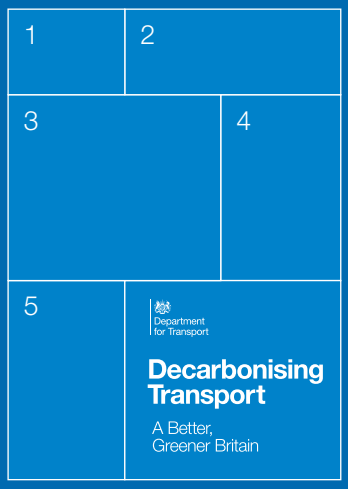
Department for Transport

Decarbonising Transport

A Better, Greener Britain



Cover Images

1 DAF LF Electric RHD

2 Living Streets

3 Nissan charging

4 London cycle path

5 Metrodecker EV in York. Image courtesy of City of York Council / First Bus

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Decarbonising Transport: A Better, Greener Britain

Foreword from the The Rt Hon Grant Shapps MP, Secretary of State for Transport

Transport decarbonisation is a dull way of describing something much more exciting and far-reaching.

Because transport is not just how you get around. It is something that fundamentally shapes our towns, our cities, our countryside, our living standards, our health, and our whole quality of life. It can shape all these things for good – or for bad.

Bad is spending longer and longer stuck in traffic. It's the huge increase in rat-running down roads which were never meant for it. It is millions of people literally, if slowly, being poisoned by the very air they breathe. Every one of these things also contributes to climate change.

And decarbonisation is not just some technocratic process. It is how we fix some of that harm. It is how we make sure that transport shapes the country and the economy in ways that are good. It's about taking the filth out of the air and creating cleaner, quieter, healthier places. It's about a second, green, industrial revolution, creating hundreds of thousands of new, skilled jobs, in some of the proud towns and cities that were the cradle of the first one.

It's not about stopping people doing things: it's about doing the same things differently. We will still fly on holiday, but in more efficient aircraft, using sustainable fuel. We will still drive on improved roads, but increasingly in zero emission cars. We will still have new development, but it won't force us into high-carbon lifestyles.

Because of the pandemic, some of it is happening faster than we expected. Homeworking has changed traditional commuter and shopping trips, probably for ever. Videoconferencing has changed business travel. These things, in themselves, will save thousands of tonnes of carbon – but they also create new challenges, such as a further rise in already proliferating delivery vehicles on the roads. This plan includes clear actions to cut delivery traffic and make it low-carbon, including harnessing new technology and 'last-mile' delivery consolidation.

Our major transport infrastructure programmes were designed before the pandemic. We want to understand how changing patterns of work, shopping and business travel might affect them. For that reason, among others, our Integrated Rail Plan, to be published in due course, will describe how HS2, Northern Powerhouse Rail and other major projects will deliver benefits for passengers, including carbon savings more quickly and effectively than under the original proposals, which would have left the North and Midlands – and the environment – waiting twenty years for any major improvement. And for the same reason, as new demand patterns become clearer, we will also review the National Policy Statement which sets out the Government's policies on the national road network.

Our ambitious roads programme reflects – and will continue to reflect – that in any imaginable circumstances the clear majority of longer journeys, passenger, and freight, will be made by road; and that rural, remote areas will always depend more heavily on roads. That is why our plan to decarbonise motor transport, the most ambitious of any major country, is so vital. In November, we announced that new diesel and petrol cars and vans would no longer be sold from 2030, and that all new cars and vans must be fully zero emission at the tailpipe from 2035, a plan that is only possible now we are no longer members of the EU. Alongside this document, we have published our consultation on ending the sale of all non-zero emission HGVs from 2040, with lighter HGVs from 2035. I can also commit to consulting on setting phase out dates for all non-zero emission road vehicles, with 2040 as a backstop, setting a path to a time when every vehicle on the roads will be zero emission.

But we cannot, of course, simply rely on the electrification of road transport, or believe that zero emission cars and lorries will solve all our problems, particularly for meeting our medium-term carbon reduction targets to 2035. Road traffic, even on pre-pandemic trends, was predicted to grow by 22 percent from 2015 to 2035 – much of it in cities, where new roadbuilding is physically difficult and disadvantages communities.[1] We cannot pile ever more cars, delivery vans and taxis on to the same congested urban roads. That would be difficult for the roads, let alone the planet, to tolerate. As we build back better from the pandemic, it will be essential to avoid a car-led recovery.

As I said in "Decarbonising Transport: Setting the Challenge" in March last year, we must make public transport, cycling and walking the natural first choice for all who can take it. Many journeys are short, could be done differently – and were done differently, in the very recent past. Even ten years ago, for instance, more children walked to school. We want to reduce urban road traffic overall. Improvements to public transport, walking and cycling, promoting ridesharing and higher car occupancy, and the changes in commuting, shopping and business travel accelerated by the pandemic, also offer the opportunity for a reduction or at least a stabilisation, in traffic more widely. That will benefit everyone, drivers included.

We know we can do this because it is happening already. In the sixteen months since March 2020, we have published ambitious policies to transform England for cycling and walking. More than 300 cycling and walking schemes have already been installed, many more are on the way, and we have clear evidence that, where they are done properly, they work and are popular. Cycling rose by 46 per cent last year, a greater rise than across the whole of the previous 20 years and easily the biggest increase in post-war history. With £2 billion of new funding, we have put our money where our mouth is.

We have published plans to fundamentally reshape our bus network along public service lines, with £3 billion of new money, lower and simpler fares, thousands of zero emission buses, and more priority lanes. Again, these are the same policies that in London and other cities have brought about clear modal shift.

We have created Great British Railways to own and control the rail system in the public interest, to make services easier to use and to grow the network. We will build on the huge acceleration of electrification we've already seen since 2010, and will shortly announce further electrification schemes. Rail is currently the only means of transporting heavy goods in a low-carbon way using existing, proven technology through electrification. Our electrification programme also, therefore includes relatively short stretches of track that can significantly increase the amount of electrically hauled rail freight and unlock new electric freight paths. With electrification, plus batteries and hydrogen, we can achieve a net zero emission rail network by 2050.

Over the last twenty years, in real terms, the cost of motoring fell by 15 per cent. Over the same period the cost of rail fares went up by over 20 per cent and bus and coach fares by over 40 per cent.[2] Gradually, we will change this. Starting with buses outside London, we want simpler, cheaper, often flat fares that you can pay with a contactless card, with daily and weekly price capping across operators. We must make buses and trains better value and more competitively priced.

For most of us, changing how we travel may be a blend, not a binary – it's about using cars less, not giving them up completely. You'll still keep a car for some journeys – or maybe borrow one from a car club – but you'll also have an electric bike to get you to the station, perhaps take it on the train and ride it off the other end, doing the door-to-door journey in a different way. If your commute isn't possible at all by public transport, you might instead use a new app to find someone in the same industrial estate you can share a car with, cutting costs and parking hassle. Some big employers are already doing this to save hundreds of car journeys a day.

These kinds of advances in technology can create new ways for people and goods to move around. Car clubs, ridesharing and mobility credit schemes can all reduce emissions on our roads. Levelling-up means that all parts of our United Kingdom, urban and rural, will benefit from the investment and policies in this plan.

We must also do better at joining up our transport, decarbonisation, and planning goals in both urban and rural areas. Too many new developments – not just by housebuilders, but by public-sector bodies – are difficult to reach without a car. But if we do development in a greener way, and if we join it to existing places, we can make it lower-carbon, lower-emission and lower-traffic – and more acceptable to local communities. We will also support local areas to decarbonise by linking local infrastructure funding to solutions that cut emissions – aligning billions of pounds of investment to our net zero mission.

Air travel may represent only seven per cent of UK greenhouse gas emissions – far lower, of course, since the pandemic – but it gets a great deal more than seven per cent of the political attention in this debate.[3] International connectivity is a vital part of Global Britain, and everyone should continue to have access to affordable flights, allowing them to go on holiday, visit family, and do business. But as the aviation sector recovers, a process likely to take several years, it must do so in a lower-carbon way. We have committed to including international aviation, and shipping, in our Sixth Carbon Budget, and propose to set a high-ambition CO_2 emissions reduction trajectory for it from 2025 to 2050 against which we will measure progress. Our Jet Zero consultation, published alongside this plan, sets out how in more detail. And our Jet Zero Council will build on British leadership in sustainable aviation fuels to deliver truly guilt-free flying. The UK is already the home of the world's first hydrogen aircraft and we have set ourselves the objective of flying the first zero emission flight across the Atlantic.

Some, I know, see change as unwelcome. But transport in this country, and every other country, is always changing, and always has changed. Our job is to ensure that it changes for the better, not the worse. Many things in our lives which we would now be appalled by, we once saw as utterly normal: adulterants in our food, rooms filled with cancer-causing smoke, dead rivers full of waste, lead in petrol. I believe that the struggle for decarbonised transport, clean development and clean air is as important as the struggle for clean water was in the 19th century. This plan sets out how we will achieve it.

The Rt Hon Grant Shapps MP
Secretary of State for Transport

Summary of commitments

Part 2a
Decarbonising all forms of transport

Increasing cycling and walking

We will deliver the Prime Minister's bold vision for cycling and walking investing £2 billion over five years with the aim that half of all journeys in towns and cities will be cycled or walked by 2030

We will deliver a world class cycling and walking network in England by 2040

Zero emission buses and coaches

We will deliver the National Bus Strategy's vision of a transformed bus industry and a green bus revolution

We will consult on modernising the Bus Service Operators' Grant in 2021

We will support delivery of 4,000 new zero emission buses and the infrastructure needed to support them

We will deliver the first All-Electric Bus Town or City

We are consulting on a phase out date for the sale of new non-zero emission buses

We will consult on a phase out date for the sale of new non-zero emission coaches

Decarbonising our railways

We will deliver a net zero railway network by 2050, with sustained carbon reductions in rail along the way. Our ambition is to remove all diesel-only trains (passenger and freight) from the network by 2040

We will deliver an ambitious, sustainable, and cost-effective programme of electrification guided by Network Rail's Traction Decarbonisation Network Strategy

We are supporting the development of battery and hydrogen trains and will deploy them on the network as we decarbonise. We will also use technology to clean up diesel trains until they can be removed altogether

We are building extra capacity on our rail network to meet growing passenger and freight demand and support significant shifts from road and air to rail

We will work with industry to modernise fares ticketing and retail to encourage a shift to rail and cleaner and greener transport journeys

We will improve rail journey connectivity with walking, cycling and other modes of transport

We will introduce a rail freight growth target

We will incentivise the early take up of low carbon traction for rail freight

A zero emission fleet of cars, vans, motorcycles, and scooters

We will consult on regulatory options, including zero emission vehicle mandates, to deliver petrol and diesel phase out dates for new vehicles

We have published a zero emission cars and vans delivery plan

We will continue to support demand for zero emission vehicles through a a package of financial and non-financial incentives

We will consult this year on a phase out date of 2035, or earlier if a faster transition appears feasible, for the sale of new non-zero emission powered two and three wheelers (and other L category vehicles)

We will deliver an action plan this year to build new UK opportunities for zero emission light powered vehicles

We will lead by example with 25% of the Government car fleet ultra low emission by December 2022 and 100% of the Government car and van fleet zero emission by 2027

We will ensure the UK's charging infrastructure network meets the demands of its users

We will support and nurture innovation in the UK automotive sector

We will invest £15 million in 2021/22 to help address the backlog in traffic signal maintenance to improve traffic flow and reduce emissions

We will review the National Networks National Policy Statement

Accelerating maritime decarbonisation

We will plot a course to net zero for the UK domestic maritime sector, with indicative targets from 2030 and net zero as early as is feasible

We will consult on the potential for a planned phase out date for the sale of new non-zero emission domestic vessels

We will assess how economic instruments could be used to accelerate the decarbonisation of the domestic maritime sector

We will accelerate the development of zero emission technology and infrastructure in the UK

We will consult this year on the appropriate steps to support and, if needed, mandate the uptake of shore power in the UK

We will extend the Renewable Transport Fuel Obligation (RTFO) to support renewable fuels of non-biological origin used in shipping

Internationally, the UK will press for greater ambition during the 2023 review of the International Maritime Organisation Initial Greenhouse Gas Strategy and urge accelerated decarbonisation

We will ensure we have the right information to regulate emissions, and to judge the effectiveness of the steps we are taking in the UK and at the IMO

Accelerating aviation decarbonisation

We will consult on our Jet Zero strategy, which will set out the steps we will take to reach net zero aviation emissions by 2050

We will consult on a target for UK domestic aviation to reach net zero by 2040

We will consult on a target for decarbonising emissions from airport operations in England by 2040

We are supporting the development of new and zero carbon UK aircraft technology through the Aerospace Technology Institute (ATI)

We will fund zero emission flight infrastructure R&D at UK airports

We will kick-start commercialisation of UK sustainable aviation fuels (SAF)

We will consult on a UK sustainable aviation fuels mandate

We will support UK airspace modernisation

We will further develop the UK Emissions Trading Scheme to help accelerate aviation decarbonisation

We will work with industry to accelerate the adoption of innovative zero emission aircraft and aviation technology in General Aviation

We will aim to agree an ambitious long-term global emissions reduction goal in the International Civil Aviation Organization by 2022

Part 2b
Multi-modal decarbonisation and key enablers

Delivering a zero emission freight and logistics sector

We are consulting on phase out dates for the sale of all new non-zero emission HGVs

We will demonstrate zero emission HGV technology on UK roads this year

We will stimulate demand for zero emission trucks through financial and non-financial incentives

We will support efficiency improvements and emission reductions in the existing fleet

We will support and encourage modal shift of freight from road to more sustainable alternatives, such as rail, cargo bike and inland waterways

We will take forward measures to transform 'last mile' deliveries

Delivering decarbonisation through places

We will support decarbonisation by investing more than £12 billion in local transport systems over the current Parliament, enabling local authorities to invest in local priorities – including those related to decarbonisation such as reducing congestion and improving air quality

We will drive decarbonisation and transport improvements at a local level by making quantifiable carbon reductions a fundamental part of local transport planning and funding

We will publish a Local Authority Toolkit in 2021, providing guidance to support local areas to deliver more sustainable transport measures

We will embed transport decarbonisation principles in spatial planning and across transport policymaking

We will create at least one zero emission transport city and four industrial 'SuperPlaces'

We will complete our review of how to best represent decarbonisation measures in transport business cases and appraisals

Maximising the benefits of sustainable low carbon fuels

We will increase the main Renewable Transport Fuels Obligation (RTFO) target

We will introduce petrol with up to 10 per cent ethanol (E10) as standard petrol in September 2021

In cooperation with stakeholders, we will review the role of fuels with higher biocontent starting this year and explore potential measures to remove existing market barriers for use in certain compatible vehicles

We will seek to maximise the use of low carbon fuel in aviation and maritime as detailed in other relevant commitments elsewhere in this plan

We will develop a strategy for low carbon fuels, from now until 2050, to set a clear signal about the Government's vision for the sector

Hydrogen's role in a decarbonised transport system

The UK Government will publish an overarching Hydrogen Strategy in summer 2021, which will focus on the increased production of hydrogen and use across the economy, including for transport

We will invest £3 million in 2021 to establish the UK's first multi-modal hydrogen transport hub in Tees Valley

Future transport – more choice, better efficiency

We will take action to increase average road vehicle occupancy by 2030

We will publish guidance for local authorities on support for shared car ownership and shared occupancy schemes and services

We will support car clubs to go fully zero emission

We will consult on a Mobility as a Service Code of Practice

We will use national e-scooter trials to understand their environmental impact, safety, and mode shift potential to evaluate whether they should be legalised

We will reduce the barriers to data sharing across the transport sector

We have launched a new annual statistical release and guidance about transport's impact on the environment and support its use by third parties

We will explore the introduction of a new sustainable travel reward scheme supported by businesses, community organisations and charities

We will support transport providers to develop communications campaigns that encourage mode-switch and sustainable transport behaviours

We will encourage and support UK businesses to lead the way in taking action to reduce emissions from their employees' travel journeys through "Commute Zero"

We will identify specific opportunities for decarbonisation through innovation in rural areas in the upcoming *Future of Transport: Rural Strategy*

We will help build a skilled workforce for the future of transport

Supporting UK research and development as a decarbonisation enabler

We will coordinate transport's investment in R&D, collaborating with key stakeholders through our Transport Research and Innovation Board (TRIB)

We will update our Areas of Research Interest (ARIs) and publish our new DfT Science Plan by summer 2021

Introduction

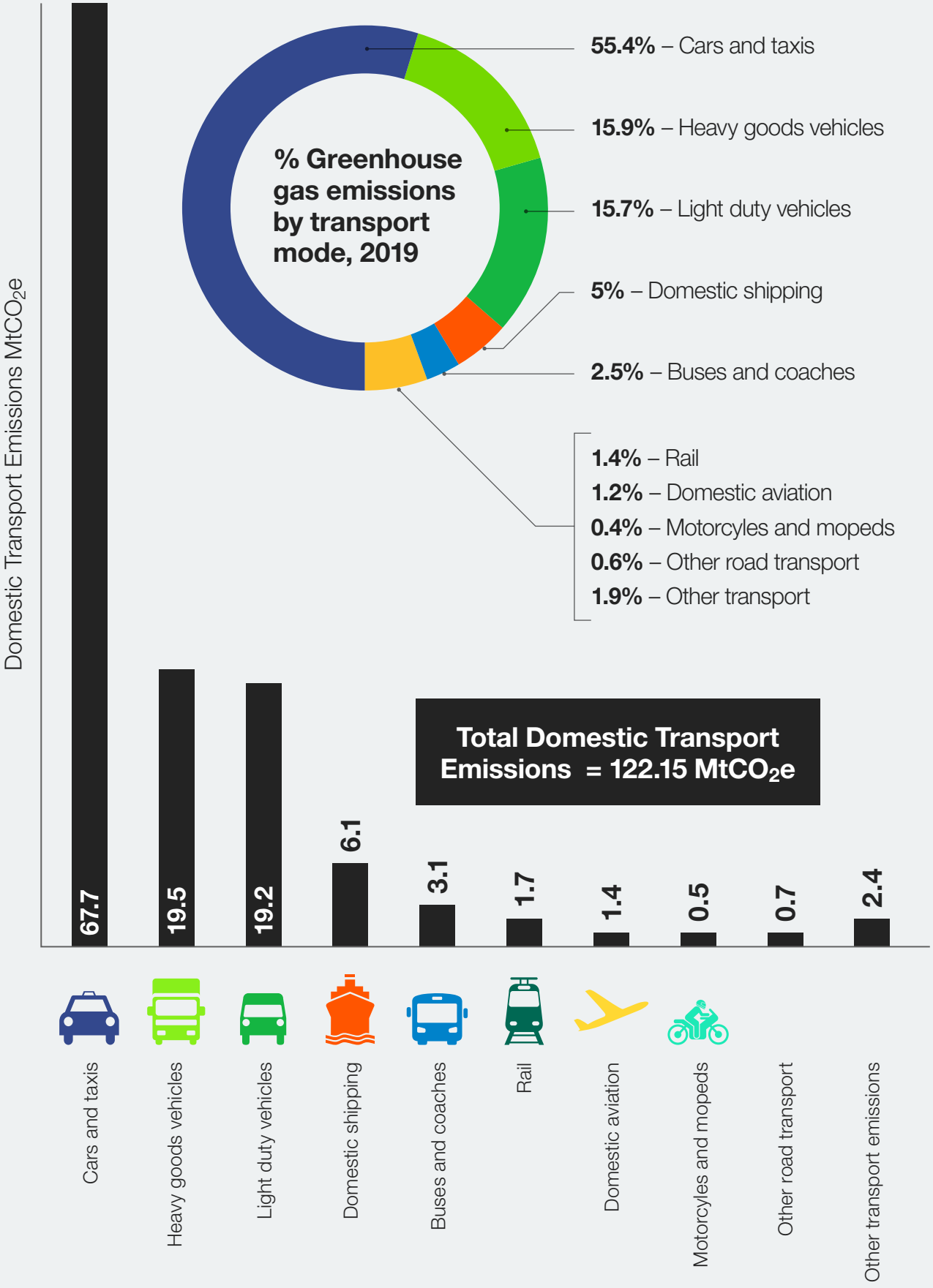
The UK is a climate leader: the first major economy to set legally binding carbon budgets, amounts by which greenhouse gas emissions must come down, and by when. We were the first major economy to legislate to end its contribution to climate change. By law the UK's emissions must now be net zero by 2050.[4]

Over 130 other nations have now set ambitious net zero targets. Now we all need to deliver.

In November, the UK will host the 26th United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP) in Glasgow. At this meeting, potentially one of the most important events in recent history, almost every country in the world will be represented. They will decide whether to deliver, and whether humanity takes what many believe to be its last best chance to get runaway climate change under control. As the president and host of the conference, the UK's own intentions and commitments will significantly affect the chances of an ambitious global deal.

Transport is the largest contributor to UK domestic greenhouse gas (GHG) emissions, responsible for 27% in 2019.[5] International aviation and shipping are not included in this figure. Domestic GHG emissions from transport have been broadly flat for the last 30 years, even as those of other sectors have declined. Better engine efficiency has been made up for by increasing numbers of journeys; the growth of electric and hybrid vehicles has been made up for by the growth in diesel and petrol SUVs. We must deliver a step change in the breadth and scale of our ambition on transport emissions to reach net zero. The measures we use to decarbonise transport must also deliver the vast wider benefits available during this change, improving air quality, noise, health, reducing congestion and delivering high-quality jobs and growth for everyone right across the UK. The need to limit global warming to well below 2°C and to pursue efforts to limiting to 1.5°C means the UK Government is committed to moving as far, and as fast, as possible. This is about the pace of change as well as the destination.

UK domestic transport emissions 2019[6]



"Decarbonising Transport: Setting the Challenge", published in March 2020, brought together existing work to reduce emissions across all forms of transport, and for the first time laid out the scale of the additional reductions needed to deliver transport's contribution to legally binding carbon budgets and delivering net zero by 2050.[7]

Sixteen months on, this plan sets out how we will deliver those emissions reductions and the associated benefits that will be realised from it across the UK. We have engaged extensively with a large range of stakeholders to inform development of this Plan including through virtual workshops, written contributions, online feedback, and the Net Zero Transport Board.

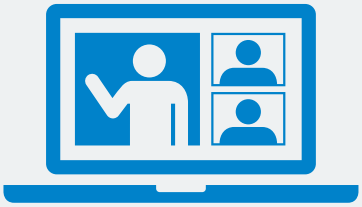
Stakeholder engagement

Over 300 written submissions and evidence on measures needed to decarbonise transport.

Over **7000 responses** received through a public Online Feedback Opportunity.

8 workshops with **49 local government representatives.** Supported by an online survey for local authorities.

59 virtual policy workshops **on our six key strategic priorities** with knowledge experts, innovators, businesses, NGOs and civil society representatives.



Formed the Net Zero Transport Board (NZTB) which is a Ministerial-led external advisory board providing independent, objective and impartial advice on transport decarbonisation to the Department for Transport.

Given the rate of technological advancement and uncertainty in the precise mix of future zero emission solutions, and the probability of significant changes in travel behaviour over the years ahead, this plan cannot precisely plot each individual step to fully decarbonising transport modes over the next 30 years. It does however set out a series of actions and timings that will decarbonise transport by 2050 and deliver against carbon budgets along the way. The Government has committed to stretching carbon reduction targets up to the end of the Sixth Carbon Budget in 2037 and by 2050. As the largest emitting sector, transport will need to make a sizeable contribution if these targets are to be met. Depending on progress in the sector at some points this may require additional targeted action (such as steps to reduce use of the most polluting cars and tackle urban congestion) to enable these targets to be met. We will regularly review progress against our targets, continue to adapt and take further action if needed to decarbonise transport. We will publish our progress and review our pathway at least every five years.

COP26

The threat of climate change demands a step change in both the breadth and scale of ambition globally, as well as domestically. In November 2021, the UK will host the UN's annual climate change conference, COP26, in Glasgow, where the UK's leadership in tackling climate change, including in transport, will be showcased on a global stage.[8]

The UK will continue to work with all to increase climate action, build resilience and cut emissions. We will bring together governments, cities, industry, businesses, and civil society to deliver shared high ambition and accelerate the shift to zero carbon transport.[9]

Four other documents are published alongside this strategy – the Jet Zero Consultation, the non-zero emission HGV Phase-Out Consultation, our Green Paper on a New Road Vehicle CO_2 Emissions Regulatory Framework for the United Kingdom and the Rail Environment Policy Statement. This plan, and the other documents we publish today, are a beginning, not an end. They are part of a series of policy announcements – including further announcements on transport – in the run-up to COP26 and beyond. These will include an overarching net zero strategy covering all sectors of the economy. It will set out Government's vision for transitioning to a wholly net zero economy and how we intend to make the most of the new opportunities for growth and employment it brings to all parts of the UK.

Structure of this document

Part 1 presents our path to net zero transport in the UK, the wider benefits it can deliver, and sets out the principles that underpin our approach to delivering it.

Part 2 sets out our commitments and the actions needed to decarbonise transport.

Scope

This plan considers GHG emissions produced from use of the UK's transport system – which are aligned with statistics on transport GHG emissions by source category. Modelling of future emissions is on this basis (excluding military aviation and shipping). Low carbon fuel emissions are generally reported as zero emission (except where there are fossil elements) in line with carbon budget accounting rules.[10]

GHG emissions from associated infrastructure, such as stations, ports and airports are not included in modelling, but are covered in the relevant sections of the document. Emissions associated with transport construction are out of scope of this document but are considered elsewhere (see below). GHG emissions associated with power generation and distribution for transport are considered in the Energy White Paper.[11]

Our detailed plans to enhance resilience to climate change risks across road, rail, ports, and aviation are contained in the UK's National Adaptation Programme.[12] The transport sector is well represented in the organisations reporting under the Adaptation Reporting Power. Under this power key organisations report on the steps they are taking to prepare for climate change, and the current list includes strategic airport operators, harbour authorities and road and rail organisations.

As the UK Government is responsible for a number of policies and programmes which affect transport sectors across the UK and internationally, some aspects of this plan apply to the UK as a whole. In other areas, where transport policy is devolved and responsibility rests with the Scottish Government, Welsh Government and Northern Ireland Executive, the proposals in this plan apply to England only. As the Transport Decarbonisation Plan is implemented we will continue to consider the views of stakeholders from across the United Kingdom. We will engage closely with devolved administrations in delivery of the Plan, respecting areas of devolved competency, as we jointly work towards our shared goals of decarbonising transport across the UK and achieving net zero UK-wide.

Leadership and climate action at a local level is also crucial. The vast majority of all transport journeys are local. We will continue to collaborate with local authorities and other regional bodies to identify and support local solutions across the UK.

Managing whole life carbon in transport infrastructure

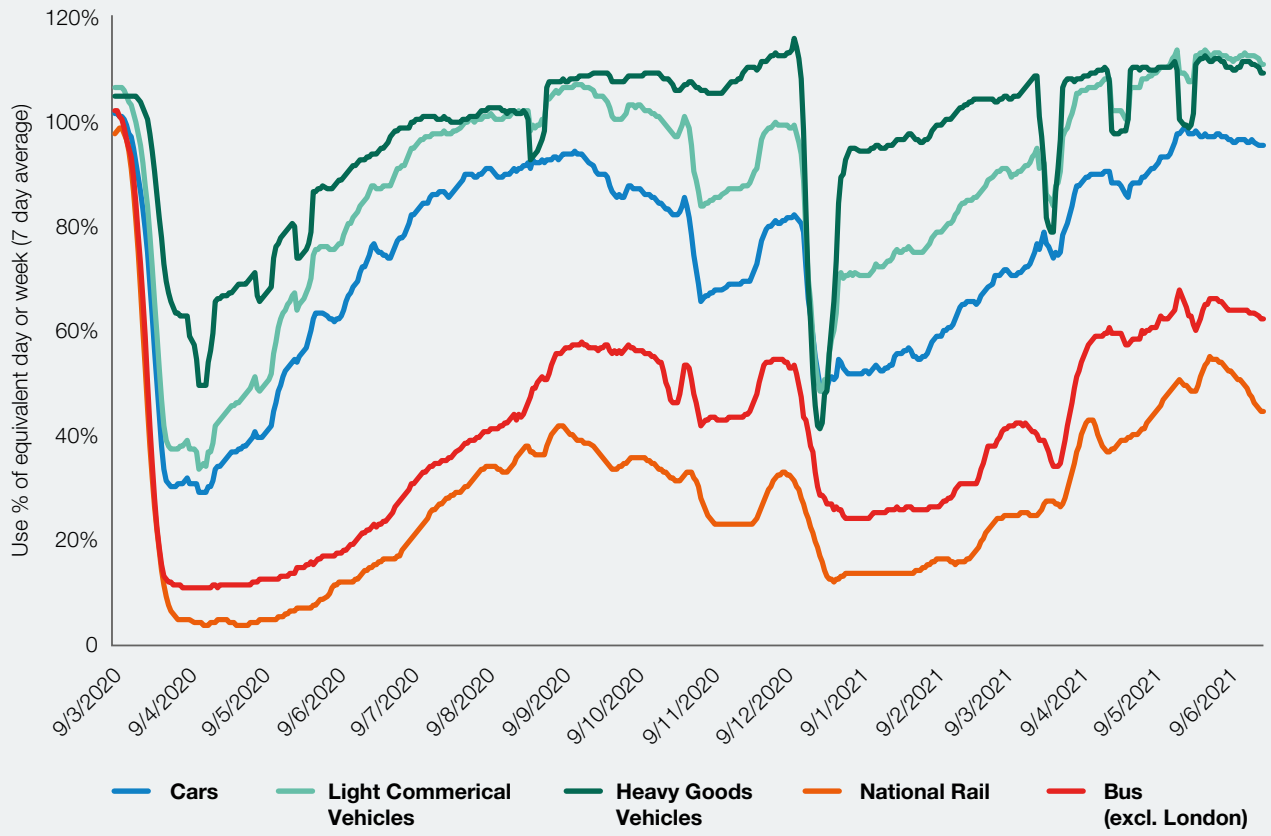
Alongside this plan, the Department for Transport (DfT) has initiated a Carbon Management Programme to embed an integrated system for managing whole life carbon of infrastructure projects at a portfolio level. The framework will include capital carbon, i.e. emissions associated with the creation or major modification of an infrastructure asset and be guided by the principles of PAS 2080 – the foremost industry-wide standard for carbon management.

This change programme will support high level decision making and project development within the Department to ensure transport plays its fullest role in the economy reaching net zero. It will guide DfT's Arm's Length Bodies' existing and future plans for carbon management and be delivered in close collaboration with key initiatives and partners, such as the Transport Infrastructure Efficiency Strategy. This is complemented by wider government efforts to reduce emissions from construction, as set out in the National Infrastructure Strategy and Construction Playbook. Reducing the embodied emissions associated with transport, for example, the materials used in construction and the manufacture of vehicles, is being informed by the Industrial Decarbonisation Strategy, and Defra's upcoming review of the End-of-Life Vehicles Regulations. In Defra's 2021 Waste Prevention Programme, Government also set out plans to explore means of increasing reuse, repair and remanufacture, in addition to design considerations such as light weighting, to further reduce waste and emissions in respect of road vehicles.

Impacts of COVID-19 and our response to the pandemic

COVID-19 has had an unprecedented impact on transport use, travel patterns and the transport sector as a whole. Total trips have dropped significantly. More recently road transport use appears to be returning to pre-pandemic levels, but public transport usage is still to regain these levels.

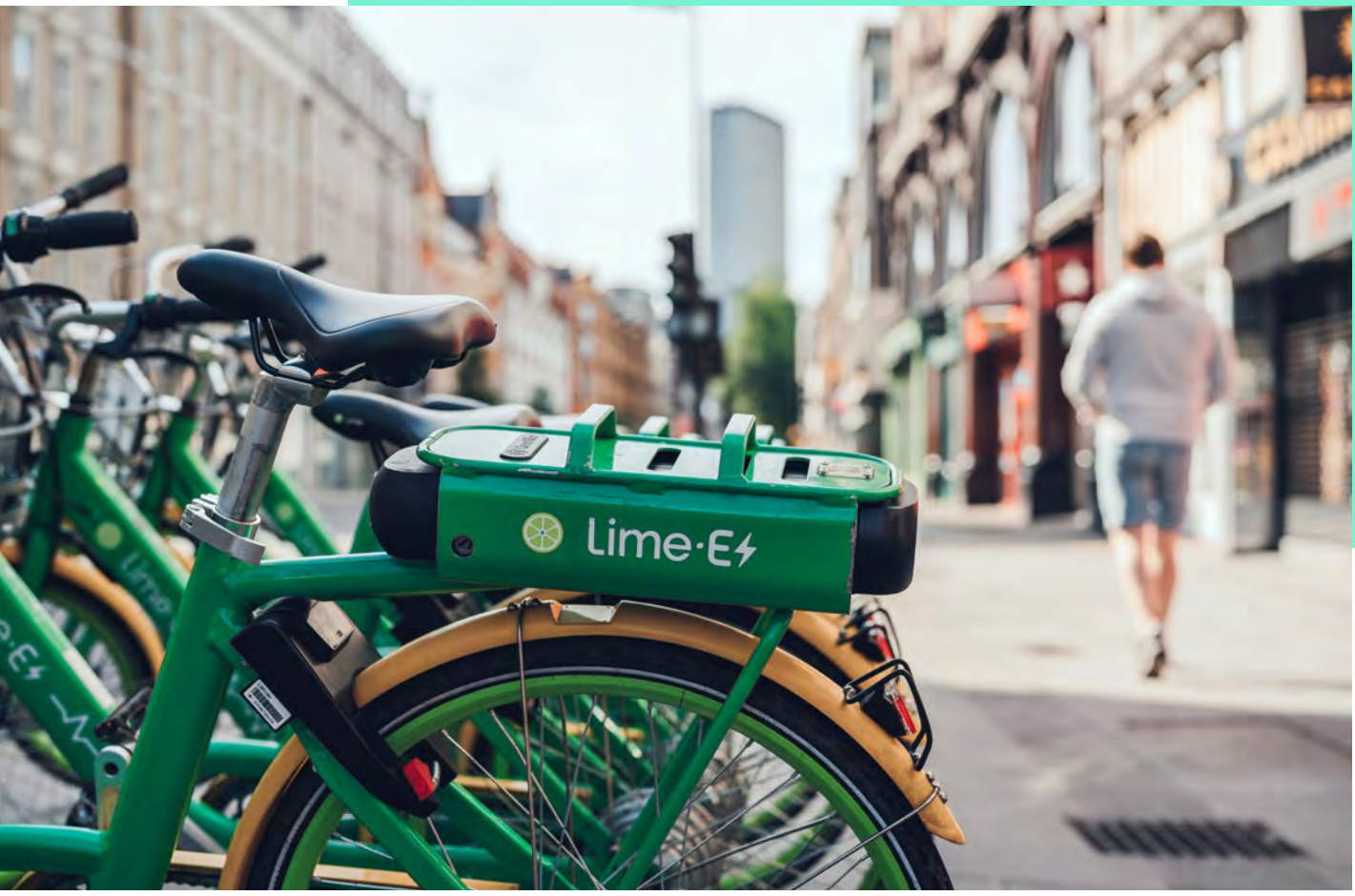
Figure 1: Transport usage by selected modes since March 2020[13]

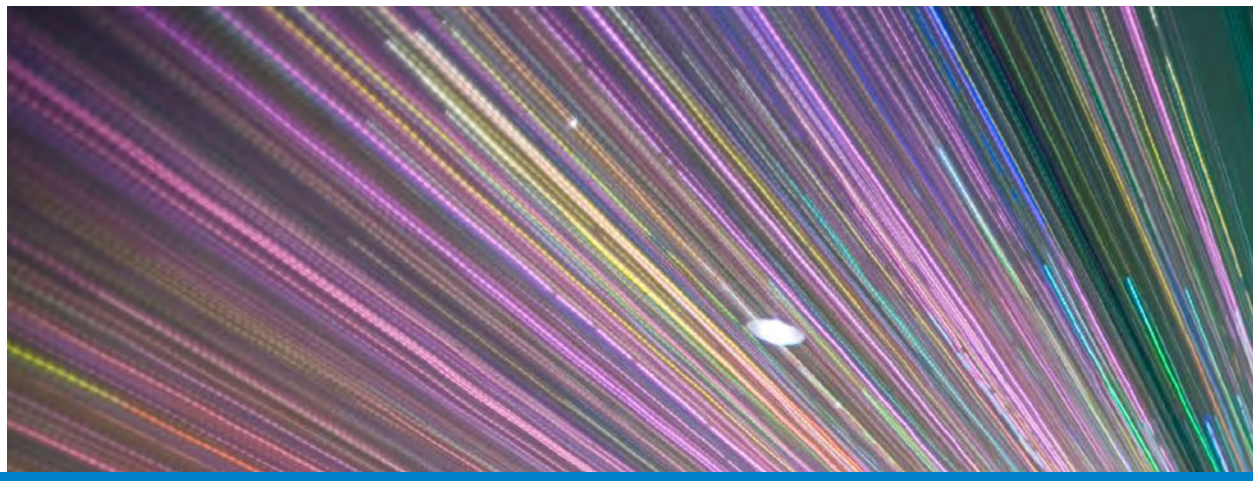


Last year, we commissioned research (see Part 2) to understand the impact of COVID-19 on current and future travel choices. It now seems likely some of the necessary short-term changes brought about by the pandemic, including the rise of home working, could remain for the longer-term and could become permanent shift in travel habits. This has created additional uncertainty for projecting forward transport usage and potential carbon emissions.

It seems highly unlikely that the demand, patterns, timings, and modal choices of transport users across all forms of transport will simply return to those of 2019.

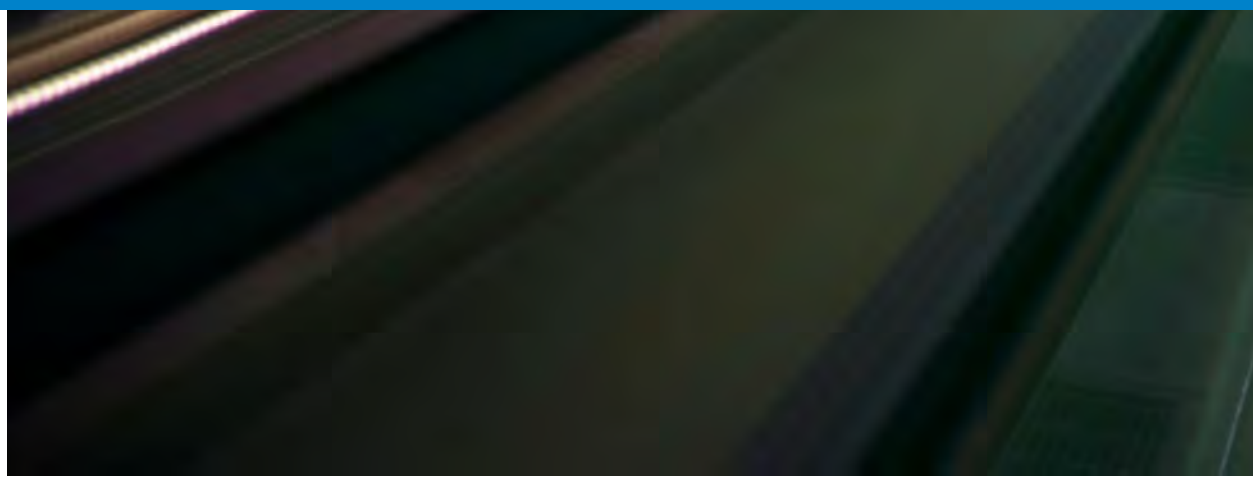
As we build back greener and better from COVID-19, we will make our economy more sustainable and resilient, and design in measures to deliver cleaner air and cut congestion. We have seen an increase in cycling and walking as a result of the pandemic and want to further embed and encourage more sustainable travel habits. While the reduction in use of public transport has been a short-term necessity, we want to ensure a speedy return to public transport and to support a growth in patronage as our rural areas, towns and cities return to life. As described below, we will review our strategic planning policy on national transport networks in the light of changes caused by the pandemic and the policies in this plan.





Part 1

Our path to net zero transport



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Vision: Clean transport is better transport

Much of the change needed to deliver net zero for the transport sector is already underway and makes sense even without the global imperative of climate change.

Decarbonisation will deliver fundamentally better transport, for everyone, every day.

It will make it faster and more efficient, as well as cleaner, and provide huge wider benefits including increased reliability and better connectivity.

There is strong public support for action to remove transport's emissions. Ending transport's damaging contribution to climate change will create better places for us to live and work in, with quieter and less congested streets. Changing the way, we travel has the power to improve the health and wellbeing of the nation.

This is also a huge industrial opportunity, a once in a generation chance to increase economic growth and future prosperity – using electricity, green hydrogen, sustainable low carbon fuels and pedal power – to invest in new jobs across our country.

The need for urgent action on carbon emissions is a catalyst to accelerate these changes and deliver better transport, a cleaner local environment, and modernise our economy.

Decarbonisation requires a rethink of how we invest in transport, technology, and skills. One example is hydrogen, fundamental to achieving net zero in heavy transport applications and a major industrial opportunity. The UK's existing strengths and expertise along its value chain makes us well placed to generate significant quantities of green hydrogen from renewable electricity. Through bold initiatives such as our world first 'hydrogen transport hub' in the Tees Valley,[14] we can now expand our innovation and infrastructure to create critical mass in its production and use.

