

# High Speed Rail: Net Zero Voices

March 2022

## About High Speed Rail Group

High Speed Rail Group (HSRG) is committed to supporting the successful delivery of a world-class high speed rail network in Britain. Our members have helped deliver major infrastructure projects in the UK and around the world, including creating entirely new high speed networks and improving the UK's existing rail network. This gives us a unique insight into both the shortcomings of the current network and the transformative capacity, connectivity and carbon benefits that high speed rail brings. We support a national high speed rail network which includes the delivery of HS2, high speed rail's integration with the existing network and investment to maximise the released capacity benefits HS2 brings on and off route, along with other rail investments such as Northern Powerhouse Rail and Midlands Engine Rail.

Find out more at [www.rail-leaders.com](http://www.rail-leaders.com)

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## FOREWORD

**Andrew Stephenson MP**  
Minister of State at the Department for Transport

HS2 is one of the most significant economic projects for generations. It will improve capacity on the UK's rail network, building towards a net zero transport system that brings people closer to jobs, education and each other.

Undoubtedly, construction of this size, scale, and ambition affects its immediate surroundings. My department has paid close attention to the voices that ask, 'What are you doing to protect our wildlife and preserve our environments?' I am proud to say we are listening, learning and acting.

We have reported on environmental impacts and highlight the often world-leading work undertaken to minimise the effects of the construction of this mega-project. And we will go further. The scale of HS2 provides a unique opportunity for the government to influence the construction sector and encourage innovation, and we have laid out our ambition to achieve net zero in construction and operation from 2035.

There is much to do, and achieving our ambitions is no simple task. But the project has created the conditions that allow us to test new green technologies in a live environment and foster the innovative approaches outlined in HS2's Net Zero Carbon Plan. We are clearing the path towards diesel-free construction sites by 2029. We are working closely with industry, and together, we are innovating for a purpose. With every mile of track, HS2 is deploying everything from low carbon concrete solutions to electrically powered cranes and diggers and redefining what it means to be an environmentally responsible infrastructure project in the 21st century.

With boots on the ground, and spades and tunnel boring machines in the earth, we are building back better and greener from the pandemic. And I believe we should always keep in mind that rail is one of the greenest forms of travel. Once HS2 opens, all its electricity will come from zero carbon sources. Trains will be powered by a clean energy grid, making journeys amongst the cleanest in the UK. Passengers will reap the benefits of faster services, connected communities, and upgraded and electrified tracks. Overcrowding on our carriages will be reduced. Capacity on our networks will be increased. And ultimately, HS2 will provide the low carbon alternative at the heart of our future, greener transport system.

Last year the Department for Transport published a plan to cut carbon out of the entire transport system. As we accelerate towards net zero, it is right and proper that the country's biggest infrastructure project is tightly aligned with our commitments to reduce transport's carbon footprint. In that way, HS2 becomes not only an integral part of a net zero carbon transport sector, the most sustainable railway of its type in the world, but also an enabler for decarbonisation across the entire British economy.

# EXECUTIVE SUMMARY

Investment in a truly national high speed rail network that connects the country north, south, east and west is one of the most tangible ways that we can drive forward our net zero ambitions. High Speed Two (HS2) will form an essential part of this aspiration, providing a high speed rail spine connecting communities up and down the country. Although much focus in the transport decarbonisation debate to date has focused on urban public transport, we know that it is longer distance travel that contributes the most to transport's carbon emissions and tackling this must be a priority ahead—with HS2 poised to do just this. In 2022, there has already been political progress on the project with the deposit of the Hybrid Bill for the Western Leg of HS2 Phase 2b, which will see plans progressed to connect Crewe to Manchester. In tandem there have been efforts to set a path for the decarbonisation of the transport sector, most notably through the Government's Transport Decarbonisation Plan, which acknowledged that building extra capacity on our rail network through high speed rail will be essential to meeting growing passenger and freight demand and supporting shifts from road and air to rail.

As the transport sector undertakes an irreversible shift towards net zero emission mobility, a high capacity, fully electrified railway such as HS2 will be vital to making this happen—joining at present the UK's only high speed route, High Speed 1 (HS1)—and in turn creating the beginnings of a truly national clean, green, high speed rail network. HS2 aims to be the most sustainable high speed rail project in the world, with all trains powered by zero carbon energy from day one of services. HS2 Ltd. have recently published their own Net Zero Carbon Plan, which CEO **Mark Thurston** expands upon in his contribution to this publication, and by 2035 the project aims to reach net zero emissions.

HS2's sustainability credentials have always been important to its ultimate success, but up until now the project's decarbonisation potential has been underplayed by a number of factors, including:

- National forecasts assuming a decrease in rail growth, with demand for HS2 capped shortly after it opens: the former assumption does not sit with achieving net zero, the latter with the experience of uplifts in passenger growth from new railway;
- The cumulative impact of wider rail upgrades needed to meet net zero, in particular up to Scotland, which would make HS2 services even more competitive to flying;
- HS2's benefits of freeing up capacity on the existing network for freight and local passenger services had, until recently, not been fully modelled;
- The potential impact of expanding European high speed rail and sleeper services within a few hours of many UK cities.

To get a sense of the sustainability gains to be made through high speed rail, we need only look to the aforementioned HS1 line, which runs between St Pancras International and the Channel Tunnel, providing a blueprint for how transformative high speed rail could be at a national level. The UK's original high speed rail line has resulted in £66 million worth of environmental benefits from those choosing not to fly since opening. It has provided benefits and improved connectivity for longer journeys in an environmentally friendly way, with journeys made by train to Paris, Brussels and Amsterdam producing 80% less CO<sub>2</sub> emissions than flying.

