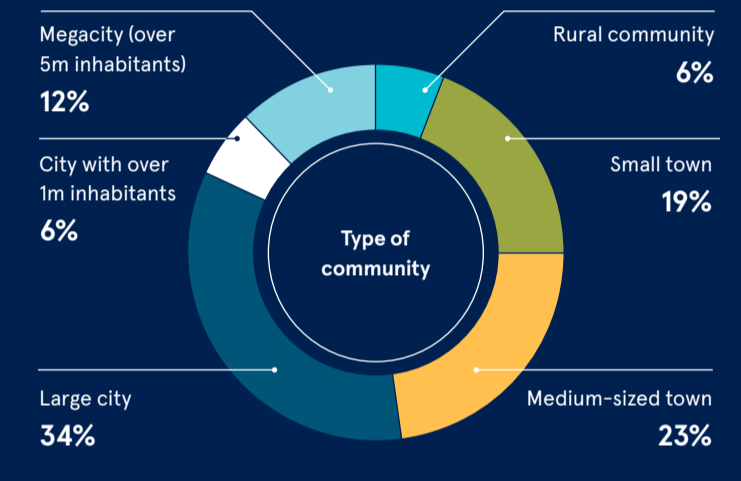
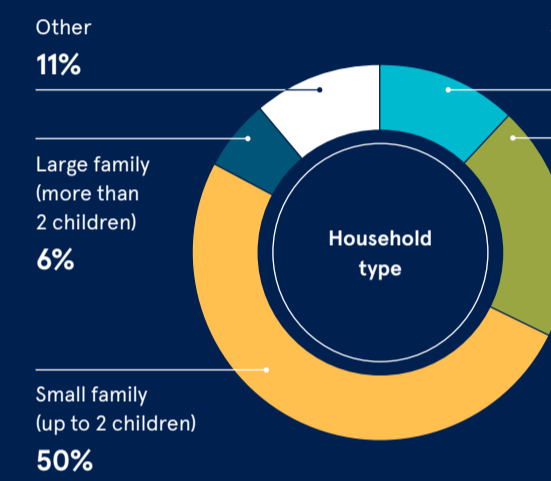
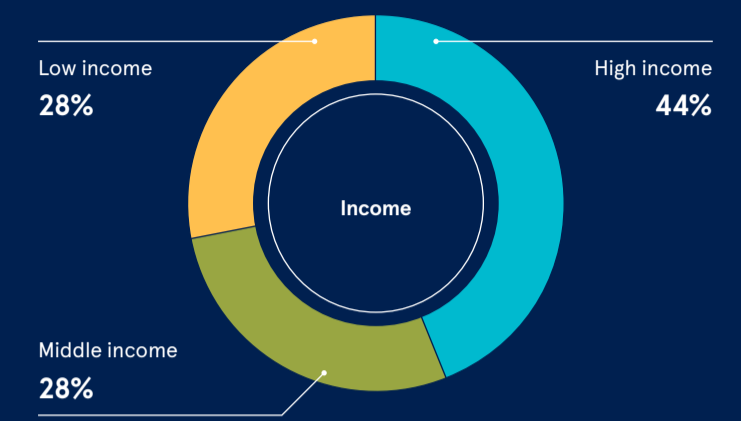
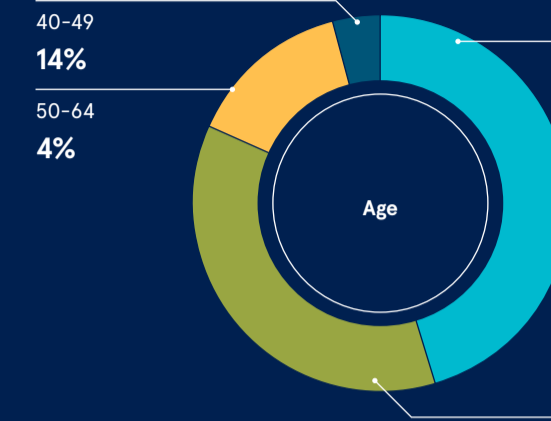
£41.30

is how much we spent on running those cars and vans on average

Office for National Statistics, 2021

WHO ARE THE TOP CAR-SHARERS?