Tees Valley 'Hydrogen Transport Hub'

Tees Valley 'Hydrogen Transport Hub' brings together government, industry, and academia to focus our future hydrogen research and development, real world testing and demonstrations. The hub will act as a living lab to understand green hydrogen's role in transport decarbonisation, and in the coming year residents of Tees Valley are likely to see the number of hydrogen powered vehicles in the local area increase, as small-scale pilots are launched as part of the Hub's first year of activity. A masterplan for the hub has been published which sets out a vision and a blueprint for the infrastructure and types of trials required to deliver against that vision.[15]

On our roads, the wholesale decarbonisation of vehicles has begun – there are already over 175,000 fully zero emission vehicles in the UK – registrations increasing threefold in 2020 on 2019 – and a further 198,000 plug-in hybrid vehicles.[16] We have announced that the sale of new petrol and diesel cars and vans will be phased out by 2030, and all new cars and vans will be fully zero emission at the tailpipe from 2035.

This plan expands our commitments to reduce and remove the use of fossil fuels from road transport, and to set achievable but ambitious phase out dates for every type of new fossil fuelled road vehicle. When complete, we will have addressed the single biggest contributor to UK transport carbon emissions and eliminated all tailpipe emissions of other pollutants.

Despite the progress we have made at national and local levels, transport remains one of the largest sources of air pollution in the UK, and poor air quality could cost health and social care services in England £5.3 billion by 2035.[17]

Taking forward measures to clean the air around us, and decarbonise transport, will save lives and improve health. There will still be particulate emissions associated with road, rail, tyre, and brake wear, and we are working to tackle those too, but the toxic by-products of burning hydrocarbon fuels will be eliminated from the roadside and rail.

Zero emission roads will be significantly and noticeably quieter. Over half the UK population is exposed to daytime noise levels above recommended limits,[18] resulting in negative impacts on health estimated to cost £7 billion – £10 billion per annum.[19] Zero emission vehicles – extremely quiet at low, urban speeds – will help address this.

Reducing vehicle noise and toxic tailpipe pollution will transform streets and communities blighted by traffic pollution. This will support levelling-up and help reinvent high streets as enjoyable places to live, work, visit and spend leisure time.

Zero emission vehicles have far fewer moving parts than their petrol and diesel counterparts. They are easier and cheaper to maintain, and far more efficient to run. While these benefits will be attractive for the private car owner, they could be transformative for the commercial fleets, freight, logistics, bus, and taxi industries.

Over time, the use of zero emission vehicles will become cleaner still as the use of renewable energy in the UK's electricity mix continues to increase – the carbon intensity of the grid reduced by over 40 per cent in the last five years alone.[20] We are confident the grid can handle the increasing demand from transport and elsewhere – with the market already bringing forward investment in further generation.

A decarbonised transport network does not simply mean changing how we power our vehicles. It means we can make better use of limited road space for all users, and provide more mobility options, especially for short journeys that dominate UK travel.

We cannot simply believe that zero emission cars and lorries will meet all our climate goals or solve all our problems. They will not, particularly in reaching the medium-term Sixth Carbon Budget targets. By its mid year of 2035, the industry body the SMMT estimates that 46% of cars on the roads could be zero emission under a central scenario; percentages for goods vehicles will be lower still. Another risk, until the electricity grid is fully decarbonised, is that carbon savings from electric vehicles are to a partial extent offset if people drive them more. Nor, of course, will zero emission vehicles reduce other harms, such as congestion or road danger, at all.

As well as decarbonising private and commercial road vehicles, therefore, we must increase the share of trips taken by public transport, cycling and walking. We want to make these modes the natural first choice for all who can take them. We want less motor traffic in urban areas. Improvements to public transport, walking and cycling, along with the changes in commuting, shopping and business travel accelerated by the pandemic, also offer the opportunity for a reduction, or at least a stabilisation, in traffic more widely.

Increasing car occupancy and encouraging public transport use are two measures that can immediately cut transport's carbon emissions. They will help tackle chronic road congestion, freeing up road space for those with no alternative but to drive.

And as more of our short journeys (43 per cent of all urban and town journeys are under 2 miles) are cycled or walked, so the carbon, air quality, noise and congestion benefits will be complemented by significant improvements in public health and wellbeing.[21]

Nearly a third of UK children and over 60 per cent of UK adults are overweight or obese, resulting in direct costs to the NHS of over £6 billion a year and wider costs estimated at over £27 billion.[22] Transport has a fundamental role to play in changing this, including through incentivising GPs to prescribe cycling, and by building cycle facilities in towns with poor health. Schemes to enable more people to cycle and walk more often also provide high value for money against investment.[23]

Millions more people are walking and cycling following COVID-19, and progress has already been made towards our target that active travel should make up at least half of all journeys in towns and cities by 2030. Last July, backed by £2 billion of new funding, our "Gear Change" White Paper and new design standards set a new level of ambition for cycle schemes. More than 300 cycling and walking schemes have already been delivered on the ground. Polling and the recent local election results have consistently shown that they are supported by the public, and court challenges to them have failed. Thanks in part to these schemes,

Co-benefits

Air quality

Noise

Congestion

Health

Jobs & growth

millions of new people have found the confidence to get cycling. Cycling on roads has risen by 46 per cent in the last year, the biggest rise in post-war history and possibly ever.[24] In the next few weeks, we will set out further policies to cement the growth of cycling and ensure that its success continues. We recognise that some traffic reduction measures are contentious, so we will also require more rigorous consultation on them, typically proper polling, so that the views of communities are fairly reflected.

Buses are the easiest, quickest, and cheapest way to improve public transport. Our National Bus Strategy, this March, charted a new path towards: lower, simpler fares, more frequent buses, services which are easier to understand and use, more bus priority lanes and thousands more zero emission buses. This will be backed by £3 billion of new funding over the current Parliament. Local authorities have been asked to submit Bus Service Improvement Plans by this October, with the improved networks taking shape from April 2022.

The benefits of decarbonisation do not stop with roads. Rail is already the greenest form of motorised transport, with almost 38 per cent of the network electrified and more to come. In May, the Williams-Shapps Plan for Rail set out our strategy to grow the network, make it easier to use, and simpler and cheaper to run. Electrified trains are faster, quicker to accelerate, more reliable and much cheaper to run. There will also be a role for new traction technologies, like battery and hydrogen trains, on some lines where they make economic and operational sense. We will achieve net zero greenhouse gas emissions from trains by 2050, transforming rail journeys within a generation.

And for those areas of transport where the technology pathway to zero emissions is not yet certain, such as aviation and maritime, the same message applies: the move from 20th century, hydrocarbon-based combustion technologies to clean zero carbon ones will deliver a whole host of additional benefits and new opportunities. With global action underway the race is on to lead these sectors. Our R&D support coupled with our drive to decarbonise transport, will put the UK at the forefront.

Across every form of transport, decarbonisation and growth will go hand-in-hand. The technologies cleaning up transport on land are transferring to our waterways and skies. And the bolder the UK is in its leadership, the greater the opportunities for our world leading science, technology, engineering, and business communities. That is why we will consult on the feasibility of domestic waterways and domestic air travel being net zero emission in advance of the economy wide 2050 target.

And the imperative to decarbonise brings with it a host of other benefits, including new business models, new modes, increasing levels of autonomy, far better integration, and a blurring of the distinction between traditional forms of transport, as well as public and private travel coming together to offer greater choice and flexibility about how and when to travel from place to place.

Data remains a key enabler. Providing better data and information for example to commuters means they can make better decisions about their regular journeys.

Goods and services will reach us more quickly through an integrated and digital network, that is not just clean, but increasingly automated and better equipped to meet user demands. Truly embracing digital technology throughout will keep businesses competitive, the sector resilient and empower users.

Our vision for decarbonised transport not only sets a path to net zero emissions; it is also a vision for a transport system fundamentally better in every way, improving journeys, encouraging growth and opportunity, and boosting the health of the nation.

Fundamentally better means transformational changes, but, whilst challenging, this is not impossible. The Government has a clear role to play, but we cannot and should not deliver this vision alone. Success will require us working in partnership with the public, industry, business, and academia; and our world-class scientists, engineers and entrepreneurs put us in the best position to lead the world in this transition.

The challenge now is to deliver it at pace not just to achieve the necessary cuts in the UK's greenhouse gas emissions, but also to allow the entire country to access the huge wider benefits that will accompany it.

The current transport system places wider costs on society, that we are seeking to address[25]

Air pollution

Costs to **health and social care** could reach **£5.3 billion** by 2035

Climate change

The Stern review estimated the overall **costs of unmitigated climate change** to be equivalent to **5-20% of global GDP** each year

Noise

It's estimated that the annual **social cost of urban road noise** in England is **£7 to 10 billion**

Health and obesity

The UK-wide NHS costs attributable to **overweight and obesity** are projected to reach **£9.7 billion by 2050**.

£49.9bn

With **wider costs to society** estimated to reach **£49.9 billion** per year.

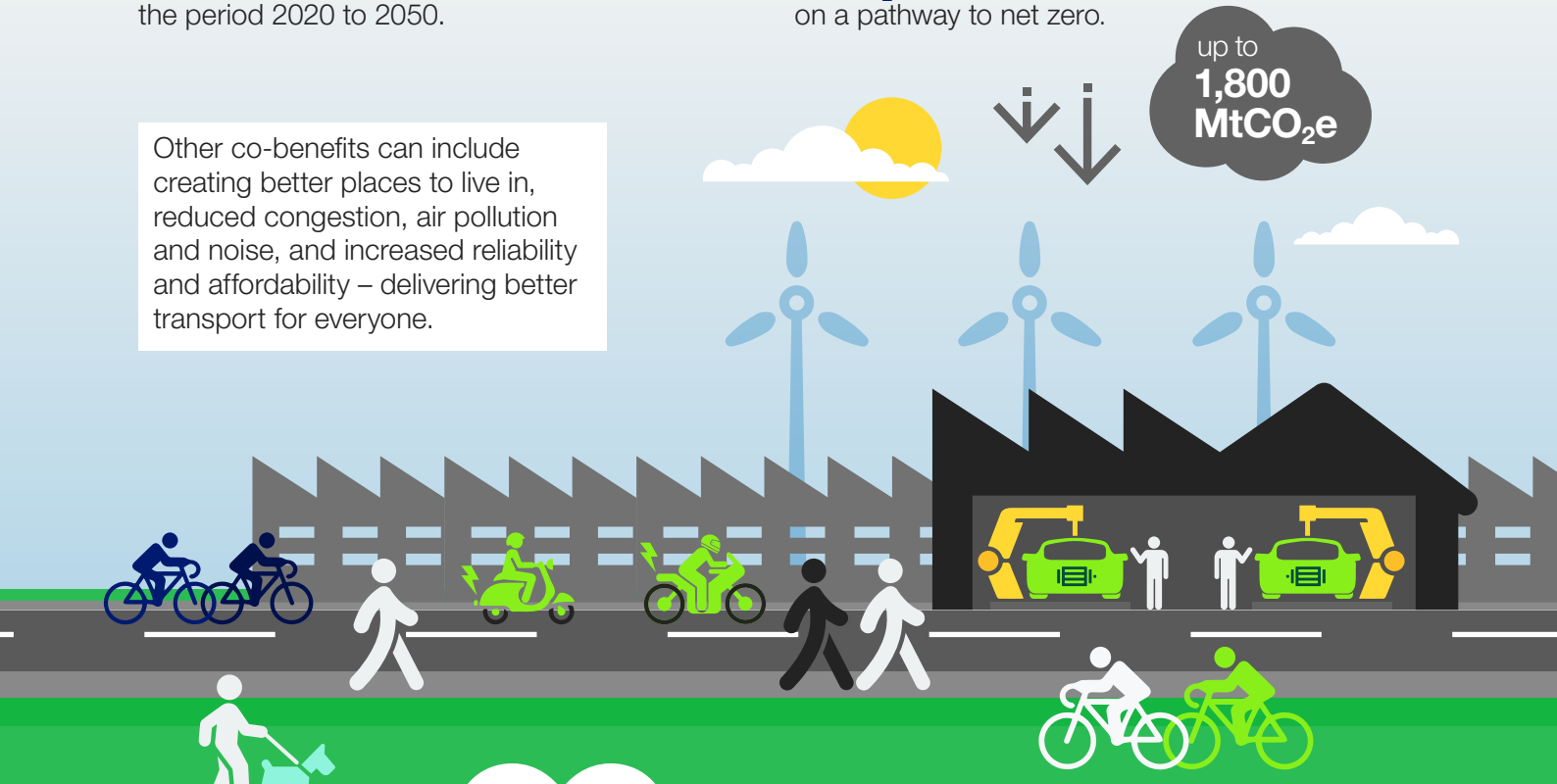
In thinking of how to decarbonise transport, we also look to address these challenges[26]

Air quality

Projections in this Plan will deliver significant benefits from improving air quality. These have been estimated at up to **£9 billion** over the period 2020 to 2050.

Reducing emissions

Over the period from 2020 to 2050 this Plan could deliver from **1,300–1,800 $MtCO_2e$** savings, getting transport on a pathway to net zero.



Other co-benefits can include creating better places to live in, reduced congestion, air pollution and noise, and increased reliability and affordability – delivering better transport for everyone.

Health

£8.2bn

Physical inactivity costs the NHS up to **£1 billion** per annum, with further indirect costs of **£8.2 billion** – active travel can reduce that.

Jobs and growth

Decarbonising transport will lead to thousands of jobs being created in transport related green industries. The production of zero emission road transport vehicles has the potential to support **72,000 jobs**, worth up to **£9.7 billion GVA** in 2050.

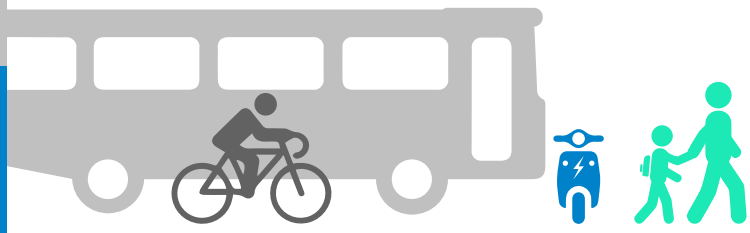
72,000 jobs

1b

How will we deliver this? Our themes to 2050

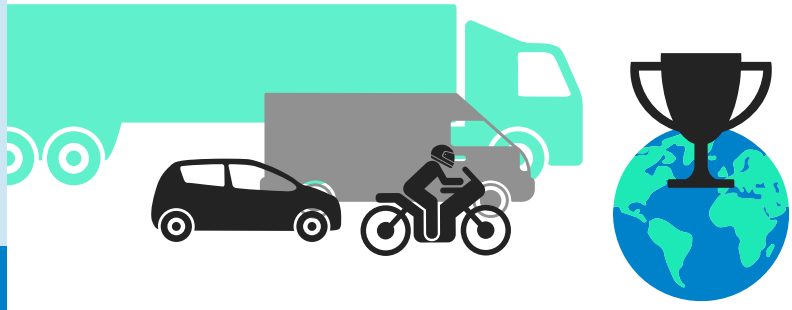
Strategic Priorities

1. Accelerating modal shift to public and active transport



- Public transport and active travel will be the natural first choice for our daily activities.
- We will have a cohesive, widely available, net zero public transport network designed for the passenger
- We will use our cars differently and less often, with new technology helping reduce our carbon footprint

2. Decarbonising Road Transport



- We will phase out all new non-zero emission road vehicles, from motorbikes to HGVs, by 2040*
- Delivered by a world leading regulatory framework and support packages, leading the global race to zero emission road transport
- We will ensure infrastructure will not be a barrier to the zero emission transition

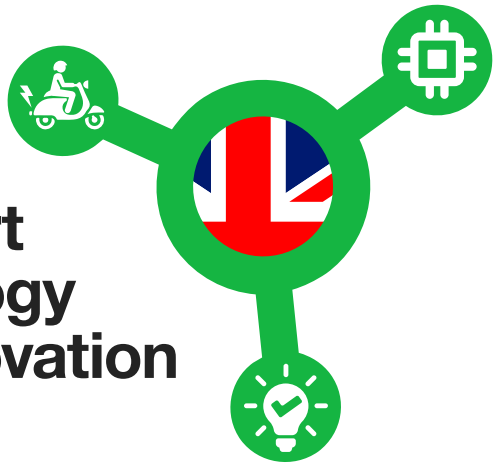
3. Decarbonising how we get our goods

- We will decarbonise our freight system, pioneering new zero emission technologies with mass scale demonstrators for HGVs
- Increasing amount of freight will shift from road and air to more sustainable modes, with digital solutions and data sharing optimising efficiency
- The last mile will be decarbonised and places will have the logistics solutions best suited to their specific needs

Our strategic priorities reflect the themes and view of the future we will pursue to decarbonise our transport system before 2050. These were set out in Decarbonising Transport: Setting the Challenge last year and remain valid as we recover from the COVID-19 pandemic.

4.

UK as a hub for green transport technology and innovation



- We will lead the modern industrial revolution through UK transport, becoming the internationally recognised leader in green technology, innovation, science and research
- We will harness the opportunities from green innovation and technology to drive UK productivity growth and create new jobs

5.

Place-based solutions to emissions reduction

- By 2050 every place in the UK will have its own net zero transport network
- We will reform the way local transport infrastructure is funded to drive decarbonisation at a local level
- All places will have the ability to take bold action to decarbonise transport, to radically change how people travel and level up the UK

6.

Reducing carbon in a global economy

- UK aviation will meet net zero by 2040* and UK shipping by 2050
- We will ensure the impact of aviation on the environment is significantly reduced and by 2050, zero emission ships will be commonplace globally
- We will continue to lead international ambition, co-operation and collaboration

*Subject to consultation

Priority 1: Accelerating modal shift to public and active transport

Increasing the share of journeys taken by cycling and walking does not rely on any technological breakthrough, delivers a host of co-benefits and is fundamental to any good local transport plan. With better quality infrastructure through high quality road design, dedicated routes, and networks, and enabling people to access cycles, people will feel safer and more confident walking and cycling for more and more short journeys.

A cohesive, integrated, and affordable net zero public transport network, designed for the needs of the passenger, will empower users to make sustainable end-to-end journeys and enable inclusive mobility. Zero emission buses will link communities with each other, town centres and the wider transport network. A modern, net zero rail network will connect the country and regions, serving commuters, holiday-makers and business travellers alike with a faster, cleaner, and more reliable rail service fair for all. We must make buses and trains better value and more competitively priced. Starting with bus fares outside London we want simpler, cheaper flat fares that you can pay with a contactless card, with daily and weekly price capping across operators. Affordable fares and season ticket caps will continue to be protected on the railways.

Where the car remains attractive for longer journeys, it will face competition from high-speed decarbonised rail and zero emission coaches offering affordable alternatives.

Embracing new ways of sustainable travel, such as e-cycles and other emerging technologies, will create opportunities for more people to travel this way and foster new alternatives for journeys too time consuming, or too long, to previously walk or cycle. Innovation is driving this change fast, with new operating models transforming traditional transport services.

Priority 2: Decarbonisation of road vehicles

The technology transformation kick-started in cars and vans will happen in all road transport. A fleet of fully zero emission road vehicles will remove the source of 91% of today's domestic transport GHG emissions.[27] Ambitious phase out dates for the sale of new non-zero emission vehicles, from scooters and motorcycles to 44 tonne trucks will be underpinned by a new, world-leading, regulatory framework and a package of support for drivers and vehicle manufacturers, as set out in the Prime Minister's Ten Point Plan for a Green Industrial Revolution last year.

Infrastructure will be no barrier, instead an opportunity for new energy business models to thrive, helping drivers and businesses reduce their bills. An extensive network of charging and refuelling infrastructure for all vehicles will enable the transition, meeting consumer demand, so drivers can embrace the technology and realise the benefits.

Low carbon fuels will continue to play a crucial role in maximising carbon savings from road vehicles during the transition, whilst increasingly being required in other transport modes such as aviation and maritime. As demand for existing petrol and diesel blends decreases, these fuels will continue to support the decarbonisation of older road vehicles (and in niche applications with limited alternatives), including by increasing the low carbon fuel content where possible and in the longer term low carbon fuels that are net zero.

Priority 3: Decarbonising how we get our goods

The UK will scale-up and roll-out new technology across the sector, including hydrogen, embracing innovation and capitalising on new industrial opportunities, as well as making best use of existing zero emission technologies and fuels. UK-based innovators will scale up and export efficient business models, creating regional and global leaders.

A shift to zero carbon modes of transporting goods and services, including greater use of rail and domestic maritime, will make our freight system net zero before 2050. Greener and more efficient, this will provide wider environmental benefits for everyone.

By 2030, larger zero emission road freight vehicles will be on our roads in increasing numbers. The last mile will be largely decarbonised through new delivery models, supported by accurate data and digital innovations driving greater efficiencies.

By the 2030s, HGVs will be increasingly zero emission and cities will have the logistics solution that best fits them, allowing places to become more people-centred while still delivering goods rapidly and reliably. Short stretches of electrification will significantly increase the amount of electrically hauled rail freight. By 2050 all rail freight will be net zero, and we will have increased the capacity to move more goods by rail.

Priority 4: Place-based solutions

Every place in the UK will have its own net zero emission transport network before 2050, serving the unique needs of its communities. Sustainability will be at the heart of levelling-up. People everywhere will feel the benefits – villages, towns, cities, and countryside will be cleaner, greener, healthier, and more prosperous and pleasant environments in which to live, work and enjoy.

Radical change will come from empowering and supporting local leaders, harnessing the strengths and expertise of local authorities, mayoral combined authorities, Sub-National Transport Bodies, the devolved administrations and local interest groups, all of whom have a crucial part to play.

Local authorities will have the power and ambition to make bold decisions to influence how people travel and take local action to make the best use of space to enable active travel, transform local public transport operations, ensure recharging and refuelling infrastructure meets local needs, consider appropriate parking or congestion management policies, initiate demand responsive travel, as well as promoting and supporting positive behaviour change through communications and education.

We will better coordinate local transport funding by engaging local areas about their investment priorities in the round, achieving key objectives such as decarbonisation through better strategic planning and more joined up infrastructure projects.

Priority 5: UK as a hub for green transport, technology, and innovation

The UK will play a leading role in this modern-day industrial revolution consolidating our position as an internationally recognised leader in green technology, science, and research. Green innovation will support UK productivity growth, increasing access to markets and skills, creating new jobs and trade. This will be underpinned by clear R&D programmes and support to demonstrate, test, and evaluate innovations in the real world.

The UK will seize the unique opportunities driven by advances in data science and artificial intelligence to transform the way people, goods and services move. Leading the global race to zero emissions will maximise our economic advantages and attract new investment (particularly in automotive battery production) and jobs in the UK.

The UK can also lead the deployment of wider future of transport technologies enabling the development of mobility as a service solutions that can reduce car dependency and drive a shift onto a better-connected multimodal transport system. Ridesharing and cycle hire schemes, car clubs, on-demand buses and ride hailing will all provide choice, increasing flexibility and reducing reliance on private vehicles.

Priority 6: Reducing carbon in a global economy

UK aviation and shipping will achieve net zero emissions by 2050. Ahead of that, our domestic lead will act as a showcase to the world and bolster our call to action internationally, where co-operation and collaboration through the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO), will continue to be vital to decarbonise these industries.

The UK will significantly reduce the impact of aviation on the environment through a combination of new aerospace technology such as electric and hydrogen aircraft, development and commercialisation of sustainable aviation fuels, operational efficiencies, and market-based measures. By continuing to build our capability and investing in R&D in the early 2020s, the UK will empower innovation in the sector.

The UK will play an important role in the development and deployment of zero emission maritime technology, particularly where we have significant market share and can build on domestic expertise to capture early market share, such as small craft. Through demonstration at scale in the 2020s of the safety and reliability of technology, the UK maritime industry will sail ahead on a clear trajectory to net zero emissions before 2050.

1c

The impact of this plan on transport's emissions


BIO

Decarbonising Transport GHG projections for UK domestic emissions

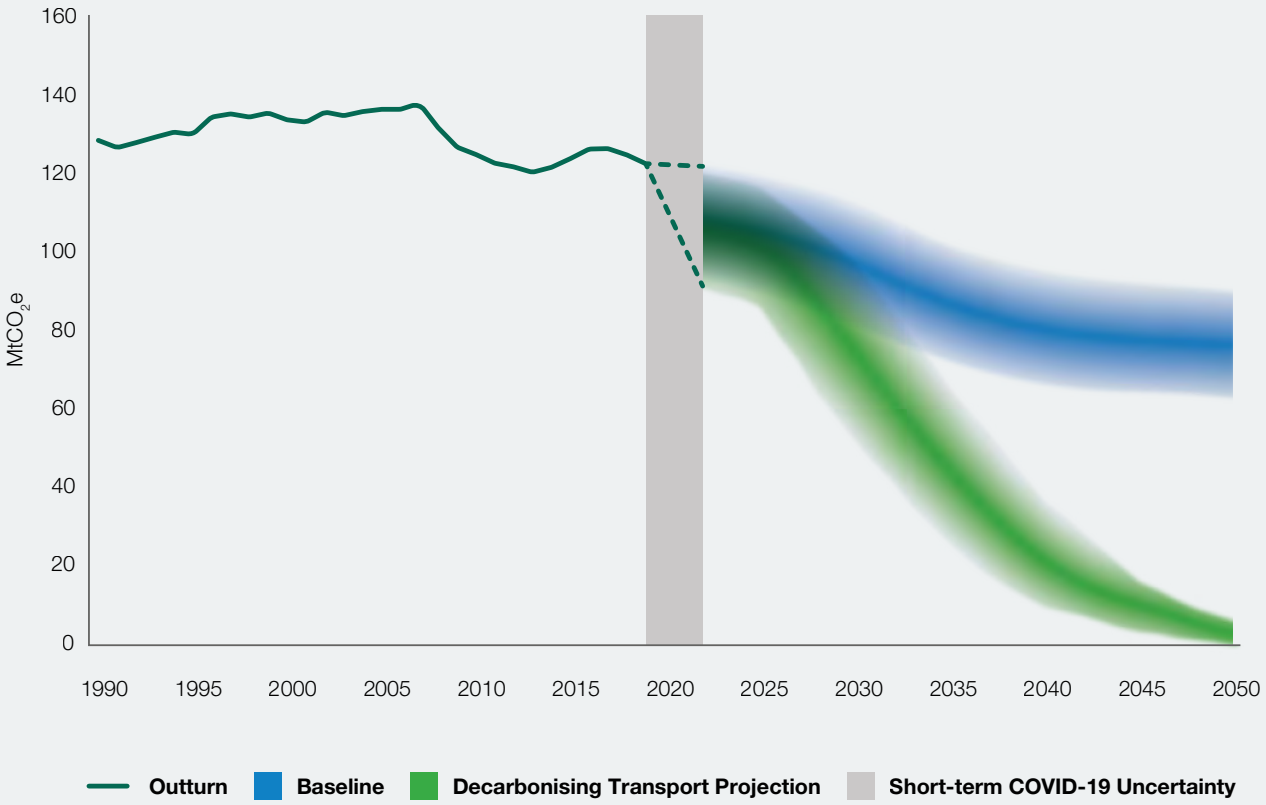
Projections of UK domestic transport GHG emissions out to 2050 based on the policies and ambitions laid out in this plan are provided below alongside an updated baseline trajectory (based on current government policy). This plan provides transport a credible, deliverable pathway to net zero GHG emissions by 2050, as well as delivering transport's contribution to demanding carbon budgets along the way.

Our projections present a range of possible outcomes, but all show significant reductions to 2050. Ultimately, this depends on how quickly zero emission technologies, fuels and efficiency measures are deployed, as well as the impacts of our policies to increase the numbers of journeys made by cycling and walking and on public transport. There are uncertainties on future travel behaviour from changes in how we work and travel, increased connectivity, better technology, and COVID-19.

In our decarbonising transport projections, lower bound emissions for land transport reach zero by 2050. This could be driven by a natural decline in petrol and diesel vehicle use as those markets, and associated infrastructure provision, decline over time. However, reaching the point of actual zero emissions may require additional measures beyond those identified here to support the final transition to fully zero emission surface transport. Similarly, additional measures beyond those identified in this plan may also be required for domestic aviation and domestic shipping. Projecting emissions out to 2050 is inherently uncertain, and technology, behaviour and policy development will continue to evolve. This is why we have committed to the next transport decarbonisation plan within five years, to ensure transport is on the correct pathway to achieve net zero.

As can be seen in the chart there is a wide range of uncertainty around our current projections. Over time, we will continue to develop and refine the range of policies and proposals set out in this plan to ensure that the transport sector fufils its contribution to our legally binding climate targets.

Figure 2: Decarbonising Transport domestic transport GHG emission projections, versus the baseline*



* Historic emissions are from published Her Majesty's Government (HMG) GHG statistics. Our projections are produced using a range of models, including the National Transport Model (road transport), and Traction Decarbonisation Network Strategy (rail), and Aviation model, adjusted for decarbonising transport measures. The shipping baseline and projections are based on the latest analysis by the CCC (https://www.theccc.org.uk/publication/sixth-carbon-budget/), which drew on research commissioned by DfT. Given the emerging nature of zero emission shipping fuels, the projections should be interpreted as possible scenarios for meeting the net zero goal that the Government has announced for the UK maritime sector rather than estimates of the impact of specific policies. Baseline forecasts are not consistent with the 2019 BEIS Energy and Emission Projections (EEP), as these use different methodologies. Where feasible, uncertainty in projections reflects uncertainty on policy design, GDP, fuel prices, trip rates, and historic volatility in emissions. The range in the policy line declines as we move out to 2050, due to a higher proportion of zero emission vehicles. Transport emission projections exclude military aircraft and shipping.

Decarbonising Transport GHG projections including international aviation and shipping

Alongside removing emissions from domestic transport, the Government is committed to cutting emissions from international aviation and shipping. In April, we announced the formal inclusion of international aviation and shipping emissions in our carbon budgets, starting from the sixth carbon budget in 2033.

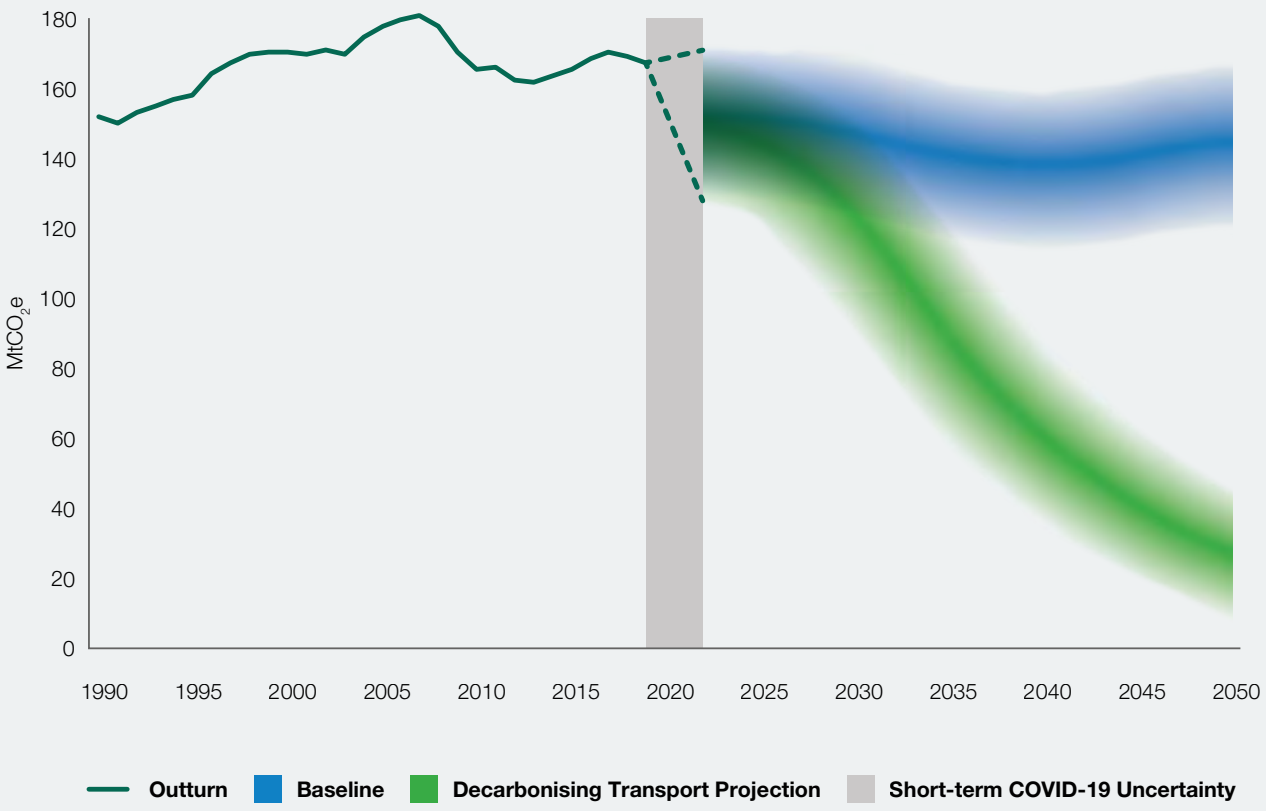
Combining projections for domestic emissions with those for international aviation and shipping show that transport emissions will continue to fall to 2050. Where positive emissions remain in transport sectors these will need to be offset by negative emissions elsewhere across the economy.

However, with the right investment and the emergence of new zero emission technologies, it could be possible to go further and faster, and the Government is keen to maintain an open dialogue with stakeholders on the potential for achieving even deeper cuts in the GHG emissions from international aviation and shipping.

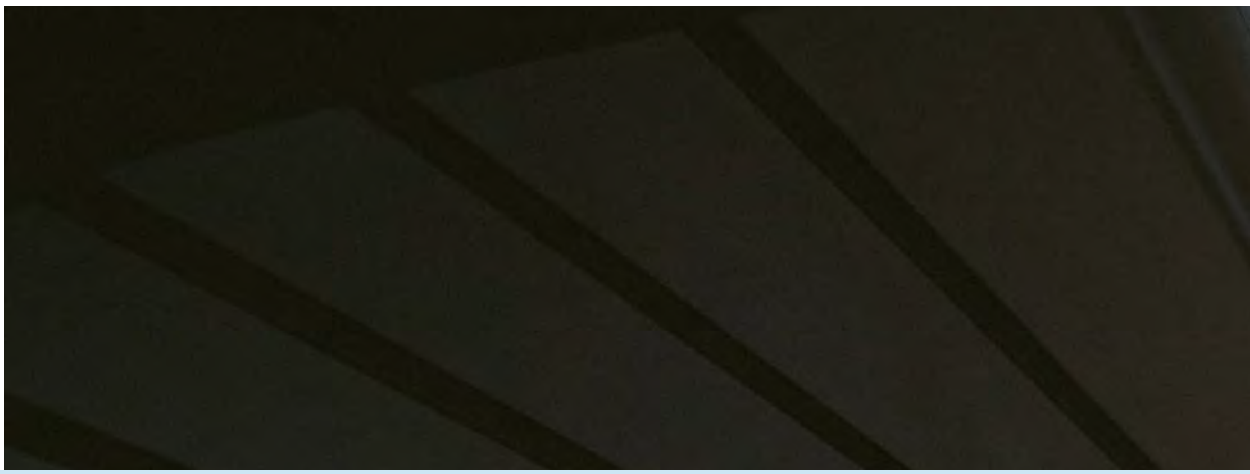
As an example of this, our Jet Zero Consultation, published alongside this plan, will seek views on the potential developments that could bring down the international aviation sector's share of transport's overall GHG emissions, and how the Government can most effectively support the realisation of these opportunities.

We will continue to develop and refine the range of policies and proposals set out in this plan to ensure that the transport sector fulfils its contribution to our legally binding climate targets

Figure 3: Decarbonising Transport domestic and international transport GHG emission projections, versus the baseline*



* See figure 2 note for details of general approach and models used for domestic transport GHG projections. International shipping projections are also based on the latest analysis by the CCC. International Aviation modelling comes from the Aviation model. In line with the CCC's recommended method for including international shipping and aviation emissions in the sixth carbon budget, the projections for international shipping and aviation emissions are based on 'bunker fuel sales', which is the approach currently used for UNFCC reporting, and represent the estimated emissions from fuel sold in the UK for use in international shipping. We will keep the measurement approach to the UK's international shipping emissions under review, and consider the appropriateness of fuel or activity based measures. Where feasible, uncertainty in projections reflects uncertainty on policy design, GDP, fuel prices, trip rates, and historic volatility in emissions. Transport emission projections exclude military aircraft and shipping.



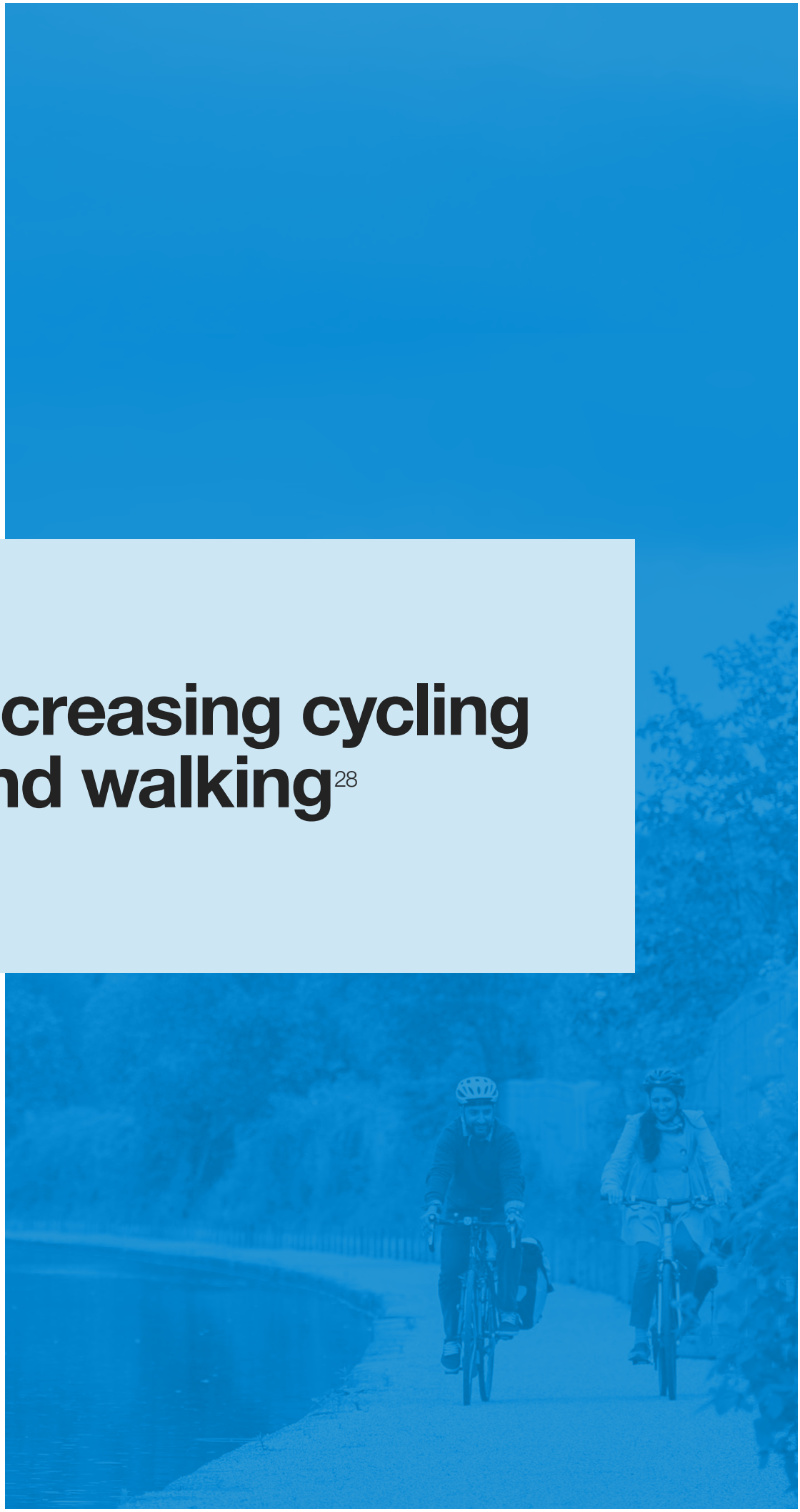
Part 2

The plan in detail: commitments, actions, and timings

2a

Decarbonising all forms of transport

Increasing cycling and walking[28]



£1–4bn
GVA supported in 2050 from manufacture, distribution, sales and repairs of bikes

40k–100k
jobs supported in 2050 from manufacture, distribution, sales and repairs of bikes

1–6
$MtCO_2e$ savings from 2020 to 2050

£20–100m
Air quality benefits by 2050

£2bn

We will invest **£2 billion** over 5 years to deliver a bold future vision for cycling and walking, making it the natural first choice for many journeys

By 2030

We will aim to have **half** of all journeys in towns and cities cycled or walked

By 2040

We will have a world class cycling and walking network in England

Co-benefits:

Congestion

Health

Air quality

Noise

Cycling and walking can help us tackle some of the most challenging issues we face as a society, not just climate change, but improving air quality, health and wellbeing, addressing inequalities, and tackling congestion and noise pollution on our roads. Increased levels of active travel can improve everyday life for us all.