There is increasing recognition that HS2 is an environmental programme as much as a transport and economic one. Indeed in 2020 the project was the first UK transport sector client to be awarded PAS2080 global carbon management standard. As the Government's HS2 Minister, **Andrew Stephenson MP**, says in his foreword to this publication 'as we accelerate towards net zero, it is right and proper that the country's biggest infrastructure project is tightly aligned with our commitments to reduce transport's carbon footprint. In that way, HS2 becomes not only an integral part of a net zero carbon transport sector, the most sustainable railway of its type in the world, but also an enabler for decarbonisation across the entire British economy.'

It is clear that high speed rail can unlock substantial benefits, demonstrating UK leadership in low carbon construction, reducing greenhouse gas emissions, congestion and air pollution, alongside biodiversity gains. This is set out in further detail below.

## Low carbon construction

HS2 presents us with an opportunity to raise the bar in sustainable building as the most sustainable UK infrastructure project in UK history. In 2016, HS2 Ltd. challenged its contractors to achieve a 50% reduction in carbon emissions by 2030, and by March 2021 reporting showed an overall reduction of 24.6%.

These targets will ultimately be reached by the supply chain cutting emissions, using efficient design and cleaner construction techniques. Members of the High Speed Rail Group (HSRG) already working on the project include the Align Joint Venture, and in their contribution to this report, Project Management Officer **Anne-Sophie Duc Dodon** details how they have adapted and improved the design of their works to result in a carbon reduction of 28% for the Colne Valley Viaduct and a 36% reduction for the Chiltern Tunnels, compared to initial design. Similarly, **Breffni Quinlivan** from the Skanska Costain STRABAG Joint Venture sets out how the integrated project team has already achieved a 25% carbon reduction on the main works programme through measures including holistic carbon monitoring and adopting biofuel technology.

Alongside upskilling the supply chain, contractors are also incorporating more environmental professionals into their teams than ever before. Skanska's **Adam Crossley** speaks to the importance of collaboration in achieving net zero, noting that by 'working together from the earliest ideation stage ... we can design and build spaces and infrastructure with the climate in mind, helping to decarbonise assets and operations.' As set out in High Speed Rail Group's *High Speed Rail and Nature Networks* report, you are just as likely to find environmental professionals working on the route as engineers, with HS2 creating more green jobs than any other major project. The scale of HS2 means there are enormous career opportunities, for instance for ecologists to work on a range of habitats and species early in their careers.

This focus on low carbon construction is already paying dividends for the project, with Birmingham Interchange achieving BREEAM outstanding certification for its sustainable design. This award recognises the Interchange will be one of the most environmentally friendly railway stations in the world, and is the first of its kind ever in the UK.

### Modal shift

With road transport accounting for some 67% of the transport sector's greenhouse gas emissions, and rail just 1.4%, it is clear that modal shift will have an important role to play if the UK is to achieve its net zero ambitions. Beneficial modal shift will only happen if there is (a) a more attractive alternative to road and short-haul air travel, and (b), the capacity to accommodate modal shift on a significant scale. Uniquely, HS2 offers precisely this combination.

In the UK, evidence shows that the tipping point for modal shift from air to rail lies in the 2½ hour–4½ hour range. Research shows that taking an hour off rail journey times on Edinburgh/Glasgow–London and Edinburgh/Glasgow–Midlands routes would result in rail market shares growing from today's 30% share of the Anglo-Scottish travel market to 75%. **Paul Tetlaw** of Transform Scotland, Scotland's national alliance for sustainable transport, writes that 'clear interventions should be developed within the timeframes identified' to bring the benefits of high speed rail to Scotland as soon as possible to encourage this significant potential for modal shift.

HS2 will create space for more new local and regional train journeys and carry over 300,000 passengers a day. Indeed, **Stephen Joseph** writes that HS2, and the rail network more broadly, should become 'the backbone of a zero carbon transport network across the UK', alongside road user charging, some taxation of domestic flights, integrated transport options for local travel and for getting to and from rail stations, and public transport-oriented development.

Evidence from international high speed rail services show significant modal shifts from car and short-haul flight alternatives. In Eurostar CEO **Jacques Damas'** contribution to this report, he points to the example of his company's London–Amsterdam route, historically one of the largest international airline markets in Europe, which within a year of offering a direct return high speed rail service between London and Amsterdam, gained a 20% market share.

But it is not just about passenger travel. HS2 will also free up space on several rail mainlines for more passenger and freight services, in particular the West Coast Main Line, Britain's busiest freight corridor. This is essential, given rail freight produces 76% less CO2 per tonne of cargo than road haulage. That means for every extra freight train HS2 creates space for, the equivalent of up to 76 lorries can be taken off the road.

### Nature

Whilst increasing rail capacity and connectivity will inevitably have some environmental disbenefits, such as noise, land take and severance—and these are not to be understated—measures are also being undertaken to ensure that HS2 has a positive environmental legacy.

The string of nature reserves that have grown up alongside the HS2 route show how building railways can facilitate nature restoration. HS2's flagship 'Green Corridor' along the Phase One route takes these ambitions to the next level, restoring and enhancing habitats and delivering ecological connectivity at the landscape scale. The Corridor will encompass 7 million new trees and shrubs, including over 40 native species; over 33 square kilometres of new and existing wildlife habitat, equating to an area the size of 4,600 football pitches; and tailor-made homes for wildlife.

Greens4HS2 member **Melanie Horrocks** speaks eloquently to concerns around the scheme's impact within the green movement and how they should be addressed in her interview for this publication. She notes that "I was taken in by the claims of the anti-HS2 lobby, as anyone with green credentials will find a phrase like '108 ancient woodlands are being destroyed' very emotive. A lot of the standard soundbites make HS2 sound like a bad thing, but once you start breaking those down you can shed some light on the bigger picture".

As our 'Voices' outline in this collection, HS2, and high speed rail more broadly, has an essential role ahead if we are to reduce emissions in line with the Paris Climate Agreement and ultimately achieve net zero. As decarbonisation requires such rapid change, there is a danger of focusing entirely on only the most direct emissions from trains themselves, but the case of high speed rail shows the importance of considering the wider emissions narrative, inclusive of construction and modal shift. Only then can we get a real sense of a mode's contribution to net zero.