Wealthy young urban families seem to be driving the car-sharing trend (percentages may not add up to 100 owing to rounding)



Statista, 2020

Statista, 2020

£760m

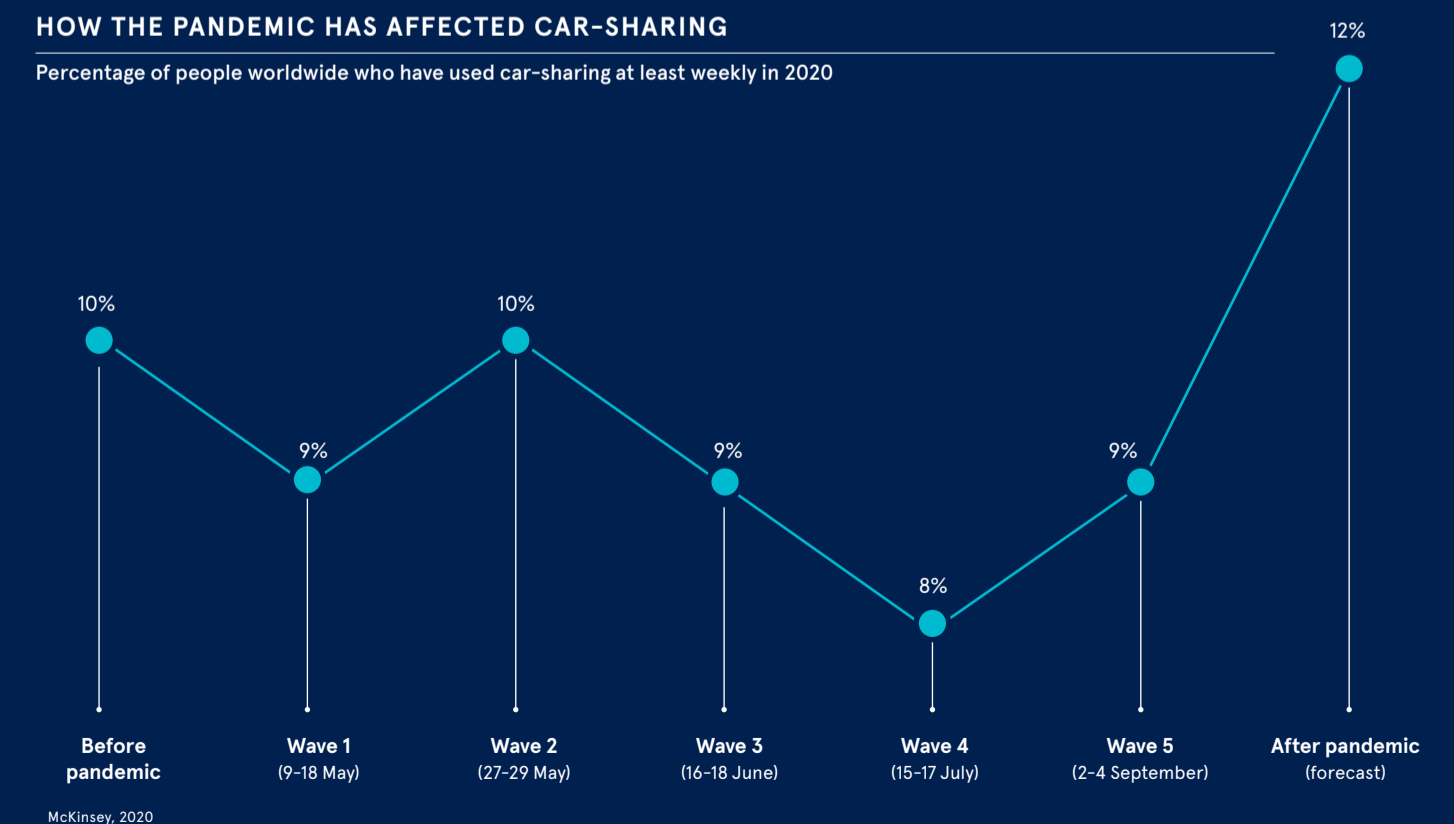
revenue earned by the UK car rentals market in 2020