Benefits of cycling and walking[29]

Health

Physical inactivity costs the NHS up to **£1 billion** per annum, with further indirect costs calculated at

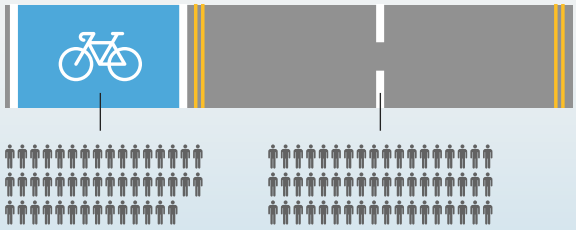
£8.2bn

Wellbeing

20 minutes of exercise per day **cuts risk** of developing depression **by 31%** and increases productivity of workers

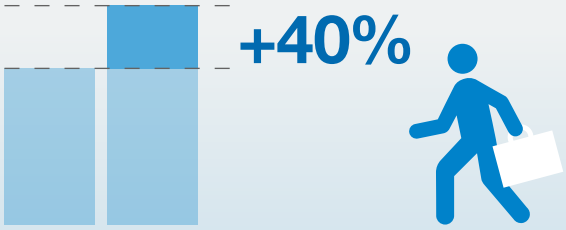
Congestion

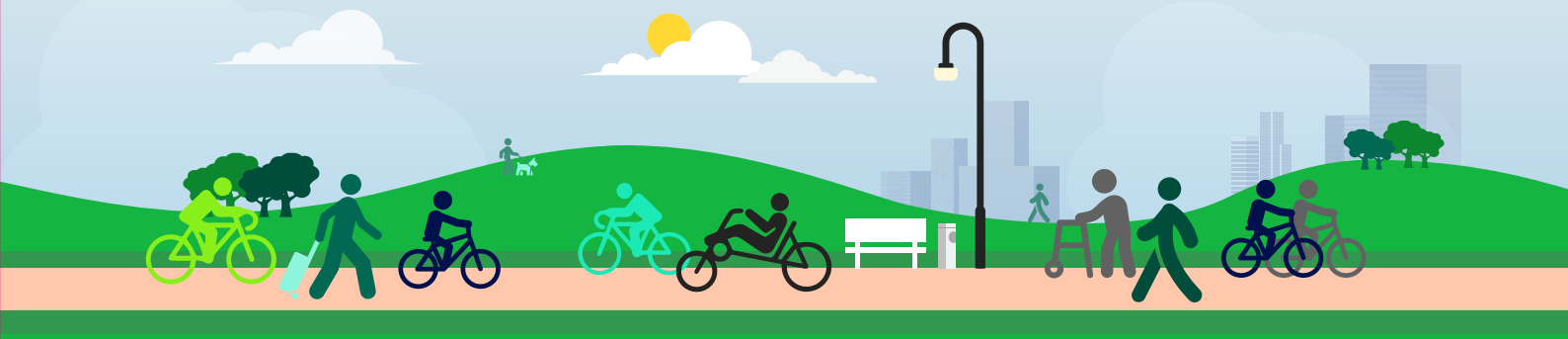
The new east-west and north-south cycle routes in London are moving **46% of the people** in only **30% of the road space**



Local businesses

Up to **40% increase** in shopping footfall by well-planned improvements in the walking environment





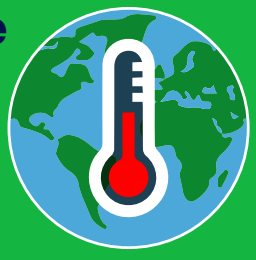
Environmental and air quality

By 2050, future active travel spending is expected to deliver

£20–100m savings from air quality improvements alone and provide opportunities to improve green space and biodiversity.

Climate change

Mode shift to active transport is one of the **most cost-effective ways of reducing transport emissions**



Economy

Bike manufacture, distribution, retail and sales **contributes £0.8 billion** per year to the economy and **supports around 22,000 jobs**.

In July 2020 the Prime Minister launched ambitious plans to boost cycling and walking, with a vision for half of all journeys in towns and cities to be walked or cycled by 2030. The 33 commitments set out in 'Gear Change' are our plan to achieve this and are supported by a £2 billion package of new funding for active travel over five years – the largest ever investment in cycling and walking.[30]

Zero emission transport city

We announced in Gear Change that we would work with a small or medium-sized city to create a zero emission transport system, with extensive cycle lanes, an all-electric (or zero emission) bus fleet, and a ban on nearly all petrol and diesel vehicles in the city centre, with deliveries made to consolidation hubs and the last mile being done by cargo bike or electric van. We will make a further announcement about this shortly.

Bikes do not need to replace a whole car journey. Cycling facilities, such as safer bike routes and more bike parking, will make it easier for people to cycle to their local railway station or high-frequency bus route, giving the same door-to-door travel as a car. E-bikes make it possible to cycle for longer journeys than conventional bikes.

Cycling and Walking Investment Strategy

Targets for delivery for 2025:

- Double cycling from 0.8 billion stages in 2013 to 1.6 billion stages in 2025, where cycling activity is measured as the estimated total number of cycle stages made each year;[32]
- Increase walking to 300 stages per person per year in 2025, where walking activity is measured as the total number of walking stages per person per year;[33] and
- Increase the percentage of children that usually walk to school, from 49% to 55% of children aged 5 to 10 in 2014 in 2025.[34]

Journeys below five miles represented 58% of all private car journeys in 2019 and provide the biggest opportunity for switching short car journeys to cycling and walking offering the potential to reduce the 68MtCO_2e of current car emissions.

Journeys below two miles represented 43% of all urban and town journeys in 2019[31]

Our plans to deliver the necessary carbon reductions:

Commitment

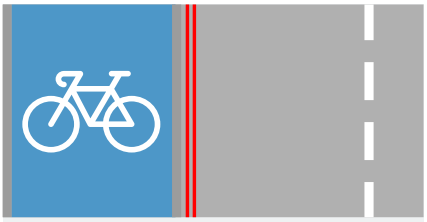
We will deliver the Prime Minister's bold vision for cycling and walking investing £2 billion over five years with the aim that half of all journeys in towns and cities will be cycled or walked by 2030

Through 'Gear Change' Government has committed to improve the safety and quality of our streets and enable people to cycle and walk more. This includes:

- The delivery of thousands of miles of safe, continuous, direct routes for cycling in towns and cities, physically separated from pedestrians and volume motor traffic.
- Creating a new funding body and inspectorate "Active Travel England" to enforce the standards and raise performance generally. This will include becoming a statutory consultee on planning applications for developments above a certain threshold and ensure that every adult and child who wants it can be trained to cycle confidently and safely.[35]
- Supporting the creation of more school streets. This will enable more children to walk and cycle to school safely by closing streets to through traffic and introducing parking restrictions at school pick-up and drop-off times. This will be supported with further investment in cycle training and behaviour change programmes to support cycling and walking to school including Bikeability training and Walk to School Outreach.

E-Cycle Extension Fund

We are providing £1.48 million to nine local authorities through the E-Cycle Extension Fund to enable the increased use of e-cycles (including adapted e-cycles) within their areas with a particular focus on hard-to-reach groups. Pilots range from hire schemes to long term loans and try before you buy schemes and will inform the development of the national e-cycle support programme outlined in the Prime Minister's Cycling and Walking Plan.[36]



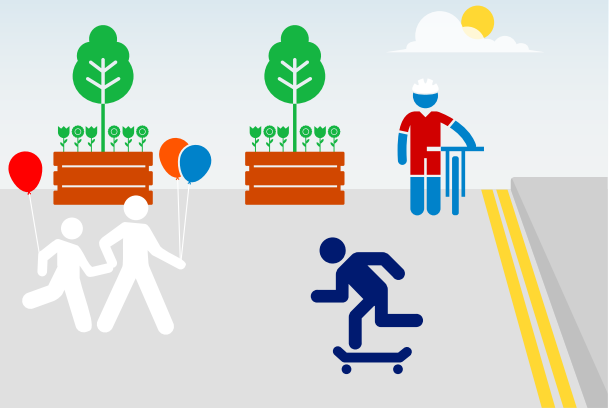
Over **£200m** was **provided to local authorities** through the Active Travel Fund between August and November 2020.

Over **400,000** cycle **repair vouchers** were issued.

The updated Cycle Infrastructure Design Guidance published in July 2020 provides advice on the design of cycle infrastructure to support high quality, safe schemes, which will attract people of all demographics who want to cycle.

School Streets
that restrict parking at school pick-up and drop-off time can **reduce the number of people driving** their children to school **by up to a third**.

Low Traffic Neighbourhoods
can provide clear, direct routes for cyclists and pedestrians that **promote cycling and walking**, significantly reducing accidents, noise, and air pollution for local residents.

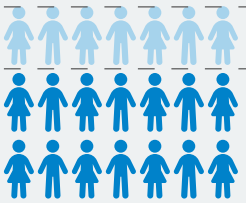


Commitment

We will deliver a world class cycling and walking network in England by 2040

This will be achieved by delivering comprehensive cycling and walking networks in all large towns and cities and widespread delivery of measures to enable cycling and walking in local areas such as school streets and cycle training delivered to all children and adults that want it. We will enable behaviour change through targeted personal incentives, such as GP prescribing, existing tax reliefs and rewards programmes.

Overcoming the known barriers to cycling (which centre around road safety concerns, lack of infrastructure and lack of confidence) and walking will provide a significant potential for growth in active travel. There is clear evidence that the provision of segregated cycle lanes and other measures such as low-traffic neighbourhoods drives significant increases in cycling and – after an initial period of adjustment – reductions in motor traffic, both locally and more widely. If cycling and walking are made safer and more pleasant, more people who previously drove choose to cycle and walk, particularly for short trips.



Schemes can reduce the **number of people driving** their children to school by **up to a third** and reduce casualties[37]


Living streets

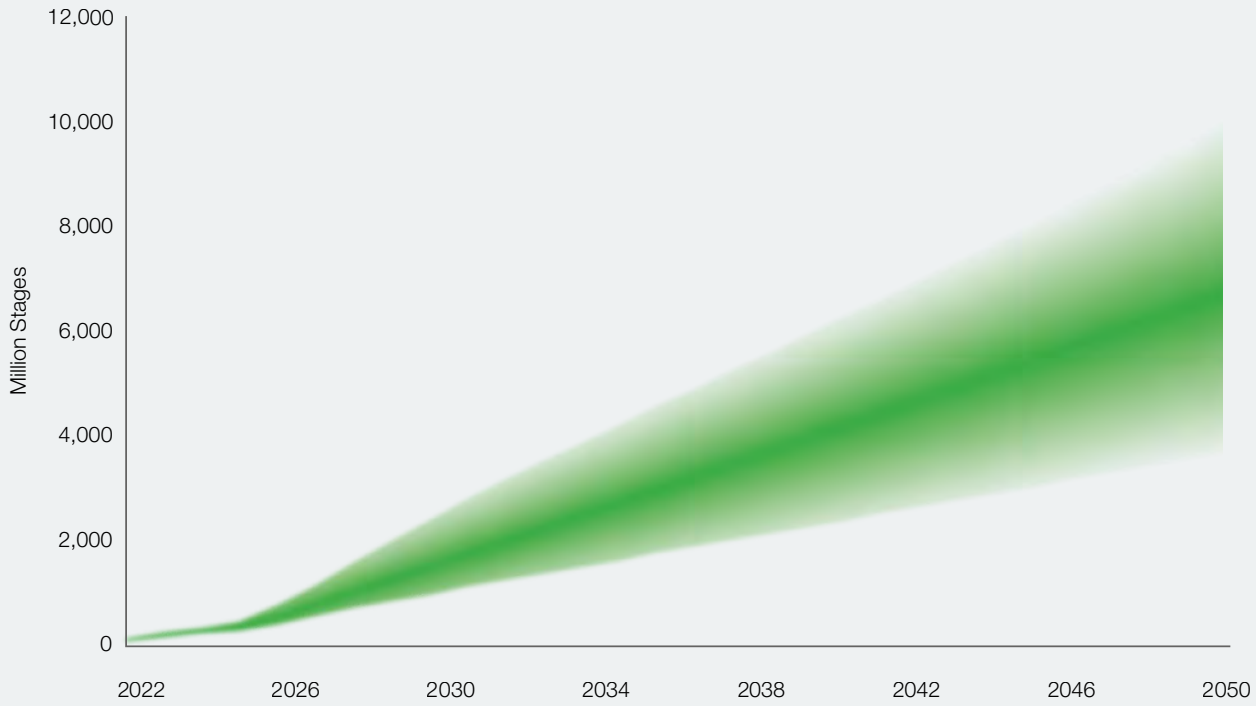
Promoting walking in primary schools

Government has invested £4.6 million between 2016 and 2021 to encourage and enable more children to walk to school. Travelling to education is the most common single purpose of walking journeys but there is huge potential to increase the proportion of children walking to school.

Living Streets, with support from the Department for Transport, has been running the Walk to School Outreach (WTSO) project since 2017. It does so mainly through behaviour change interventions delivered in schools, including WOW, Living Streets' year-round walk to school challenge, and by influencing local infrastructure decisions.

An evaluation carried out at the end of March 2019 shows that walking rates increased by 38% among new WTSO project schools and increased walking rates were sustained in existing schools in 2018 to 2019. This represents around 4 million new walking trips and 1.3 million fewer school run car journeys in that year with total vehicle miles reducing by around half a million.[38]

Figure 4: Active travel stages projections under high and low scenarios



The figure above presents a range for the potential increase in active travel stages in England due to future spending above the £2 billion already committed. Each journey comprises one or more stages, with a new stage beginning where there is a change in the mode of transport. The range accounts for uncertainty in future investment and scale of behaviour change.[39]

The carbon saving from people shifting from car to active travel depends on various factors including the proportion of active trips replacing car journeys, the lengths of walking and cycling trips and the uptake of ultra-low and zero emission vehicles. Of these factors, the first two will depend in part on the level of uptake of e-cycles.

Increased walking and cycling is projected to reduce car GHG emissions in England by 1–6 $MtCO_2e$ between 2022 and 2050.[40] Higher GHG reductions could potentially be achieved with complementary traffic restraint measures, making active travel relatively more attractive.

Spending on active travel typically offers at least high value for money and provides a highly cost-effective approach to reduce GHG emissions. Improvements to health typically represent some of the largest benefits from increased active travel. By 2050, future active travel spending is projected to prevent around 50–130 thousand premature deaths and reducing work absence by around 50–140 million days.[41] Further announcements on cycling and walking will be made later this summer.

Many children do not get enough exercise. But rates of walking to school have declined in recent years, causing significant pollution and danger to children outside schools. It has come about partly because of a vicious circle – more people driving their children to school increases parents' concerns about road safety, in turn resulting in yet more people driving their children to school. We are trying to break this circle.

Dozens of school street schemes have been introduced since the COVID-19 pandemic, where roads around schools are closed to motor traffic at school times. According to Hackney Council, which helped pioneer the concept, its first four school streets reduced traffic around the schools concerned by an average of 68 per cent, cut vehicle emission pollution at the schools by 74 per cent and increased the number of children cycling to school by 51 per cent.[42] We will introduce many more of these schemes.

Zero emission buses and coaches[43]

3.1

$MtCO_2e$ emissions in 2019

3% of 2019 domestic GHG emissions from **buses and coaches**

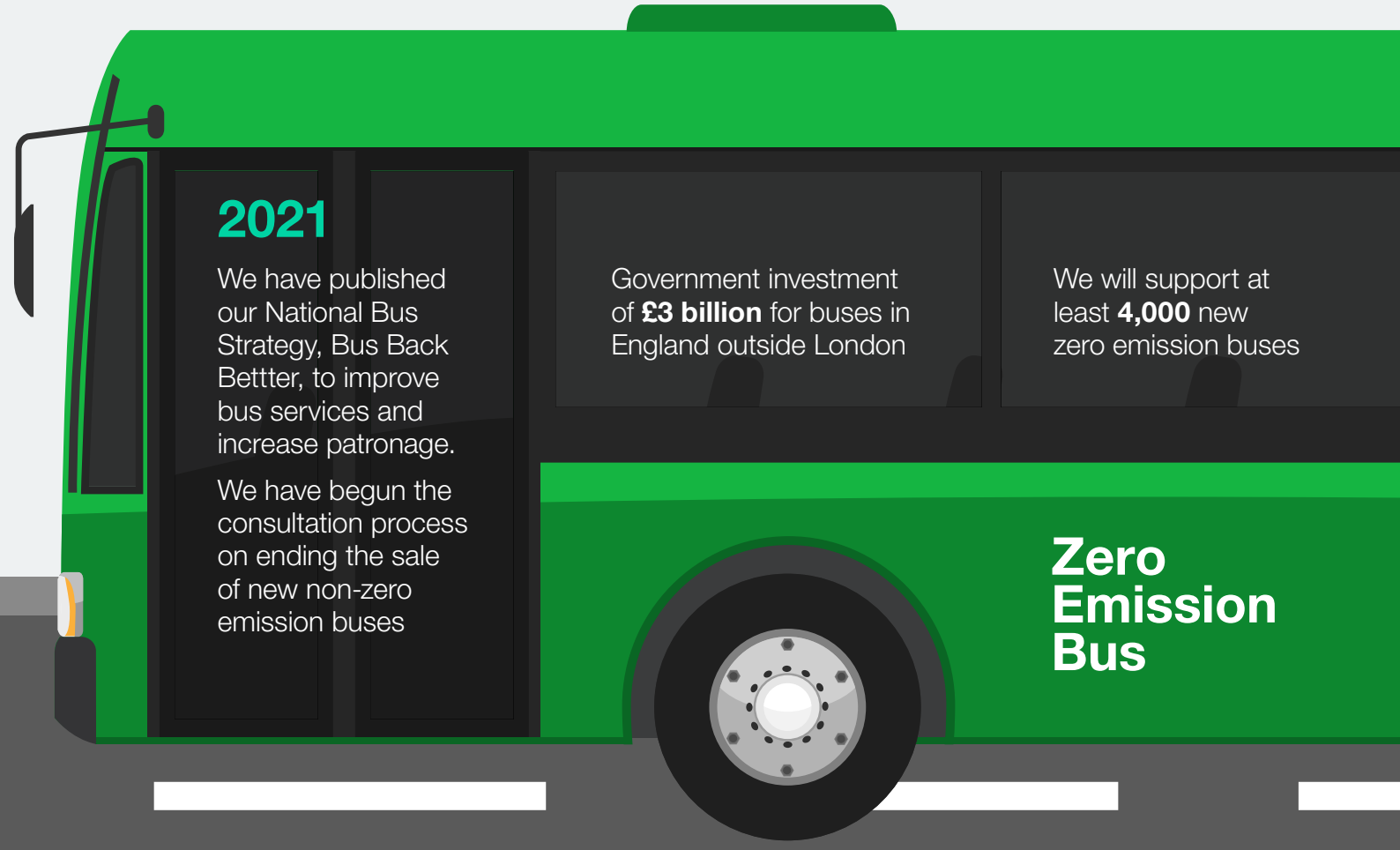
£120m **investment** in 2021/2022

Up to **£1bn** **GVA supported** in 2050 from zero emission vehicle manufacture

Up to **7,000 jobs supported** in 2050 from zero emission vehicle manufacture

35–37 **$MtCO_2e$ savings** from 2020 to 2050

Up to **£160m** **air quality benefits** from 2020 to 2050



Co-benefits:

Congestion

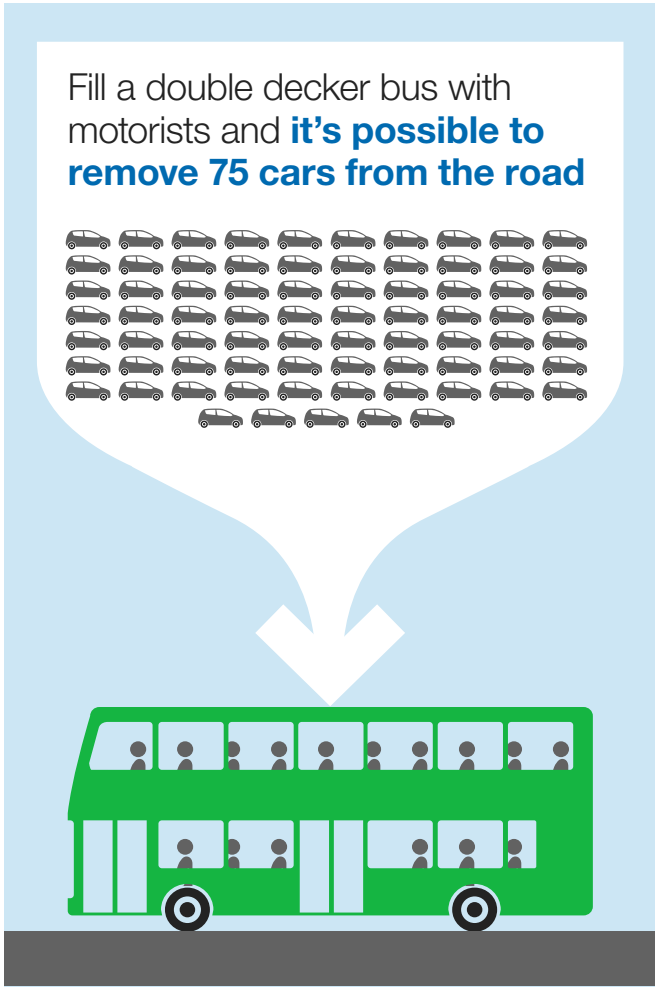
Jobs & growth

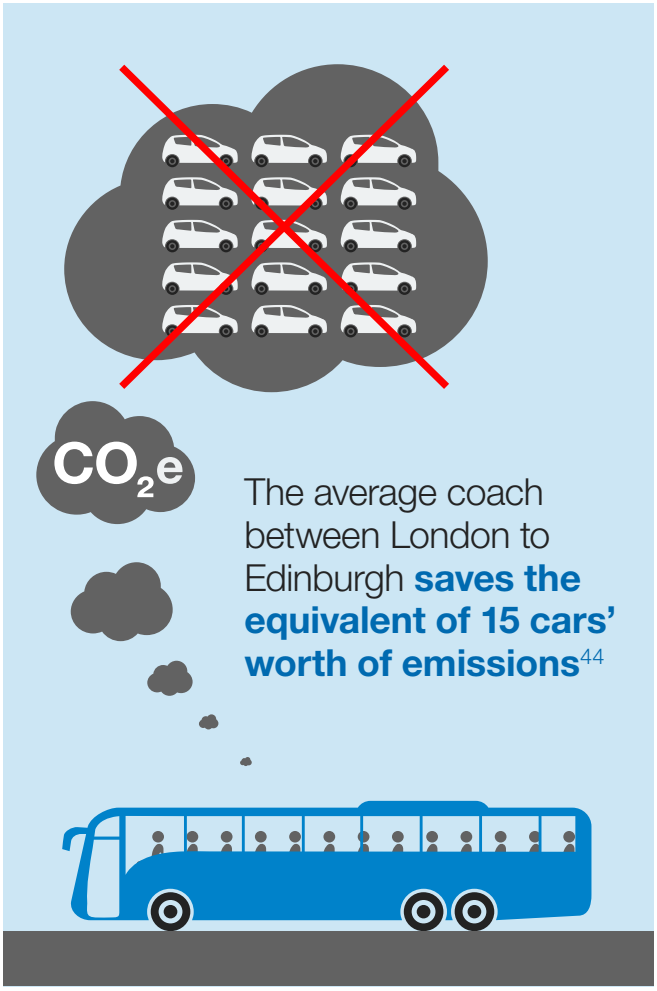
Air quality

Buses and coaches have a crucial role to play in transport achieving net zero and driving the green transformation. We must increase the share of journeys taken by public transport – particularly in congested areas.

As noted earlier, COVID-19 has caused a relatively large reduction in demand for public transport, and car use has recovered more quickly. To avoid the worst effects of a car-led recovery, we need to not only shift those additional journeys back quickly, but by making radical improvements to local public transport as normal life returns we can encourage even more people to complete even more of their journeys by public transport.

During the pandemic the role of buses at the centre of the public transport network has become clearer than ever – that is why we have provided significant emergency state support of over £1 billion to ensure these vital services can continue.





Bus operators have invested significantly in new cleaner and greener electric and hydrogen buses in recent years, supported by government initiatives such as the Low and Ultra-Low Emission bus schemes benefitting many local areas.[45] However, there is much more to do. Only 2 per cent of England's local operator bus fleet is zero emission today – so it is vital that we go further faster.[46]

Bus operators share our ambitions to achieve a zero emission bus fleet. Several have committed to purchase only ultra-low or zero emission buses from 2025.[47]

In addition to the wider co-benefits zero emission buses can bring, we would expect zero emission buses to achieve long term operating cost savings, which can be reinvested in more frequent services, lower fares, and other improvements for passengers.

Our plans to deliver the necessary carbon reductions:

Commitment

We will deliver the National Bus Strategy's vision of a transformed bus industry and a green bus revolution[48]

Bus Back Better, the National Bus Strategy for England, was published in March 2021. It sets out how we will make buses more frequent, more reliable, more comprehensive, easier to understand and use, better co-ordinated and cheaper – improving appeal for the bus user and non-bus user – to dramatically increase passenger numbers and reduce congestion and carbon emissions. Partially based on a version of the policies which achieved significant modal shift to public transport in London and backed by £3 billion of transformative funding, its central aim is to get overall patronage back to pre-COVID 19 levels, then to exceed it, by making buses a practical and attractive alternative to the car for more people.

It specifies that bus services should be better integrated with other modes of transport – with more bus routes serving railway stations and improved integration with cycling and walking routes and networks – and provides a roadmap to decarbonise. The strategy also outlines that on key radial routes there should be significant investment in bus priority.

Commitment

We will consult on modernising the Bus Service Operators' Grant in 2021

The National Bus Strategy includes a commitment to review the existing Bus Service Operators Grant (BSOG)[49] funding stream, which is a discretionary grant paid to eligible English bus operators outside of London to help them recover some of their fuel costs. One of the key objectives of this review is to ensure that the funding stream is aligned with government priorities, in particular, benefitting the environment. The take up of zero emission buses is crucial to improving the carbon footprint of the sector, and the inbalance between the existing support provided to diesel buses through BSOG against that provided to zero emission buses needs to be addressed.

Given the Government's commitments to deliver 4,000 zero emission buses, we plan to increase the rate at which the BSOG green incentive can be claimed for zero emission buses to 22p per km, ahead of the wider review in order to help the Government meet these commitments and accelerate the take up of zero emission buses.

We will consult on a proposed new funding regime to take a holistic approach targeted at the delivery of the policies in this plan, and other specific benefits; growing patronage, increasing efficiency, improving the environment and securing modal shift from the private car.

Commitment

We will support delivery of 4,000 new zero emission buses and the infrastructure needed to support them

As announced by the Prime Minister the Government will support the introduction of 4,000 zero emission buses and the infrastructure needed to support them.

This will be the single largest investment ever made in zero emission buses, representing the replacement of nearly 12 per cent of England's local operator bus fleet.[50] It will support the market for zero emission buses and is expected to provide a boost to UK bus manufacturing, helping to secure thousands of green manufacturing jobs and apprenticeship opportunities across the country, including in Scotland, Northern Ireland and the north of England. We will consider both battery electric and hydrogen fuel cell buses when rolling out the 4,000 zero emission buses.

In 2021-22 we will invest up to £120 million in zero emission buses through the Zero Emission Bus Regional Areas scheme, which could support the introduction of up to 500 zero emission buses and the infrastructure needed to support them. This is in addition to £50 million provided through the All-Electric Bus Town or City scheme, which will support up to 300 zero emission buses, and over 100 zero emission buses supported by previous green bus funding schemes.

Buses on demand

In lower-density, often rural, areas, not served or barely served by conventional buses, we will support new forms of provision, such as demand responsive travel in smaller vehicles. These service innovations may be how we improve evening and Sunday services in places which currently lack them, integrated with conventional buses during the day. As part of the Better Deal for Bus Users, we have invested £20 million through the Rural Mobility Fund to trial demand responsive bus services in 17 rural and suburban areas across England. Some of these will use zero emission vehicles.

Commitment

We will deliver the first All-Electric Bus Town or City

The All-Electric Bus Town and City scheme will demonstrate what can be achieved when there is a real commitment to move all buses in a place to electric zero emission.

In March 2021, the Government announced that Coventry had been selected as the winner of the All-Electric Bus Town or City Scheme. The West Midlands Combined Authority has been awarded £50 million to replace the entire local operator bus fleet in Coventry with electric buses. This funding will support the introduction of up to 300 electric buses and the charging infrastructure needed to support them.

City of York Council / First Bus

York's Zero Emission Park and Ride fleet

York has one of the largest electric bus fleets in the country. Working together, City of York Council and First Bus have introduced 33 electric buses for the city's park and ride service. These electric buses were introduced with funding support from the UK Government's Low Emission Bus Scheme and Green Bus Fund. In 2017 City of York Council secured £3.3 million from the UK Government to introduce 21 electric double decker buses and vehicle charging infrastructure. These new buses began operating in July 2020 and are estimated by First Group to save 1.6 million kilos (1,600 tonnes) of CO_2 emissions every year.[51] They joined an existing fleet of 12 electric buses, part funded by the UK Government's Green Bus Fund, to form the UK's largest zero emission park and ride bus fleet.

Commitment

We are consulting on a phase out date for the sale of new non-zero emission buses

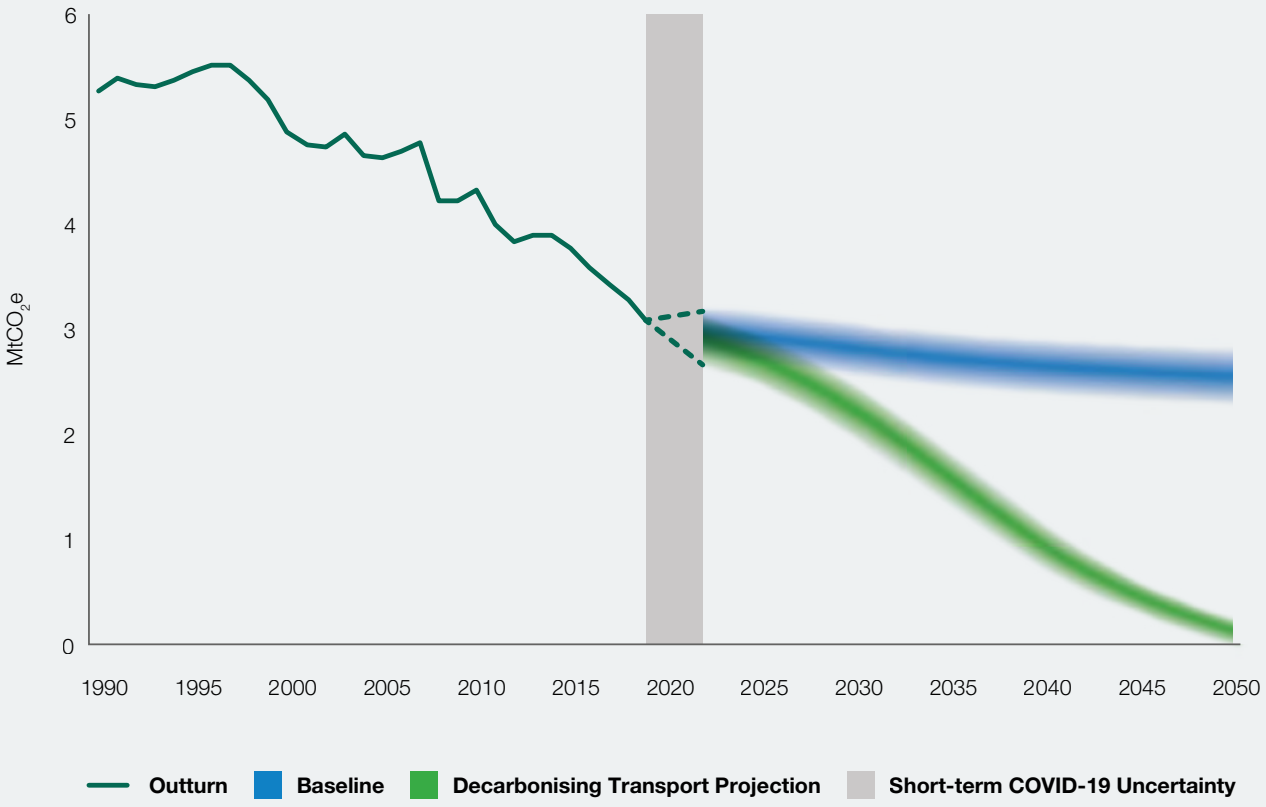
We have begun consulting on an appropriate date to end the sale of new non-zero emission buses and on the introduction of the appropriate supporting policy and regulatory framework. An initial consultation closed on 11 April 2021 and there will be a further consultation later this year.

Commitment

We will consult on a phase out date for the sale of new non-zero emission coaches

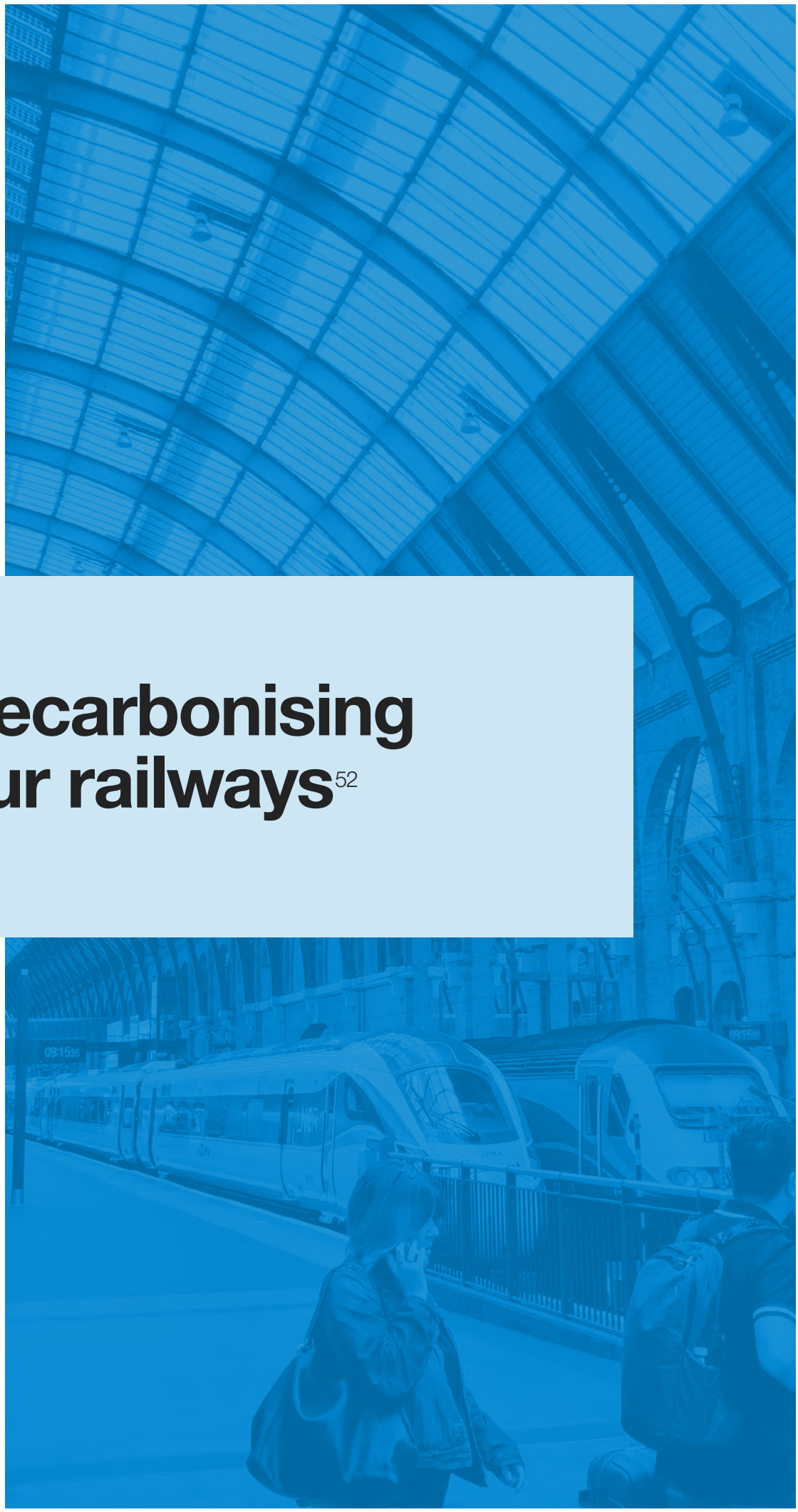
For longer distance travel, coaches offer a greener alternative to private cars. We will consult on a phase out date in due course for the sale or purchase of new non-zero emission coaches. The coach industry faces different challenges to decarbonisation from the bus industry and we want to understand the barriers the sector faces as well as the opportunities.

Figure 5: Decarbonising Transport bus and coach GHG projections, versus the baseline*



* Historic emissions are from published GHG statistics. Future bus and coach emissions are modelled using the National Transport model and adjusted for Decarbonising Transport measures. Bus and coach service levels in the central case are estimated based on 2015 levels. The uncertainty bands around projections reflect uncertainty on the form of final policy and uncertainties on future demand for road transport - related to future trends in travel, uptake of connected and autonomous vehicles, fuel prices, GDP growth, and historical volatility. Carbon savings are driven by Decarbonising Transport policies and ambitions. Modelling assumes zero emission technology is available for all buses and coaches. There is significant uncertainty about future business models for the bus and coach fleet (e.g. mobility as a service), which are not factored in these projections.

The figure above shows our projections for GHG emissions from buses and coaches, for a baseline scenario based on firm and funded policies, and for policy scenarios including the ambitious policies listed above alongside savings from low carbon fuels. This shows emission reductions starting immediately from the deployment of zero emission buses, which can get bus emissions on a pathway to net zero.



Decarbonising our railways[52]

1.7

$MtCO_2e$ emissions
in 2019

1%
of 2019 domestic GHG emissions from **rail**

Up to **£11m**
GDP supported
in 2035 from performance improvements from electrification

Up to **3,000**
highly specialised jobs supported in Overhead Line Electrification

CO_2e

21–22
$MtCO_2e$ savings
from 2020 to 2050

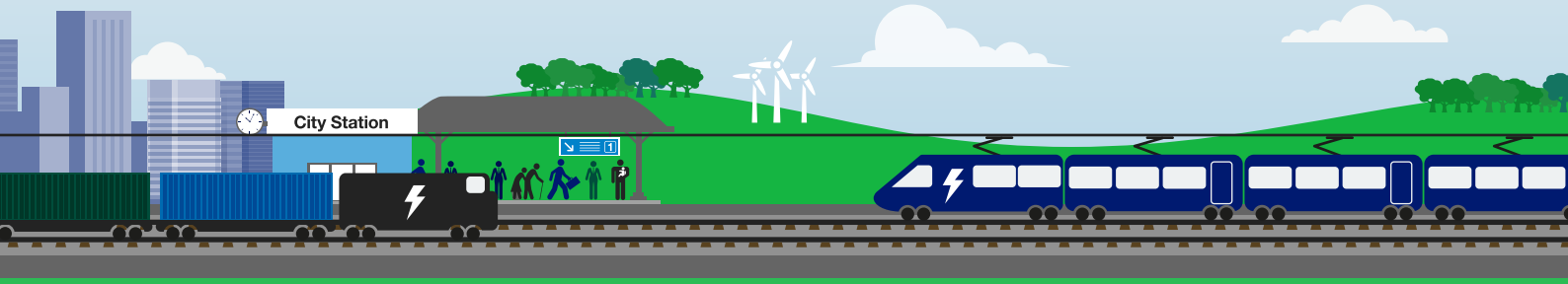
Up to **£1bn**
Air quality benefits
from 2020 to 2050

Between now and 2050

Great British Railways will deliver a programme of further electrification, together with use of battery and hydrogen trains, to enable a zero carbon railway

2021

The WIlliams-Shapps Plan for Rail has set out a transformation in rail, encouraging a shift to cleaner, greener journeys



2020s–2030s

Policies will incentivise the take up of low carbon traction by rail freight operators.

Freight Operating Companies will use more electric and low carbon traction. Investing in High Speed rail and extra capacity on our network will support modal shift to rail

By 2040

Ambition for all diesel-only trains to be removed from the network by 2040

By 2050

The rail network will be net zero

Co-benefits:

Congestion

Jobs & growth

Air quality

Commitment

We will deliver a net zero rail network by 2050, with sustained carbon reductions in rail along the way. Our ambition is to remove all diesel-only trains (passenger and freight) from the network by 2040

Rail is already a green mode of transport for passengers and goods with 38 per cent of our track already electrified.[53] This is a great starting point, but there is still a lot to do and we will need to use all options available to us to decarbonise the rest of the network.

As we stated in the recent rail white paper, the Williams-Shapps Plan for Rail, electrification – a proven, existing technology – is likely to be the main way of decarbonising the majority of the network.[54] Electrification does not merely decarbonise existing rail journeys; it has a clear record of attracting new passengers to rail, the so called "sparks effect", thus also decarbonising journeys previously done by road. We will also pursue options for electrifying the remaining diesel pockets of the third-rail network. Further electrification schemes will be announced shortly.

The rail freight market has changed significantly over the last twenty years, with a shift from the dominance of coal to intermodal and construction traffic flows.[55] The geography of rail freight has subsequently changed, with the consolidation of rail freight on already partially electrified routes. This means that relatively short stretches of new infill electrification could allow a significant rise in the electric haulage of freight. We will pursue such electrification to maximise the benefits gained from rail freight.

We will exploit newer technologies such as hydrogen and battery trains. By deploying the most appropriate technology for each route across the network we will continue to improve rail's performance, providing more reliable services for users that offer significantly lower running costs.