**Mark Thurston**  
CEO, HS2 Ltd.

As the CEO of High Speed Two (HS2) Ltd, Mark has the privilege and ultimate responsibility for leading the company that has been charged with delivering a new high speed railway that will connect the major cities of the UK.

Mark joined HS2 Ltd. in March 2017; he has some 30 years' experience including leadership roles in engineering, project and programme management and business operations. Having worked for client, consulting and delivery organisations, Mark has a successful track record across a mix of major organisations and investment programmes and worked on both the London 2012 Olympics and Crossrail. He was previously the European MD of engineering and projects company CH2M.

Mark started his career as a technician apprentice on the London Underground.

## OUR PLAN TO REACH DESTINATION NET ZERO

The carbon emissions challenge our industry faces has never been clearer. The UK's pledge to bring greenhouse gas emissions to net zero by 2050 is rightly considered amongst the most pressing social and economic issues. However, as it stands, the transport sector is the largest single emitter of greenhouse gases, which places a huge responsibility on those of us in the industry to innovate, challenge, and ultimately set new standards for ourselves. As the CEO of Europe's largest infrastructure project, it's a responsibility that I take personally and very seriously, both in terms of the construction and operation of the railway.

Our green vision at HS2 is to build the most sustainable high speed rail network in the world, providing zero carbon travel as a clean alternative to long-distance car journeys and flights, helping to cut carbon, tackle climate change and improve air quality.

For the UK to tackle climate change while supporting a growing economy and population, it needs more zero carbon forms of transport, which HS2 will deliver from 2029 with trains powered by carbon-free electricity. **High speed railways have a well-established precedent** for decarbonising transport; by getting people out of high-carbon emitting forms of transport such as planes, cars, and lorries used for long-distance, and onto electric-powered trains. On Britain's only existing high speed infrastructure, HS1, Eurostar services have reduced air passenger volumes by 50–60% on London-Paris/Brussels routes. But to go beyond this and achieve the same level of results seen in mainland Europe, we need to build an entire national high speed rail network to enable even more people and goods to travel by rail.

Building the infrastructure needed for a national high speed railway comes with its own set of challenges. The materials and processes involved in large-scale construction tend to be very carbon intensive. At HS2 we've recently published our Net Zero Carbon Plan to explain how we plan to tackle these challenges, setting out how we can pioneer a cleaner, more sustainable way to build and run high speed railways. Our plan maps out how HS2 will reach net zero carbon from 2035 by reducing carbon emissions as much as possible and making those that cannot be eliminated to net zero by using natural or technological methods, known as carbon offsetting. Put simply, we'll remove the same level of emissions that are produced as we build, maintain and operate HS2 from 2035.

To reach destination net zero, we've set a range of industry-leading targets to progressively decarbonise HS2, which we hope will be adopted by the wider building and construction sector—responsible for 39% of global carbon emissions. Our targets include: making all of our construction sites diesel-free by 2029—with the first one expected this year—and halving emissions from the production of steel and concrete by 2030 when compared with 2021 levels. Innovative technologies will play a key role in making these targets a reality. Our innovation programme at HS2 is already accelerating the advances needed to make construction cleaner using alternative fuels, battery-powered machinery and renewable energy to help get us to net zero. Only last month, we became the first UK construction project to have three giant fully electric cranes working on the ground as part of our move towards diesel-free sites.

But whether it's our innovation programme or how we design the railway, every aspect of our work has been informed by our commitment to sustainability, with our team of experts working over many years to get us where we are today. Back in 2013, HS2 became one of the first major infrastructure projects in the world to have its carbon footprint assessed. And in 2016, we set new, industry-leading carbon targets, challenging our contractors to cut emissions by 50%. We're making good progress against this target with a reduction of 25% reported in March 2021. So, although our Net Zero Carbon Plan has only recently been published, our work to deliver it has already begun in earnest.

My colleagues and I at HS2 are well aware of the scale and the opportunity of the challenge that now lies ahead of us. We know it demands a step change in both the breadth and scale of our ambition, and our duty to act quickly and decisively to reduce our carbon emissions. We are completely focused on the task at hand, pressing ahead to deliver against our plan and the unique opportunity that HS2 has to offer: to show the world that national high speed railways can be built more sustainably, to provide a zero carbon alternative to long-distance travel and decarbonise construction, and to leave a better, cleaner, greener world for the next generation.





**Jacques Damas**  
CEO, Eurostar International Ltd

Jacques became CEO of Eurostar in October 2020. He joined the SNCF Group in 1982, and held several senior roles including Chief Operational Officer for Eurostar between 2000 and 2005, during the launch of the first high speed line in the UK. Having returned to SNCF in 2005, he was appointed to the SNCF Executive Committee in 2006 as COO and became Deputy General Manager in 2012. He then joined the Keolis Group in 2014 as Executive Director responsible for safety and security, operations and maintenance, sustainability and corporate responsibility policies. He was also representative of the European Railway Community (CER) from 2009 to 2013 and was a Director on the Board of Thalys from 2012 until his appointment as Eurostar CEO.

## A MODAL SHIFT SUCCESS STORY WHICH IS FAR FROM OVER

Pre-pandemic, demand for Eurostar high speed rail services had grown year on year for the last two decades, with passengers increasingly recognising the benefits of train versus plane. Fast, seamless rail travel from city centre to city centre offers a compelling alternative to air travel, evidenced by Eurostar's position as market leader for both our London-Paris and London-Brussels routes.

Within a year of offering a direct return high speed rail service between London and Amsterdam, we have gained 20% market share. This is one of the largest international airline markets in Europe, attracting over three million passengers, and it offers huge potential for our high speed rail services to further revolutionise travel between two iconic tourist and business hubs.