£1.7bn

forecast revenue by 2025

HOW THE PANDEMIC HAS AFFECTED CAR-SHARING

Percentage of people worldwide who have used car-sharing at least weekly in 2020



McKinsey, 2020



Polestar facts

Founded in
2017

3 Models

Polestar 1
a high performance hybrid

Polestar 2
100%
Electric fastback

Polestar 3
100%
Electric SUV launching 2022

Founded by Volvo and Geely

Headquartered in
Gothenburg, Sweden

CEO is Thomas Ingenlath

How Polestar plans to eliminate all emissions

The Swedish EV brand is on an ambitious mission to create world's first truly climate-neutral car

Top Gear magazine ran a special report in April to find the best electric cars on the market, and found the best all-rounder to be? The Polestar 2 of course.

The editor wrote: "The Polestar 2 is a standout. Not because it's perfect, but because it has a gentle character that gives it just that little measure of soul. If the future of electric cars is built on first attempts like this, then the future is bright for EVs. And, like the star that shares its name, the Polestar leads the way."

Polestar is familiar with winning awards. The Swedish electric vehicle brand, founded by Volvo and Geely, produces arguably the most advanced electric vehicles on the market today.

But the real prize Polestar is searching for is unrelated to horsepower or looks. The brand wants to be a pioneer in sustainability. In the same month it won the Top Gear award Polestar announced a moonshot goal to create the world's first truly climate-neutral car by 2030.

"Offsetting is a cop-out," says Thomas Ingenlath, Polestar's CEO.

"By pushing ourselves to create a completely climate-neutral car, we are forced to reach beyond what is possible today. We will have to question everything, innovate and look to exponential technologies as we design towards zero."

This mission is forcing Polestar to rethink how cars are made. The Polestar factory in Chengdu was the first LEED Gold-certified automotive production facility in China. It was designed by the Norwegian architecture firm Snøhetta and runs on 100% renewable electricity.

Innovative materials are critical to the journey. WeaveTech, a 100% vegan, durable and lightweight material, is used in the Polestar 2. The amount of chemical plasticiser is reduced from the industry standard of 45% to around 1%. Precept, the brand's first concept car, now slated for production, explores materials such as natural flax composite fibres and 3D tailored knit seat covers made from 100% recycled PET bottles. Carpets are even made from Nylon 6

- a material manufactured from discarded fishing nets.

The toughest challenge is to eliminate carbon emissions across the supply chain. Electric cars require multiple components such as battery cells, body steel, electronics, the wheels and tyres, all of which generate emissions.

To track the impact of components, Polestar is partnering with Circular, a blockchain-based supply chain tracker. This means the origin and movement of components can be monitored - including by consumers and third-party bodies.

“By pushing ourselves to create a completely climate-neutral car, we are forced to reach beyond what is possible today

Cobalt, for example, is a perfect candidate for blockchain tracking. Cobalt is required for the battery, but not all sources are equally sustainable. Circular ensures the origin and impact of cobalt is clear for all to see.

"Caring about ethics and the environment is key to Polestar," says Ingenlath. "This unprecedented level of traceability means that Polestar can promote sustainable and ethical practices in its supply chain, and provide better transparency for consumers."

For total transparency, the company published a full Lifetime Cycle Assessment (LCA) for the Polestar 2, complete with methodology. The report encompasses aluminium production and refining, plastics production, electricity used in component manufacturing, logistics, and the end-of-life of the vehicle. Everything is laid bare. Overall, a Polestar 2 leaves the factory gates with a CO2e impact of 26 tons. However, if charged exclusively with renewable energy, its emission curve remains flat, as opposed to a fossil fuel car that will keep spitting out tailpipe emissions throughout its lifetime. However, regardless of how the energy is generated to charge Polestar 2 it will have a lower carbon footprint over life than an equivalent combustion engine car.

In June, Polestar joined the Exponential Roadmap Initiative and UN Race to Zero. The initiative connects businesses committed to taking action in line with the 1.5 °C climate target, through exponential climate action and solutions. The target, outlined in the Paris Agreement, means restricting a global temperature increase to 1.5°C above pre-industrial levels. This will be

crucial to hold off some of the worst impacts of climate change, and avoid irreversible damage to societies, economies and the natural world.