Network Rail, working with a wide group of rail industry stakeholders, has developed its Traction Decarbonisation Network Strategy (TDNS) with recommendations on which technology to deploy on each route. We will use TDNS to guide our work with partners across the rail sector to deliver an affordable, deliverable programme to fully decarbonise our railway.

One in every

10 miles

travelled in England in 2019 was by rail, but the Government wants to increase this in the future by making our railways even better.[56]

The Williams-Shapps Plan for Rail promises to bring together responsibility for the whole system under a single organisation: Great British Railways. Great British Railways will be responsible for identifying the right technology for the right part of the network, delivering the necessary infrastructure, and commissioning the right train services, ensuring net zero emissions from the railway by 2050.

Great British Railways will also improve how the railway is run, with trains on time, simple fares and a railway that is more accessible for all. Making rail travel easier, simpler, and better integrated, including through improving journey connectivity with walking and cycling and other services, will encourage a shift to cleaner travel.

The Plan for Rail will encourage more freight onto rail from roads, reducing emissions. We will support this by providing the right conditions for the rail freight industry to grow with better coordination, modern contracts, and new safeguards.

Long-term Government investment in rail can stimulate regeneration and support employment opportunities, as well as helping to meet our global climate goals, through projects such as electrification of existing lines. For example, the Integrated Rail Plan (IRP) will set out how best to deliver and sequence HS2, Northern Powerhouse Rail and other major rail schemes.

In the last three years, we have completed almost

700
track miles

of electrification in England and Wales.[58]

Commitment

We will deliver an ambitious, sustainable, and cost-effective programme of electrification guided by Network Rail's TDNS

Removing diesel trains reduces air and noise pollution, brings lower operational costs, and improves performance. Further electrification will allow removal of diesel passenger trains and will enable the rail freight industry to invest in new electric locomotives. Our sustained programme will present opportunities to develop supply chain capacity, support highly skilled, specialised long-term employment opportunities in overhead line electrification, and reduce costs. This programme will help level up the UK, bringing greater benefits to currently unelectrified areas outside London and south-east England.

We will announce further electrification projects shortly, ensuring the lessons of previous schemes are learned and that individual projects deliver value for money.[57]

TDNS estimates that by 2050,

97%

of emissions could be removed given the assumed levels of electrification, hydrogen and battery technologies.[59]

Commitment

We are supporting the development of battery and hydrogen trains and will deploy them on the network as we decarbonise. We will also use technology to clean up diesel trains until they can be removed altogether

Battery and hydrogen trains will be considered alongside electrification as we decarbonise each currently unelectrified rail line. We will always deploy the most suitable technology for each rail line considering technology capability and value for money. On less intensively used lines, battery and hydrogen trains are likely to deliver lower whole life costs than electrification. Until the railway can be fully decarbonised, we will encourage reductions in carbon and pollutant emissions through improved efficiency of existing diesel trains.

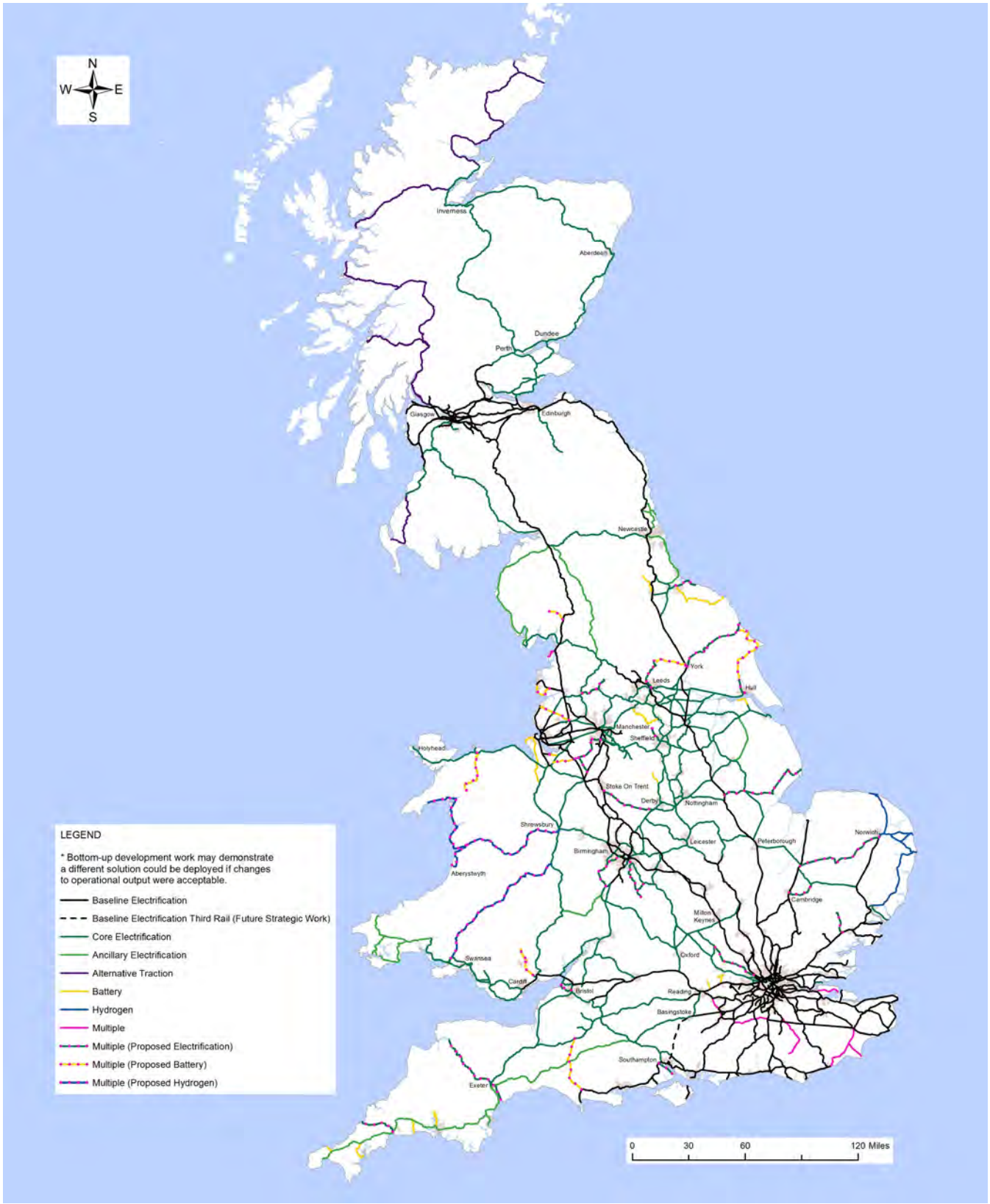
DfT's Rail Innovation Programme funds "First of a Kind" competitions to develop and demonstrate existing technology for use on the railway. The programme is providing a further £9 million support for projects in 2021/22, with 'Low emissions and a greener railway' one of three themes. Through the First of a Kind competitions we have already provided nearly £3 million funding for projects developing new traction technologies, including £750,000 for HydroFLEX, both for the first UK mainline testing of a hydrogen train and making this technology passenger ready.[60]

HydroFLEX

Supported by £750,000 in grant funding from DfT's 'First of a Kind' competitions, and following almost 2 years' development work and a £7 million investment by both Porterbrook and the University of Birmingham, HydroFLEX was the first-ever hydrogen-powered train to run on the UK mainline on 29 September 2020.[61] Unlike diesel trains, hydrogen-powered trains do not emit harmful gases, instead using hydrogen and oxygen to produce electricity, water and heat. The team are now developing the first prototype production version of HydroFLEX and the supply chain to support the technology in the future. The ground-breaking technology behind the trains will also be available by 2023 to retrofit current in-service trains to hydrogen, helping decarbonise the rail network and make rail journeys greener and more efficient.

The map below shows the recommendations of Network Rail's Traction Decarbonisation Network Strategy for technology deployment to decarbonise the unelectrified railway based on existing technology capability. It will be updated as technology develops.

Figure 6: TDNS technology deployment recommendations



Commitment

We are building extra capacity on our rail network to meet growing passenger and freight demand and support significant shifts from road and air to rail

We are committed to the construction of new lines to meet growing demand for rail travel. The Government is already getting on with building HS2 Phase One and 2a, which will create 170 miles of new electrified track between London, Birmingham and Crewe by the early 2030s.[62] In line with the Prime Minister's announcement in February 2020, the Integrated Rail Plan, to be published in due course, will set out how we will do the later stages of HS2, and Northern Powerhouse Rail, differently to deliver benefits for passengers, including carbon savings, sooner. HS2 will operate as a high capacity, high-frequency inter-city service, on dedicated lines. By building HS2 and running intercity train services on the new line, HS2 will free up train paths and platforms across the heavily congested West Coast Main Line for additional local, cross-country and commuter services and will provide additional passenger capacity on the East Coast and Midland Mainlines.

HS2 will be an integrated part of Great Britain’s future rail network, unlocking benefits for passengers across the country. When combined with other major rail schemes, this will encourage even more people to make journeys by rail.

By taking some long distance passenger trains off the southern part of the West Coast Main Line, HS2 will also release spare capacity, some of which will could support our commitment to expand opportunities for rail freight operators to grow and develop.

Passenger services

Commitment

We will work with industry to modernise fares ticketing and retail to encourage a shift to rail and cleaner and greener transport journeys

The Williams-Shapps Plan for Rail has set out a transformation in how people will pay for their journeys in the future to encourage a shift to rail and more cleaner, greener journeys. On long distance routes, flexible pricing will improve choice, offer simple options for passengers and enable cheaper fares at quieter times. This will end sudden price jumps for peak time trains and reduce the number of empty services. We will preserve affordable 'walk up and go' fares. On shorter-distance routes, we will increasingly move to contactless ticketing to improve convenience for passengers.

Commitment

We will improve rail journey connectivity with walking, cycling and other modes of transport

Greater provision of walking and cycling routes to and from stations will be introduced to support healthier greener journeys after the pandemic. Secure cycle storage, cycle/e-cycle hire, dedicated car-pooling parking spaces, and electric vehicle rental points and charge points will be significantly expanded, including at smaller stations. In 2021/22 we will spend a further £2 million to improve cycling access to stations and increase sustainable journeys by installing cycle racks, security systems, ramps, and cycle paths through the Cycle Rail Scheme, building on the £40 million provided since 2012.

Ensuring better integration with other local transport services through Local Transport Plans will transform stations into joined-up mobility hubs within local and regional transport networks. As rail ticketing and fares systems are updated, we will consider opportunities for facilitating integrated electronic ticketing with buses. More bus routes and demand-responsive services should serve railway stations for easy connections between modes, and bus services should be timed to connect with trains.

We will increase the amount of space for bikes on trains wherever practically possible, particularly on popular leisure routes, and will make it easier to reserve bike spaces online and without reservations on emptier trains. All future trains will include more bike space relevant to the markets served. We will continue to restrict bikes on peak-hour commuter trains, where the space is needed for passengers.

Cycling Rail Scheme in Ashford

The Cycle Rail grant scheme aims to promote economic growth, improve journeys, and encourage environmentally friendly transport to cut carbon. The scheme improves cycling access to stations and increases sustainable journeys by funding installation of cycle racks, security systems, ramps and cycle paths. Through the scheme we have provided more than £40 million funding since 2012 to create over 22,000 new parking spaces and other features, spread across more than 200 stations UK-wide. Cycle Rail funding has enabled the construction of a new cycling hub at Ashford International station, providing secure bike parking for 96 bikes and freely-available parking for a further 220. Prior to commuting changes as a result of the pandemic, there were around 300 to 350 bikes parked at Ashford International station on typical weekdays, compared to around 100 bikes earlier in the decade.[63]

Freight services

The rail freight market has been transformed over the past quarter century, from largely moving coal and steel to now moving construction goods, containers, and food supplies. Freight trains reduce road congestion, connect markets over long distances and are much less carbon intensive than road freight. The Williams-Shapps Plan for Rail sets out the Government's commitment to supporting a growing, innovative, modern rail freight market that can maximise rail's potential to deliver cleaner, greener freight journeys.

Commitment

We will introduce a rail freight growth target

As initially set out in the Williams-Shapps Plan for Rail, we are committed to introducing a rail freight growth target for all areas of the network DfT oversees, to encourage the continued growth of rail freight. Rail freight trains currently emit around a quarter of the CO_2 emissions of HGVs per tonne mile travelled.[64] Great British Railways will also have a statutory duty to promote rail freight.

We are investing in the growth of rail freight: we are investing in the rail network for freight, building on the £235 million of investments made in Control Period 5 (2014-2019), supporting the development of an expanded network of Strategic Rail Freight Interchanges, and continuing to fund grants that support the modal shift of freight to rail.[65] The £20 million (2021/22) for Mode Shift Revenue Support and Waterborne Freight Grant schemes supports the carriage of freight by rail and water on routes where road haulage has a financial advantage. These grants help to remove around 900,000 HGV loads off the road each year.[66]

A rail freight growth target will help provide private operator investment confidence and galvanise action across local partners and industry. We will work closely with industry partners to develop the target.

Commitment

We will incentivise the early take up of low carbon traction for rail freight

The emissions benefits of network electrification can only be delivered by using compatible electric locomotives. Around 90 per cent of in-use freight rolling stock is diesel-only.[67] Short "infill" electrification projects could quickly deliver benefits and enable rail freight operators to immediately switch services over to electric traction. This would reduce costs as electric locomotives cost less to operate and could also reduce journey times as electric traction provides quicker speeds and better reliability than diesel fuelled services. By filling in electrification gaps to key ports and terminals, we can open new opportunities for electric, cleaner, greener rail freight journeys. As freight electrification is rolled out further, additional electric locomotives will be required to supplement those already available.

We will develop further interventions, in partnership with industry, to help freight operating companies have the confidence they need to invest in replacing current rolling stock. Those companies making the early moves will have real commercial opportunities to meet customer demand for lower carbon services. As we develop potential policy interventions, we will ensure rail freight maintains its competitiveness with road freight, and that interventions represent value for money for the taxpayer.

In 2019/20, the rail freight industry resulted in around

6.5m fewer

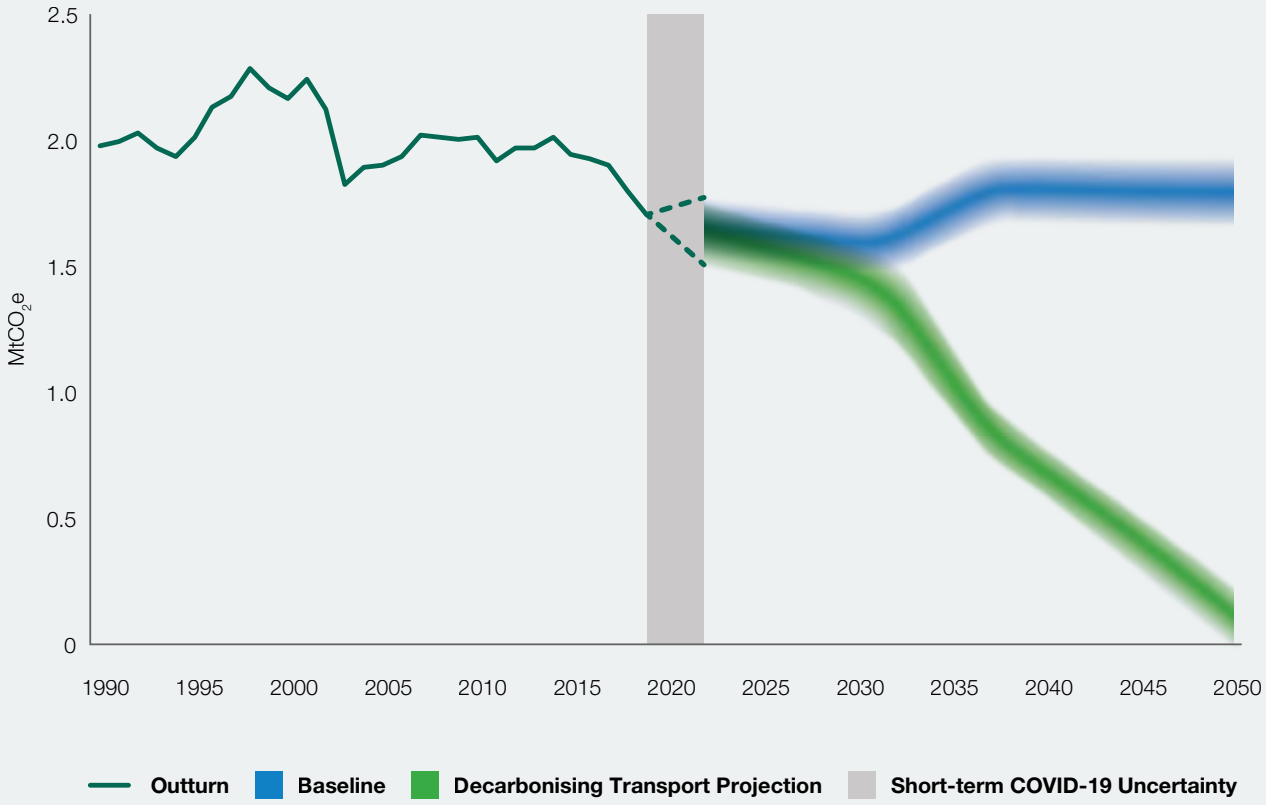
lorry journeys.[68]

Frieghtliner

Reducing emissions with stop-start technology

Freight Operating Companies have taken multiple steps to lower their emissions, including by fitting 'stop-start' technology in their diesel locomotives to reduce carbon, air quality, and noise emissions when idling. Stop-start technology is a system that automatically turns the engine off and on to minimise engine idling when stopped. We continue to work with the rail freight industry, the Rail Safety and Standards Board and Innovate UK to look at how best to progress options on research, development, and innovation to reduce emissions from rail freight. Through the 2021 First of a Kind competition, we are providing nearly £2 million in funding for five projects that will reduce harmful emissions from rail freight.

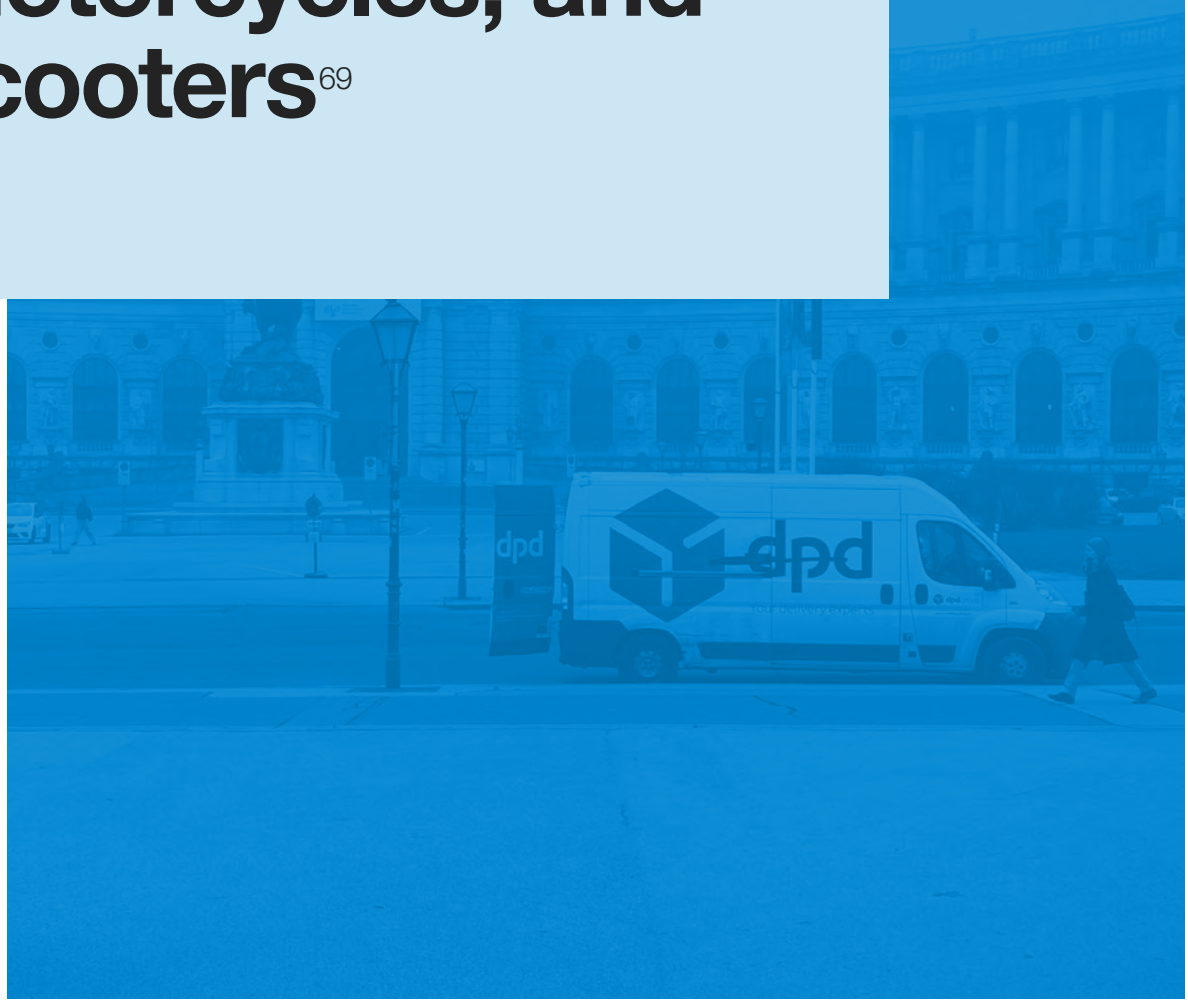
Figure 7: Decarbonising Transport rail GHG projections, versus the baseline*



* Historic emissions are from published GHG statistics. Carbon savings have been estimated using TDNS analysis. The uncertainty bands around projections reflect uncertainty on the form of final policy, and on historic volatility in rail. Emission reductions are primarily driven by rail electrification, but also from the deployment of battery electric and hydrogen trains on difficult to electrify sections of the rail network. Modelling assumes successful implementation of battery or electric trains.

The figure above shows our projections for GHG emissions from rail, for a baseline based on firm and funded policies, and for a Decarbonising Transport policy scenario including the ambitious set of rail policies listed above. This shows rail following a pathway which can achieve net zero emissions by 2050.

A zero emission fleet of cars, vans, motorcycles, and scooters[69]



87.4

$MtCO_2e$ emissions in 2019

55% of 2019 domestic GHG emissions from **cars and taxis**

16% of 2019 domestic GHG emissions from **light vans**

Up to **£2.8bn** **investment**

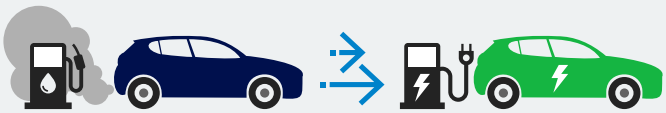
Up to **£8bn** **GVA supported** in 2050 from zero emission vehicle manufacture

Up to **60,000 jobs supported** in 2050 from zero emission vehicle manufacture

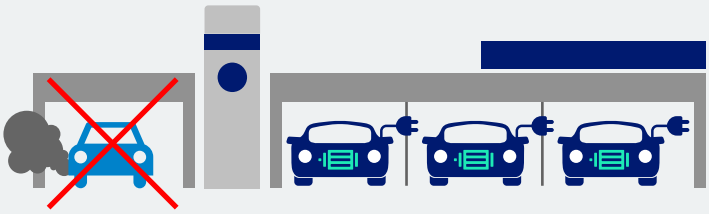
620–850 **$MtCO_2e$ savings** from 2020 to 2050

Up to **£8bn** **air quality benefits** from 2020 to 2050

Early 2020s



Up to **£2.8 billion** investment will support the transition to zero emission vehicle technology, including through incentives, charging infrastructure and R+D support



A new road vehicle regulatory regime will be introduced to help deliver the commitment to end the sale of new petrol and diesel cars and vans and ensure significant progress to reduce emissions is made along the way

We will remove all emissions from road transport

2030

We will end the sale of new petrol and diesel cars and vans

2035

All new cars and vans must be **100%** zero emission at the tailpipe

2035

All new L-category vehicles to be fully zero emissions at the tailpipe*

2040

End the sale of all non-zero emission HGVs

There were almost **400,000** plug-in electric vehicles on the UK's roads at the end of 2020 and over one in seven cars sold so far in 2021 had a plug.

There are nearly **25,000** publicly available charging devices. This includes nearly **4,500** rapid devices.

*subject to consultation

Co-benefits:

Jobs & growth

Noise

Air quality

Removing tailpipe emissions from cars and vans is fundamental to decarbonising transport, as they were responsible for almost a fifth (19%) of the UK's total domestic greenhouse gas emissions in 2019.[70] From 2030 we will end the sale of new petrol and diesel cars and vans, 10 years earlier than previously planned, and from 2035 all new cars and vans must be zero emission at the tailpipe. Between then, new cars and vans will only be able to be sold if they offer significant zero emission capability.[71]

Zero emission motorcycles and other powered two wheelers are an efficient and clean form of mobility that can reduce congestion, improve urban air quality and reduce noise – we will take forward measures to remove these emissions, including consulting on a date to end the sale of new non-zero emission motorbikes, ensuring we support the development of new industrial opportunities for the UK.

Motorists are making the switch to electric vehicles in record numbers to take advantage of lower running and maintenance costs, a quieter and more enjoyable driving experience as well as instant torque giving drivers an immediate response.

There are now over half a million electric plug-in cars registered in the UK with nearly one in seven cars sold so far in 2021 having a plug, making it one of the largest global fleets.[73]

Government had already committed £1.5 billion between April 2015 to March 2021 to support the early market and remove barriers to electric vehicle ownership.[74] It has pledged a further £2.8 billion package of measures to support the switch to clean vehicles. This includes up to £1 billion to build an internationally competitive electric vehicle supply chain at pace and scale in the UK.[75] The first £500 million of support will be delivered over the next four years through the Automotive Transformation Fund. Securing investments in battery cell manufacturing – gigafactories – is a priority, alongside investments related to motors, drives, power electronics and fuel cells. It also includes £1.3 billion to accelerate the roll out of charging infrastructure and £582 million for plug in vehicle grants.[76]

Zero emission vehicles – delivering jobs and levelling up our country

Investment in the development of the UK's electric vehicle supply chain could create 40,000 extra jobs across the country by 2030, including in our Midlands and North East England manufacturing heartlands.[72]

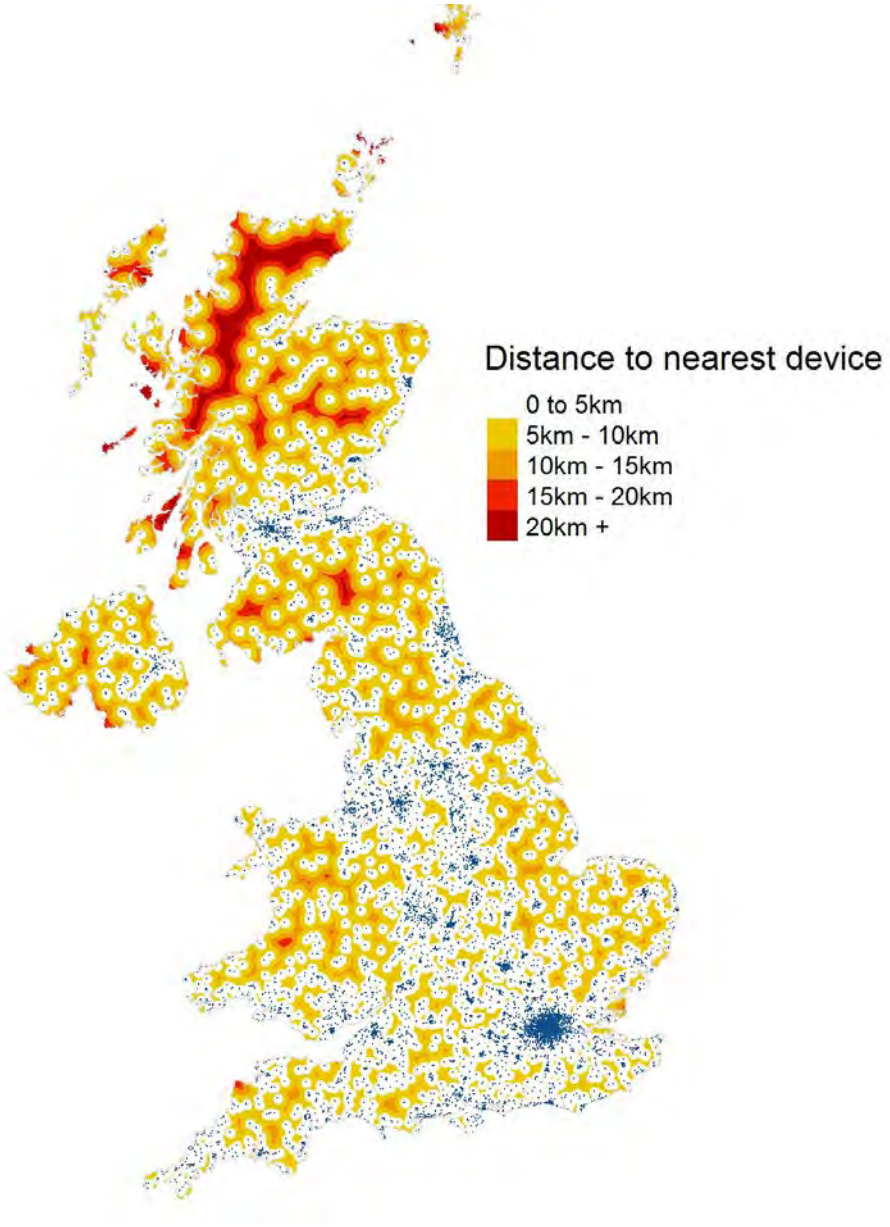
We are already seeing progress. In July 2021 Nissan and Envision AESC announced that they are creating a North East England electric vehicle manufacturing hub and the UK's first large scale gigafactory in Sunderland. This investment will deliver high-quality green jobs in the area as well as manufacturing batteries to power future generations of electric vehicles made in the UK. This was followed by Stellantis in July 2021, announcing that its first dedicated EV factory in Europe will be at Ellesmere Port, Cheshire. The investment will transform Stellantis' existing car plant so that from 2022 it will produce a new electric van.

Despite significant early progress, action is needed to go further, faster. The market for battery electric vehicles and the necessary charging infrastructure is growing fast, but the barriers of vehicle price and supply, infrastructure provision, and the consumer experience of using that infrastructure, need to be addressed.

Alongside this document the Government has published a 2035 Delivery Plan to reach our target phase out dates for cars and vans. This sets out our ambitious set of commitments and funding streams to decarbonise cars and vans, into a single document. It outlines key timelines and milestones for how we will continue to tackle barriers to zero emission motoring.

Battery electric car registrations increased almost threefold in 2020, compared to the same period in 2019;[77] charging infrastructure is more prevalent than ever with nearly 25,000 public charging devices, including more than 4,500 rapid devices – one of the largest networks in Europe.[78]

Figure 8: Distance from the nearest public EV charging device across the UK



The map above shows the distance from the nearest public EV charging device across the UK.

The Government is supporting the market-led development of a charging infrastructure network to meet drivers' needs. This will ensure motorists can charge wherever they need to – at home, at work, on longer journeys and make sure our towns and cities are ready for the transition. Preparing the UK for our zero emission future will support manufacturing, supply chain and electrical installation jobs right across the UK.

A driver is never more than 25 miles away from a rapid (50 kilowatt) chargepoint anywhere along England's motorways and major A roads.[79]

Electric Vehicle Batteries

We are keen to create a circular economy for electric vehicle batteries to maximise the economic and environmental opportunities of the transition to zero emission vehicles. That is why we are supporting the innovation, infrastructure, and regulatory environment for a UK battery recycling industry. The £330 million Faraday Battery Challenge is tackling the technical challenges of reusing and recycling battery components, with an aim of making them 95% recyclable by 2035, up from 10-50% today.[80] We are supporting research to develop UK battery recycling infrastructure. The 2009 Waste Batteries Regulations bans the disposal of EV batteries to landfill or incineration and battery producers are obligated to take back EV batteries free-of-charge and treat them at approved facilities.[81]

The right regulatory framework will be needed for both vehicles and infrastructure to secure our long-term ambitions. Vehicle end of sale dates have not been set in regulation, as this was not possible under EU legislation. Since 1 January 2021 manufacturers have been subject to a GB-only regulatory regime[82] and, outside the EU, we now have the opportunity to regulate in a manner that better suits the UK. The Green Paper on a New Road Vehicle CO_2 Emissions Regulatory Framework for the United Kingdom published alongside this plan will consider both overall fleet efficiency and the path to delivering the move to 100 per cent ZEV sales for cars and vans, and consider options including zero emissions vehicle mandates. It will take into account the UK market, ensuring we can secure the right outcomes to meet our domestic goals, while also supporting interim carbon budgets and the UK automotive sector.

Providing consumers with affordable options for zero emission vehicles is essential to ensure sufficient uptake. We are already seeing the upfront cost of electric vehicles drop, and we expect this to continue as batteries become cheaper and the production of vehicles is scaled up. However, in some cases, it can already be cheaper to own an electric vehicle today due to the lower refuelling and maintenance costs. The Government will continue to grow its R&D ecosystem to reduce the costs of batteries and develop cost-effective and sustainable solutions for EVs. We are also supporting investment in mass manufacturing to provide economies of scale and reduce the cost of electric vehicles to the consumer. As most motorists buy their vehicles second-hand, developing this market will be crucial in driving mass ownership. We are helping to develop the second-hand market for electric vehicles through a framework of supportive policies such as tax incentives and grants for chargepoint infrastructure. Our incentives for buying new EVs will also help increase supply to the second-hand market.

In terms of vehicles on the road today, low carbon fuels are the primary driver of carbon savings from the existing fleet – we will ensure that ambitious proposed increases to the Renewable Transport Fuel Obligation targets, as set out in section on 'Maximising the benefits of sustainable low carbon fuels', can be delivered sustainably and lead to genuine carbon savings.

The Government has committed to stretching carbon reduction targets up to the end of the Sixth Carbon Budget in 2037 and by 2050. As the largest emitting sector transport will need to make a sizeable contribution if these targets are to be met. And emissions from car and van use is the largest component of total transport emissions. Depending on progress in the sector at some points this may require additional targeted action (such as steps to reduce use of the most polluting cars and tackle urban congestion) to enable these targets to be met. We will regularly review progress against our targets, and continue to adapt and take further action if needed.

Readying our energy system

The electricity system will have to expand to enable the mass uptake of EVs. Government analysis estimates that electrifying the UK car and van fleet could increase electricity generation in 2050 by approximately 20% (65TWh–100TWh) relative to a system with no EVs. The Energy White Paper sets out the policy framework to ensure that there is sufficient investment to power the EV transition, and robust and proven market mechanisms are in place to ensure that supply will meet demand. In addition, smart charging could help reduce the impact on generation capacity and network reinforcement required by shifting charging demand to off-peak times, and the Government will regulate to ensure that all new home and workplace chargepoints have smart capability by the end of this year.

We recognise that enabling the EV transition is not just about generating enough electricity it is also about ensuring that consumers can connect to the grid in a timely and convenient way. For smaller connections, such as a domestic household installing one chargepoint, the existing electricity supply is often sufficient. However, for larger connections where multiple chargepoints are installed, such as at depots or in car parks, a new or upgraded connection may be required to cope with the new demand, and this can sometimes create a need for wider network reinforcement works. Through regulation by Ofgem, network operators must ensure that they provide connecting customers with the cheapest option that meets their requirements. Ofgem is currently reviewing the ways charges are allocated and has recently published a consultation proposing that all network reinforcement costs should be socialised across electricity bill payers, rather than falling on the individual connecting customer. This should often reduce the costs of connecting EV chargepoints to the network.[83]

Our plans to deliver the necessary carbon reductions:

Commitment

We will consult on regulatory options, including zero emission vehicle mandates, to deliver petrol and diesel phase out dates for new vehicles

To deliver our ambitious plan to end the sale of new petrol and diesel cars and vans in 2030 we are consulting on the design of a new domestic regulatory regime for road vehicles CO_2 emissions, including the possible introduction of a zero emission vehicle (ZEV) mandate, as recommended by the Climate Change Committee.[84]

A ZEV Mandate establishes sales percentage targets that must be met by vehicle manufacturers, requiring to them to sell a certain proportion of zero emission vehicles. Manufacturers earn credits for selling ZEVs, rather than the targets being monitored directly, so manufacturers can meet their target either by earning credits through the sale of ZEVs, or from buying excess credits from manufacturers that have overperformed against their own target.

The Green Paper on a New Road Vehicle CO_2 Emissions Regulatory Framework for the United Kingdom, published alongside this Plan, sets out the options which include developing the fuel efficiency and CO_2 emissions regulations already in place, or using ZEV sales targets alongside CO_2 regulation. We will seek to define the 'significant zero emission capability' (SZEC) that all new cars and vans will be required to deliver between 2030 and 2035. Regulatory certainty alongside the targeted government support set out in the Prime Minister's Ten Point Plan for a Green Industrial Revolution can drive new investments in technology and the supply chain to meet the needs of the UK market.1[85]

These measures will establish a regulatory framework that could subsequently be applied to all forms of road vehicle. Over time, regulation will support decarbonisation of the UK's entire road vehicle fleet as well as making sure that significant reductions in carbon emissions from conventional vehicles are delivered along the way.

Sales of all new non-zero emission road vehicles will be phased out by 2040

- Cars and vans (under 3.5t): all new cars and vans required to have significant zero emissions capability from 2030 and 100% zero emissions at the tailpipe from 2035.
- Heavy Goods Vehicles (above 3.5t): sales of all new medium sized trucks (up to and including 26t) to be zero emissions from 2035, with the heaviest (>above 26t) zero emission by 2040*
- Powered two wheelers: all new motorcycle sand scooters to be fully zero emissions at the tailpipe from 2035*
- We are consulting on dates to end the sale of new non-zero emission buses
- We will consult on a phase out date for the sale of new non-zero emission coaches

*Subject to Consultation

Commitment

We have published a zero emission cars and vans delivery plan

To give greater clarity on the pathway to the phase out dates for industry, we have published a 2035 Delivery Plan. This plan brings together all of our committed funding streams and measures for decarbonising cars and vans, in one place. It outlines our key timelines, milestones and how we intend to monitor progress, which will be reported on an annual basis. We will conduct a review of progress towards the phase out dates by 2025, with a view to taking corrective action if required to ensure they are met.

Commitment

We will continue to support demand for zero emission vehicles through a package of financial and non-financial incentives

To support drivers and industry make the transition to zero emission vehicles, Government has put in place a package of measures that includes:

- £582 million for plug-in car, van, taxi, and motorcycle grants until 2022-23, reducing ZEV purchase prices for consumers.
- Green number plates for zero emission vehicles were introduced in December 2020.[86] The plates increase visibility of the rapidly growing number of clean vehicles on our roads and help local authorities deliver new policies, such as zero emission zones.
- Favourable company car tax rates for zero emission cars out to 2025, zero emission cars and electric vans pay no vehicle excise duty, and a nil rate of tax is applied to zero emission vans within the van benefit charge.

Commitment

We will consult this year on a phase out date of 2035, or earlier if a faster transition appears feasible, for the sale of new non-zero emission powered two and three wheelers (and other L category vehicles)

Zero emission powered light vehicles are a clean and efficient way of getting around and can reduce congestion, air, and noise pollution from transport. While cars and vans outnumber motorcycles on UK roads, motorcycles are an important and sizeable vehicle population, with 1.4 million licensed in 2020 and we do not want to see them remaining fossil fuelled as the rest of the vehicle fleet cleans up.[87]

Commitment

We will deliver an action plan this year to build new UK opportunities for zero emission light powered vehicles

Innovation in urban logistics and personal mobility can generate substantial industrial opportunities for the UK, as the world transitions to greener transport systems. The opportunities for zero emission light powered vehicles (ZELPV) are enormous. We will build on our existing support in this segment, such as with the plug-in motorcycle grant, to benefit urban logistics and wider mobility and look to grow a new UK industrial supply chain. We will use Zemo Partnership's strategic partnership with the Motorcycle Industry Association (MCIA) to stimulate and coordinate activity in this area and publish options to develop this at national and local level this year.

Zero emission light powered vehicles

Powered light vehicles are two, three and four wheeled passenger or cargo vehicles. They are smaller and lighter than many other vehicle types and so can have a significant impact on urban transport systems, particularly when used in place of other forms of low occupancy vehicles. Their size also makes them complementary to increased public transport use and the growth of cycling and walking infrastructure.

Commitment

We will lead by example with 25% of the Government car fleet ultra low emission by December 2022 and 100% of the Government car and van fleet zero emission by 2027

Government will ensure one in four of the central Government car fleet is ultra low emission by 2022 and achieving a fully zero emission car and van fleet by 2027. Government is leading the way here, going further and faster and again demonstrating that ZEVs are credible for fleet users across the UK.

Decarbonisation in the wider public sector

Many local authorities and the wider public sector are also taking action to decarbonise their own fleets. For example, NHS England, as part of their "Net Zero National Health Service" plan has set a long-term commitment that 90% of the NHS fleet must use low, ultra-low and zero emission vehicles by 2028, and pledged to go beyond this with the entire owned fleet of the NHS eventually reaching net zero emissions. The Mayor of London's Environment Strategy commits that all new cars and vans, including response vehicles, in the GLA group (encompassing Transport for London, the London Fire Brigade and the Mayor's Office for Policing and Crime, among others) must be zero emission capable from 2025.[88]

Commitment

We will ensure the UK's charging infrastructure network meets the demands of its users

The Government has helped fund the installation of over 190,000 private chargepoints in homes and business across the country.[89] In terms of the public network, the market, supported by Government, has provided almost 25,000 chargers[90] with more than 4,250 of these being rapid chargers. We are committed to working with industry to accelerate the pace of rollout further and we are investing £1.3 billion over the next four years.