Furthermore, the success of HS1, the first high speed line in the UK, has led to direct socio-economic benefits of £281m per year<sup>1</sup> with the urban regeneration seen in the King's Cross and St Pancras area now a blueprint for other European cities.

Accelerated by the pandemic, sustainable travel is now high on the agenda. Across Europe, governments are starting to make moves to make rail the default option for short haul travel. With a passenger's carbon footprint from one flight between Amsterdam and London the equivalent of seven Eurostar journeys, it is clear the impact this kind of approach can have.<sup>2</sup>

As businesses increasingly mandate rail for corporate travel, high speed rail is well equipped to help governments meet global climate change targets, but they need to help us compete by levelling the playing field.

One area where airlines have the clear advantage is price. Eurostar operates in an open access market, without any subsidies. High speed rail operating costs are high, with infrastructure charges representing 60% of them.

The modal shift over long distances will not happen without significantly lowering rail prices in order to compete with low cost airlines. High speed infrastructure is built to last and bring people wellbeing for centuries, not for decades. If governments reflected this by absorbing the capital investment costs over a longer period of time for future projects, this would significantly reduce the cost to operators—a saving which could be quickly passed on to the consumer. Carbon pricing is another option—meaning that the price paid by a car driver or airline passenger reflects the environmental costs.

As an operator, what we can control is our product and our service and we have invested significant resources to enable us to offer the best possible customer experience, setting us apart from our competitors. Customers are at the heart of everything we do, and our teams have gone above and beyond during the pandemic to continue to offer a comfortable and accessible service, reassuring passengers every step of the way.

- <https://highspeed1.co.uk/media/vemkxmot/delivering-for-britain-and-beyond-the-economic-impact-of-hs1-march-2020.pdf>
- <https://www.eurostar.com/uk-en/tread-lightly>



We work tirelessly to ensure a smooth and efficient check-in process, despite the challenges brought during the pandemic. A few years ago, the introduction of e-gates across our city centre terminals helped maintain acceptable boarding times. We now have the ambition to deploy fully automated border controls to retain our edge and as part of this we are trialling SmartCheck, a contactless fast-track service using biometric face verification to expedite the boarding process.

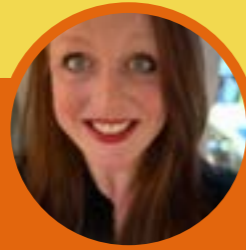
The story doesn't stop here. In our 'Message to Glasgow' signed by 10 rail partners on the occasion of COP26, we highlighted areas where we need to be more ambitious.

Electricity powering our trains is a significant contributor to our carbon footprint, so this is an area we are focusing on. We aim to reduce energy consumption by 5% per journey using a driver advisory system, and to reduce carbon emissions associated with this consumption by reaching 100% renewables by 2030. Our trains are already electric, and so securing 100% renewable electricity supply is the key to achieving net zero carbon emissions. We are actively challenging our suppliers on this topic, but it requires government support in our markets to ensure it is a focus for each country's respective national strategy.

Alongside this, we will offer five return services a day on the Amsterdam route by 2025 which could represent 1.2 million passengers per year choosing to take the train rather than a plane, and a potential saving of 62,760 tonnes of carbon emissions.

None of this will happen by itself. If governments and business are true to their word and respect the very ambitious climate commitments they have made in recent years, they must do everything to place rail at the core of a decarbonised transport system.





**Melanie Horrocks  
Greens4HS2**

Melanie is a member of Trafford Green Party in Manchester, as well as a member of Greens4HS2, a group of Green Party members who support high speed rail in the UK and elsewhere. Melanie was the Green Party's Mayoral candidate for Greater Manchester in May 2021, and has previously stood as a candidate in local and general elections.

## INTERVIEW WITH MELANIE HORROCKS, GREENS4HS2

**It is fair to say that the Green Party has historically been split on the subject of HS2. You've gone on the record saying that the Green Party "...seems to have been misled by the flawed assumptions and motivated reasoning behind the anti-HS2 campaign." Could you unpack this a bit more?**

A lot of catchy slogans have been used by the anti-HS2 camp. The first one that springs to mind is that '108 woodlands are going to be destroyed'—but when you look into the reporting, it actually says that 108 woodlands will be 'impacted'. For many of these, not a single leaf or tree will be harmed, but the line passes within two kilometres of the ancient woodland. In some cases, there is a motorway in closer proximity than HS2 will be! But for anyone with green beliefs that initial statistic is very emotive, and it is hard to move beyond slogans like these. Similarly, you hear the line that HS2 is 'only twenty minutes quicker', but that ignores the entire premise around modal shift and increased capacity.

**The split within the Green Party on the subject of HS2 is largely due to concerns around nature impact. As a supporter of the scheme, what would your counterpoint to these arguments be, and what can be done to convince your colleagues of the sustainable merits of the project?**

The Green Party's policy is actually in favour of a high speed rail network from north to south. At our Autumn conference both pro and anti-HS2 motions were tabled, and support was overwhelming then for a sensible approach to HS2. Greens4HS2 have several members who are elected councillors along the route of HS2, and they are doing an excellent job in supporting the scheme whilst holding HS2 Ltd. to account. That is a distinction I very much make: you can support high speed rail without necessarily being a cheerleader for the company.

For me, this is where the challenge is: is the company making the right decisions, putting the right protections in place, and supporting infrastructure? Greens4HS2 have one member who has successfully campaigned to make sure there is cycling access around the Euston terminus in London. I think areas like that are where we should be having the fight, and as Greens, the railway industry should be our friend.