Johan Falk, head of the Exponential Roadmap Initiative, says, "Electric cars will be superior in terms of price and performance and manufacturers will start to cut their fossil production lines for economical reasons, sooner than later. Disruptive companies like Polestar play an important role in accelerating this transformation."

The result? A car brand that not only leads the electric market on performance and aesthetics, but is a pioneer in sustainability, and transparency.

For buyers looking for a brand to match their own outlook, Polestar is unrivalled. Polestar's head of Sustainability, Fredrika Klarén, is proud of the mission. She says, "We're electric, so we don't have to worry about combustion engines producing toxic emissions - but that doesn't mean our job is done. We will now work to eradicate all emissions stemming from production."

She urges the entire industry to follow Polestar's lead: "Now is a historic and exciting time for car makers, an opportunity to seize the moment, do better and dare to build the dream of climate neutral, circular and beautiful cars."

To find out more please visit
[Polestar.com](https://www.polestar.com)



Markus via Gettyimages

ACCESSIBILITY

Charting a route to truly accessible transport

Navigating public transport can be a challenge for people with disabilities, particularly during the pandemic. How should service providers respond?

Sam Forsdick

Using public transport can be particularly stressful for disabled travellers. Social media feeds tell horror stories of people being abandoned on trains, while vital information can be difficult to obtain. For instance, when National Rail Enquiries changed its online timetables to black and white to mark the Duke of Edinburgh's death in April, it rendered them unusable for many people with visual impairments.

While figures published by the Department for Transport indicate that 99% of buses and 92% of trains are accessible, this is not always reflected in the lived experiences of travellers with disabilities.

disabled people. Pennick explains that contact assistance was, in some cases, "essentially scrapped" because of the lockdown restrictions, while the move to al fresco dining has left little room for wheelchair users to navigate city streets. "Unfortunately, what we've seen during the pandemic is the very fast implementation of many initiatives that didn't necessarily have accessibility in mind and have actually further excluded disabled people," she says. "It's all very well having an accessible bus fleet, but, if the bus stop or if the pavement on the way to the bus stop is inaccessible, the buses are irrelevant."

A new passenger assistance app is one way in which transport providers are hoping to improve the experience of travellers with special accessibility needs. After initially designing an app to improve the customer experience of train passengers in general, Jay Shen, the founder and MD of Transreport, quickly realised the technology's potential to improve the journeys of those with disabilities.

While presenting the app to a panel of transport industry experts, Shen was approached by equality consultant Nick Goss, who is a wheelchair user. He explained how the app could benefit people who, like him, have been left at railway stations without someone to help them board their train.

The conversation resonated with Shen, who says: "As an able-bodied person, I can take travelling by train for granted. For disabled people, the anxiety kicks in when they start planning the journey. They need to know whether the station is accessible, if they need a ramp to board, whether someone will be there to help and whether there's an accessible toilet."

He adds: "This planning can take hours on top of the journey itself, which can be a stressful experience."

“As an able-bodied person, I can take travelling by train for granted. For disabled people, the anxiety kicks in when they start planning the journey

Shen set about creating a passenger assistance app that would help people to plan their journey and notify rail operators of their accessibility requirements more easily. After three years of development, the app has been rolled out across all rail providers, thanks to a partnership with National Rail. It's been downloaded more than 3,000 times.

The slow pace of change is partly down to outdated tech, according to Shen. "In the past, station staff relied on email and fax to see the booking information of people with accessibility issues, which can be hard to track at a busy station during peak hours. With the app, this information is always up to date."

There are plans to introduce new features to help users plan bus, taxi and underground journeys, and to navigate their way around airports.

"Our vision at Transreport is to provide a truly door-to-door, accessible travel experience," Shen says. "We need to realise that people are not disabled because of their medical or physical conditions; they are disabled by the inaccessibility of the society around them."

This is an element of accessibility that Govia Thameslink Railway, the nation's busiest rail operator, is conscious of improving. Its newly appointed accessibility manager, Carl Martin, has the task of leading a cultural change at the company and promoting the work it's doing to improve accessibility.