We welcome the acceleration of private investment, illustrated by recent announcements from Gridserve (committing to upgrading their Electric Highway network), bp pulse (expanding their network replacing legacy chargers) and Motor Fuel Group (investing £400 million to install 2,800 high powered chargers by 2030[91]). As this market begins to flourish, we will increasingly focus Government efforts on putting in place a policy and regulatory framework that supports increased investment and competition whilst meeting the needs of consumers.

We are introducing a range of regulatory and other measures to ensure the charging network meets users' needs:

- To support motorists making longer journeys in EVs, the Government's £950 million Rapid Charging Fund will invest in upgrading grid capacity at service areas across motorways and A-roads. By 2035 we expect to support the roll-out of 6,000 ultra-rapid chargepoints across the strategic road network.
- For those households unable to charge at their home, the On-Street Residential Scheme supports local authorities in installing EV infrastructure on-street and in public car parks. The scheme has been enhanced in response to local authority feedback, to increase the funding available per chargepoint and remove the maximum project size cap. We have committed £20 million for 2021/22.
- A new £90 million Local EV Infrastructure Fund, opening in 2022, will support the rollout of larger on-street charging schemes and rapid charging hubs across England, meeting a broader range of consumer needs.
- Given the crucial role that local authorities must play in supporting the roll-out of charging, and to navigate the complexities involved, we will publish an EV infrastructure guide for local authorities later this year.
- For properties with dedicated off-street parking, the Electric Vehicle Homecharge Scheme will provide funding towards the cost of a chargepoint and its installation. From April 2022, we will shift the focus to supporting leaseholders, renters and those living in flats. Our Workplace Charging Scheme will provide funding for EV chargepoints at workplaces and is being extended to small and medium sized enterprises and charities.
- The process and cost of connecting charging infrastructure to the electricity network can be a major barrier to roll-out. We are working with Ofgem and others to make getting new connections as timely, efficient, and affordable as possible. Through its 'Access and Forward-Looking Charges Review', Ofgem is consulting on whether more, or all, of the costs associated with a new connection could be socialised across energy bill payers, reducing the costs for the connecting customers.
- We plan to regulate later this year for all new-build residential and non-residential buildings with an associated parking space to have a chargepoint.
- We also plan to regulate this year on measures to improve the consumer experience of public charging. We will open up public chargepoint data; improve the reliability of the network; streamline the payment methods offered to drivers; and increase pricing transparency.

- We will regulate later this year to ensure charging infrastructure is smart, to help delay or reduce the need for new electricity generation or network infrastructure investment, reducing costs for all bill payers.

The Government's plans for EV infrastructure are set out in more detail in the 2035 Delivery Plan and, later this year, we will publish an EV infrastructure strategy, setting out our vision for infrastructure rollout, and roles for the public and private sectors in achieving it. This will ensure there is sufficient infrastructure provided at the pace required, and that consumers needs are met.

Vision for the rapid chargepoint network in England

Key stats:

By 2023, working with Highways England, we aim to have at least 6 high powered, open access chargepoints (150–350 kilowatt capable) at motorway service areas in England, with some larger sites having as many as 10–12.

By 2035, we expect around 6,000 high powered chargepoints across England's motorways and major A roads.

Commitment

We will support and nurture innovation in the UK automotive sector

Government has a longstanding programme of support to help transform the automotive sector to zero emission vehicles and has built a globally recognised R&D ecosystem. With industry, almost £1.5 billion has been invested through the Advanced Propulsion Centre and Faraday Battery Challenge to research, develop and commercialise low carbon and zero emission automotive technologies.[92]

As announced as part of the Prime Minister's Ten Point Plan for a Green Industrial Revolution, nearly £500 million of funding for the Automotive Transformation Fund (ATF) will be made available in the next four years to invest in capital and R&D projects to build an internationally competitive electric vehicle supply chain.[93] This is part of the up to £1 billion committed by the Government to ensure that the UK takes advantage of this once in a generation opportunity.[94] The ATF will help to secure an internationally competitive automotive supply chain for the future, supporting the 149,000 existing jobs in automotive manufacturing, including clusters of activity in the Midlands and North East.[95]

We are also investing nearly £80 million through the Driving the Electric Revolution (DER) programme to accelerate the capability and growth of the Power Electronics, Machines & Drives (PEMD) supply chain in the UK. This is cross-sector programme, spanning from automotive to rail and robotics to industrial processes, and is a key building block to deliver the technology required to achieve net zero targets by 2050.

Support available includes collaborative R&D (c.£40 million), Industrialisation Centres across the country (c.£30 million) and retraining and upskilling (c.£6 million).[96]

R&D: Gridserve

Investment in R&D is key to our mission of putting the UK at the forefront of the design, manufacture and use of zero emission vehicles. These technologies can help deliver our transport decarbonisation goals and anchor economic activity across the UK. That is why the Office for Zero Emission Vehicles (OZEV) has invested £400 million in a series of R&D competitions supporting innovation and developing vehicle and charging infrastructure technologies.

Our £40 million On-Street, Wireless and Catalysing Green Innovation Programmes include £5.4 million (£7.5 million total project cost) support for the UK's first Electric Forecourt in Braintree, Essex.[97] This first-of-a-kind demonstrator makes electric vehicle charging as easy as using a petrol station and could pave the way for a national network, helping address concerns around electric vehicle (EV) charging. The development is 100 per cent renewably sourced, thanks to a solar canopy and on-site battery storage, which reduces emissions and helps to balance demands on the grid. The Braintree site has 24 ultra-rapid charging bays with additional facilities including convenience retail, healthy eating and an 'airport-style' lounge with access to high-speed internet.

Our 'On-street' R&D competition set out to deliver low-cost, scalable charging solutions for EV owners and the 8 million dwellings in England without access to off-street parking.[98] Projects include: utilising spare energy capacity in Virgin Media's existing broadband network assets (e.g. green telephone cabinets) to charge an EV; lamppost charging solutions; and retractable chargepoint devices to reduce street clutter.

Commitment

We will invest £15 million in 2021/22 to help address the backlog in traffic signal maintenance to improve traffic flow and reduce emissions

Investment in the national traffic signal asset is needed to maintain an effective traffic management system. Traffic signal controls are essential for managing congestion, delay, and emissions, but these operations are undermined by poorly maintained detection systems and out of date traffic management plans.

£15 million of investment in 2021/22 will help highway authorities to make their signals working effectively again. Investing in the maintenance of this essential asset will not only improve emissions but also enable new technologies and data systems that will support the delivery of a digital and connected road network.

Figures over the page show our projections for GHG emissions from cars and vans, for a baseline based on firm and funded policies, and for a Decarbonising Transport policy scenario including the ambitious set of car and van policies listed above, alongside savings from modal shift and low carbon fuels policy. Both cars and vans show the potential for relatively fast reductions in emission ahead of 2050, due to current efficiency measures, and the ability to build on the existing deployment of zero emission vehicles.

Commitment

We will review the National Networks National Policy Statement

In 2019, our roads handled 88 per cent of all passenger travel by distance, the vast majority of it by car or van. Even doubling rail use across the country would only reduce this proportion to 75 per cent, assuming that overall demand did not rise. The roads also carry more than three-quarters of freight traffic, and of course nearly all pedestrian, cycling, bus and coach journeys.

Continued high investment in our roads is therefore, and will remain, as necessary as ever to ensure the functioning of the nation and to reduce the congestion which is a major source of carbon. Almost half of our £27 billion programme for England's strategic roads, though often described as for roadbuilding or capacity expansion, is in fact for renewing, maintaining and operating the existing network, or for funds to improve safety and biodiversity, deliver active travel schemes and tackle noise or pollution. In the coming years, our ambitious and accelerating plans to decarbonise all road traffic, described elsewhere in this document, will transform roads' impact on greenhouse gas emissions.

We have always said, however, that we must ensure the road network meets today's demands, not those of the past. In the last eighteen months, fundamental changes have occurred in commuting, shopping, and business travel, which before the pandemic made up 30 per cent of all road journeys by distance, and a much higher proportion at the times and places of greatest pressure.[99]

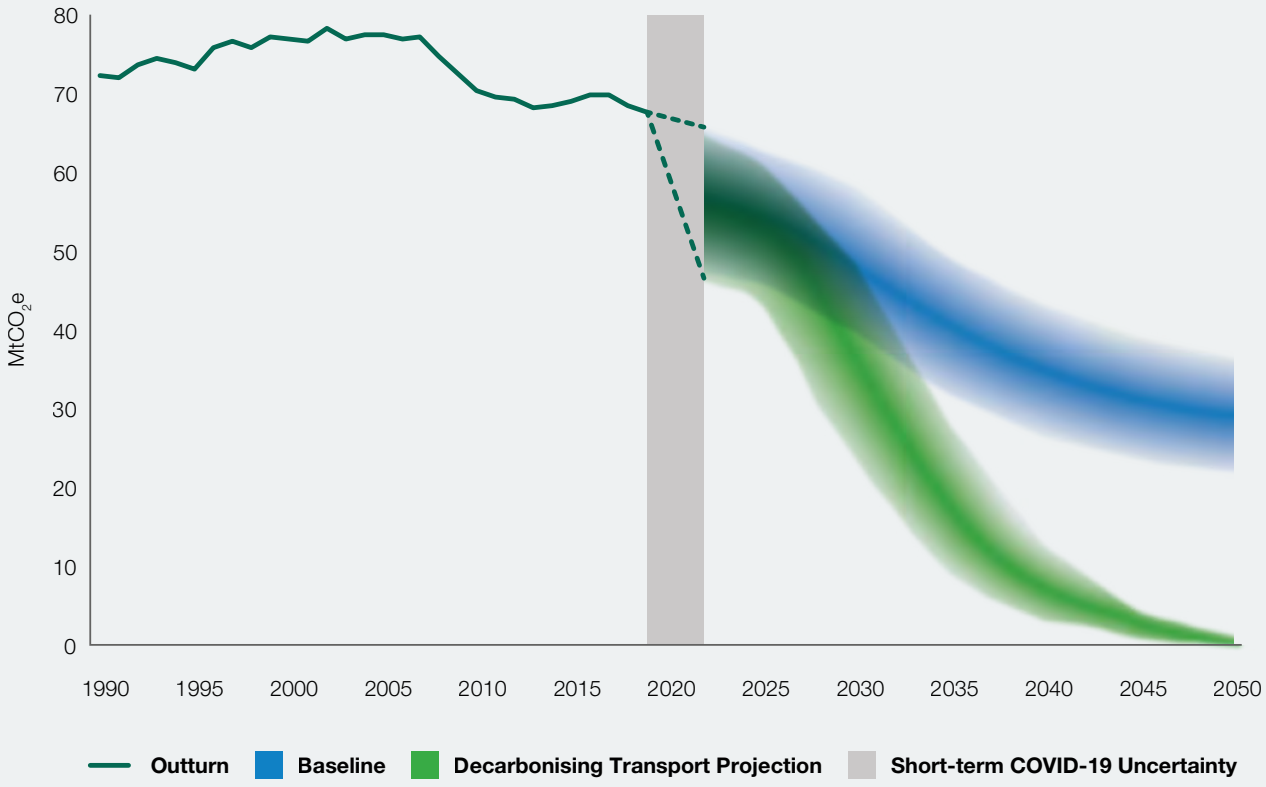
Trends already underway in homeworking, online shopping, and videoconferencing, all of which had reduced trip rates even before the pandemic, have dramatically increased, and seem unlikely to be fully reversed. Against that, though, must be set the effects on road demand of the hopefully temporary move away from public transport during the crisis; of increases in delivery traffic; and potentially of increases in driving when electric and autonomous vehicles become common.

The current National Policy Statement (NPS) on National Networks, the Government's statement of strategic planning policy for major road and rail schemes, was written in 2014 – before the Government's legal commitment to net zero, the 10 Point Plan for a Green Industrial Revolution, the new Sixth Carbon Budget and most directly the new, more ambitious policies outlined in this document. While the NPS continues to remain in force, it is right that we review it in the light of these developments, and update forecasts on which it is based to reflect more recent, post-pandemic conditions, once they are known.

As we said in last November's 10 Point Plan, as we move forward with the transition to zero emission vehicles, we will need to ensure that the tax system encourages the uptake of EVs and that revenue from motoring taxes keeps pace with this change, to ensure we can continue to fund the first-class public services and infrastructure that people and families across the UK expect.

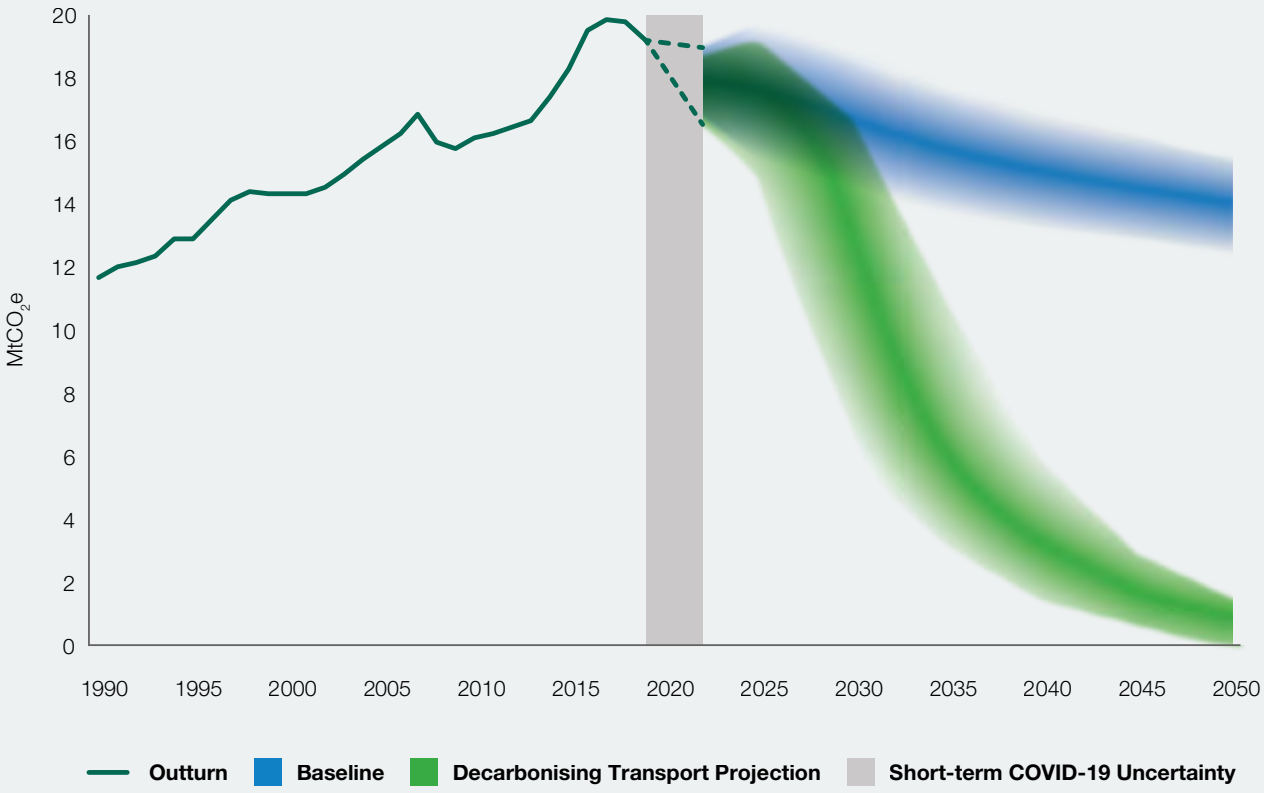
Figures 9 and 10 show our projections for GHG emissions from cars and vans, for a baseline based on firm and funded policies, and for a Decarbonising Transport policy scenario including the ambitious set of car and van policies listed above, alongside savings from mode shift and low carbon fuels policy. Both cars and vans show the potential for relatively fast reductions in emission ahead of 2050, due to current efficiency measures, and the ability to build on the existing deployment of zero emission vehicles.

Figure 9: Decarbonising Transport car GHG projections, versus the baseline*



* Historic emissions are from published GHG statistics. Future car and van emissions are modelled the using the National Transport model and adjusted for Decarbonising Transport measures. Uncertainty bands around projections reflect uncertainty on the form of final policy and uncertainties on future demand for road transport - related to future trends in travel, uptake of connected and autonomous vehicles, fuel prices, GDP growth, and historical volatility. Carbon savings are driven by Decarbonising Transport policies and ambitions. The range of uncertainty in emissions projections falls in the policy line as the proportion of miles by zero emission vehicles increases. From 2040 the lower end of policy projections includes emission reductions from speculative scenarios to get emissions to zero.

Figure 10: Decarbonising Transport van GHG projections, versus the baseline



Accelerating maritime decarbonisation[100]

6.1

$MtCO_2e$ domestic emissions in 2019

14

$MtCO_2e$ domestic and international emissions in 2019

5% of domestic GHG emissions from **shipping**

£20m

investment in 2021/2022

Around **£17bn**

GVA supported, by helping future proof the UK maritime sector

Around **220,000**

jobs supported, by helping future proof the UK maritime sector

180–230

$MtCO_2e$ savings from 2020 to 2050 (domestic and international)

Decarbonisation of UK shipping has the potential to **significantly reduce emissions of NOx, SO_2 and PM2.5**

2021

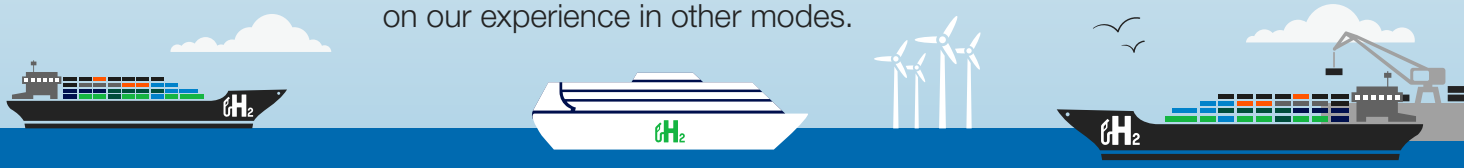
We will consult on how Government can support the wider deployment of shore power

2021

We will explore establishing a UK Shipping Office for Reducing Emissions, building on the success of the £20 million Clean Maritime Demonstration Competition and on our experience in other modes.

2021

We will assess how economic instruments could be used to accelerate the decarbonisation of the domestic maritime sector.



2022

In the review and refresh of our Clean Maritime Plan, we will establish ambitious indicative targets for the domestic maritime sector and plot a 'Course to Zero' to accelerate decarbonisation

2022

We will consult upon the potential for a planned phase out date for the sale of new non-zero emission domestic vessels

2023

Lead global efforts to secure greater ambition in the IMO's 2023 revision of its Climate Change Strategy

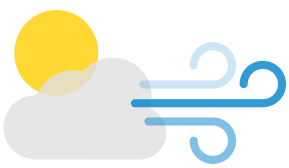
By 2050

or earlier if possible, the maritime sector will achieve net zero

*Estimated emissions for UK international shipping represent the estimated emissions from fuel sold in the UK for use in international shipping

Co-benefits:

Air quality



Jobs & growth

Maritime is an important challenge for decarbonisation. It reaches from small recreational crafts through to the vessels that serve as the backbone of international trade, and relies on shoreside infrastructure to service, support and facilitate operations.

Although shipping represents a relatively carbon efficient mode for transporting freight today,[101] in 2019 UK domestic shipping emitted more greenhouse gases in total than rail and bus transport combined.[102]

The sector has begun to decarbonise, but with new technologies now reaching the stage of demonstration and initial deployment – we must increase the pace to enable significant fleet-wide emissions reductions in the 2030s. Shipping can achieve net zero through a transition to alternative fuel powered vessels using energy from low or zero emission sources (such as ammonia produced from hydrogen created using green electricity or with the use of carbon capture and storage) or highly efficient batteries, as well as integration of ports into our decarbonised energy network and supplying the fuels of the future.[103]

Our ports and harbours have a role to play in achieving net zero, by decarbonising their own operations, deploying green, alternatively powered tugs, pilot boats and port equipment from cranes to straddle carriers and reachstackers. They are critical parts of the wider transport network and will need to act to support the decarbonisation of their customers in the maritime, road and rail freight sectors, as well as the passengers travelling to and from our ferry terminals.

We are firmly committed to achieving net zero in maritime as soon as we can, and there is evidence that the sector may be able to achieve net zero earlier than 2050 with modelling undertaken for the Department for Transport suggesting such a transition may be possible in the 2040s.[104] As set out below, we will actively explore the possibility of achieving early decarbonisation.

The UK maritime sector is important to the UK, and is estimated to have directly supported around 220,000 jobs in 2017. The sector touches on every part of our coast, from the very north of Scotland through Northern Ireland, Wales and England and we have a proud tradition of the sea and seafarers across the country, and many businesses both large and small that provide jobs. Driving forward maritime decarbonisation is an opportunity to revitalise our ports and coastal communities across the UK, and one which we must take.

In decarbonising our maritime sector, we can also leverage our investments to gain a larger share of the global market for clean maritime technology. This is a pivotal opportunity to futureproof and grow UK industry and create jobs right across the UK.

Victoria of Wight – a highly efficient combined diesel electric drive ferry

Wightlink's newest vessel, Victoria Of Wight, entered into service in 2018 on the Portsmouth – Fishbourne crossing from the mainland to the Isle of Wight. Costing £30 million to build and capable of carrying almost 1,200 passengers, the hybrid energy flagship has a combined diesel electric drive, with significantly reduced emissions compared to similarly sized ships giving immediate benefits to air quality and lower greenhouse gas emissions.[105]

Victoria of Wight is 17% more energy efficient than the design it replaced, in part due to the battery system and the higher efficiency options that unlocks, and in part due to having been designed from the keel up to reduce energy use and recover waste heat. The ship has a 408kWh battery array onboard, to supplement four high efficiency marine diesel engines. It uses the batteries to balance the load of the engines, keeping them at an efficient load point and reducing both emissions and noise when arriving at berth.[106]

Our plans to deliver carbon reductions include:

Clear targets for getting to net zero

Commitment

We will plot a course to net zero for the UK domestic maritime sector, with indicative targets from 2030 and net zero as early as is feasible

We will establish, following public consultation in 2022, an ambitious 'Course to Zero'. This consultation will explore the technical, operational and policy options available for Government to accelerate decarbonisation in this sector to achieve net zero by no later than 2050 or earlier if possible.

Following consultation, we will establish ambitious indicative targets for the domestic maritime sector recognising that we have ground to make up, covering 2030 and onwards. These targets will guide the design and enable us to measure the success of future policy interventions.

We will embed this course in our Clean Maritime Plan (CMP), as part of a planned review and refresh which is due to start in 2022 and include within the CMP the long term interventions needed to achieve full decarbonisation.[107]

Maritime Research and Innovation UK (MarRI-UK) – Clean Maritime Programme

As part of the work of MarRI-UK, we provided targeted funding to ten small, high value projects considering the issue of decarbonisation. The public funding (totalling £1.4 million) was invested following competitive tendering in projects across the country to support small businesses, research organisations and the wider maritime sector in meeting the challenge of decarbonisation.[108] The programme included projects to develop new fully electrical engines for small crafts, to demonstrate a small fully electric ferry in operation, to test the use of advanced fuels such as ammonia, use data analytics to optimise vessel operations, trial the development of an innovative new biofuel and support the testing and deployment of advanced battery systems. The success of this programme has helped support the Government taking further action through the ongoing Clean Maritime Demonstration Competition.

Commitment

We will consult on the potential for a planned phase out date for the sale of new non-zero emission domestic vessels

Following the conclusion of the current Clean Maritime Demonstration Competition and the Course to Zero consultation, we will consult in mid-2022 upon the potential for long term decarbonisation to be accelerated through carefully designed, well signposted measures to phase out the sale of new, non-zero emission domestic vessels, building on the experiences of the steps being undertaken today in other modes of transport.

This work will focus on vessel types where near-term technical solutions are becoming available (for example electrification) as well as considering the longer-term deployment of advanced fuels such as ammonia and hydrogen.

Accelerating decarbonisation

Commitment

We will assess how economic instruments could be used to accelerate the decarbonisation of the domestic maritime sector

Building on the work undertaken in Maritime 2050, the Clean Maritime Plan, and the Department's published research, we will further investigate the use of economic instruments to drive sectoral decarbonisation.

Commitment

We will accelerate the development of zero emission technology and infrastructure in the UK

We have recently launched a £20 million funding package – the Clean Maritime Demonstration Competition (CMDC) – to support and accelerate research, design and development of zero emission technology and infrastructure solutions for maritime and accelerate decarbonisation. The CMDC will run for a year from March 2021 and will provide support to projects that contribute to both reducing emissions in the near term and demonstrating how the sector can transition to net zero operations.

We will explore the establishment of a UK Shipping Office for Reducing Emissions (UK-SHORE). This is a dedicated unit within the Department for Transport focused on decarbonising the maritime sector. UKSHORE will build on the success of the CMDC, delivering a suite of interventions inspired by our experience with decarbonising other transport modes, looking at programmes such as the Office for Zero Emission Vehicles and the Future Fuels for Flight and Freight Competition.

UK-SHORE aims to transform the UK into a global leader in the design and manufacturing of clean maritime technology. Government will continue to engage with industry to consider how the establishment of this programme in cooperation with UKRI and Innovate UK could unlock the necessary industry investment in clean maritime technologies , tackling supply and demand side barriers as well as developing infrastructure and consumer confidence..

Commitment

We will consult this year on the appropriate steps to support and, if needed, mandate the uptake of shore power in the UK

Plugging in domestic and international vessels while in port and ensuring charging capacity is provided for the roll out of electric ships has the potential to quickly reduce greenhouse gas and pollutant emissions from the ports and shipping sector.

Shore power has a role to play in immediately reducing emissions from vessels visiting ports, and is an option that is likely to be ‘low/no regrets’ as vessels utilising the less energy dense alternatives will look to plug in where they can.

Research undertaken by both industry and government has highlighted significant existing barriers including the cost of infrastructure (both in ports and for national grid connections) and a lack of clarity about long term levels of demand from vessels.

We will consult in winter 2021 on how government can support the wider deployment of shore power, including consideration of regulatory interventions, for both vessels and ports, that could drive deployment as we transition to a net zero world, and bring forward appropriate measures.

Commitment

We will extend the Renewable Transport Fuel Obligation (RTFO) to support renewable fuels of non-biological origin used in shipping

We consulted in March 2021, on a potential expansion of the RTFO to include some advanced maritime fuels in order to support their deployment.[109] The RTFO mandates that a certain proportion of road fuel must be from a sustainable renewable source. Maritime fuels currently have no equivalent system, which we aim to change. We recently announced that we will make renewable fuels of non-biological origin used in shipping eligible for incentives under the RTFO.[110]

Working internationally to deliver emissions reductions

Commitment

Internationally, the UK will press for greater ambition during the 2023 review of the International Maritime Organisation Initial Greenhouse Gas Strategy and urge accelerated decarbonisation

International Shipping Emissions fall under the remit of the International Maritime Organization (IMO), the United Nations Specialized Agency with responsibility for shipping. The IMO agreed its initial strategy for GHG emissions in 2018 committing to cut emissions by at least 50% by 2050, compared with 2008 levels, and to phase them out completely as soon as possible this century.[111] The IMO will review its strategy in 2023 and as set out in the recent G7 Climate and Environment Communique[112] the UK will be seeking to increase ambition to ensure that international shipping plays its part in delivering decarbonisation.

We will promote close alignment with the Paris temperature goals and challenge the international community to deliver on the IMO initial strategy commitment to 'phase out' emissions from the international sector as soon as possible.

Commitment

We will ensure we have the right information to regulate emissions, and to judge the effectiveness of the steps we are taking in the UK and at the IMO

We will review, and if appropriate amend, the operation of the UK's existing monitoring, reporting and verification system for greenhouse gas emissions from international shipping, to ensure it is fit for purpose and delivering the information we need to decarbonise the maritime sector.

We will keep the measurement approach to the UK's international shipping emissions under review and consider the appropriateness of fuel or activity-based measures.

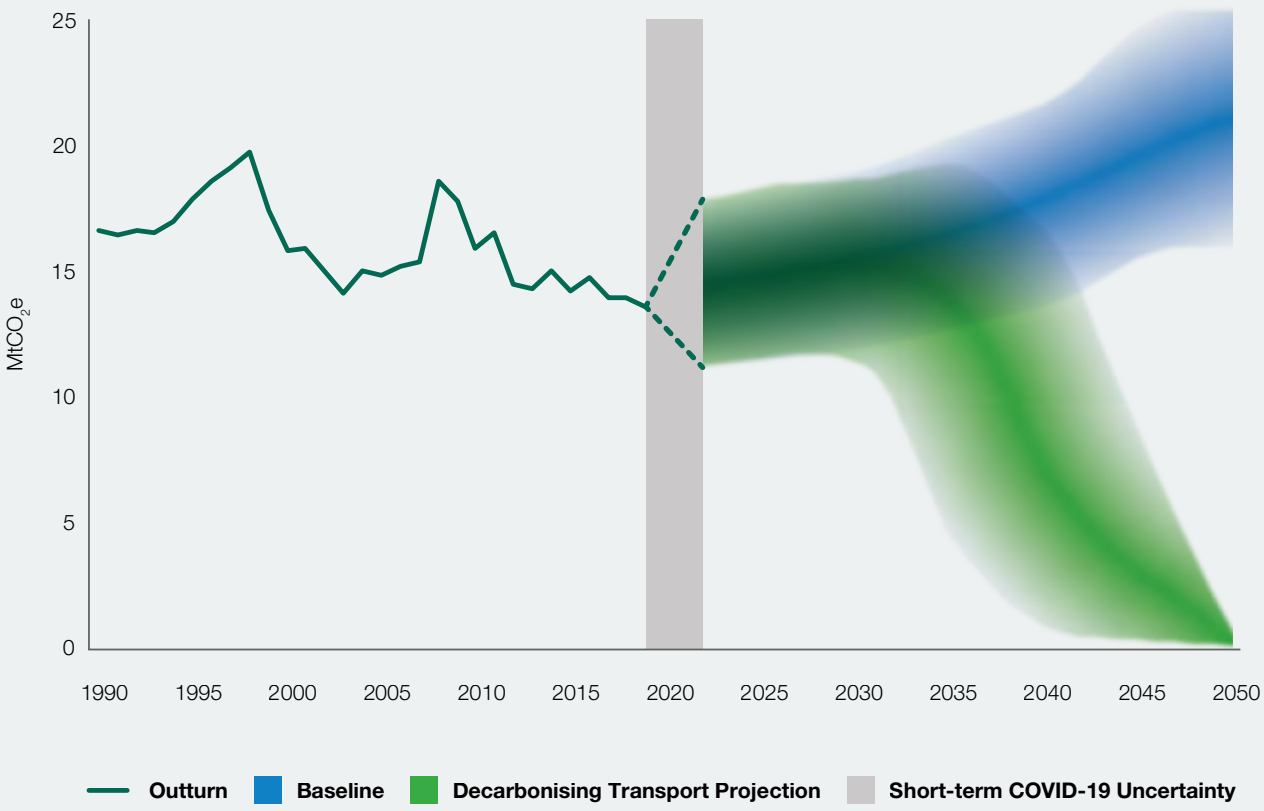
Additionally, we will consider how similar information can be collected for the domestic fleet, in order to provide a better evidence base for future policy interventions.

The figure shows our projections for GHG emissions from domestic and international shipping, for a baseline based on firm and funded policies, and for Decarbonising Transport policy scenarios consistent with net zero. There is significant uncertainty at present surrounding the optimal trajectory for reaching net zero shipping emissions – based on the latest available evidence from the CCC. Our figure illustrates several potential net zero consistent GHG emissions trajectories that shipping could follow. Decarbonising Transport GHG projections show the opportunity for large emissions reductions in the long term from the deployment of zero emissions fuels in shipping. However this may not reflect the full range of pathways and the Government will seek further views on how best to reach net zero by 2050 as part of the consultation process outlined above.

We will include the UK international aviation and shipping emissions in the Sixth Carbon Budget

The Government has set the Sixth Carbon Budget to include the UK's share of international aviation and shipping emissions, as recommended by our independent climate advisors, the Climate Change Committee (CCC). This allows those emissions to be accounted for consistently with other emissions included within the Sixth Carbon Budget.[113]

Figure 11: Decarbonising Transport domestic and international shipping GHG projections, versus the baseline*



* Historic emissions are from published GHG statistics. The baseline and projections are estimated from CCC CB6 analysis (https://www.theccc.org.uk/publication/sixth-carbon-budget/), which drew on research commissioned by DfT to inform the Clean Maritime Plan. These have been adjusted to account for the historic volatility of domestic and international shipping emissions, and the CCC's assumptions about the impacts of COVID-19 have been removed for consistency with other sectors. Given the emerging nature of zero emission shipping fuels, these projections should be interpreted as possible net zero-consistent scenarios rather than estimates of the impact of specific policies. In line with the CCC's recommended method for CB6 and UNFCC reporting, the projections for international shipping emissions represent the estimated emissions from fuel sold in the UK for use in international shipping.

Accelerating aviation decarbonisation[114]

1.4
$MtCO_2e$ domestic emissions in 2019

38
$MtCO_2e$ domestic and international emissions in 2019

1%
of domestic GHG emissions from **aviation**

£21m
investment in 2021/2022

over **£85bn added to the economy** through the ATI programme supported by UK government

over **73,000 high value jobs have been supported** through the ATI programme supported by UK government

250–430
$MtCO_2e$ savings from 2020 to 2050 (domestic and international)

2021

We will support R&D to develop transformative green aviation technology

2021

We will consult on our Jet Zero strategy including, getting domestic aviation in the UK to net zero by 2040

2021

We have run a Sustainable Aviation Fuel (SAF) industry competition and set out our plans for a UK SAF blending mandate to accelerate the production and use of sustainable aviation fuels in the UK

2022

We will work internationally and aim to agree an ambitious long-term global emissions reduction goal in the International Civil Aviation Organization

2025

We will mandate the supply or use of sustainable aviation fuels

Co-benefits:

Air quality

Jobs & growth

Noise

Decarbonising aviation is one of the biggest challenges across the global economy. The technological requirements to provide the power to propel aircraft the distances required far outstrip those for equivalent land-based transport.

This, plus a projected increase in passenger numbers, and the need for global coordination, means that decarbonisation will require a consistent, long-term effort from government and industry, both in the UK and internationally. Through these efforts, we are determined to meet this challenge and are committed to UK aviation achieving net zero by 2050.[115]

UK aviation has grown significantly since 1990, with passenger numbers increasing threefold to reach 296 million in 2019.[116] Aviation has been one of the sectors most severely impacted by COVID-19. While we expect air travel to recover, the speed of recovery and longer-term impact of COVID-19 on the aviation sector are uncertain. However, by 2050 the Climate Change Committee (CCC) expects the sector to be the second largest contributor to UK GHG emissions unless significant action is taken.[117]

We are already taking decisive action. Last year we launched the Jet Zero Council, a pioneering partnership between the Government and the aviation sector to fast-track zero emission flight and the production of sustainable aviation fuels (SAF) in the UK. This was supported by an initial £21 million investment in SAF and R&D into airport infrastructure upgrades for zero emission flight.[118] Earlier this year we also launched the UK Emissions Trading Scheme (ETS) which will be the world's first net zero carbon cap and trade market.

The Jet Zero Council

The Jet Zero Council is a partnership between industry and government that brings together senior leaders in aviation, aerospace, and academia to drive the development of new technologies and innovative ways to cut aviation emissions. Its aim is to deliver zero emission transatlantic flight within a generation. The Council is considering how to: develop and industrialise clean aviation and aerospace technologies; establish UK production facilities for SAF and commercialise the industry; and develop a coordinated approach to the policy and regulatory framework needed to deliver net zero aviation by 2050. The Government will continue to work closely with industry on our Jet Zero ambition and provide information in a transparent and timely manner.

Internationally, the UK plays a lead role, for example in developing and securing agreement to Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) – the first scheme to address CO_2 emissions globally across a single sector.[119] The UK will be one of the earliest participants in the scheme, and recently implemented the monitoring, reporting and verification provisions in the UK.[120] We aim to implement the offsetting provisions for CORSIA by April 2022.

What's more, the UK Emissions Trading Scheme already covers emissions from domestic flights, flights from the UK to the European Economic Area and flights between the UK and Gibraltar. In 2019, these flights made up 44 per cent of all commercial flights to and from UK airports.[121]

This is just the start. Alongside this publication, we are publishing a consultation on Jet Zero – a draft strategy to reach net zero aviation by 2050. Delivering this will require ambitious action across a number of key areas: the development of new zero emission aircraft, accelerating the supply and uptake of SAF, modernisation of our airspace and airports, and the development of trusted and verifiable markets to offset residual emissions. Information also needs to be made available to consumers which allows them to choose the most sustainable routes and travel providers when planning and undertaking their journeys. We need rapid progress in each of these areas to put aviation onto a credible and sustainable pathway to achieving net zero.

As the sector emerges from COVID-19, we need to be very clear about where it will need to get to by 2050 and the years leading up to it. The Prime Minister's Ten Point Plan for a Green Industrial Revolution made clear that this is an opportunity to build back better and align our economic recovery with our environmental commitments.[122] Through our plan and draft Jet Zero strategy, not only will aviation reach net zero by 2050, but we will look to move even sooner in certain areas such as domestic aviation and airports.

And whilst the focus of this plan is on the UK's emissions, there's a bigger prize within our grasp in aviation: the chance to reach an ambitious long-term global agreement on reducing all international aviation emissions. This remains a key area of focus as our international leadership can help deliver much greater emissions reductions and help reduce the risk of carbon leakage[123] and competitive distortions that could undermine our domestic approach.

UK Emissions Trading Scheme (ETS)

On 1 January 2021 the Government established a UK Emissions Trading Scheme (UK ETS) to replace the UK's participation in the EU Emissions Trading System (EU ETS).[124] The UK ETS covers emissions from the UK's power sector, heavy industry and aviation, and puts a cap on the greenhouse gases that businesses can emit, which will decrease over time.

ZeroAvia: The world's first hydrogen fuel cell powered flight

On 23 September 2020, the world's first hydrogen fuel cell powered commercial-grade aircraft, a Piper M-class six-seater, completed a full flight including taxi, take-off, circuit and landing at Cranfield Airport. The flight also showcased local hydrogen production onsite at the airport through electrolysis, showing a full zero emission ecosystem. Supported by £15 million of government funding as part of the Aerospace Technology Institute's programme, ZeroAvia is working on scaling-up its hydrogen technology for use on a 19-seater aircraft, securing up to 300 design jobs and 400 manufacturing jobs in Cranfield, Warwick and Orkney.[125] Through our zero emission aircraft programme of work, we will help prepare airports and airfields to handle these new forms of aircraft.[126]

Further details on our plans to decarbonise aviation will follow in our Jet Zero strategy.

Our plans to deliver the necessary carbon reductions:

Clear targets for getting to net zero

Commitment

We will consult on our Jet Zero strategy, which will set out the steps we will take to reach net zero aviation emissions by 2050

The strategy will set out our approach to accelerating efficiency improvements of aircraft, airports and airspace, positioning the UK as a global leader in zero emission flight and SAF, and will explore how we can support consumers to make more sustainable travel choices when flying.

Commitment

We will consult on a target for UK domestic aviation to reach net zero by 2040

Following the CCC's recommendation, we will consider whether UK domestic aviation should aim to achieve net zero earlier than the UK's share of international aviation emissions, which could support our wider ambitions by driving innovation and early technology adoption in the UK.

Commitment

We will consult on a target for decarbonising emissions from airport operations in England by 2040

Airports represent a small but material share of emissions from aviation. Several airports including Manchester and Gatwick have already achieved carbon neutrality;[127] and many are now setting more ambitious targets, including Bristol, which is aiming for net zero emissions by 2030.[128] We will consult on introducing an ambitious target across all airports.

Accelerating decarbonisation

Commitment

We are supporting the development of new and zero carbon UK aircraft technology through the Aerospace Technology Institute (ATI) programme

The ATI Programme provides £150 million of funding per year, matched by industry, for mid-stage collaborative R&D projects from 2013 to 2026.[129]

This includes the ATI led FlyZero study – the first essential step in setting out a detailed plan for how the UK might best contribute to a zero emission aircraft by 2030.[130] As of May 2021, 327 R&D projects valued over £2.9 billion involving 352 unique organisations (including 218 SMEs) have been supported by the UK Government through the ATI Programme.[131]

Commitment

We will fund zero emission flight infrastructure R&D at UK airports

We will invest £3 million in 2021/22 through the Zero Emission Flight Infrastructure programme to accelerate R&D into infrastructure requirements at airports and airfields to handle new forms of zero emission aircraft.[132] This will help UK airports and airfields to adapt more quickly to handle these exciting new technologies.

Commitment

We will kick-start commercialisation of UK sustainable aviation fuels (SAF)

SAF are expected to play a key role in decarbonising aviation. We are putting in place a comprehensive policy framework that could enable greater SAF uptake than is accounted for within the CCC's Balanced Pathway if the market develops quickly.[133] We have recently launched the £15 million Green Fuels, Green Skies competition[134] to support the production of SAF in the UK, building on the success of the Future Fuels for Flight and Freight Competition.[135] We will invest £3 million to establish a SAF clearing house, the first of its kind announced in Europe, to enable the UK to certify new fuels, driving innovation in this space.