**Everyone knows that HS2 will shorten journey times, but you've spoken in the past about how the benefits would be much wider ranging than that. Taking an area like Greater Manchester as an example, do you want to list a few other benefits to delivering the scheme?**

I have been contacted by Greater Manchester residents who are very pleased that cycle routes will be opened up as a direct result of HS2. In the north west we predominantly use cars, as it can be very difficult to get to places on the train. We've all had the experience of paying the equivalent of one of your internal organs to travel somewhere by rail, only to be stood outside the loo for the whole journey! That inconvenience puts people off. HS2 will free up capacity on busy intercity lines, and that will bring prices down and provide more space.

If we can properly link up an integrated public transport system then we would completely change Greater Manchester. I speak endlessly about being able to put bikes onto trams, buses and trains because that makes public transport viable—and at the moment, it generally isn't.

**As an outspoken supporter of HS2 and a member of Greens4HS2, have you always been in favour of high speed rail as a tool in fighting climate change, or is it a position you've come round to over time?**

I have used a lot of public transport in Europe, including high speed rail, but initially I didn't equate those experiences with a requirement for high speed rail over here. I was taken in by the claims of the anti-HS2 lobby, because anyone with green credentials will find a phrase like '108 ancient woodlands are being destroyed' very emotive. A lot of the standard soundbites make HS2 sound like a bad thing, but once you start breaking those down you can shed some light on the bigger picture. My view was changed by putting these 'facts' into some context, and I've used that to explain these ideas outwardly to people. The challenge comes in making this viewpoint accessible to people.

**What would your message be to any fellow Green Party members who are on the fence where HS2 is concerned? How can colleagues positively engage with high speed rail, recognising that if done right, it supports our green transport goals?**

HS1 is a great example: now that it is up and running, the environmental impacts are very minimal. People should not focus solely on the construction, but the overall story. Equally, the messaging should not just be limited to reduced journey times, and 'look how fast we can go!' If we talk about how the line will become embedded into our transport system and how much greener it will be, then that will get a lot more engagement. In fact, some of the Greens4HS2 group's messaging has started to be reflected by HS2 Ltd., so they are very much aware of us as an organisation, and I welcome the progress they've made on sustainability and biodiversity gains.

I would point out to people that I used to be where they are. As a party we like to bill ourselves as being based on facts, on science, on expert advice. We're about evidence-based politics. As a party, we should have moved on from those anti-HS2 statements at conference ten years ago. We're now in a very different position, and that needs to be considered. For example, HS2 is one of the biggest investors in habitat creation in Europe, let alone the UK. It's a shame that things like that are lost in the noise. That's where my argument is: look at what experts are saying, and let's move our focus towards getting the best out of HS2, ensuring that the negative environmental impact is kept to a minimum, and people travelling by high speed rail.





**Anne-Sophie Duc Dodon**  
**Project Management Officer,**  
**Align Joint Venture**

Anne-Sophie graduated from the Paris Institute of Political Sciences (Sciences Po) in 2014 with a master's degree in Finance and Strategy Management. She joined Bouygues Construction where she has held a number of different roles in project management, mergers and acquisitions.

In 2021 Anne-Sophie joined Align, a Joint Venture of Bouygues Travaux Publics, VolkerFitzpatrick and VolkerWessels delivering the Central 1 portion of HS2 Phase One, as Project Management Officer supporting the Project Director with a specific focus on project coordination and improvement, risk management and the implementation of Align's innovation and carbon strategy.

[ Photo © Benoît Grogan-Avignon ]

## CONSTRUCTING A NET ZERO FUTURE

Building major infrastructure projects is all about leaving a legacy: in architecture, in engineering and in skills. However, one legacy we do not want to hand down to future generations is a significant carbon footprint. This commitment is at the heart of HS2's plan to achieve net zero carbon construction and operation from 2035. Contractors operating on HS2 Phase One will play a key role in ensuring this target is achieved by improving design and construction processes, and making sure that the legacy linked to carbon is a positive one focused on low carbon construction, built using best practice and innovative solutions.

It is this objective that dictates how we operate at Align JV, the main works civils contractor delivering the central portion of HS2 Phase One that includes the Chiltern Tunnels and the Colne Valley Viaduct. We believe that low carbon construction should not just be a priority for one or two specialists working on the project—but rather it requires the commitment and support of everyone in Align and our supply chain partners. This shared commitment is embodied in collaboration, one of Align JV's key values, working with our partners on our journey to deliver low carbon construction. This journey is going to take some time and it requires preparation, monitoring and implementation from design to construction, through to maintenance and operation.

Let me take you through Align JV's journey to implementing low carbon construction and contributing to the success of HS2's Net Zero Carbon Plan.

### Reducing carbon at design stage

First stop is design improvement, to reduce the quantities of steel and concrete needed to build our various assets. These two components are the biggest contributors to the carbon footprint on most construction projects.

With the help of our integrated design team Align-D, we adapted and improved the design of our works, resulting in a carbon reduction of 28% for the Colne Valley Viaduct and a 36% reduction for the Chiltern Tunnels, compared to initial design. Practically, this amounts to a saving of more than 200,000 tonnes of CO<sub>2</sub>e (Carbon dioxide equivalent)—or the equivalent energy consumption required for 25,000 homes over a year in the UK. This was achieved through reducing the thickness of concrete where possible, avoiding the use of steel rebar to promote steel fibres instead, and cutting out the design elements that wouldn't be essential to the final use, all without impacting on the quality of the overall design.

We also cut our emissions by improving the performance of our concrete mixes to reduce the use of cement to a minimum. This supports HS2's commitment to cut emissions from concrete by 50% by 2030. A secondary benefit and one that is not insignificant, is the cost saving that we are able to deliver as a result of making these changes.

### Green power for our TBMs and construction sites

When our Tunnel Boring Machines (TBMs) Florence and Cecilia were launched last summer, the first TBMs to start their journey on HS2 Phase One, we were able to display ‘zero carbon’ banners. These machines are fully powered by zero carbon electricity and so is Align JV’s main site at the South Portal, HS2’s largest construction site, and many of our other compounds. When some of our more remote sites or assets cannot be connected to the grid, solar or hydrogen generators are our preferred option.