Martin readily admits that accessibility was not something that he had considered for the first 36 years of his life, but he started to see the world from a different perspective after a motorbike accident left him paralysed from the chest down.

"I am very focused on people and on how people deliver our services. This is because how you're dealt with can make you feel valued as an

individual within the community," Martin says.

More than 3,000 front-line employees at Govia Thameslink Railway have undertaken training in disability awareness so far.

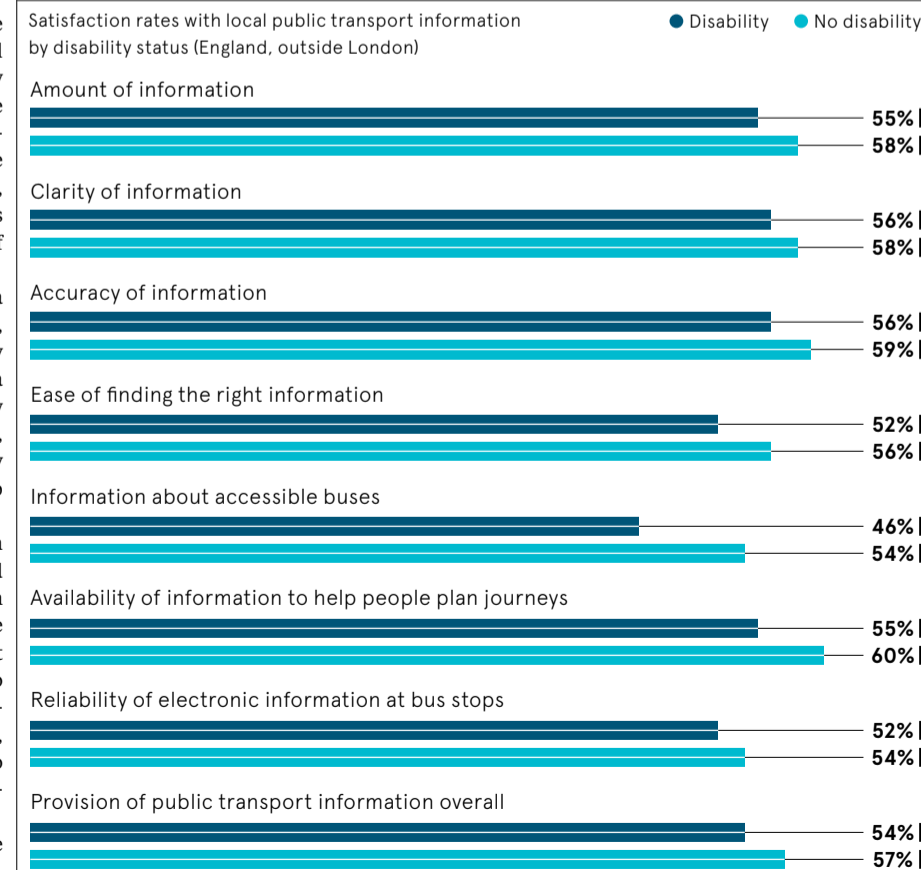
"It is really important that every assistance works. One failed assistance is one too many," says Martin, who will also highlight successful journeys made by disabled passengers to boost the confidence of other travellers with accessibility needs.

"If in a year's time I can say that we've increased the number of people with accessibility needs travelling on our network, I will have done what I set out to achieve," he says.

It's important to remember that catering for those with disabilities is not a minority pursuit. Just over 14 million people in the UK have a disability. It is estimated that the combined annual spending power of households with at least one disabled member is £274bn.

"Travel is a fundamental right - and accessibility should be central to the design of any transport system," Pinnock says. "It can no longer be thought of as a luxury or just a nice thing to have." ●

DISABLED PEOPLE ARE LESS SATISFIED WITH PUBLIC TRANSPORT INFORMATION



DECARBONISATION

Aviation confronts its emissions challenge

Aircraft manufacturers are making progress with innovative decarbonising technologies, but commercialising these will be far from simple

Heidi Vella

Few sectors have been hit harder by the pandemic than aviation. But as vaccine roll-outs help to ease restrictions and the industry plots a route back to profitability, it's facing another existential threat: the pressure to decarbonise.