Commitment

We will consult on a UK sustainable aviation fuels mandate

In 2021 we will consult on a SAF mandate to blend greener fuels into kerosene, which will create market-led demand for these alternative fuels. With government support for the emerging industry, we want to position the UK as a market leader, capturing significant environmental and economic benefits from the emerging global SAF market, potentially worth up to £1.5 billion per annum for the UK economy by 2040.[136]

Sustainable Aviation Fuels

Both DfT and industry research has highlighted the potential benefits the UK SAF sector could bring to the entire UK, including up to 11,500 jobs in the next few decades.[137] Our Future Fuels for Flight and Freight Competition (F4C) has received applications from and awarded funding to projects located in areas across the country. With SAF plants already planned in Immingham, Port Talbot and Ellesmere Port, it is clear there is an opportunity to develop these areas further and help them transition to more sustainable fuels production. Our SAF programme of work, boosted by the new £15 million Green Fuels, Green Skies competition, will look at ways to scale up the domestic SAF sector and ensure it can bring about environmental and industrial benefits to the country.

Commitment

We will support UK airspace modernisation

We will support airspace modernisation to deliver quicker, quieter, and cleaner journeys, alongside annual carbon savings of up to 0.6 $MtCO_2e$ (based on 2019 figures), for the benefit of those who use and are affected by UK airspace. The CAA's updated Airspace Modernisation Strategy, due to be consulted on later in 2021, will provide further detail. Meanwhile, the Government is providing up to £5.5 million funding in the years 2020/21 and 2021/22 to ensure the programme remains on track through the global pandemic.

Airspace modernisation has the potential to deliver a reduction in planes queueing in holding stacks over the UK and allow more efficient flight paths to be optimised. These changes will help to bring emissions reductions and potential noise benefits to those living underneath flightpaths, as well as reduce delays.

Commitment

We will further develop the UK Emissions Trading Scheme (ETS) to help accelerate aviation decarbonisation

We will look to improve the system for aviation, for example by reviewing the sector's free allocation in line with the commitment to a net zero consistent ETS cap trajectory, exploring whether to expand the pollutants covered, and determining how the UK ETS will interact with the global offsetting scheme for aviation, CORSIA.

Commitment

We will work with industry to accelerate the adoption of innovative zero emission aircraft and aviation technology in General Aviation

General Aviation refers to the operation of non-scheduled commercial and leisure flights. The sector encompasses a wide range of aircraft and types of flying including private and business flights, flight training, emergency services and medical transfer services. The Government has published the General Aviation Roadmap which states our support for encouraging the adoption of new technology in the sector.[138]

Working internationally to deliver emissions reductions

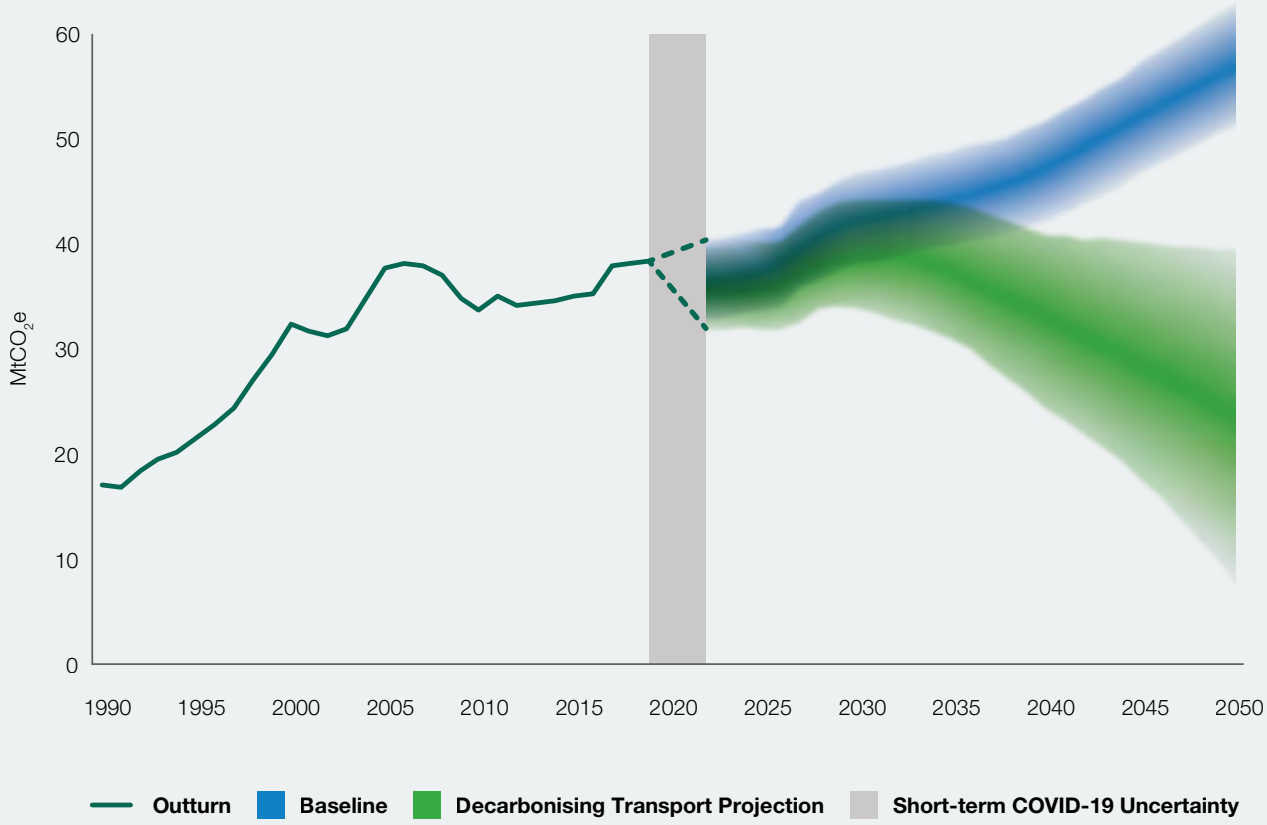
Commitment

We will aim to agree an ambitious long-term global emissions reduction goal in the International Civil Aviation Organization by 2022

A long-term climate goal for international aviation through the UN International Civil Aviation Organization (ICAO), which is consistent with the global temperature goals of the Paris Agreement, remains a top priority.[139] We will build on the success of CORSIA to negotiate for the adoption of an ambitious goal by ICAO's next Assembly in 2022.

A globally co-ordinated, sector-based approach to tackling international aviation emissions reduces the risk that these emissions simply move to other jurisdictions in response to individual countries taking unilateral action. Our focus therefore remains on international action to address emissions from this inherently international sector, alongside bold domestic action.

Figure 12: Decarbonising Transport aviation GHG projections, versus the baseline*



* Historic emissions taken from published UK GHG statistics. Emissions projections taken from the DfT Aviation model. The baseline represents no further policy intervention above that which is already in place. Uncertainty bands have been added, based on historic volatility within aviation emissions, to reflect uncertainty surrounding future emissions. GHG savings are driven by fuel efficiency improvements, uptake of sustainable aviation fuels, introduction of zero emission aircraft, and the impact of a carbon price on demand. Positive emissions in 2050 will be offset to ensure that transport achieves net zero.

The figure above shows our projections for carbon emissions from UK aviation (domestic and international). The baseline reflects a counterfactual scenario with no further policy intervention (no carbon price or uptake of sustainable aviation fuels, and only a low annual fuel efficiency improvement of 0.5%).[140]

The policy projection is based on illustrative scenarios that have been produced for the Jet Zero Consultation. These scenarios reflect the range of potential pathways to net zero for aviation, depending on how different technologies and their costs develop over time. The scenarios are based on 2017 forecasts of passenger demand and therefore do not take into account the potential long-term impact of COVID-19 on aviation demand. The upper bound of the projection broadly reflects a continuation of current trends, including annual efficiency improvements of 1.5% and moderate uptake of SAF (5% of total aviation fuel usage in 2050) and the application of a universal carbon price to all flights. The lower bound is a speculative scenario with some zero carbon aircraft and a very high uptake of sustainable aviation fuels (75% of total aviation fuel usage in 2050) – the feasibility of this will depend on the availability of sustainable feedstocks, blending limits and the extent to which costs fall in future. Any residual emissions in 2050 will be offset to ensure that aviation reaches net zero.

Offsetting

Residual emissions from the aviation sector will need to be offset by credible, verifiable and demonstrable additional offsets that would see an equivalent amount of carbon removed from the atmosphere. Our Jet Zero Consultation will consider how existing market-based mechanisms such as the UK ETS and CORSIA, as well as innovative greenhouse gas removal technologies, can address residual emissions.

Carbon Offsetting in Transport

Carbon offsetting enables individuals and organisations to compensate for any emissions they cannot avoid or reduce by ensuring an equivalent amount of emissions is reduced or removed elsewhere. These emissions savings are generated through the implementation of a wide variety of projects, which range from planting trees and installing solar panels, to technologies which can capture and store atmospheric carbon, such as BECCS and DACCS. To meet net zero across the economy, any residual greenhouse gas emissions in 2050 must be offset. This includes any remaining emissions from transport. In 2019, the Government ran a call for evidence on Carbon Offsetting in Transport,[141] including asking for views on whether travel providers should be required to provide offsets. Many respondents, from a wide range of organisations, suggested that Government should focus on direct emissions reductions, and not on offsetting. Some respondents did support offsetting, while noting that it should only be used while the sector also attempts to reduce its own emissions, and not as an alternative. As set out in this document, our primary aim is to reduce and eliminate emissions wherever possible, and having considered responses to the call for evidence, the Government does not consider it appropriate at this time to introduce a requirement for travel providers to offer offsets. This position will be kept under review to ensure it reflects the latest developments in technology and offsetting schemes.

2b

Multi-modal decarbonisation and key enablers


West Midlands Metro

Delivering a zero emission freight and logistics sector 142

19.5

MtCO$_2$e emissions in 2019

16% of 2019 domestic GHG emissions from **HGVs**

Up to **£700m** **GVA supported** in 2050 from zero emission vehicle manufacture

Up to **5,000 jobs supported** in 2050 from zero emission vehicle manufacture

200–220 **MtCO$_2$e savings** from 2020 to 2050

Up to **£600m** **air quality benefits** from 2020 to 2050

2021–22

£20 million to support the Mode Shift Revenue Support and Waterbourne Freight Grant Schemes

2021

Consult on phase out dates for the sale of new non-zero emission HGVs

2021

£20 million investment in Zero Emission Road Freight Trials

2035

End sale of new non-zero emission HGVs (under 26t)*

2040

End sale of new non-zero emission HGVs (above 26t)*

*subject to consultation

Co-benefits:

Jobs & growth

Air quality

Noise

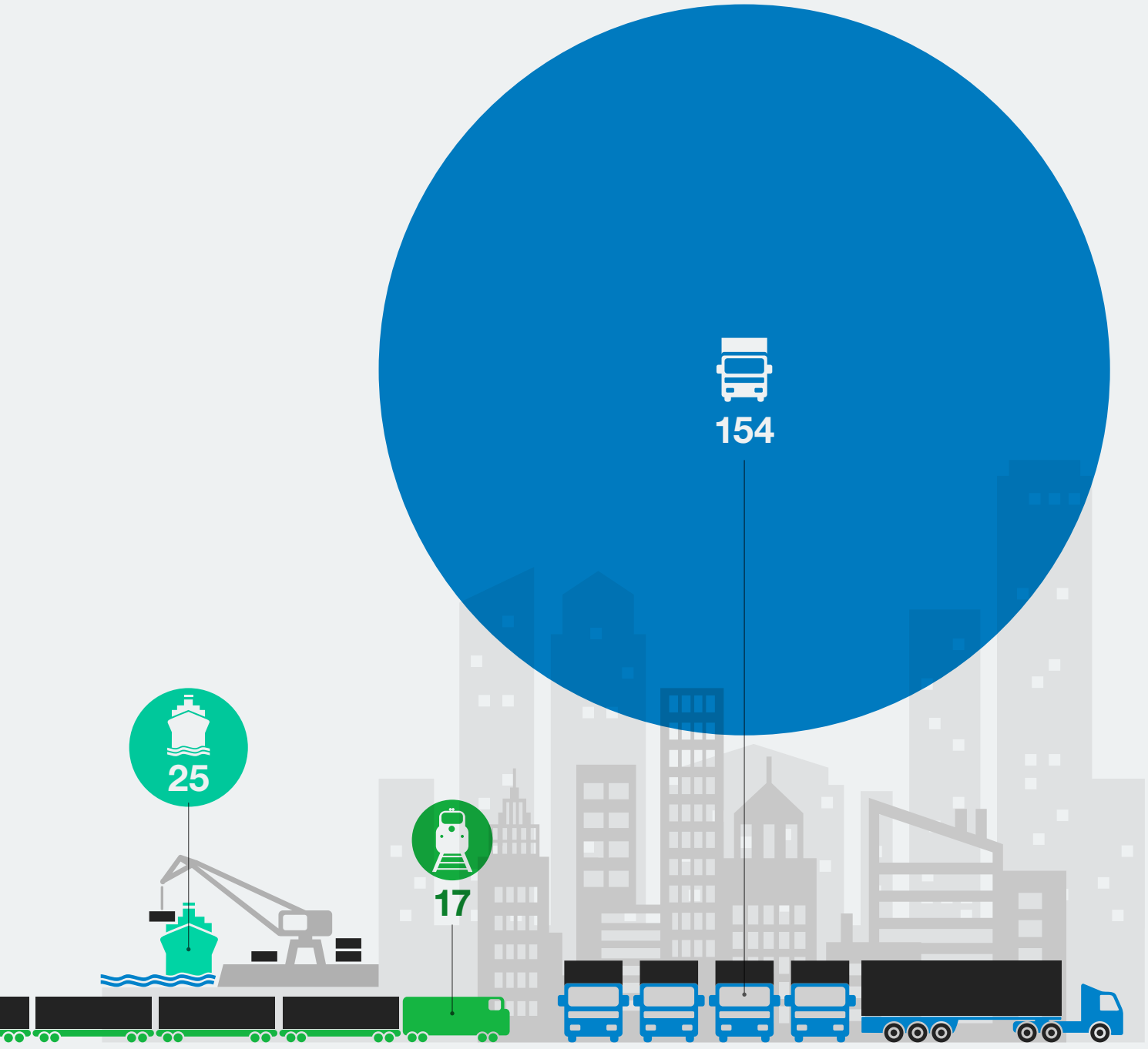
Freight and logistics encompass everything involved in the movement of goods, from the largest trucks on our roads to local deliveries, as well as freight carried by rail, water and air. The vast majority of freight is moved by vehicles on our roads. Removing these emissions requires the development and deployment of clean technologies, as well as the use of more sustainable forms of transport, many of which are already available including cargo bikes and rail.

The transition to zero emission is already underway for small commercial vehicles. The next decade will see rapid progress and investment in zero emission technology options for larger heavy goods vehicles (HGVs), alongside deployment of supporting infrastructure and increasing demand from businesses. Decarbonising the last mile will create cleaner, more liveable places, and a more integrated, efficient, and sustainable delivery system will encourage freight to shift from both road and aviation to rail, reducing congestion and emissions.

Our freight sector is critical to our economic wellbeing, ensuring the flow of goods along our supply chains are reliable and efficient. Government is considering its wider approach to the freight sector through its Future of Freight programme. The strategy will describe the Government's long-term vision for the freight sector across a range of indicators, including decarbonisation, and provide a policy route map to achieve that vision. The Government will take forward work on the strategy throughout 2021.

Domestic freight transport, by mode: 2019[143]

Goods moved (billion tonne kilometres)



Our plans to deliver the necessary emissions reductions:

Commitment

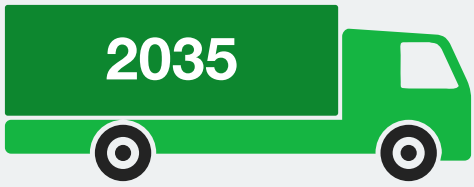
We are consulting on phase out dates for the sale of all new non-zero emission HGVs

The European truck manufacturers' association, ACEA, has already pledged to end the sale of fossil fuelled HGVs by 2040. We are consulting on ending the sale of new non-zero emission HGVs by 2035, for vehicles 26 tonnes and under, and 2040, for vehicles over 26 tonnes. We are proposing two different dates to encourage the faster uptake of zero emission technology in smaller vehicles, where this product is already reaching the market. Emissions savings may be modest initially but will ramp up considerably as new technologies come to market and operators refresh their vehicle fleets.

Phase out dates for new non-zero emission Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs):

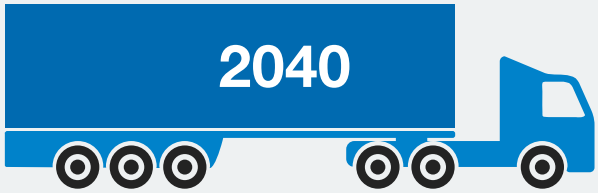
LGVs (under 3.5t) all new vehicles required to have significant zero emissions capability

and 100% zero emissions at the tailpipe **from 2035**



HGVs (above 3.5t and up to and including 26t) End the sale of new non-zero emission HGVs in this category **by 2035**, or earlier if a faster transition seems feasible*

HGVs (above 26t) End the sale of all new non-zero emission HGVs **by 2040**, or earlier if a faster transition seems feasible*



*Subject to consultation

The Green Paper on a New Road Vehicle CO_2 Emissions Regulatory Framework for the United Kingdom will establish a regulatory framework to deliver these phase out dates and ensure emissions reductions from conventional vehicles along the way.

DAF LF Electric truck. Accreditation: Leyland Trucks Ltd.

Electric HGVs creating manufacturing jobs in the UK

Leyland Trucks, a PACCAR company and the UK's largest HGV manufacturer, recently announced the zero emission DAF LF Electric, coming to market this year. This 19-tonne, fully electric distribution truck has a range of 174 miles on a single charge and can complete a rapid recharge from 20% to 80% in 60 minutes. For urban distribution, this will allow the truck to charge during a driver's rest break. The truck is also designed to power auxiliary equipment such as a refrigeration unit or a crane. The LF model is in addition to the heavier CF Electric, up to 37 tonnes, suitable for interurban, supermarket, and waste collection. Leyland Trucks manufactures the full line of DAF models and is based in Lancashire, employing over 1,000 people in the UK.[144]

Commitment

We will demonstrate zero emission HGV technology on UK roads this year

Given uncertainty about which zero emission technology is most suitable for decarbonising long-haul HGVs, we are investing £20 million this year to support industry to develop cost-effective, zero emission HGVs and refuelling infrastructure across the UK. This includes designing electric road system and hydrogen fuel cell trials, developing technology and UK supply chains, and providing funding to demonstrate and prove real world applications of emerging battery electric trucks.[145]

In line with advice from the Climate Change Committee, turning designs into full trials will inform decisions on the best route to a fully zero emission UK road freight sector, particularly the roll out and location of the necessary supporting infrastructure.[146]

Commitment

We will stimulate demand for zero emission trucks through financial and non-financial incentives

Zero emission trucks are already entering the market, particularly in the medium sized categories undertaking urban and regional deliveries. They are suitable for a range of duty cycles and operations but currently have a higher upfront price than diesel equivalents. We have committed to a package of measures to accelerate the deployment of new zero emission HGVs and realise early carbon savings:

- We have provided £582 million to continue the plug-in grants until 2022–23, including support for the plug-in truck grant. The plug-in truck grant reduces the purchase price of zero emission commercial vehicles for consumers. Grant rates for eligible trucks are set at 20% of the purchase price, with up to £25,000 of funding available for the largest HGVs.
- As part of the HGV phase out date consultation, we are consulting on whether to increase maximum vehicle weights for alternatively fuelled and zero emission trucks. This would offset the additional weight from the use of batteries and/or hydrogen storage tanks, increasing their commercial viability and attractiveness to operators.

Commitment

We will support efficiency improvements and emission reductions in the existing fleet

Government will continue to use a range of measures to cut emissions from the existing HGV fleet in advance of zero emission alternatives becoming mainstream.

- We will use the Energy Saving Trust's online Freight Portal, to showcase the commercial benefits of improved fuel and logistical efficiencies, including information on available technologies, training and advice which operators can adopt to save time and money while reducing their emissions.[147]
- We will build on the initial work of Zemo Partnership and others in identifying zero emission solutions for transport refrigeration units and auxiliary power units, producing an action plan for their identifying the technologies available, barriers to introduction, and opportunities.
- The Renewable Transport Fuel Obligation will continue to support the use of sustainable low carbon fuels in road vehicles. To increase emissions savings, we will explore the potential to increase the biocontent in fuels for use in compatible vehicles, for example through the use of higher blends of biofuels or drop-in fuels. More details can be found in the section on 'Maximising the benefits of sustainable low carbon fuels'.
- Government has committed to maintaining the fuel duty differential up to 2032, subject to review in 2024, to encourage the use of biomethane and other gaseous fuels that create carbon savings compared to fossil fuels.[148]

Trailar full vehicle line up.
Accreditation: Aaron Thomas, CEO Trailar.

TRAILAR: Combining solar technology with commercial vehicles

TRAILAR is a novel transport innovation that utilises solar technology integrated with commercial vehicles to reduce emissions, fuel and maintenance spend. The technology is applicable to trucks, trailers, refrigerated vans, buses, waste collection vehicles and electric vehicles. The TRAILAR systems can be fitted to new vehicles whilst in production or retrofitted to existing vehicles, both providing a quick return on investment. The advanced onboard system telematics provides end-users data on emission and fuel savings, together with operational insights such as GPS tracking, fleet utilisation and battery conditions.[149]

Commitment

We will support and encourage modal shift of freight from road to more sustainable alternatives, such as rail, cargo bike and inland waterways

This will be supported by a package of policies including:

- Investing in the capacity and capability of the rail network for freight, including on projects like the upgrade to the key freight corridor between Southampton and the Midlands.[150] HS2 will release a significant amount of spare capacity on the southern part of the West Coast Main Line, some of which could create opportunities for freight operators to grow and develop.

- The Mode Shift Revenue Support [151] and Waterborne Freight Grant Schemes[152] which will continue to incentivise modal shift and help to remove around 900,000 HGV loads off the road each year.[153]
- Introducing a rail freight growth target to encourage the continued growth of this sector. The modal shift of freight from road to rail would not only lead to a reduction in GHG levels, but also reduce congestion and noise pollution. Further details about this commitment can be found in the section on 'Decarbonising our railways'.
- Our 'last mile' package of measures which will support more sustainable freight alternatives in urban areas.

Modal shift to rail – Tesco

Tesco is working to decarbonise its operations and become net zero by 2035. Decarbonisation of transport is a key element of this and the business has recently invested £5 million into their rail network to move freight from road to rail. Their freight trains radiate out from their distribution centre in Daventry, in the Midlands, and connect their depots across country. They have a number of new services planned giving further countrywide coverage enabling more HGVs to be removed from the roads. Together, Tesco estimates the service takes 72,000 HGV journeys off the road each year and saves around 24,000 tonnes of CO_2 emissions.[154] In addition Tesco is also committed to electrifying their distribution fleet and encouraging customers to make the shift to electric, through their extensive roll-out of EV charge points at their largest stores across the UK.[155]

Commitment

We will take forward measures to transform ‘last mile’ deliveries

Reforming last mile deliveries has the potential to create healthier and more liveable places. We are committed to transforming the last mile into an efficient and sustainable delivery system. Whether it’s new vehicles like e-cargo bikes or improvements to the logistics system, this area is ripe for innovation which offers benefits on top of decarbonisation. Our policies include:

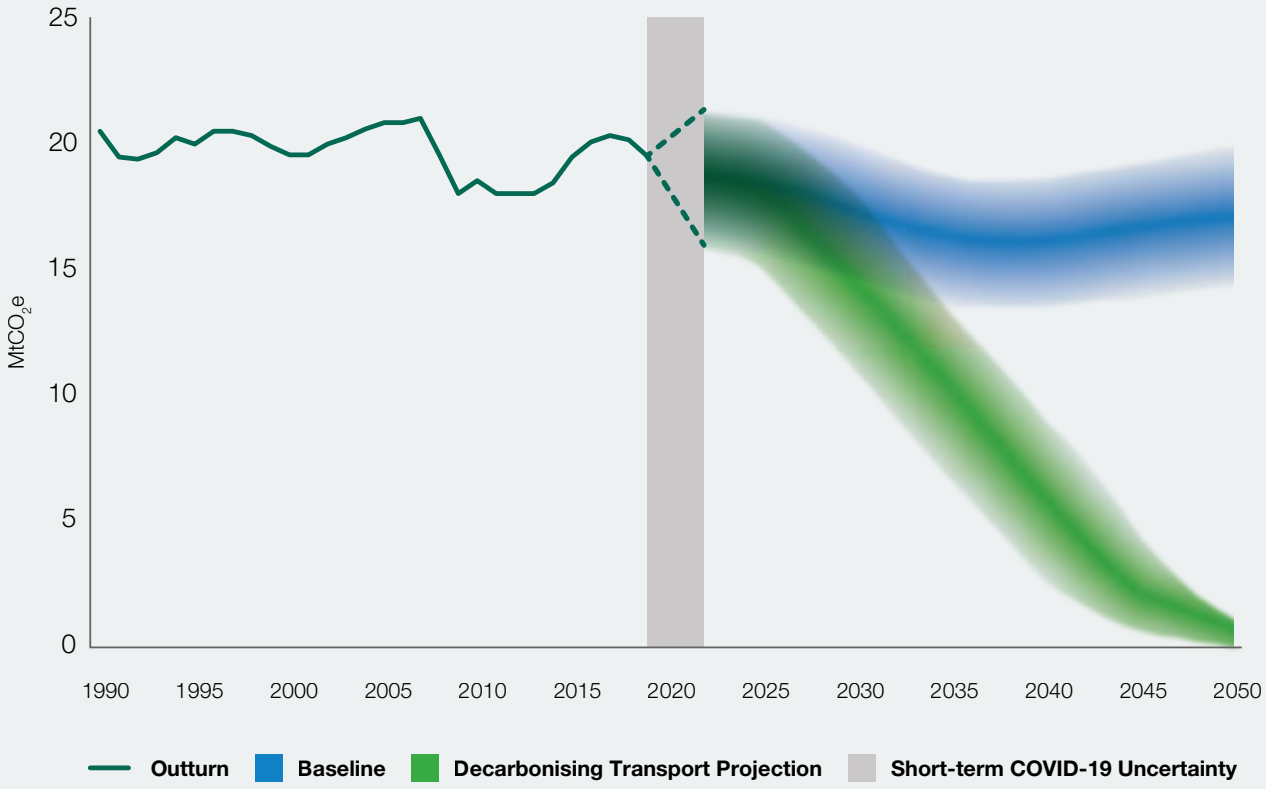
- We will work with industry, academia, and other stakeholders to understand how innovation in the Category L sector can benefit the UK delivery market.
- We are reviewing the Traffic Regulation Order (TRO) legislative framework and will consult on improvements that could deliver near-term carbon savings by reducing the number of vehicle movements later in 2021. New technology and smarter regulation offer significant opportunities for reducing high-carbon delivery traffic, including dynamic kerbspace and delivery management and road and non-road based zero emission logistics solutions. The DfT's Future of Transport programme is investing in pathfinder projects in this field and reviewing if enabling legislation is required.
- We will research the legal and practical issues around compulsory consolidation centres setting the groundwork for future pilots. Pilots will seek to ensure that the majority of urban deliveries are consolidated and transferred to zero emission vehicles for the last mile.
- Parts of some cities are served by as many as 50 waste management and delivery companies, with multiple pickups from businesses on the same street and large numbers of delivery vehicles duplicating trips. Voluntary projects in areas such as Mayfair, in the West End of London, which aim to reduce the number of suppliers, have brought about significant reductions in commercial vehicle traffic. We will pilot allowing some local authorities to franchise certain delivery and waste management services. This will help them to better co-ordinate the number of deliveries and waste collections in certain areas, enabling competition and choice while reducing the number of operators and vehicle movements.

- We will work across government to consider more opportunities for the joint collection of household and non-household municipal waste. As well as increasing access to services and reducing costs, combined collections of both non-household municipal waste and household waste could offer environmental benefits such as fewer waste disposal journeys along streets where there are both homes and non-household municipal waste producers.
- Measures to improve air quality and accelerate the transition to a low emission economy are supported by the £880 million NO2 Programme.[156] This will result in the implementation of Clear Air Zones in a number of local areas, which will help accelerate the turnover to less polluting and zero emission vehicles, encourage vehicle retrofitting to reduce pollutants, and drive work with local businesses to reduce vehicle mileage by consolidating deliveries or using e-cargo bikes. There is scope for greater use of artificial intelligence and data tools in the freight sector, improving efficiency which cuts emissions, particularly for the many small operators in what is a fragmented industry.

Urban freight consolidation – Solent Mobility Zone[157]

Through the Future of Transport programme, the Department of Transport is funding research to promote the development of macro and micro consolidation in the Solent Mobility Zone – encompassing Hampshire County Council, Portsmouth & Southampton City councils and the Isle of Wight. These projects will identify how freight flows and urban space can be adapted to enable more sustainable deliveries and gather data on the impact of freight consolidation on the carbon footprint and congestion impacts of last-mile deliveries. Successful implementation of freight consolidation and zero emission last mile solutions in the Solent region could be replicated in other areas of the UK to help reduce congestion and emissions.

Figure 13: Decarbonising Transport HGV GHG projections, versus the baseline*



* Historic emissions are from published GHG statistics. Future HGV emissions are modelled using the National Transport model, adjusted for Decarbonising Transport measures. The uncertainty bands around projections reflect uncertainty on the form of final policy and uncertainties on future demand for road transport - related to future trends in travel, uptake of connected and autonomous vehicles, fuel prices, GDP growth, and historical volatility. Carbon savings are driven by Decarbonising Transport policies and ambitions. The range of uncertainty in emissions projections falls in the policy line as the proportion of vkms by zero emission vehicles increases – this modelling assumes successful implementation of zero emission HGVs for all categories of HGV.

The figure above shows our projections for GHG emissions from HGVs. The baseline is based on firm and funded policies. The Decarbonising Transport projection includes the ambitious set of policies listed above, alongside savings from low carbon fuels policy. This shows emissions starting to fall quickly as we move past 2030 on a trajectory where emissions by 2050 could get to zero. Although all road transport emissions savings are subject to uncertainty, the exact rate of zero emission HGV deployment is particularly uncertain since the preferred zero emission technology for some HGV segments is yet to emerge.

Volta Trucks

Delivering decarbonisation through places

Local transport infrastructure funding reform

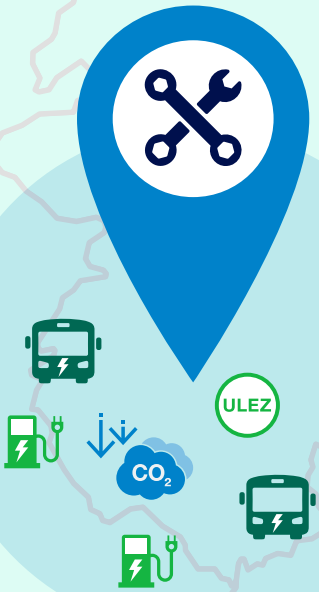
We will reform the way local transport infrastructure is funded to drive and deliver decarbonisation at a local level.

We will embed transport decarbonisation principles in spatial planning and across transport policy making to ensure that new development is designed in a way that promotes sustainable travel choices.

We will create at least one zero-emission transport city and four industrial 'SuperPlaces'.

At least £12bn to support local delivery of transport decarbonisation

By investing at least **£12 billion** in local transport systems over the current Parliament, we will support measures to reduce emissions at a local level, through the levelling up fund, active and public travel funding, intra-city settlements, and EV charging infrastructure.



Toolkit of guidance to support local authorities

We will publish a toolkit of guidance and information later this year, to support local authorities in planning and delivering measures to reduce carbon emissions from transport, recognising the important role local areas will play.

We will complete our review of how to best represent decarbonisation measures in transport business cases and appraisals to ensure that decision outcomes are aligned with Government's ambitious vision to decarbonise transport by 2050.

Co-benefits:

Health

Air quality

Congestion

Aerial shot of Bristol

There is no uniform approach to decarbonisation and each place in the UK has its own unique role to play in ensuring that the UK meets its target of net zero by 2050. For transport, local and regional level organisations are often best placed to make the decisions that will deliver the practical changes required, as well as ensuring local communities and businesses are engaged.

We have already seen many improvements that this place-based approach can achieve. These include supporting levelling-up across the UK, reducing congestion in areas where it is a barrier to productivity, bringing extra capacity to greener public transport, improving health and wellbeing by making places more pleasant to live and work in and supporting jobs to deliver our future transport needs.

With strong local leadership and ambition these benefits will be felt by everyone, everywhere. The Government will continue to support such an approach through policy, regulation and guidance, and by encouraging strategic coordination and sharing of best practice across authority boundaries. This will help local areas and regions identify and shape the vision of their net zero futures.

We are committed to reforming future local transport funding to better support local leaders to deliver their priorities and achieve key objectives, including decarbonisation and levelling-up.

Examples of place-based solutions to decarbonising transport across the UK

Government has committed almost £16 million of Active Travel funding to **Greater Manchester**, enabling a further 24 miles of permanent cycling and walking routes in addition to the 55 miles of routes that will be created by December 2021.

1 **Green hydrogen produced from curtailed wind** in North Antrim will supply the fuel at **Northern Ireland's first hydrogen fuelling station** in Belfast.

Transport for Wales is expanding its **demand responsive "fflecsi" bus service in north west Pembrokeshire**. The service can adjust its route to pick up and drop off passengers and has the potential to transform public transport services in rural areas.

Didcot Garden Town is an ambitious project to create a green community supporting the building of 15,000 homes and 20,000 new jobs, **designed to encourage people to choose sustainable modes of transport**.

Plans are being drawn up for a network of up to 50 **"mobility hubs" across Plymouth** to encourage the use of electric bikes and cars, including in the most deprived neighbourhoods.

1 **The Orkney Islands are home to a series of innovative hydrogen vessel projects** and are an internationally recognised centre of excellence for renewable energy, advanced fuels and island decarbonisation.

1 **Aberdeen has developed a cluster of hydrogen activity** with two publicly accessible hydrogen refuelling stations and one of the largest and most varied fleets of hydrogen vehicles in Europe.

The **Tees Valley Combined Authority**, in partnership with the UK based **e-scooter company, Ginger**, was the first pilot region to **test the rental of e-scooters** as a zero emission alternative to conventional public transport for shorter trips.

Coventry has been announced as the **UK's first all-electric bus town or city**, with £50m to fund up to 300 electric buses and charging infrastructure.

Milton Keynes has England's highest ratio of **electric vehicle public charging devices** outside of London, with 133 devices per 100,000 people. The City's Electric Vehicle Experience Centre is the UK's first brand neutral centre dedicated to electric vehicles.

Since the Mayor of London launched the world's first **Ultra Low Emission Zone** (ULEZ) in 2019, it has had a **significant impact on reducing the number of older more polluting vehicles** that enter London's central zone.

As part of the **£28m Solent Transport Future Transport Zone project, a drone delivery service is being trialled** to transport medical supplies from the mainland to St Marys Hospital on the Isle of Wight, taking delivery vehicles off local roads.

Our plans to deliver the necessary carbon reductions include:

Commitment

We will support decarbonisation by investing more than £12 billion in local transport systems over the current Parliament, enabling local authorities to invest in local priorities – including those related to decarbonisation such as reducing congestion and improving air quality

This investment will be delivered through existing funding streams where decarbonisation sits alongside other core government objectives, in order to support local delivery of transport decarbonisation:

- £5 billion of new funding to overhaul bus and cycle links for every region outside London to level-up local transport connections throughout the country.[158]
- The £4.8 billion Levelling-Up Fund will invest in infrastructure that improves everyday life across the UK, including upgrading local transport, regenerating town centres and high streets and investing in cultural and heritage assets. Within the local transport theme, proposals are requested for schemes that will reduce carbon emissions, improve air quality, cut congestion, support economic growth, and improve the experience of transport users. The fund will invest in a range of local projects across the UK, including public transport and active travel infrastructure.[159]
- Funding for City Region Sustainable Transport Settlements: a £4.2 billion investment in the transport networks of eight city regions across England starting in 2022–23.[160] This will support these city regions to improve intra-city transport and deliver the Government's transport ambitions, including decarbonisation. £50 million of resource funding has been provided to city regions in 2021/22 to support the development of their plans.[161]

- £20 million of funding is available to local authorities in 2021-22 through the On-Street Residential Chargepoint Scheme (ORCS), to support the costs of installing chargepoint infrastructure for residents without off-street parking.[162] DfT funds the Energy Saving Trust (EST) to provide expert advice and support to local authorities throughout the ORCS application process. Local authorities in England can also take advantage of EST's Local Government Support Programme, which offers free, impartial support on developing and delivering EV strategies. Government has also committed a further £90 million for local authorities to fund local EV charging infrastructure. This will support the roll out of larger, on-street charging schemes and rapid hubs in England.[163]

Commitment

We will drive decarbonisation and transport improvements at a local level by making quantifiable carbon reductions a fundamental part of local transport planning and funding

Local Transport Plans (LTPs)[164] are existing statutory requirements that set out holistic place-based strategies for improving transport networks, proposed projects for investment and, ultimately, lay out how key objectives will be achieved. Going forward, LTPs will also need to set out how local areas will deliver ambitious quantifiable carbon reductions in transport, taking into account the differing transport requirements of different areas. This will need to be in line with carbon budgets and net zero.

Cargodale: Zero emission delivery in Calderdale. Photo credit Daisy Brasington, Remember the Future

We will support local areas by providing guidance on designing sustainable transport solutions through LTPs. Having quantified plans in place will ensure that every place understands the level of ambition required to reduce emissions and ensure that this ambition can be translated into action. We also want to facilitate collaboration between areas, similar to that between Coventry and its surrounding areas in the case study below, and cross regional work led by Sub-National Transport Bodies.

For future local transport funding, we will transition to a state where this is conditional on local areas being able to demonstrate how they will reduce emissions over a portfolio of transport investments through LTPs, which will become a focus of engagement between central and local government about future funding. We are also committed to designing future funding opportunities in a way that minimises local burdens and costs and will engage closely with local areas to plan for this transition.

While we work toward revitalised LTPs, we will continue to ensure that existing committed investments achieve emissions reductions. To enable this, local investment plans will need to commit to certain measures. The approach taken to this will depend on the funding stream and its associated assessment criteria for allocating funding. For example, Gear Change sets out the Government's ambition to create cycle and walking corridors and the Bus Back Better National Bus Strategy sets out how access to bus transformation funding will require publication of Bus Service Improvement Plans and local commitment to bus franchises or partnerships.

The role of Sub-National Transport Bodies

Seven Sub-National Transport Bodies (STBs) cover all of England, apart from London, and support the Government's aims to level-up the country. STBs are by their nature spatially focused, and bring together stakeholders in each region, representing local government and business. STBs can support the Government's decarbonisation objectives by joining up local plans across a wider geography, to capitalise on economies of scale and ensure coherence across local authority borders.

Government tasks each STB with developing a transport strategy for their region – a framework for a place-based approach which helps Government identify transport schemes to invest in. As part of this, the STBs are working to turn national priorities into actionable plans for their region. Every STB is developing a strategy to decarbonise the transport system, which is rooted in the opportunities and needs of their region. England's Economic Heartland (EEH) STB co-ordinates this workstream and help share best practice across STBs to enable long-term sustainable connectivity in all types of communities across England.

West Midlands Combined Authority

Working together to decarbonise Coventry and the surrounding areas

Coventry City Council is committed to reducing its emissions and driving the shift toward a low carbon economy whilst continuing to meet the housing, transport, and other needs of the city. There are already a range of innovative initiatives being developed in and around Coventry to achieve this and deliver a wide range of benefits including job creation, improved public health, more green space, and improved accessibility.

Coventry City and Dudley Metropolitan Borough Councils are collaborating to help establish the West Midlands as a world-class business investment location by developing Very Light Rail (VLR) technology in the UK.

The Coventry VLR programme aims to create an affordable integrated tram system that comprises a light weight, low cost vehicle and innovative trackform. The low cost means it can be implemented at scale, thereby driving significant mode shift to a low carbon mode, with an ambition to achieve zero carbon by using 100% renewable energy to power the system.

Coventry City Council are taking a 'total system' approach looking at last mile solutions (e.g. e-scooters) and the creation of mini transport hubs. Autonomous operation of VLR is also being explored as a means of allowing a higher frequency of operation to further drive mode shift. The first VLR route for Coventry will link the rail station, city centre, and University Hospital, and the Council's ambition is to have an operational section in place by late 2025. Ultimately, the Council plans to link the first route to a City Linking Energy and Network Hub (CLEAN Hub); a hub of innovative, low carbon transport and energy technology, providing infrastructure and services that support the decarbonisation and growth of the local and regional economy, and support the UK's national transition to net zero by 2050. It is expected that the affordable VLR system will be commercially available to other towns and cities across the UK and globally, thus enabling significant modal shift and reduction in emissions nationally.

The Dudley programme will deliver a new, national innovation centre and test track facilities at Castle Hill, in Dudley, where VLR technology will be tested and improved for future implementation. The Council is also working with Transport for West Midlands on the Mobility Credits pilot programme which will give Coventry residents with an older, polluting car the chance to exchange their vehicle for mobility credits. The credits could be spent on bus and rail travel, as well as new transport modes such as car clubs or bikeshare schemes.