The best way to reduce carbon is to not use power at all. Hence, reducing the number of lorries on the road has been a key target since the very beginning of the project. All the concrete required for the Chiltern Tunnels and the Colne Valley Viaduct is produced by our partner Tarmac using three batching plants located centrally at our South Portal site just inside of the M25. Tunnel segments and viaduct segments are prefabricated in dedicated factories on site, saving thousands of lorries journeys over the four year construction period.

The 2.7million<sup>3</sup> of spoil from the tunnels is being converted into slurry (a mix of chalk and water) and is being pumped back to our south portal site where it is being treated before being used for landscaping on site, thereby reducing the need for thousands of HGV journeys on local roads.

In order to address the fact that the use of fuel cannot be avoided, Align JV is preparing to operate its vehicles and plant using Hydro Vegetable Oil (HVO) by the end of March 2022, in line with HS2’s target to have diesel-free construction sites by 2029. This renewably sourced, sustainably accredited, fully biodegradable biofuel will replace diesel for generators and plant, enabling huge carbon savings and reducing the impact on the environment. It will enable Align to deliver a carbon saving equivalent of close to 90 economy flights between London and Sydney per week over a three-year period. We are also in the process of equipping all our lorries with telemetry, and training our operators on eco-driving techniques to reduce idling time and overconsumption of fuel. Hence, our workforce will also be a key player to help us reduce our carbon footprint.

### Innovating today for tomorrow

Our innovation, technical, production and environmental teams are working hand in hand to develop and implement carbon saving initiatives for the future.

The development of low carbon concrete is one such initiative. The trials ongoing in partnership with Tarmac will not only benefit Align as part of HS2 Phase One, but potentially other areas across HS2, by improving our understanding of the workability of these materials.

We also aim to give a second life to our concrete waste with the creation of calcareous grasslands along our route, developed in partnership with Cranfield University. As mentioned above, all the slurry extracted from our tunnels is being landscaped on site and mixed with this reused crushed concrete to create a unique habitat over 127 hectares, extremely rich in biodiversity. Not only will this innovation reduce carbon during construction by keeping lorries off the road, but it will also enable a permanent and lasting environmental legacy, thanks to carbon sequestration this grassland will deliver in years to come.

Although construction is now well underway, we continue to investigate with the support of HS2 how the various assets we are building could also be used to produce energy for nearby communities, and to look out for the next carbon opportunity to implement or trial on site with our supply chain.

There are still big challenges ahead to reach the net zero carbon target, however Align JV’s journey is well underway. The increase in environmental disasters linked to global warming reminds us every day of the necessity to change our industry and the way we operate. We fully support HS2’s goal to achieve their target of net zero carbon from 2035, bringing into this journey all stakeholders across the project in a collaborative effort—and with this, create a positive legacy for future generations.



**Stephen Joseph**  
**Professor in transport planning at the**  
**University of Hertfordshire and Trustee of**  
**the Foundation for Integrated Transport**

Stephen is a transport policy consultant, specialising in urban and local issues and in smart transport. He was Chief Executive of Campaign for Better Transport (formerly Transport 2000) from 1988 to 2018. During that period, he led campaigns to reduce major road building, to increase rail investment including in new/ reopened lines and stations, and to highlight the importance of buses and the impact of cuts in bus services. He was awarded the OBE in 1996 for services to transport and the environment. He was appointed a visiting professor at the University of Hertfordshire in December 2018, having received an honorary doctorate from the University in November 2010.

## HIGH SPEED RAIL AND NET ZERO—THE BIGGER PICTURE

The HS2 project has aroused considerable opposition from some environmental groups. There is concern about its immediate environmental impact, especially on ancient woodland, but there is also focus on the carbon emissions, and the work by HS2 Ltd. suggesting that the project will result in significant extra emissions.

However, as independent policy research group Greengauge 21 has argued in the past<sup>3</sup>, the impacts of HS2 on UK carbon emissions can only be considered in the wider context of energy, transport and planning policy, and the changes in these to meet the net zero target by 2050, and intermediate carbon budgets set by the Committee on Climate Change. Previous work by the High Speed Rail Group has shown the importance of these other factors in maximising HS2's contribution to net zero.

The areas that might influence HS2's—and wider high speed rail's—carbon record include:

- **The cost of travel** The Government has frozen fuel duty since 2010, and there seems little prospect of this being increased. This and other factors have seen the overall cost of motoring fall, though the war in Ukraine has resulted in near record fuel prices which may change this long-term trend. On top of this, electric vehicles don't pay much tax on their electricity, and benefit from a range of tax benefits and grants. By contrast, the cost of public transport has increased in real terms, with above inflation rises in rail fares and increases in bus fares too. Air Passenger Duty has been reduced for domestic flights making flying cheaper for shorter journeys. This could change, especially if the UK Government and/or devolved administrations bring in a system of road pricing. In particular, the taxation of travel in electric vehicles will be important in determining future travel trends.
- **Other transport investment** The Government has a large road building programme, and is consulting on the next Road Investment Strategy. Schemes in this include smart motorways and dual carriageways such as the A1 north of Newcastle and the A66 across the Pennines. There are also various airport expansion plans being progressed. These will have an impact on the competitiveness and attraction of high speed rail, and hence its share of travel.