Aviation contributes between 2% and 3% of the world's greenhouse gas emissions, but is on course to become the second-highest emitter in 2050, as other sectors reduce their impact. Owing to the technological leaps required to reduce emissions, experts say the groundwork must start now if the world is to meet the targets agreed in the Paris accord.

Given all the turbulence that aviation has gone through, the timing couldn't be worse. But, despite the adversity, the industry is responding. Last September, airline alliance oneworld announced that all 13 of its members, including British Airways, had committed to net zero emissions by 2050.

Governments are also outlining their ambitions for the sector. The UK is one of the biggest exporters of aerospace products and services globally. This month the government, as part of its £125m 'jet zero' ambition to deliver the first zero-emission flight across the Atlantic, published a strategy

consultation on how the UK can lead progress.

"There's no single technology that we believe can achieve carbon neutrality by 2050," says Bram Peerlings, consultant for sustainable aviation at Amsterdam-based research centre NLR and co-author of *Destination 2050*, a report on how to decarbonise the industry.

Nonetheless, NLR believes that some approaches, such as sustainable fuels and operational improvements, "can be implemented fairly quickly, whereas others are at a very early stage of development and commercialisation", Peerlings says.

The report suggests that 92% of industry-associated CO₂ emissions from flights departing the EU and the UK can be reduced by the sector. The remainder will require carbon capture and reforestation.

In some ways, the pandemic has expedited measures to reduce the industry's emissions. For instance, KLM Royal Dutch Airlines and BA both substituted more efficient carriers for their ageing Boeing 747s earlier than they had planned to. It's estimated that next-generation models such as the Airbus A320neo are about 20% more fuel-efficient than their predecessors.

But it will take more than a fleet upgrade to get the industry to where it needs to be. In the short term, replacing kerosene or blending it with sustainable aviation fuel (SAF) is one of the most promising. Made from renewable feedstocks such as waste oils and agricultural residue, SAF can reduce carbon emissions by 70% compared with standard jet fuel.

SAF is two to three times more expensive than conventional fuel and production is only 0.05% of total jet fuel consumption in the EU. To incentivise its development,

“It's not a simple swap out of technology. We need to almost start again with the aircraft design

the European Commission has proposed a progressive tax on polluting jet fuel, as well as increasing minimum SAF blends to 2%, rising to 5% in 2030 and 63% in 2050.

The World Economic Forum's 'Clean skies for tomorrow' initiative also hopes to boost the consumption of SAF by means of a certificate programme that enables companies to pay a premium for the fuel when flying, which can then be used in their accounting for scope-three greenhouse gas emissions.

SAF needs no new infrastructure or equipment investment, unlike electricity- and hydrogen-powered aircraft, which require entirely new engineering. Despite the difficulty, it looks as though shorter commercial routes could be using electric planes by the end of this decade.

In a notable move, United Airlines announced in July that it would be buying 100 19-seat electric planes from Swedish startup Heart Aerospace, on condition that they meet various safety and commercial standards. Using battery power rather than jet fuel, these zero-emission aircraft can fly up to 250 miles. They're expected to be operational from 2026.

It's unlikely that battery power would ever be viable for bigger aircraft, though, owing to the weight of the batteries. But there will probably be levels of "hybridisation" along the way, according to Mark Howard, head of commercial strategy at FlyZero, a £15m government-funded initiative that is being delivered by the Aerospace Technology Institute. Its remit is to outline a future decarbonisation framework for the sector.

The *Destination 2050* report calculates that range- and capacity-optimised hybrid-electric aircraft

could reduce CO₂ emissions by half for smaller, single-aisle aircraft.

Larger carriers consider aircraft fuelled by ammonia or green hydrogen to be the front-running technology. But these aren't expected before 2035, owing to the amount of technological and supply-chain development still required.

Howard, who's worked for Airbus for 35 years, says that FlyZero's current thinking is that liquid cryogenic hydrogen – which is kept at -253°C – will be needed.