Commitment

We will publish a Local Authority Toolkit in 2021, providing guidance to support local areas to deliver more sustainable transport measures

As of February 2021, over 70 per cent of local authorities had declared the urgent need to act on the causes and impacts of climate change.[165] To support turning these declarations into action plans to reduce GHG emissions from transport, Government will publish a toolkit of guidance and information to help local authorities build business cases, develop innovative sustainable transport policies, secure funding and deliver measures on the ground.

Changing behaviours

- Demand Responsive Transport
- Promoting zero emission car clubs
- Cycling infrastructure and encouraging active travel
- Behaviour change through communications
- Encouraging car / ride sharing

Reducing the need to travel

- Space reallocation
- Greater use of existing planning powers allowing for the implementation of low carbon transport i.e. spatial planning
- Best practice implementation of mobility hubs and transport hubs

Measures considered for inclusion in the **Transport Decarbonisation Toolkit** for local authorities, which will be published later this year

ULEZ Charging schemes

- Parking policies more broadly e.g. park and rides
- Congestion charging
- Emissions zones

Decarbonising the vehicle fleet

- Ultra Low and zero emission buses
- EV infrastructure and incentives
- Freight / e-cargo bikes
- Decarbonisation of LAs' own fleets, and requiring contractors to use zero emission vehicles

These measures have been the result of continued engagement with local authorities and Sub-National Transport Bodies to understand their existing challenges in reducing transport emissions.

In some areas, local authorities have encouraged changes in travel behaviour with charging schemes

In some areas, local authorities have decided that charging schemes can provide fair and efficient mechanisms for reducing congestion and emissions while also raising additional funding to support greener public transport. A range of options are open to local places, including congestion charging and Low and Ultra Low Emission Zones (LEZs and ULEZs). A number of areas are choosing to introduce Clean Air Zones, with the specific objective of reducing Nitrogen Dioxide concentrations to within legal levels in the shortest time possible.[166]

In London, income from the Congestion Charge, LEZ and ULEZ is spent on improving transport in line with the Mayor's Transport Strategy. Although it has been difficult to distinguish between COVID-19 impact and ULEZ impact in 2020, in January 2020, after its first ten months of operation, the ULEZ had a significant impact on air quality, with an observed increase in the rate at which older vehicles were removed from the fleet, or replaced, above the normal churn.[167]

Government has already published a Clean Air Zone Framework to support those local authorities implementing these zones in line with legal obligations, and through the LA Toolkit, we will provide further guidance and information to help places design and implement wider schemes which consider how private vehicles are used.[168]

Commitment

We will embed transport decarbonisation principles in spatial planning and across transport policymaking

The Government wants walking, cycling or public transport to be the natural first choice for journeys. Where developments are located, how they are designed and how well public transport services are integrated has a huge impact on whether people's natural first choice for short journeys is on foot or by cycle, by public transport or by private car. The planning system has an important role to play in encouraging development that promotes a shift towards sustainable transport networks and the achievement of net zero transport systems.

Traffic issues have often caused opposition to housebuilding. There is a legacy of developments that give people few alternatives to driving, are difficult to serve efficiently by public transport and are laid out in ways which discourage walking and cycling. Developments which are planned to minimise car use, promote sustainable transport choices, and are properly connected to existing public transport could help make new building more publicly acceptable.

The National Planning Policy Framework (NPPF) makes clear we already expect sustainable transport issues to be considered from the earliest stages of plan-making and development proposals, so that opportunities to promote cycling, walking and public transport are pursued.[169] Planning policies should already provide for high quality cycling and walking networks and supporting facilities such as cycle parking (drawing on Local Cycling and Walking Infrastructure Plans). The NPPF also outlines that new developments should promote sustainable transport, taking opportunities to promote walking, cycling and public transport. However, while many local plans already say the right things, they are not always followed consistently in planning decisions. Developments often do little or nothing meaningful to enable cycling and walking, or to be properly and efficiently accessible by public transport. Sometimes they make cycling and walking provision worse. We can and must do better.

Last summer, the Government set out its vision for a new and improved planning system in the Planning for the Future White Paper, a vision to make good on the Government's pledge to build back better, build back faster and build back greener. The White Paper set out how the planning system is central to our most important national challenges, including combating climate change and supporting sustainable growth.

A reformed planning system can assist in achieving the ambition of a zero emission transport future. The planning reforms will provide an opportunity to consider how sustainable transport is planned for and importantly how it is delivered to support sustainable growth and drive more sustainable use of our existing built environment e.g. planning for new development around existing transport hubs, for all developments to be easily and safely accessible and navigable by foot and cycle, and to make existing cycling and walking provision better. Through good design and proper consideration of the needs of our communities, we can better connect people, making communities more accessible, inclusive, safe, and attractive as well as promoting the principles of 20-minute neighbourhoods.[170] We are working with the Ministry of Housing, Communities & Local Government and the Local Government Association to place cycling, walking and public transport provision at the heart of local plan making and decision taking for new developments. In doing so, we recognise the particular challenges faced by rural and remote areas in this regard, and will work, including through the upcoming Future of Transport: Rural Strategy, to ensure policies recognise differing geographies.

Gear Change committed to establishing a new body, Active Travel England (ATE), to promote cycling and walking. One of its functions will be as a statutory consultee within the planning system to press for adequate cycling and walking provision in all developments over a certain threshold, and to provide expert advice on ways in which such provision can be improved. Work on this is underway and we expect the body to be established this year. ATE will be a strong and clear voice, championing the delivery of sustainable transport and active travel options across the country and securing better outcomes within the planning system both in terms of plan making and decision taking.

The National Model Design Code sets out a process for developing local design codes and guides, with supporting design guidance on movement and public spaces including streets. It outlines an expectation that development should consist of a well-connected network of streets with good public transport and an emphasis on active travel modes including walking and cycling. Building on this, we will also ensure that an updated Manual for Streets aligns with these principles and is routinely used for plan making and decision taking to secure better outcomes for our streets and public realm. These documents can play a key role in delivering high quality, accessible, secure and safe cycle storage. We will work with Active Travel England and other key stakeholders to ensure that the importance of securing high quality cycling and walking provision is embedded within the planning system.

We recognise that the Government has a role in helping Local Planning and Highways Authorities to better plan for sustainable transport and develop innovative policies to reduce car dependency. We need to move away from transport planning based on predicting future demand to provide capacity ('predict and provide') to planning that sets an outcome communities want to achieve and provides the transport solutions to deliver those outcomes (sometimes referred to as 'vision and validate'). We will continue to work with MHCLG to identify how we can best support local authorities to develop innovative sustainable transport policies as part of the planning process, how this can be used to better assess planning applications, and better monitor local transport outcomes to deliver on our ambitions for sustainable transport use.

Achieving these ambitions will require a long-term collective effort across government, local authorities, communities, businesses, and developers. We are exploring with MHCLG how the planning system can be designed to facilitate better collaboration and planning for growth across local authority boundaries, with all key stakeholders involved, to ensure that we align that growth with both strategic and local infrastructure delivery to make good on our manifesto commitment to put infrastructure first and drive growth sustainably.

The public sector, too, must play its part. Too many recent developments by bodies such as the NHS, including many new hospitals, have been on out-of-town sites which are difficult to reach by public transport. As well as generating car traffic (and difficulties with parking), such sites are inherently less inclusive to patients who cannot drive. Future developments must be more accessible to public transport, walking and cycling. Schools, colleges and universities also have a part to play in encouraging sustainable transport to and from their sites. It is imperative that we provide real modal choice to and from these institutions, to ensure the next generation are healthier, more active and more likely to maintain sustainable travel behaviours.

From our recent experiences of the COVID-19 pandemic as well as in the commitments in this plan, it is clear that we have the opportunity to change the way we think about movement and to challenge our behaviours. With technological advances and our changing needs for goods and services, it is imperative that we also create a planning system that is capable of supporting innovation in the way we travel and the way we process, move and distribute our goods more sustainably.

Countryside and L&Q, the developers of Beaulieu, Chelmsford

Chelmsford Garden Community: From planning principles to innovative and sustainable transport proposals

Chelmsford Garden Community (CGC) is one of government's recognised garden villages and has received support and financial backing from the Garden Communities Programme. Situated north-east of Chelmsford, it will eventually provide around 10,000 new homes and significant employment areas to support a new community of up to 30,000 people.[171] The design will be underpinned by the Town and Country Planning Association's Garden City philosophy[172] and Chelmsford City Council's Spatial Principles contained within its adopted Local Plan[173].

These principles will ensure that it will be highly sustainable on all levels, designed as connected, walkable neighbourhoods. Walking and cycling trails will link the things that people generally access on a day-to-day basis such as green areas, leisure facilities, primary schools, shops, and employment opportunities, all within 15 minutes' walk or 5 minutes cycling distance. Measures such as regular travel guidance, free cycling lessons, and gift vouchers have already doubled pedestrian and cycling journeys in the past four years.

The first phases of the CGC called Beaulieu and Channels are being built and already include an express bus service. In June 2019, 54% of households at Beaulieu received one year's free travel on the bus service, and research shows that as a result, the recorded trip rates for the private car are 30.2% lower than originally modelled in the morning peak and 16.2% lower in the evening peak.[174] In addition, Chelmsford's Local Plan policies require new car sharing schemes and an electric vehicle charging point for each new home.

While future development at CGC will still need servicing space and some on-plot parking, they are already planning ahead to when self-driving and autonomous vehicles might reduce the use of private cars and render these obsolete, and how parking spaces might then be reclaimed as community or private space.

Commitment

We will create at least one zero emission transport city and four industrial 'SuperPlaces'

We will establish at least one zero transport emission city. We will set out shortly further details of how we intend to take forward the commitment in the Prime Minister's 2020 Cycling and Walking Plan for England[175] to work with at least one small or medium-sized city which wants to create a zero emission transport system.

As set out in the Prime Minister's Ten Point Plan for a Green Industrial Revolution[176] we will also create four world-leading industrial 'SuperPlaces' in areas such as the North-East, the Humber, North-West, Scotland and Wales, that will unite clean industry with transport and power.

Commitment

We will complete our review of how to best represent decarbonisation measures in transport business cases and appraisals

We are reviewing the evidence base for measuring the carbon impacts of schemes in transport business cases and appraisals to ensure that decision outcomes are aligned with Government's ambitious vision to decarbonise transport.

Impacts on carbon must be accurately assessed in transport appraisal and presented with prominence to decision-makers. The value Government places on changes in carbon emissions is regularly reviewed to ensure an approach which is fit for purpose and based on the latest scientific evidence. In particular, the existing approach to carbon valuation is currently under review in light of recent changes in the UK's GHG emissions reduction targets. Following this, BEIS is expected to publish updated carbon values for use in policy appraisal later this year, which we will reflect in DfT appraisal guidance and tools at the earliest opportunity in order to give scheme promoters time to prepare to include the updated values in a full appraisal.

In interim guidance issued in July 2020, the Department updated the vehicle mix forecasts to be used in appraisal using the latest evidence and based on current policies.[177] These reflect updated modelling assumptions, including the introduction of new tighter CO_2 emissions standards for cars, vans and HGVs to be implemented in 2025 and 2030, new sales figures showing a further decline in sales of diesel cars compared to 2018, and updated consumer choice modelling of the take-up for ultra-low emissions vehicles, which collectively have resulted in updated electric vehicle and fuel efficiency forecasts. These were incorporated into further updates to guidance, issued in May 2021, as part of a broader set of changes associated with the TAG Route Map, which will be made definitive in July 2021.[178]

Furthermore, we are reviewing Transport Appraisal Guidance to reflect the enhanced assessment of carbon that projects are required to undertake, which includes consideration of capital carbon.

Light Rail – an existing zero emission choice

Light rail schemes can be transformational for highly populated areas bringing societal, economic, and environmental benefits to our cities by connecting communities to jobs, hospitals, and leisure activities.

There are currently eight electric-powered light rail systems in England, encouraging greater use of public transport, further reducing total carbon emissions, and tackling congestion.

Between 2010 and 2018, passenger journeys on Greater Manchester Metrolink increased by 128 per cent. Over the same period, they increased by 94 per cent on Nottingham Express Transit (NET). Investments in NET formed part of a wider package to reduce private car activity and encourage public transport use; traffic volumes in Nottingham grew by 30% less than the England average.[179]

As we look to build back greener, Light Rail has the potential to be an environmentally sound local transport solution in its own right. West Yorkshire's Mass Transit Vision[180] highlights the potential for attracting inward investment and growth through providing access to previously underdeveloped or less well-connected areas.

Recognising the importance of light rail, now and in the future, the Government has provided more than £200 million of revenue support since April 2020 to Light Rail networks through the Revenue Grant and Restart Grant support schemes.[181] This funding has ensured that light rail services continued to run throughout the pandemic, enabling essential journeys such as those made by NHS staff and other key workers.

In 2019, the Government conducted a call for evidence on how to better use and implement light rail and other rapid transit solutions in cities and towns. The Department is incorporating insight and analysis from the Call for Evidence to inform future policy.


iFix
ENTERTAINMENT
EXCHANGE
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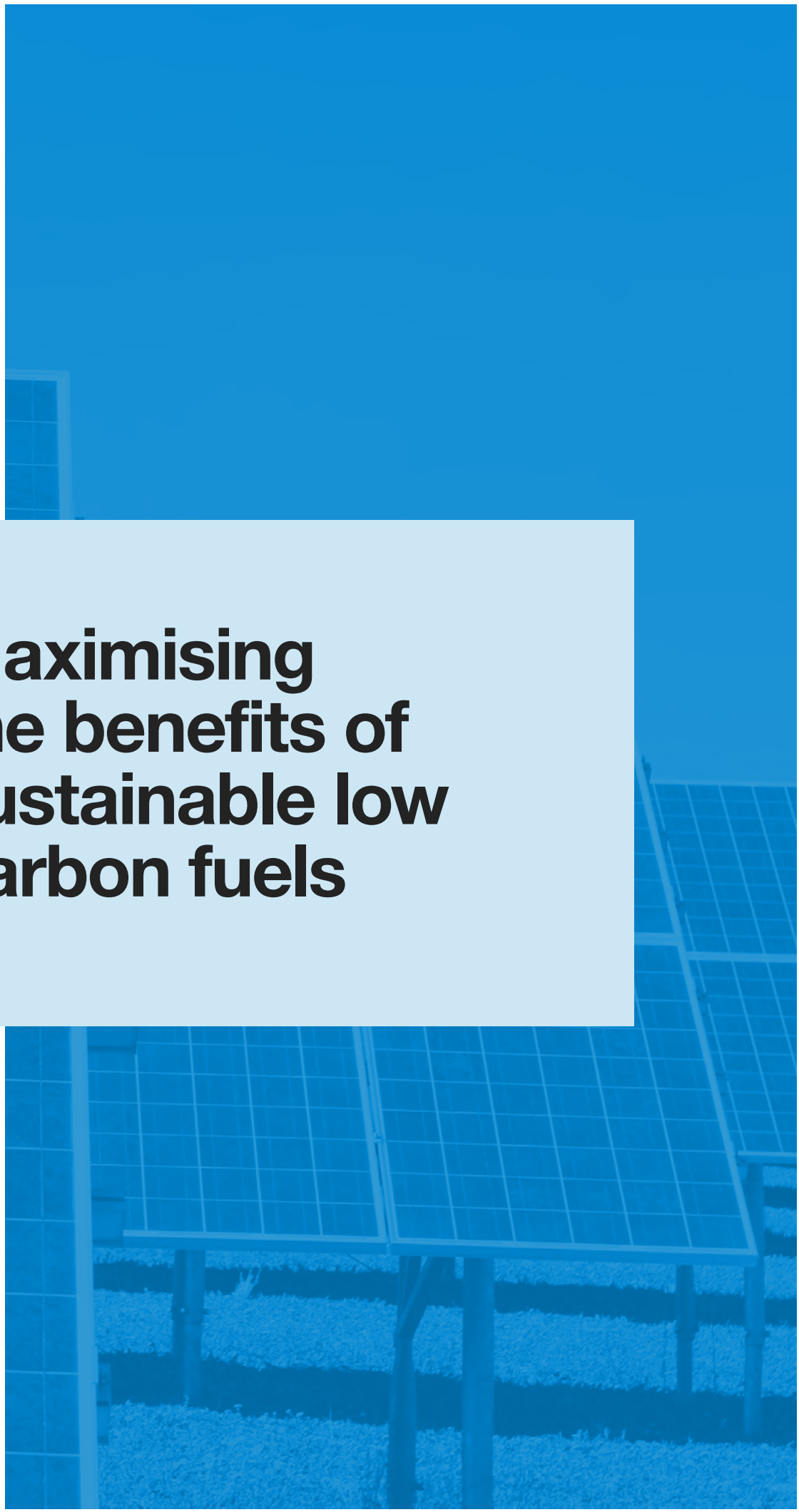
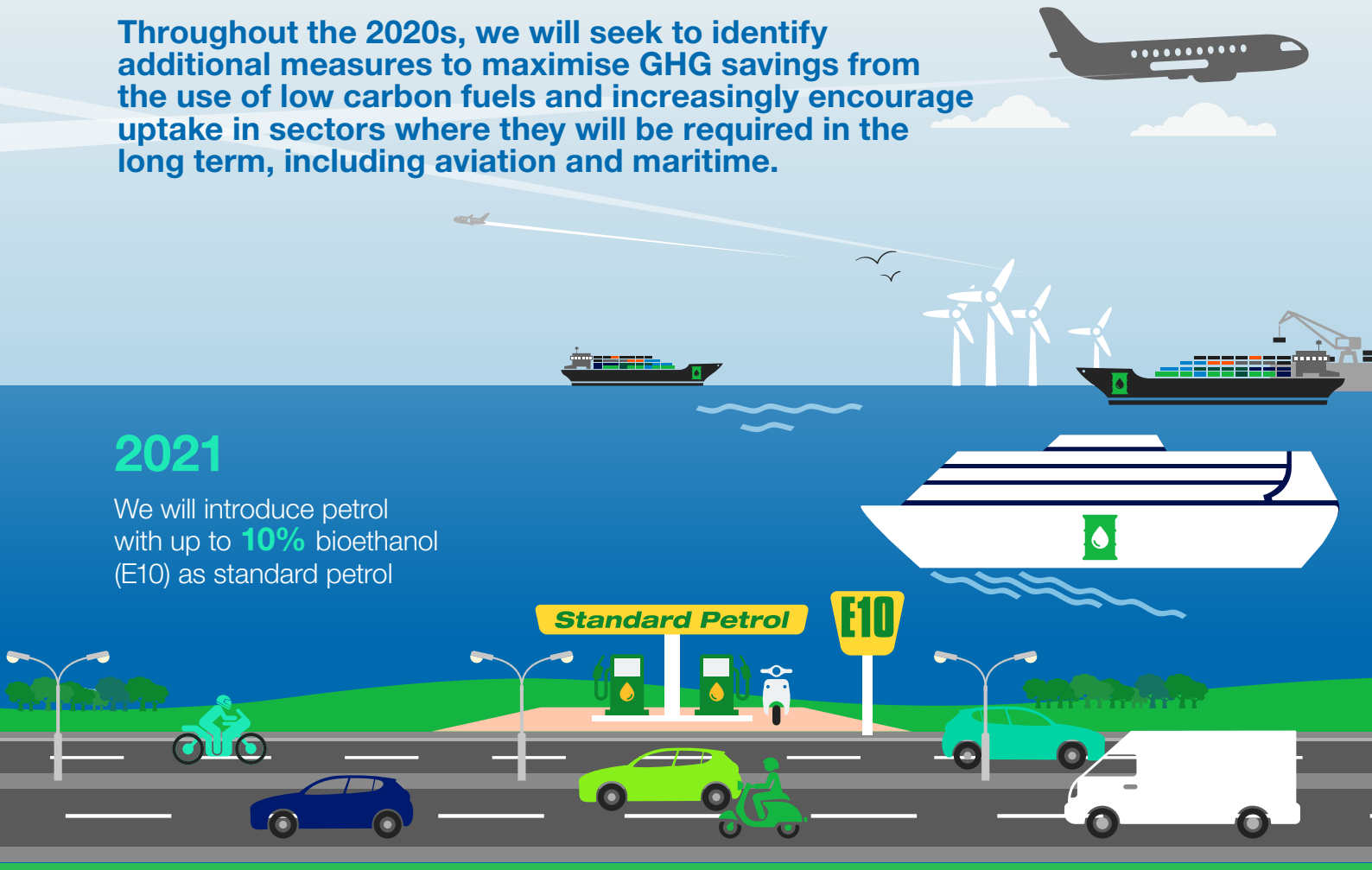
Maximising the benefits of sustainable low carbon fuels



Up to **£900m** GVA supported in 2040*

Up to **5,100 jobs** in 2040*[182]

Throughout the 2020s, we will seek to identify additional measures to maximise GHG savings from the use of low carbon fuels and increasingly encourage uptake in sectors where they will be required in the long term, including aviation and maritime.



2021

We will introduce petrol with up to **10%** bioethanol (E10) as standard petrol

2021

We will amend the Renewable Transport Fuel Obligation (RTFO) to increase the main target in the period up to 2032

2022

We will develop a strategy for low carbon fuels, from now until 2050, to set a clear vision for the sector

*Projections for jobs and GVA are based on those for the sustainable aviation fuels (SAF) sector as SAF is expected to make up a large proportion of the low carbon fuel mix by 2040.

Co-benefits:

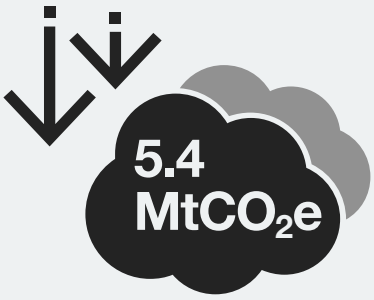
Jobs & growth

Low carbon liquid and gaseous fuels – predominantly biofuels deployed in road transport – deliver about a third of all domestic transport carbon savings under current carbon budgets.[183] Our overall strategy is to deploy low carbon fuels across the transport sector in a way that achieves maximum greenhouse gas savings.

The availability of sustainable raw materials for low carbon fuels is however limited, with increasing demands from other sectors. It is therefore important to prioritise the use of low carbon fuels for modes with limited alternatives to liquid and gaseous fuels, such as aviation. To be genuinely "net zero", the use of most low carbon fuels will need to be combined with carbon capture and storage. Their limited air quality benefits (when used in internal combustion engines) also need to be considered.

In the short term, low carbon fuels will continue to be an available and flexible resource to deliver immediate emissions savings in all road vehicles. The medium-term need is expected to shift to long-haul HGVs in the road sector with increasing demand also from aviation and maritime which are likely to need the largest proportion of low carbon liquid or gaseous fuel in the longer term.

Sustainable low carbon fuels offer major industrial benefits. Given the location of many UK production plants and the economic benefits they can provide, this industry is well-suited to support efforts to reduce regional disparities. There is a genuine strategic opportunity for the UK to be a global leader in low carbon fuel production, including SAF and renewable hydrogen. Our ambitious policy will encourage technology and infrastructure developments, expansion of existing plants and the building of new plants across the UK.



An estimated **5.4 $MtCO_2e$ were saved in 2019** by displacing fossil fuels with low carbon fuels, which is **equivalent to taking 2.5 million** cars off the road.

In 2019, low carbon fuels accounted for approximately **5%** of total UK fuels by volume, of which **⅔** were made from waste materials, such as used cooking oil, fatbergs, food waste or road side grass.[184]

Supporting the UK's low carbon fuels market and industry

Since 2008, our Renewable Transport Fuel Obligation (RTFO) has incentivised the supply of low carbon fuels for road vehicles and non-road machinery with a mandate that creates demand and compensates for their higher production costs compared with fossil equivalents. We have led the way to ensure our measures are governed by strict sustainability criteria, discourage supply of fuels that do not offer significant GHG savings compared to fossil fuels and avoid uptake of low carbon fuels beyond sustainable levels. The RTFO sets an annual obligation on fuel suppliers to supply a certain share of renewable fuels – with the overall target currently set to increase from 10.1% of total transport fuel in 2021 to 12.4% in 2032 and then remaining at that level. Increasing RTFO targets can help achieve higher carbon savings, provided they are met with genuinely sustainable fuels. A particular concern is that the production of biofuels can lead to direct or indirect land use change such as deforestation. Targets therefore need to be set carefully, with appropriate enabling measures to deliver genuine GHG savings and address constraints around sustainability and feedstock availability.[185]

Our plans to deliver the necessary emissions reductions:

Commitment

We will increase the main Renewable Transport Fuels Obligation (RTFO) target

Alongside this document, we have published the Government response to a recent consultation, setting out our plan to increase the RTFO main obligation by five percentage points, increasing it from 9.6 per cent in 2021 to 14.6 per cent in 2032.[186] This is estimated to achieve additional carbon savings of up to 20.8 $MtCO_2e$ over this period.[187] We have committed to implement other proposals set out in that consultation, including updating the sustainability criteria; making recycled carbon fuels (RCFs) produced from waste materials eligible for incentives; and extending support to renewable fuels of non-biological origin (RFNBOs) used in maritime, rail and non-road mobile machinery.

The 'development fuels' sub-target, which incentivises specific fuels of strategic importance, is already set to increase from 0.5 per cent in 2021 to 2.8 per cent by 2032. We will review this target as part of the statutory RTFO review due to be published in 2023.

Commitment

We will introduce petrol with up to 10 per cent ethanol (E10) as standard petrol in September 2021

On 25 February we announced that E10 would become the standard petrol. E10 can reduce GHG emissions from a standard petrol car by around 2 per cent. Combined with the RTFO target increase above, this could result in additional carbon savings of 0.7-0.8 $MtCO_2e$ per year, equivalent to removing 350,000 additional vehicles from our roads.[188] Introducing E10 will provide a significant boost to the UK ethanol industry and farmers, predominantly based in the north-east of England where it will secure jobs and encourage further investment.

Commitment

In cooperation with stakeholders, we will review the role of fuels with higher biocontent starting this year and explore potential measures to remove existing market barriers for use in certain compatible vehicles

Achieving higher carbon savings from low carbon fuels in the short to medium term depends on the supply and uptake of drop-in fuels and higher blend biofuels for compatible vehicles. The RTFO already provides basic support for any biofuel, irrespective of what level it is blended with fossil fuels, as well as additional incentives for drop-in fuels. However, further measures might be needed to make use of opportunities to increase the use of higher blends and drop-in fuels, such as those discussed in a recent study on use in heavy duty road vehicles.[189]

Commitment

We will seek to maximise the use of low carbon fuel in aviation and maritime as detailed in other relevant commitments elsewhere in this plan

As highlighted in the relevant sections, measures to promote low carbon fuels are being considered for aviation and maritime, where there is likely to be a market for as much sustainable low carbon fuel as can be produced and used in the UK well past 2050. We will explore how cross-modal policies, including the RTFO, can continue to support this process and determine measures to increase sustainable supply of these specialised fuels. The increased use depends on the rapid development of new advanced low carbon fuels, predominantly from waste feedstocks, during the 2020s.

Commitment

We will develop a strategy for low carbon fuels, from now until 2050, to set a clear signal about the Government's vision for the sector

We will work with stakeholders to develop a longer-term strategy for low carbon fuels, reflecting the opportunity to evolve the UK industry to meet decarbonisation challenges across transport sectors. We will start engagement on this strategy this year to develop a common understanding of the transition ahead, its opportunities and risks, and identify what additional policy measures may be required to encourage uptake and use across transport modes to 2050. This will be published in 2022.

The strategy will also look at how carbon savings from low carbon fuels could be maximised in a sustainable manner while making the most of new fuels and technologies. The carbon savings delivered in practice will depend on a range of factors, including the rate of road vehicle electrification and how supply and demand for different low carbon fuels may change over time.

The strategy will set out the likely transition from road to other transport sectors, the size of the opportunity for UK industry, the ways in which this transition could be supported, and interactions with other sectors such as heat and chemicals.

Advanced Biofuels Demonstration Competition

Launched in 2014, the Advanced Biofuels Demonstration Competition (ABDC) was created with the aim of supporting innovative projects that turn low value wastes into high value fuels. The ABDC successfully supported the construction of two cutting edge plants in the UK: Nova Pangaea Technologies in Teesside, awarded £4.5 million for demonstrating their forestry wastes to ethanol process; and Advanced Biofuels Solutions in Swindon, which received £11 million for a first-of-a-kind waste gasification plant. This support has proved crucial as the projects embark on the next stages of their commercial development and contribute to innovation in the sector.

Low carbon fuels

Fuels that can provide GHG savings compared to fossil fuels on a life-cycle basis under the RTFO.

Renewable fuels

Fuels made from biomass and renewable electricity

Biofuels

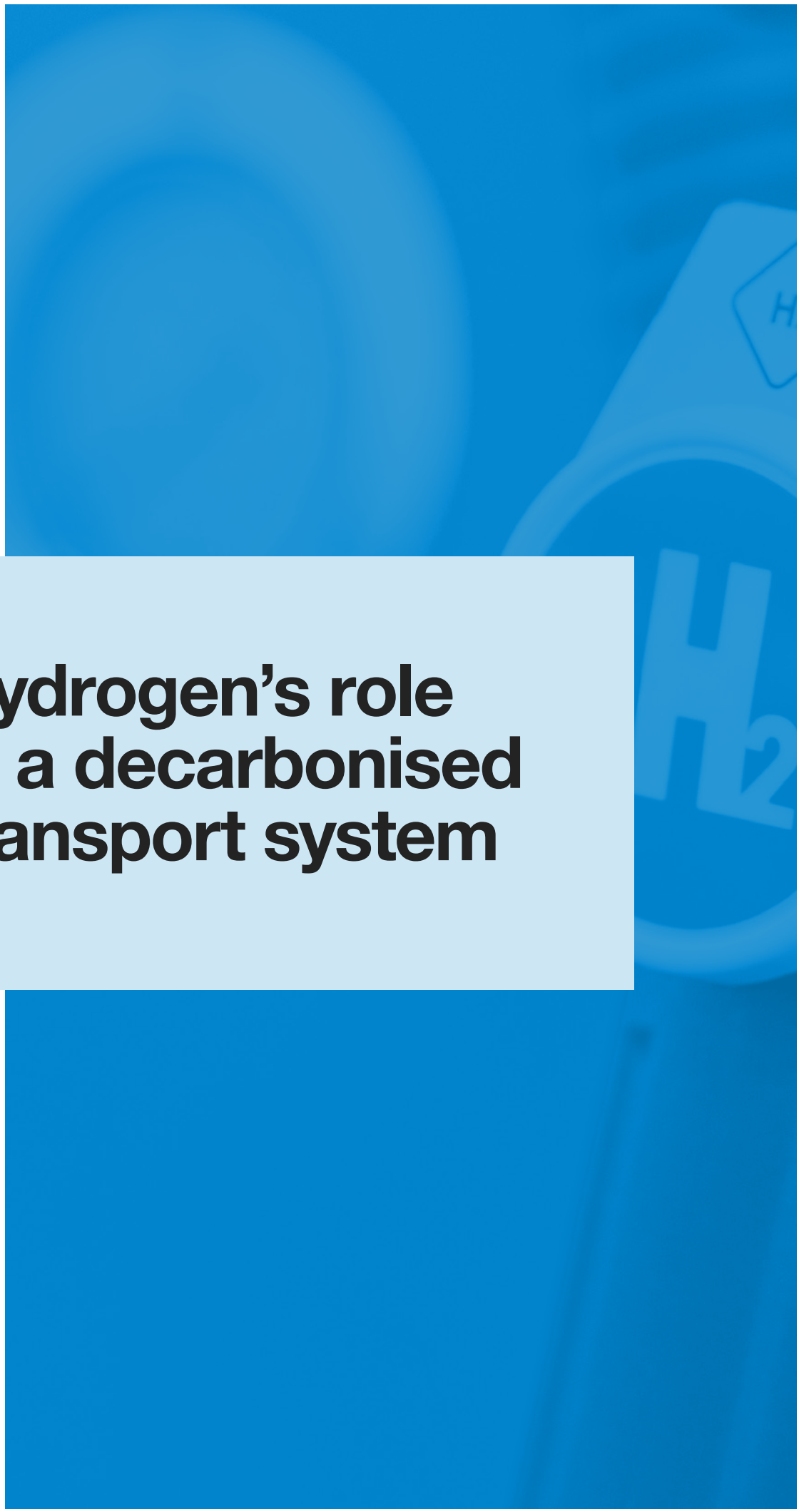
Fuels made from biomass (incl. wastes, residues, crops), e.g. bioethanol, biodiesel, biogas.

+ Renewable fuels of Non-Biological Origin (RFNBO), e.g. hydrogen produced via electrolysis using renewable electricity, fuels made from renewable hydrogen and carbon dioxide.

+ Recycled Carbon Fuels produced from fossil waste

Note: Fuels listed are those considered to be able to deliver substantial carbon savings compared to fossil fuels and are currently supported under the RTFO or under consideration for support."


E10



Hydrogen's role in a decarbonised transport system

2021

Government will develop a sector-wide Hydrogen Strategy, including its role for transport

£3m

2021

We will invest **£3 million** this year to establish the UK's first multi-modal hydrogen transport hub in Tees Valley

Co-benefits:

Air quality

Jobs & growth

Hydrogen is a key strategic component to fully decarbonising the UK's economy.

The UK has strengths and expertise along the hydrogen value chain, particularly though our science and innovation ecosystems, supported by a long history of gas technology development and an integrated national network. We are well positioned to lead on the production of green hydrogen with significant technical expertise in electrolysers from world leading companies such as ITM Power, and the potential to generate significant quantities of renewable energy from offshore wind. We are home to world leading fuel cell powertrain companies such as Ceres Power and Arcola, and parts suppliers such as Johnson Matthey. Our unparalleled access to carbon capture and storage sites is an enabler for the production of blue hydrogen.

In transport, our focus is on the use of genuinely 'green' hydrogen, maximising its opportunities so that it can play a full part in our renewable energy system. Use of renewable hydrogen is already incentivised under the RTFO. Hydrogen is likely to be most effective in transport in areas 'that batteries cannot reach', where energy density requirements or duty cycles, weight and volume restrictions and refuelling times make it the most suitable green energy source.

Our dedicated R&D funding and support is now focussed on rail, maritime, aviation and heavy road freight: sectors where there is not yet a proven 'winning' technology, where hydrogen offers in-use advantages and the largest global market potential. We want to maximise its potential alongside electrification on trains, buses, and coaches.

Commitment

The UK Government will publish an overarching hydrogen strategy in summer 2021, which will focus on the increased production of hydrogen and use across the economy, including for transport

Progressing the UK's hydrogen economy means rapidly expanding our existing expertise, and infrastructure to create a critical mass and overcoming barriers to production and use. There are areas across the UK with access to the necessary skills base, a range of potential customers (industrial, domestic, transport), as well as ready access to renewable electricity to make quick headway.

Hydrogen transport hubs unite transport with industry and energy sectors and can be used to drive local industrial strategies, levelling-up, and local benefits. They accelerate technology development, test at scale providing better understanding of operational costs, and enable the benefits to be felt by users sooner.

Commitment

We will invest £3 million in 2021 to establish the UK's first multi-modal hydrogen transport hub in Tees Valley

Our first hub launched last year in Tees Valley and has £3 million of funding this year to enable hydrogen for transport to develop alongside its application in the industrial, energy and other sectors. The hub is bringing together government, industry, and academia to focus our future hydrogen research and development, real world testing and demonstrations. A hub masterplan has identified options in the Tees Valley, as well as providing a blueprint for the creation of hubs in other areas across the UK.[190]

The funding will kick-start activity across the region, supporting collaborative R&D pilot projects and pop-up trials that demonstrate hydrogen technology solutions across transport modes and forge new industry and academic partnerships.

The Holyhead Hydrogen Hub aims to build a pilot hydrogen plant to support the decarbonisation of the heavy goods vehicle and maritime markets on the Isle of Anglesey (Ynys Môn). The emerging design for the pilot plant aims for an initial capability to produce 400kg of hydrogen per day. Over the medium-term, the project intends to scale up and expand into electrolytic ('green') hydrogen production. The region's favourable natural and physical resource endowments and position as a cross-border multi-modal transport corridor mean it is well-placed to test, develop and apply this strategically important net zero technology.

The proposal speaks to the UK Government's intention to explore how hydrogen can play a key role in decarbonising a range of sectors and it will provide £4.8 million, subject to business case and other relevant approvals, to support the construction of the pilot project. The project, led by a local development agency, Menter Môn, has received additional development funding from the Welsh Government.[191]


Aberdeen
HydrogenBusProject
Operated by
Stagecoach
NEW A330 VANHOOL
SP14 DMJ

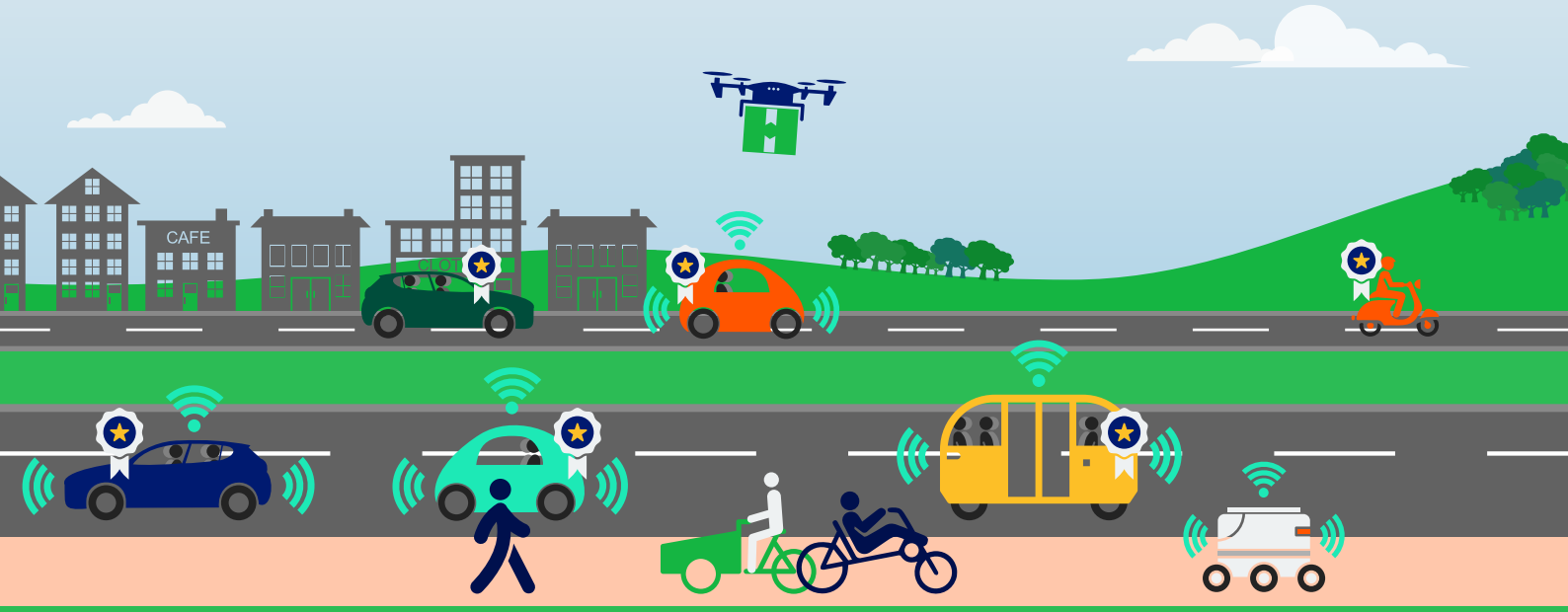
Future transport – more choice, better efficiency

We will take action to increase average road vehicle occupancy by 2030.

2021
Supporting car clubs to go fully zero emission

2021
Providing places, business and people with accurate carbon emissions data

2021
We will establish a Commute Zero programme



2021–2022
We will explore the introduction of a new sustainable travel reward scheme supported by businesses, community organisations and charities

2022
Providing guidance for local authorities to support shared car ownership and shared occupancy

Co-benefits:

Jobs & growth

Air quality

Congestion

Embracing new technology, shared mobility and using data to drive change

Zero emission technology will help deliver net zero and offers some early opportunities to deliver a lower carbon, better, transport system in parallel.

Technology is already driving radical changes in transport, with profound implications for users and businesses from digital connectivity, artificial intelligence, automation, and data innovation. By better understanding people's different needs and preferences, including motivations for, and barriers to, using these technologies, we can encourage changes in behaviours and more sustainable travel to increase the pace of decarbonisation.[192]

Our Future of Transport programme fosters the development and deployment of technology, ensuring the benefits are spread to all areas of the UK.[193] It targets emissions cuts from new and existing mobility services and encourages modal shift.

Innovation to reduce emissions is not limited to technology. Actions taken by businesses and other organisations to make journeys more efficient, such as organising car sharing, are not the product of recent advances in technology. We want to harness and share the best ideas, provide clear data on the carbon emissions, and remove any barriers preventing organisations from reducing their emissions. The commitments in this section can help deliver all the co-benefits set out in the plan. They can also directly help tackle congestion by supporting fewer overall car and other vehicle trips, supporting better journeys for all road users.

Shared mobility

Shared mobility services can decarbonise and decongest our transport network, offer an alternative to traditional mass transit, and provide new forms of transport for the first and last mile connecting to public transport.