3. <http://www.greengauge21.net/the-carbon-impacts-of-hs2/>

- **Other transport services** HS2 enables much greater capacity for passengers and freight on the existing network. The use of this capacity has the potential to result in reduced car and lorry mileage, depending on what services are provided. Better inter-regional passenger services on existing lines and more rail freight services will result in reduced carbon emissions. Further benefits can be provided through turning HS2 stations, and those on existing lines relieved by HS2, into “mobility hubs” with bus services, bike hire, e-scooters and car clubs. This is already being tested out in the ‘Future Transport Zone’ around Coventry and Warwick<sup>4</sup>. If, on the other hand, HS2 stations are accessed principally by car, and access to existing rail stations is also car-based, these carbon benefits will not be realised.
- **Spatial planning** The development of new housing and commercial areas around HS2 stations, and more widely, could have a big impact on future carbon emissions. As has been shown, despite ambitious masterplans, much new housing is low density and car dependent, and current planning policy encourages this<sup>5</sup>. By contrast, a focus on 15 minute neighbourhoods based around good local public transport would have much lower carbon emissions.

This wider picture is important for those planning the role of HS2, and high speed rail generally, within wider transport networks.

4. <https://www.rail-leaders.com/wp-content/uploads/HSRIL-HS2-Towards-a-Zero-Carbon-Future-Report-Nov-19.pdf> .wmca.org.uk/news/ground-breaking-trial-project-launched-to-reduce-private-car-use-at-the-university-of-warwick/

5. <https://www.transportfornewhomes.org.uk/>; <https://www.createstreets.com/wp-content/uploads/2022/02/Computer-says-road-1.pdf>

One reason for the criticism of HS2 as a high carbon transport scheme is that its early work had pessimistic assumptions on modal share and modal shift, with very limited impacts on air and road travel. In this work, rail fares were assumed to increase while fuel prices were projected to fall with the move to electric vehicles. This is explored further in the recent High Speed Rail Group report—*Modal shift matters—and HS2 delivers it*<sup>6</sup>.

In practice, there are different scenarios. At one end of the spectrum, HS2 becomes a link between car dependent parkway stations and airports, part of a transport system which, while electrified, has seen increased rather than reduced carbon emissions and reduced costs of travel by road and air.

At the other end of the spectrum, HS2, and further high speed and conventional rail links, become the backbone of a zero carbon transport network across the UK, with road user charging, some taxation of domestic flights, integrated transport options for local travel and for getting to and from rail stations, and public transport-oriented development.

If net zero is to become reality rather than rhetoric, and the climate crisis is to be taken seriously, the latter scenario is the one that has to be followed.

6. <https://www.rail-leaders.com/publications/modal-shift-matters-and-hs2-delivers-it/>

This is strengthened by including the issue of embodied carbon—the carbon emitted in building new transport infrastructure including HS2, highlighted recently in a report from the DecarboN8 programme<sup>7</sup>. This makes clear that there is a “payback period” for new infrastructure, and public transport infrastructure must therefore reduce car use in order to pay off emissions generated during construction. So, for HS2 to result in reduced rather than increased carbon, it has to be part of a broader strategy to cut road traffic and transport emissions generally.

Contrary to the arguments made by some, HS2 can contribute to net zero and to reduced carbon emissions—but it has to be part of this broader strategy if this is to be the case.

7. <https://decarbon8.org.uk/EmbodiedEmissions/>



**Adam Crossley**  
**Director of Environment, Skanska UK**

Adam is the Director of Environment, with overall responsibility for sustainability across Skanska UK. He reports to President and CEO Gregor Craig and took over the role of Director of Environment in 2015. He has played a central role in the development and introduction of Skanska UK's target to cut direct and supply chain carbon emissions to net-zero by 2045. He also has a number of industry-influencing roles, including membership of the Green Construction Board and the CO2nstructZero Programme Board, both of which are part of the Construction Leadership Council, and is chair of the UK Green Building Council's Contractors' Forum.

Before joining the company in 2007, he was an officer in the British Army for four years. He is a cofounder, and former chair of the board of trustees, of the Sophie Hayes Foundation, a charity which works against human trafficking and slavery.

## WHY COLLABORATION IS KEY TO ACHIEVING NET ZERO CARBON

One of the greatest challenges facing society today is the impact of climate change. We need to work together to protect our planet and people, and that starts with one of the world's biggest emitters of carbon emissions—the building and construction sector. While that's a sobering thought, it also means we have the biggest opportunity to do something about it. And, we have the best chance of success if we work in true collaboration.

### Clear carbon targets

Looking back over recent decades the industry has been slow to react, taking time to recognise the size and scale of climate change, in many ways reflecting society more broadly. Over recent years, we have seen greater commitment to tackling carbon emissions, particularly within the building and infrastructure sectors. That's fantastic to see, but commitment needs to be backed by action.

It starts with a clear vision that sets specific targets, milestones and clarity on expectations. HS2 has set the standard with the publication of its Net Zero Carbon Plan, which breaks down the scope definitions of the greenhouse gas protocol to HS2 as a railway and HS2 as a limited company. Embodied emissions related to construction and management of waste in building the new high speed railway make up the largest proportion of HS2's carbon footprint. For us as a contractor, building the London Tunnels section of HS2 as the Skanska Costain STRABAG Joint Venture, it means that we know what we need to do to help HS2 to achieve their ambitions—with milestones, actions and outcomes clearly identified.

### The role of the contractor

This is where the value of collaboration and industry-wide alignment comes to the fore. HS2 has published its Net Zero Carbon Plan, and Skanska UK has done likewise—with our target to achieve net zero carbon emissions by 2045. That doesn't just relate to the c.10% of emissions that we as Skanska UK emit, it applies to our entire supply chain. In our plan we are clear on what we want to achieve, with our supply chain, to support our customers in achieving net zero carbon. We are all in it together.

It is by working together from the earliest ideation stage that we can design and build spaces and infrastructure with the climate in mind, helping to decarbonise assets and operations. Using data, expertise and insights from all parties, we can design low carbon choices in all aspects of a project.

To succeed, we need to create integrated working environments that enable all parties to bring their expertise to the table. We can bring our knowledge and foresight, combining it with the support of our partners to innovate, trial and embed new ways of working. We've already seen many great examples of this on our London Tunnels project, from the use of worn-out wind turbine blades to create carbon-friendly reinforced concrete to the deployment of a new carbon and cost estimating solution, powered by artificial intelligence (AI), as well as the trial of an electric crawler crane and forklifts.