"It's not a simple swap out of technology. We need to almost start again with the aircraft design," he explains. Airbus revealed three hydrogen-powered concept planes last year, all taking different engineering approaches.

Any new technology adopted will need to be commercialised and – crucially – universally trusted.

"Everyone is accustomed to operating with kerosene-powered aircraft," Howard says. "There needs to be a level of technological maturity and cost minimisation before the equipment manufacturers, the airlines and the public will accept change, both technologically and in terms of cost, which is why we need to act now to address the carbon-reduction challenge."

The global aviation industry is expected to be worth about £4tn by 2050. Yet in April alarm bells rang in the UK after the Aerospace Technology Institute, which allocates public money to the sector, was forced to suspend its funding programme for 2021.

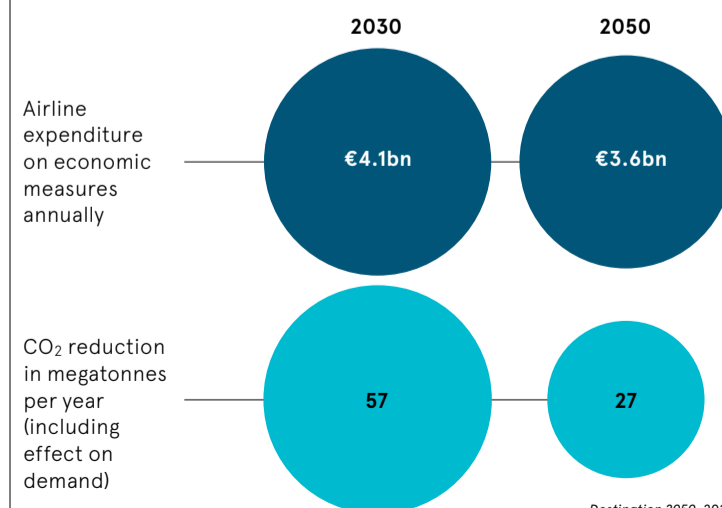
With so much investment and transformation required, a key question arises: will it make flying more expensive for the masses? "That's what our modelling foresees," Peerlings says. "But it is possible that companies might decide to internalise some of those costs."

He and Howard agree that, in order to achieve these ambitious goals, governments must create the right policies and provide funding streams to incentivise and support the necessary investments.

"By not doing this, governments risk missing an opportunity to capitalise on the sustainable aviation market," Howard says. "It's a global problem and a global industry, so there is a race to compete." ●

WHAT DECARBONISING AVIATION COULD REALLY COST

Projected rates of CO₂ reduction and European airline expenditure on economic measures for 2030 and 2050



Yasunobu Kato/Getty Images

Equipping automotive designers with the tools to create the cars of the future

The automotive world may have changed beyond recognition, but design remains at its core. As experts in the field, Autodesk has moved with the times to provide the tools to enable those designing the transport of the future

If you were to show someone in the car industry 50 years ago what making a vehicle would look like in 2021, they probably wouldn't believe their eyes. Vehicles today are unrecognisable compared to their predecessors and continue to change and evolve, from how they work and the way they're powered to what they look like and how they're designed. Those changes aren't stopping, with the transport of the future set to be just as different from today's as today's is from yesteryear's.

Such huge changes don't just happen. They're the result of intricate design work and inspirational creativity – a sphere that has also changed beyond belief. While people once modelled the cars of the future with clay and sketches, now state-of-the-art technology is key to creating the transport of the future, helping to explore new designs and develop innovative, aesthetically impressive cars and vehicles.

It's an area that software corporation Autodesk excels in, giving the creative minds of the automotive sector the tools they need to design the vehicles of the future. "We're a group of passionate people with decades of experience in automotive design," says Thomas Heermann, vice-president, automotive, concept design & XR. "We're in the position to provide best-in-class tools for the automotive design studio and our customers in that space to get the latest and greatest designs on the market. Design is a differentiator. It's not just about a badge or logo. It's about the topology, the curvature." What people want from the design of their vehicle is also changing,

Heermann observes, with an increased focus on the interior and aesthetic as our experience changes as we become more passenger than driver in increasingly autonomous vehicles.