Shared ownership/access

This includes formal and informal sharing or access to a vehicle. Examples include:

- **Back to base and one-way car clubs:** (also known as car-sharing) where electronic systems are used to provide customers unattended access to cars for short-term rental, often by the hour.
- **Peer-to-peer sharing:** where privately-owned vehicles are mediated through an app to organise the booking, allowing individuals to rent out their private cars on a short-term basis.

Shared occupancy/shared at the point of use

This includes the formal and informal sharing of rides in privately owned vehicles between unlicensed drivers and passengers who share a common or similar route. Examples of business models include:

- **Ridesharing/lift sharing (with known people):** the co-ordinated matching up of rides between travellers. The driver offers a ride and is only recompensed the equivalent expenditure for that journey
- **Ride-pooling (with unknown people):** services where users book a ride, usually through an app or digital platform, which they are prepared to share with an unknown third party.

Demand Responsive Transport in the West Midlands

The Transport for West Midlands £20 million Future Transport Zone is testing a range of innovative mobility services in real-life environments at scale. As part of the trials, the 'West Midlands Bus on Demand' service began operation in April. Through this service, consumers can book a ride in the West Midlands On Demand app by inserting a pick-up and drop-off location. Consumers are then matched with other passengers heading in the same direction. It is operating in the surrounding areas of the University of Warwick, including Kenilworth, Warwick Parkway, Leamington Spa and the Wellesbourne campus, and is aimed as those who commute to the University Campus but are not near to a bus stop.[194]

Commitment

We will take action to increase average road vehicle occupancy by 2030

Increasing road vehicle occupancy can significantly reduce carbon emissions as well as directly help tackle congestion when it displaces otherwise additional road vehicle journeys. Data from the 2019 National Travel Survey shows that the average occupancy rate is 1.55 across cars and vans, and when looking at commuting trips, this rate is only 1.14. In England, 62 per cent of trips are taken by lone drivers, which has been stable since 2002.[195] Most commuting trips by car are taken by lone drivers.

Increasing the occupancy rate is not straightforward but has the potential for very significant carbon savings. For instance, increasing car occupancy from 1.55 to 1.7 could save nearly 3Mt of carbon a year by 2030 – roughly equivalent to that currently emitted from all buses in a year. An increase to 1.6 could save nearly 1Mt a year by 2030.[196]

Increasing average commuting car occupancy by 10 per cent could save as much carbon as doubling passenger rail use. Recognising that not all commuter journeys will be switchable to public or active transport, new tools and online platforms offer the opportunity for a step change in improving car occupancy.

We will integrate measures to encourage shared occupancy within the commitments outlined below. We are continuing to build our evidence base to understand the barriers and potential policies to increase the uptake of shared mobility and will work with industry and local authorities to understand where further action can be taken.

Commitment

We will publish guidance for local authorities on support for shared car ownership and shared occupancy schemes and services

Guidance will benefit both local authorities and industry by enabling the sharing of best practice, evidence, and evaluation of different schemes. Local authorities will be able to pool resources, particularly regarding the evidence base supporting local decision making about the provision of car club infrastructure.

It will provide examples of best practice of the use of car clubs and ride sharing within local authority fleets and will be published within our Local Authority Tool Kit as set out in the section on 'Delivering decarbonisation through places'.

Enterprise car club partnership with Highlands Council

In 2018, the Highland Council in northern Scotland developed a partnership with Enterprise which aimed at providing council employees with access to Enterprise car club and pool car rental vehicles in order to reduce the number of journeys that they travelled in private cars. Since the partnership began, Enterprise car club and pool car rental has contributed to an estimated 649 tonne reduction in CO_2 emissions in the Scottish highlands by transferring grey fleet mileage onto their fleet of hybrid and electric vehicles. This fleet of 60 vehicles is located across 21 highland council offices, and the majority of vehicles are plug-in hybrids which are available to book by the hour or by the day by employees who would previously use a personal car. Along with the 37% reduction in carbon emissions since 2018, there has also been a 28% drop in business mileage and a reduction in business travel costs of over £900,000.[197]

Commitment

We will support car clubs to go fully zero emission

As car club fleets tend to contain newer vehicles, they can lead the transition to zero emission vehicles. Successful car clubs with zero emission vehicles could support users to choose zero emissions should they buy a vehicle in the future.

The Office for Zero Emission Vehicles (OZEV) will continue to provide a platform for discussion with local authorities and industry to encourage the sharing of information and learning. Best practice and lessons learned will be fed into the Local Authority Toolkit.

New services and modes

Beyond shared mobility, we are starting to see the emergence of new business models, which have the potential to make lower carbon journeys easier.

Commitment

We will consult on a Mobility as a Service Code of Practice

Mobility as a Service (MaaS) is the integration of different forms of transport with information and payment functions into a single mobility service. These platforms can make mass transit and active journeys more convenient for people through streamlining planning and payment. A new Code of Practice will signal the UK's intent for MaaS to shape the transport outcomes we want. To help consumers choose lower carbon journeys, this guidance will look to encourage inclusion of carbon data for each route offered.

Commitment

We will use national e-scooter trials to understand their environmental impact, safety, and mode shift potential to evaluate whether they should be legalised

Since July 2020, e-scooter trials have launched in 32 regions across England . Evaluation is underway and a key area of focus will be on the nature of mode shift e-scooters achieve. This will help us to understand the potential impact on transport emissions and air quality.

E-scooter trials

250	Bournemouth
900	Buckinghamshire
900	Cambridge and Peterborough
450	Cheshire West & Chester
80	Copeland
2,050	Derby and Nottingham
3,125	Essex
250	Gloucestershire
100	Great Yarmouth
400	Kent
2,500	Liverpool
19,800	London
1,300	Milton Keynes
1,600	Oxfordshire
1,050	Newcastle
250	Norfolk
3,400	North and West Northamptonshire
1,000	North Devon
250	North Lincolnshire
400	Redditch
600	Rochdale
550	Salford
250	Slough
3,250	Solent
400	Somerset West & Taunton
350	South Somerset
400	Staffordshire
300	Sunderland
900	Tees Valley
7,500	West Midlands
8,700	West of England (WECA)
1,000	York

*The number of e-scooters depicted are those approved by the Department for Transport for deployment and do not reflect what may actually be in operation. These figures are accurate as of June 2021.

E-scooter figures approved by the Department for Transport for deployment as of February 2021.

Data

The UK is a world leader in open data and the sector can thrive through decarbonisation. Data is the foundation for designing effective policy interventions that support the decarbonisation of the transport system. Better data can provide new policy and operational insights, drive new products and services and 'nudge' people towards lower emission journeys.

Commitment

We will reduce the barriers to data sharing across the transport sector

For the benefits of data to be unlocked, data needs to be shared. That is why we have been working closely with the transport sector in developing a Transport Data Strategy (TDS) to help overcome the barriers to data sharing and use, improving the discoverability, accessibility and quality of data.

In the recent consultation to improve the consumer experience at public chargepoints, we proposed opening public electric vehicle chargepoint data, to help consumers locate chargepoints, understand whether they are in use and promote greater choice when deciding where to charge. Accessibility and availability of this data will not only provide consumers with better information to encourage the shift to zero emission vehicles but will also support local authorities and distribution network operators to identify where installation is required. This consultation closed on 10 April, with regulations expected in the second half of 2021.[198]

We will look to support the growth of the UK transport data industry and continue to fund innovation projects and support their effective deployment and implementation.

Bus Open Data Service

Bus operators are now legally required to openly publish passenger information, including timetables, fares and location data to the Bus Open Data Service through the Public Service Vehicles Open Data Regulations 2020.[199] Data consumers can access these data, without restrictions on use or disclosure, to create journey planning applications, products and services to enable passengers to easily plan journeys, find best value tickets and receive real time service updates offering seamless journeys on the public transit network regardless of where they live, work or travel.

Commitment

We have launched a new annual statistical release and guidance about transport's impact on the environment and support its use by third parties

We recently published a new annual statistical release drawing together various data sources on transport's impact on the environment and guidance explaining the detail of estimating greenhouse gas emissions for different modes and journeys.[200] We encourage third parties to use our methodology. Data consumers can use these data, without restrictions on use or disclosure, for journey planning applications, products and services enabling users to plan green journeys.

This publication features transport environment statistics in a clear and transparent way, presenting cross-modal comparisons and focusing on metrics for future monitoring. These statistics will help transport users understand how the emissions from their journeys are changing over time.

West Midlands Combined Authority

Transport for West Midlands

The West Midlands has invested heavily in the passenger information it offers to citizens. Transport for West Midlands (TfWM) is one of the UK's largest transport authorities. The authority is responsible for a region encompassing the cities of Birmingham, Wolverhampton, and Coventry, with a population of 2.9 million people and delivers 326 million passenger journeys a year.

To improve customer experience and increase public transport usage, TfWM has invested significantly in the provision of accurate passenger information. Timetable and location data for bus, tram and rail needs to be delivered to journey planning applications, websites and third-party developers, to 1,800 real-time information displays at bus and tram stops and rail stations, alongside multi-operator printed timetables and mapping at all 12,200 bus stops in the region.

To increase the coverage of real-time information, TfWM has invested to ensure that smaller operators are able to openly provide location data feeds. This location data from the individual buses is then aggregated and transformed into reliable arrival time predictions data as a single feed or single source of truth which is then made available through a range of passenger facing applications such as Google Maps, Apple Maps and Citymapper, and at stops and stations through digital signage. TfWM is working with bus operators to bring all bus operator information into a single app for customers in the region.[201]

Encouraging lower carbon choices

Public perceptions and attitudes need to be built into the heart of transport to deliver options that meet people's needs and encourage more sustainable travel choices. By doing this we can promote a shift in behaviour and change how transport is used in the future.

Commitment

We will explore the introduction of a new sustainable travel reward scheme supported by businesses, community organisations and charities

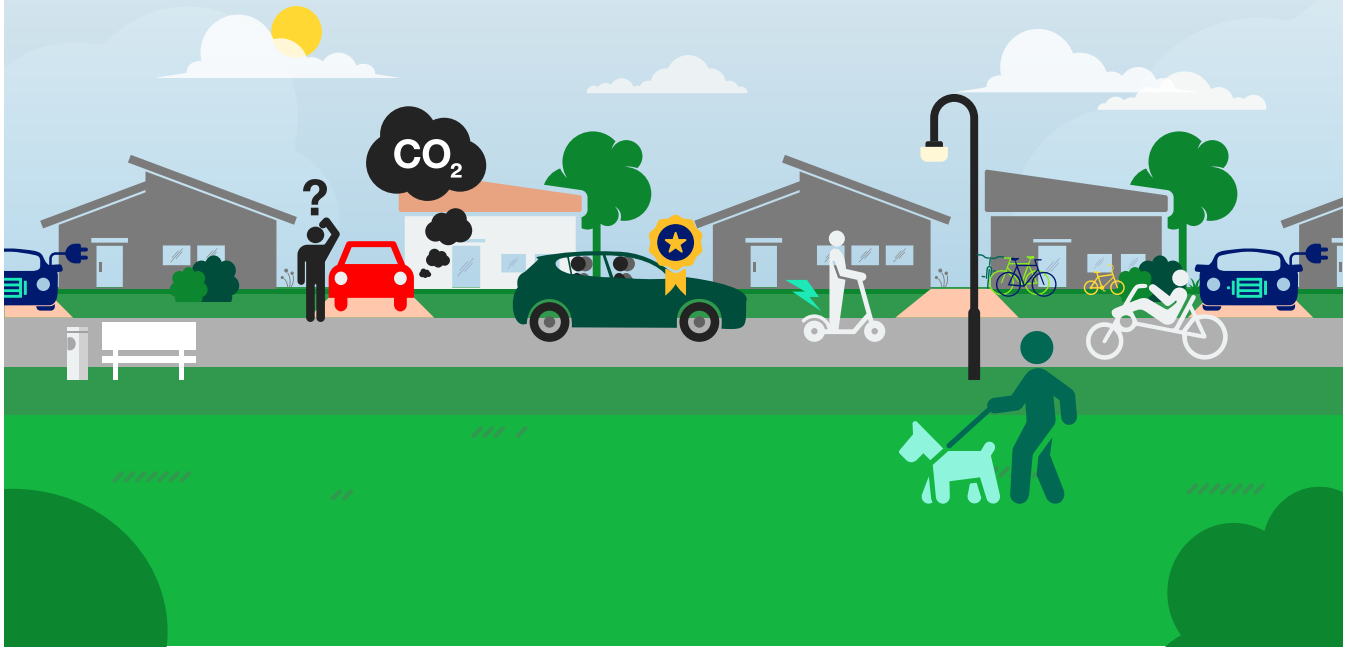
We will explore the feasibility of a travel reward scheme that utilises peer-driven motivation and encourages individuals to switch to, or continue to use, sustainable modes of travel. We are currently undertaking research in the area and aim to set out plans for piloting next year, before potentially bringing the scheme online in 2024.

The scheme will look to champion both technological innovation and behavioural science, working with businesses to encourage the public to make use of existing transport infrastructure and services. Through app-based software, transport users would receive points for journeys made using sustainable modes of transport, collaborating with friends, peers, and colleagues to earn rewards as a collective. Once a group has met their points target, individuals in the group can choose from a wide range of rewards provided by private sector partners including goods and discounts from national and local retailers and service providers.

Encouraging sustainable travel[202]

Long term motivation to continuing choosing sustainable travel is **enhanced by social norms**; people are encouraged when they know others are switching too.

DfT Deliberative Research found that **incorporating social elements to interventions** like low traffic neighbourhoods and group cycle training could enable people to enjoy benefits beyond the environment.



Commitment

We will support transport providers to develop communications campaigns that encourage mode-switch and sustainable transport behaviours

Working alongside transport providers, we will look to influence more sustainable travel behaviours by providing advice and guidance on the messages that are most effective in driving behaviour change towards use of sustainable transport. Research suggests the most persuasive factor in transport mode-switch decisions are stories of others who have made similar switches.[203] This work will explore the narratives and messaging that are most effective in encouraging the use of public transport and sustainable travel in a post-COVID 19 world.

Commitment

We will encourage and support UK businesses to lead the way in taking action to reduce emissions from their employees' travel journeys through "Commute Zero"

Commuting accounts for around one in five car journeys in the UK, with vehicle occupancy 26% lower than for car journeys as a whole.[204] If we could reduce single occupancy commuting journeys by 10%, this could have the potential to save 500,000 tonnes of CO_2 a year.[205]

To help support this, we will work with large employers in the public and private sectors on measuring and reporting on their total and average commuting emissions. This will build on the current consultation on strengthening the Energy Savings Opportunity Scheme[206] which runs to 28 September, and proposes to develop a methodology to reduce carbon emissions from staff commuting as part of the option to add a net zero element to energy audits by all large UK businesses. We will also bring Ministers and the UK's biggest employers together to share best practice.

This will lead to a Commute Zero programme which will convene and work with leading companies and large employers to research, support and encourage long-term changes to employee travel habits and support the take-up of lower carbon commuting, such as public and active transport, and car-sharing initiatives, including a pilot commuter census survey and demonstrator projects.

Liftshare

Liftshare is a social enterprise that has worked with over 700 of the UK's largest employers to reduce the number of single occupancy vehicles on our roads. With an online community of over 1 million members, it is estimated that Liftshare members have saved over 1 billion car miles by sharing their commutes.[207] Members include Tesco, which provides special parking and other incentives for ridesharers at its Hertfordshire headquarters. A third of the site's staff now share their car commute, reducing the number of cars driving there by 700 a day. Liftshare recently launched a sister brand – Mobilityways – with a renewed mission to make Zero Carbon Commuting a reality. Mobilityways provides software tools to make it simple for employers to evidence, track, plan and reduce their commuter emissions. The innovation underpinning it is ACEL© – the first ratings system to provide organisations a simple way to benchmark and understand their Average Commuter Emissions Level.

Behaviour change research

Climate Change Committee (CCC) analysis indicates that 59 per cent of emissions reductions to reach net zero will involve some form of societal behaviour change.[208] Behavioural science is important in encouraging people to make more sustainable choices and to align policy with society's values.[209]

In July 2020, the DfT commissioned deliberative research to understand the complexities and drivers of current and sustainable travel behaviour, the impact of COVID-19 and what interventions will encourage people to travel more sustainably.[210] The COM-B model of behaviour change was used to analyse the findings.[211]

This research has revealed multiple opportunities to change travel behaviour, but that travel decisions are driven primarily by convenience and cost, not environmental concerns. This means to be competitive with the car, public and active travel options must be easy, accessible, reliable, and affordable.[212]

What did our deliberative research find?

To make people feel capable of change:

- **Try before you buy** schemes (e.g. for new modes of transport like e-cycles) create the understanding and ability needed to use alternatives. Try before you buy lowers the cost barriers to entry and prompts action by allowing people to test whether alternatives suit them and their lifestyles before making any long-term commitments.
- **Linking environmental impact and travel choices** more explicitly, such as through journey planning apps that include carbon emissions information for different modes of transport, could be a good first step towards people considering sustainable transport options in the future.

To provide opportunity for change:

- **A gradual transition** to more sustainable modes over a number of years was felt by participants to be more realistic, both in terms of enabling the relevant infrastructure to be updated and developed and in terms of their own behaviour, allowing them to plan and prepare for changes to their lifestyles and routines.
- **Addressing negative perceptions of cycling and cyclists** and broadening the image of who can be a cyclist, by making cycling more accessible and aspirational to a wider group of people, would help to break down current social barriers to uptake.
- **Increasing the visibility of electric vehicle (EV) infrastructure** to make them appear more widespread, such as through green number plates, and visible charging infrastructure, clearly signposts to the public that this technology is ready for them today.

To motivate people to change:

- **Address the safety concerns of cycling** and make it feel safer for a wider group of people by ensuring that cycle lanes are continuous, well-lit, and separated from traffic.
- **Focus on leisure journeys as a first step**, including introducing cost incentives, as these behaviours are far less habitual and less entrenched, allowing people to try alternatives when decisions can be more considered and less time pressured.
- **Highlight the social and community benefits** that accompany decarbonisation initiatives, such as Low Traffic Neighbourhoods' (LTNs) role in enabling safe spaces for children to play. This appeals to a wider set of motivations and engages a broader audience.

Youth panel

Alongside the core research, a broad sample of 11–18 year-olds were engaged with to understand their travel experiences, their attitudes towards the environment and how transport factors into this. The research found that the environment was more top of mind in this age group compared to older age groups, and that they were surprised to learn how much transport contributed to carbon emissions. This made them feel it was important for individuals to take responsibility and to travel more sustainably. When thinking about future transport, young people became excited about new technologies and the possibilities these will bring.

Commitment

We will identify specific opportunities for decarbonisation through innovation in rural areas in the upcoming Future of Transport: Rural Strategy

While some technological change in transport is happening first and fastest in urban areas, there are different opportunities in rural areas that require different solutions. DfT research found that people living in rural areas were less receptive to exploring non-car travel modes due to having limited alternatives.[213] The Future of Transport: Rural Strategy will focus on enabling technologies that could help improve mobility in rural areas while reducing car dependency. There could be a significant role for liftsharing in this space.

Midlands Connect Rural Mobility Toolkit

In 2020, Midlands Connect produced a 'Rural Mobility Toolkit'. The toolkit provides a framework for discussions with local communities around how transport innovation, such as ride sharing, mobility hubs and automated vehicles can meet their community mobility needs, while addressing broader concerns such as decarbonisation.[214]

Commitment

We will help build a skilled workforce for the future of transport

For the UK to become a world leader in shaping the future of transport, it is imperative that the UK has a workforce capable of developing, procuring, implementing and operating (and scaling up) mobility solutions in a manner that maximises the acceptance and benefits derived from them. As noted in the Prime Minister's Ten Point Plan for a Green Industrial Revolution last year, we will create hundreds of thousands of new jobs by investing in pioneering British industries and ensuring a skilled workforce is in place to deliver net zero.[215]

Green Jobs Taskforce

To ensure we have the skilled workforce to deliver net zero and our Ten Point Plan, we launched the Green Jobs Taskforce in November 2020, working with business, skills providers, and unions, to help us develop plans for new long-term good quality, green jobs by 2030 and advise what support is needed for people in transitioning industries. The Green Jobs Taskforce will focus on a wide range of challenges in delivering skilled workers for the UK's transition to net zero including:

- Ensuring we have the immediate skills needed for building back greener;
- Developing a long-term plan that charts out the skills needed to help deliver a net zero economy;
- Ensuring good quality green jobs and a diverse workforce, and;
- Supporting workers in high carbon sectors, ahead of net zero.

The taskforce concluded its work this spring and will feed into the Net Zero Strategy being published later this year.[216]

Government is already working to ensure people can access the skills they need for the jobs of the future, including through our Apprenticeships, Skills Bootcamps, Traineeships, T-Levels, and the forthcoming National Skills Fund – to help us grow future talent pipelines and deliver the skilled individuals we will need. The Lifetime Skills Guarantee will help people train and retrain at any stage of their lives and so develop the skills most valued by employers. With help from the Green Jobs Taskforce, we will ensure that these programmes can be directed to support net zero, and to identify where the evidence tells us we might need to go further or faster. Starting this year, we are providing £2.5 billion for a new National Skills Fund (NSF). The NSF aims to fund the skills needed for the economy of the future and help people retrain and upskill into better more productive jobs, including those opportunities provided by the green recovery and net zero.[217]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Supporting UK research and development as a decarbonisation enabler

We'll use R&D to build on the world leading expertise of UK business and academia, maximising opportunities for growth, new exports and create hundreds of thousands of high quality jobs

R&D investment to 2.4% of GDP

Government has committed to increasing total R&D investment to **2.4%** of GDP by 2027, making it central to a green recovery and transition to net zero

Current public investment in transport decarbonisation R&D topped **£1.5 billion**

Our Areas of Research Interest (ARIs) will set out transport's core science, research and innovation priorities and needs over the coming years. We will also publish our new DfT Science Plan by Summer 2021

Decarbonisation of the transport system is a complex, interdisciplinary problem with technologies at different stages of development and market readiness. Successful deployment of solutions is shaped by lifecycles, behaviour and meeting user needs.

Global innovation and R&D are the keys to achieving our decarbonisation goals by ensuring there is a pipeline of solutions and the continuous development of new ideas. These will help us accelerate change by unlocking new green technologies, cutting the overall cost of decarbonisation, delivering system level efficiencies, and helping us deliver the levels of social and behavioural transformation needed.

Government has committed to increasing total R&D investment to 2.4% of GDP by 2027 and signalled that R&D is central to a green recovery and the transition to net zero.[218] We will ensure the UK remains the best and leading place in the world for scientists, researchers and entrepreneurs to innovate and through government's vision for R&D will cement Britain's reputation as a global science superpower.[219]

In transport, we use R&D to build on our expertise to maximise opportunities for growth, new exports and create hundreds of thousands of high-quality jobs. R&D will inform future policy and investment decisions and help us scale-up and transfer solutions to other parts of the UK and sectors of the economy.

The complexity of net zero requires a joined-up and coordinated government R&D portfolio delivering solutions for the system as a whole, as well as the evidence needed to inform decisions to deliver significant carbon reductions year on year. R&D cannot operate successfully in a silo, so it is critical that we engage with others who intersect and sometimes overlap with our transport decarbonisation agenda. For example, we are using our space applications and expertise to support decarbonisation. This includes using satellites to monitor the environment and enable connected and autonomous vehicles, and transformational technologies enabling lower emission flight using thermal management. Some also help tackle climate change beyond their uses in space, such as the development of battery cooling systems for electric vehicles, facilitating faster charging times, longer battery life and extended range.

Commitment

We will coordinate transport's investment in R&D, collaborating with key stakeholders through our Transport Research and Innovation Board (TRIB)

Government's current investment in transport decarbonisation R&D exceeds £1.5 billion. Continued strategic coordination of investment in R&D will remain critical to realising our decarbonisation ambitions. We will work closely with UK Research and Innovation (UKRI) and other research and innovation funders to deliver joint programmes ensuring the academic, SME and innovation community are aware of our challenges and can work with us, our stakeholders and industry to solve these.

TRIB coordinates innovation and R&D in transport building on our close working relationships within the R&D sector, including EPSRC, ESRC and Innovate UK, the Royal Academy of Engineering, Royal Society and Professional Engineering Institutions, such as the IET, the ATI and University Groups such as UTSG.

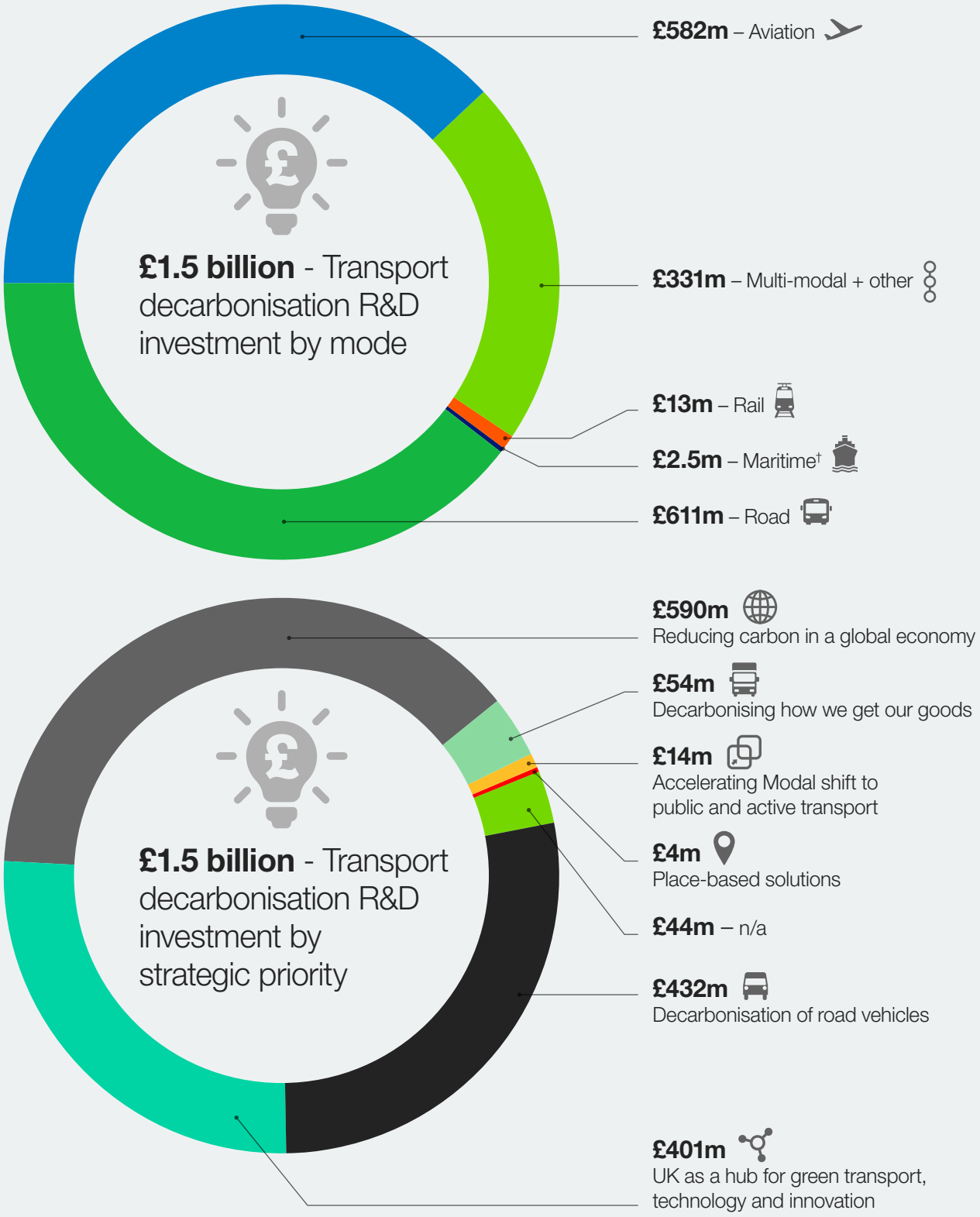
Transport Research and Innovation Board

Our Transport Research and Innovation Board (TRIB) brings together the leaders of major R&D funders in the transport sector including from DfT's Arm's Length Bodies, to provide strategic coordination to transport R&D, ensuring that activities and investments are aligned with R&D priorities in transport and coordinated across the sector. TRIB will help identify, prioritise and coordinate the delivery of R&D across organisations and transport modes and support the developing, testing and scaling of transport solutions through demonstrator projects and living labs.

Understanding our future integrated energy system is crucial to be sure that the energy vectors and fuels needed to decarbonise transport modes are available where needed, at the scale required, are 'genuinely' green, from a resilient supply and are available at a cost transport can reasonably bear. Much of this is coordinated through the Net Zero Innovation Board, Hydrogen Advisory Council, and pan-Government R&D Board on which the Department's Chief Scientific Adviser sits.

Current public investment in R&D for transport decarbonisation[220]

Assessment undertaken by the Transport Research and Innovation Board (TRIB)



Focussing and prioritising our R&D investments

We commissioned Mott MacDonald to consider what technology R&D needs to take place to reduce and remove direct emissions from the UK's domestic transport sector by 2050. They produced seven roadmaps considering future progress of candidate technologies and recommended research and innovation interventions needed over the next five to ten years. Their analysis for each mode in regard to technological progress is illustrated overleaf.

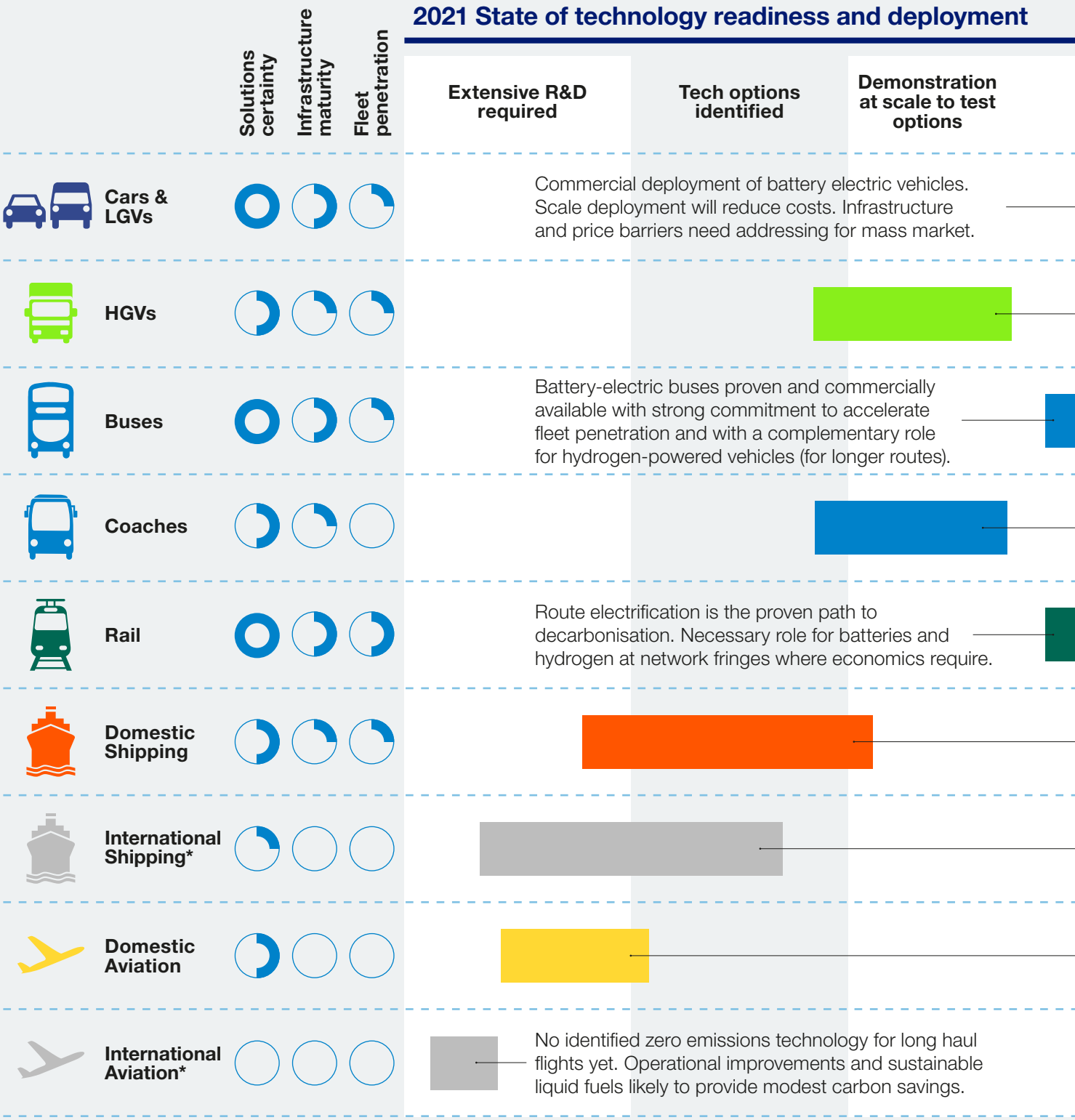
These roadmaps demonstrate that R&D needs to be prioritised around those transport modes where there are currently no clear technology or deployment pathways. This is particularly the case for hard to decarbonise heavier modes across HGVs, aviation and maritime. These are the areas where we are committing critical R&D seed funding over the next year, initiatives which will set the course to deliver longer-term solutions.

Commitment

We will update our Areas of Research Interest (ARIs) and publish our new DfT Science Plan by summer 2021

Our updated ARIs sets out the Department for Transport's research and evidence needs over the coming years to academia, industry and other funders of research and innovation.[221] Decarbonisation is one of the largest themes within the ARIs. The Science Plan sets how we will engage and catalyse activity in the research base, support innovation from concept through to commercialisation, as well as the supporting governance and plans to deliver it.

Technology requirements for reducing and removing direct emissions from UK transport

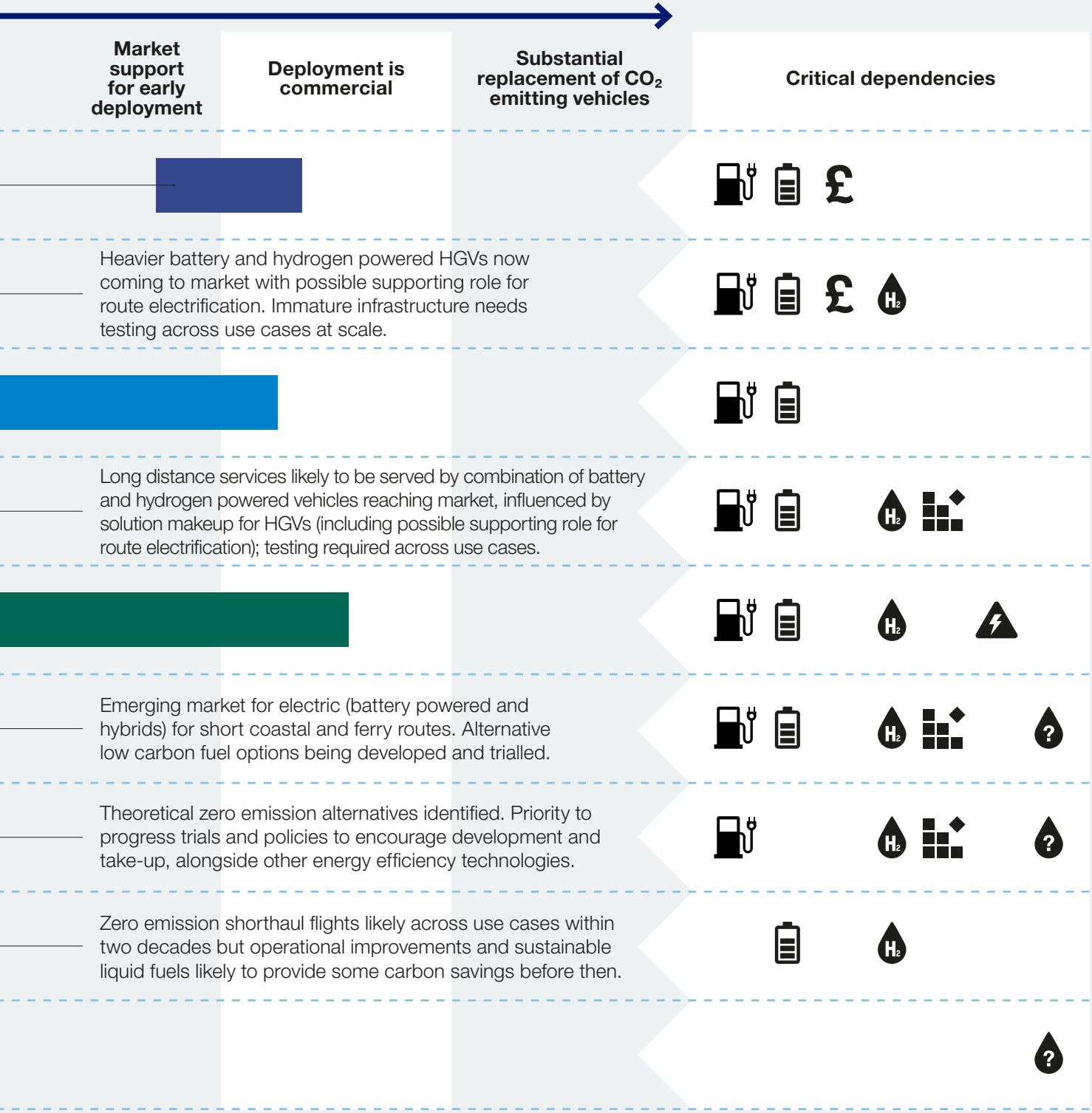


MOTT MACDONALD

This is a summary prepared by Mott MacDonald and partners of their report which provides a set of seven roadmaps for decarbonising domestic transport (*excluding international shipping and aviation).

Key:

Very low · Low · Medium · High · Very high



Dependencies key:

- Refuelling/recharging infrastructure
- Battery development
- Supply and price
- Hydrogen development
- Industry fragmentation
- Rate of route electrification
- Other low carbon fuels development

Unlocking green finance

Delivering the transition to zero emission transport requires major investments in every mode. As set out in this plan, this government has and will continue to invest billions of pounds to deliver the emissions reductions required. However, at every stage, this needs to be combined with green private finance, building on the world leading expertise of UK businesses to both effectively drive the transition and allow those businesses to fully grasp the opportunities from decarbonisation.

Across transport, there are already huge private investments taking place from EV chargepoints to zero emission flight. We have clear plans to bolster this through strategic public funding in transport innovation to trial and deploy new technologies that galvanise private sector investment, such as through investing £3 million in the Tees Valley Hydrogen Transport Hub, £20 million in trials of zero emission heavy goods vehicles, and £20 million to support zero emission technology and infrastructure solutions for maritime.

We also support the conditions for investment through removing barriers and reducing uncertainty. At the highest level, net zero and the plans set out in this document show a clear direction to zero emission travel, underpinned by clear targets in every area of transport. Since the announcement that from 2030 we will end the sale of new petrol and diesel cars and vans, and from 2035 all new cars and vans must be zero emission at the tailpipe, we have seen several major auto manufacturers bring forward new, earlier, zero emission intentions. We believe that this plan will help drive such announcements and associated investments across the transport sector.

This is then complemented by tackling practical barriers, such as those affecting the rollout of the necessary charging infrastructure, as set out in the section on ‘A zero emission fleet of cars, vans, motorcycles and scooters’, in order to support major private investments.

This work is supported by the government's wider green finance plans. One of core objectives of the new UK Infrastructure Bank, headquartered in Leeds with £22 billion of financial capacity, is to help tackle climate change. The Government will also issue its first sovereign green bonds (or 'green gilts') and NS&I's retail Green Savings Bonds under the Green Financing Framework published on 30 June.[222] These financing instruments will help support projects that reduce emissions including in transport. The inaugural green gilt is expected to issue in September. The UK's green taxonomy will provide common scientific definitions for environmentally sustainable economic activities, including transport. This will facilitate financing for low-carbon transport and ensure transparency regarding the impact of firms' activities in the sector.

We will continue to work with organisations such as the Green Finance Institute, seed funded by the UK Government and the City of London Corporation, to build on this work, identify and remove barriers and ensure the optimal conditions for investments to deliver net zero transport.

Views from the Green Finance Institute: The role of finance

Whilst finance is critical, it is not the panacea. In an effective ecosystem, finance should not be the blocker to decarbonisation and for this reason, the Green Finance Institute has established the Coalition for the Decarbonisation of Road Transport, to bring together industry experts, policymakers and finance practitioners to identify and unlock the barriers to investment in decarbonising transport and co-create the solutions required to overcome these.

Achieving the goals of the Transport Decarbonisation Plan will require considerable investment from both the public and private sector. Whilst the investment required is vast, it is important to remember that it is not one singular quantum of money, but pragmatic pockets of investment targeted towards different segments of the transport sector, requiring different solutions and financial innovations. There is consistent growth in demand for Environmental, Social and Governance investments from UK investors, with more than €2.2 trillion of UK assets under management today.[223] Unlocking this commercial capital for green transport and infrastructure has to be a key focus when designing cohesive government policy.

Early adoption of electric vehicles on UK roads has been strongly supported by government funding. Via mechanisms such as OZEV grants and Local Authority budgets to fund the rollout of charging infrastructure and to narrow the gap between the purchase price of electric vehicles and their ICE counterparts. As we approach price parity, the role of private sector finance will grow, and innovative financial mechanisms may be required to ensure all members of society can access clean, green transport.

The Green Finance institute was established in 2019 as a direct response to a key policy recommendation made by the industry-led Green Finance Taskforce to the UK Government in March 2018.[224]

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