Digitalisation as a key for creativity

It's with these changes in mind that Autodesk offers a range of solutions for the automotive industry, spanning project management software, design software and 3D visualisation and animation to equip designers at original equipment manufacturers (OEMs) with the tools they need to explore new ideas. "We give them tools so they can be creative," says Heermann. "They can articulate ideas in 3D and use tools to virtualise them to collaborate over the ideas."

That collaboration is key when it comes to bringing designers and engineers closer together, he adds, and while a big clay model in a studio may have worked before, the future lies in digitalisation. Whether it's having the ability to make changes at pace – what Autodesk dubs the 'need for speed' – or a desire to digitise workflows and allow people to work together from wherever they are, digitalisation allows different people, departments and companies to collaborate at a scale and speed never seen before.

Extended reality as a key for collaboration

A key development in technology that enables that collaboration is the world of Extended Reality (XR), including both Virtual Reality (VR) and Augmented Reality (AR), says Heermann. Not only do they allow people to visualise

Commercial feature



designs and share ideas like never before, but they also save time and make the whole process of collaboration and design more efficient. He gives one example of Nissan's chief designer giving a whole presentation at the Tokyo Motor Show via VR. But on a more hands-on basis, XR provides an environment that allows both creativity and collaboration, says Heermann. The leverage of such technology means design reviews can take place more easily than ever, with designers, engineers, decision-makers and stakeholders able to meet virtually from around the globe. In another example, rather than fly to Korea from Europe for a design review, one studio chief used VR to have a virtual session – a more effective way of engaging than sharing on a computer screen yet less time consuming than making the four-day journey around the world for a face-to-face session.

Such flexibility has not only been vital during the Covid-19 pandemic but a

growing acceptance of such technology means the automotive industry of the future is likely to increasingly rely on it to ensure fast, flexible and agile design and development of vehicles. "What's interesting is the convergence between the physical and digital worlds – they are always in sync. And no matter where you are, what device you have, you can collaborate on the latest designs, share your opinions, get stakeholders aligned. You can even make decisions on digital models with confidence and that's one of the things that has set us apart over the last couple of years."

Freeing up designers to get creative

Elsewhere, developments in computational design allow computers to generate solutions in minutes that may previously have taken days. That doesn't just speed up the process, says Heermann, but frees up designers to get creative. "It gives them a lot more time to experiment with different ideas – to be more playful and develop different thoughts." Another thing it allows is what Heermann refers to as 'design intent', helping creatives convey that intent to the engineers charged with producing their creations. "The tools that we have actually allow those creative minds to be able to keep that design intent for the engineer. So the engineer doesn't come back and say no, that's not feasible. These tools are actually having those components of visibility already inside and it helps the creative to really be

able to transport the intent to the production. Otherwise, you can come up with the most amazing idea but it will never reach production."

When it comes to design, Autodesk's attributes don't stop at technology. The company's broad spectrum of experience makes it well placed to help design the vehicles of the future, whether they're electric vehicles, flying helicopters or vehicles for urban transportation. "Because we do engineering, we do architecture, we bring these domains together and give our customers a bigger and more inclusive picture." Take, for example, a customer who creates electric, personal urban mobility systems that are connected via pillars in a city – converging architectural planning, mechanical design and engineering together, he explains. "There's a lot of convergence of different themes. You're not just having one solution. The entire concept is a solution that has to work together. It will leverage what the creatives do in the design studio, and combine it with the entire strength of the company or this artist, because coming together here offers seamless integration."

To find out more about how Autodesk is powering change for products, industry and customers, visit blogs.autodesk.com/design-studio/

AUTODESK

“Huge changes don't just happen. They're the result of intricate design work and inspirational creativity

Virtual testing of ADAS and AV



Solutions for vehicle simulation

- Supports vehicle development from concept through to verification and validation
- Customisable vehicle physics models covering vehicle dynamics, powertrain, HVAC and control
- Ideal and physics-based perception sensor models – radar, LiDAR, camera
- Scenario based testing with test automation and validation to explore system performance
- Digital twins of real world locations and fully synthetic test environments
- Support for open standards: OpenSCENARIO, OpenDRIVE, Modelica, FMI

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