## Driving transformation

We can achieve true transformation when we harness the collective strength of Government, industry bodies, customers and contractors. The industry response to Covid-19 is a great example and shows it can be done. To achieve the best possible outcomes in our journey to net zero, we need to be focused. Steel, cement and fossil fuelled plant all play a huge role in modern construction, with each a big cause of carbon emissions. If we can tackle these high-emitting elements then we can go a long way to achieving our goals.

To this end, Skanska UK has recently joined other international organisations in committing to the Climate Group's SteelZero initiative, where we have committed to procuring, specifying and stocking 100% net zero steel by 2050. This includes an interim commitment of using 50% responsibly produced steel by 2030.

We all have a big role to play, in terms of the work we are doing collectively in delivering HS2 and sharing the lessons learnt. We also need to look outside of our industry and to other operations globally where we can find inspiration—adopting or adapting innovations or technologies that we can use on our projects here.

As the biggest infrastructure project in Europe and a 20-year programme of works, in HS2 we have a huge opportunity to deliver a step change that can help the entire industry to achieve its carbon commitments.



## Collaborating to achieve net zero carbon

### Zero trim piling

Working with our project partners, we have developed the zero trim piling technique which significantly reduces carbon emissions associated with piling.

Zero trim was developed jointly by Cementation Skanska, the Skanska Costain STRABAG Joint Venture that is delivering the London tunnels section of HS2, and specialist sub-contractor Hercules Site Services. The technique uses a vacuum excavator to suck out excess concrete from a pile while it's still wet—traditionally concrete is overpoured and then site teams have to break out the excess concrete.

It means that significantly less concrete is used compared to traditional methods, leading to carbon benefits. In addition it reduces health and safety risks, and cuts cost, noise and programme durations. We are now working to develop the approach further so it can be used on future project sites.

### Green fuel

We worked closely with our supply chain partner Green Biofuels to introduce a framework agreement for a new cleaner fuel that will tackle plant and equipment emissions.

The agreement will enable Skanska UK to cut carbon and harmful air emissions by using the low emission, high performance fuel Green D+, a hydrotreated vegetable oil (HVO) fuel, to power all site plant and equipment. The fuel is certified under the International Sustainability and Carbon Certification scheme and is exclusively generated from waste or secondary renewal source material. This will equate to a 90% saving in CO<sub>2</sub>e and an 85% reduction in other emission particulates.

The agreement includes our supply chain. The big benefit is that it can be used today, while work continues to further trial and develop electric and hydrogen powered construction plants that can be used at scale.



**Paul Tetlaw**  
**Convenor, Policy Forum and Rail**  
**Spokesperson, Transform Scotland**

Paul spent most of his full time career in environmental management in the water industry, taking early retirement from Scottish Water where he was a General Manager.

He has since served as Chair of Transform Scotland and is currently Convenor of the Policy Forum. This has allowed him to pursue his interest in sustainable transport and its relationship with individuals' quality of life and the built environment.

He also acts as Rail Spokesperson for Transform Scotland and in that capacity served as the first Chair of the ScotRail Stakeholder Advisory Panel under the Abellio franchise.

## ANGLO-SCOTTISH MODAL SHIFT MUST BE A NET ZERO PRIORITY

At Transform Scotland, we recently responded to Great British Railways' call for evidence on the Whole Industry Strategic Plan. This followed a number of recent announcements from the UK Government which mostly centred on the railways in England, but which have significant consequences for Scotland and Anglo-Scottish rail routes. The Integrated Rail Plan resulted in a downgrading of the planned HS2 network and the scrapping of the Eastern Leg of HS2 to Leeds. Plans to instead upgrade classic routes such as the East Coast Main Line (ECML) are fraught with problems and seem unlikely to create the extra capacity for local services and for freight—a key element of HS2.

For Scotland this means that planned HS2 services to Edinburgh now seem unlikely via the ECML. Scotland will be served by HS2 trains on the West Coast Main Line (WCML), as new trains will be 'classic compatible' and as such move between high speed lines and existing (classic) lines. Services are initially planned to Glasgow, with a degree of uncertainty about how Edinburgh might be served from the WCML. Under current plans, journey times to London will see only modest improvements and the replacement of the current Pendolino trains with a capacity for tilt with non-tilting trains will actually increase journey times on the classic network.

Separately, the Union Connectivity Review has recommended upgrades to both the ECML and WCML to maintain competitive rail journey times from Scotland to England. These are crucial to reduce rail journey times and create extra capacity for more services. The lack of capacity on the ECML was dramatically highlighted by a recent consultation exercise on improving LNER journey times to London, where it became clear that this can only be achieved by removing other services from the route and by existing stations such as Berwick-upon-Tweed having a reduced frequency of stops. Added to that, there remains uncertainty about how to serve new stations such as Reston and East Linton.

Work had been ongoing by Transport Scotland to develop plans to upgrade both the ECML and WCML for extra capacity and to improve journey times. We have been a member of Transport Scotland's High Speed Rail Partnership Group for many years and were party to the plans being developed which clearly need co-operation by those on both sides of the border. However, we now know that development work ceased around two and a half years ago.



Before the pandemic there were over a hundred daily flights from central Scotland to London, with modal share between air and rail being 70% air to rail's 30%. Added to that, there is no current capacity for extra local services and freight. This leaves ambitions for decarbonisation and modal shift from road and air to rail without any clear strategy or way forward. High Speed Rail Group's recent *Modal Shift Matters* report showed that cutting rail journey times from Edinburgh and Glasgow to London to 3 hours would enable rail's modal share to grow to 75%. However, it's not just journeys to London that are crying out for a modal shift to rail. Currently, the best journey time from Edinburgh to Birmingham by rail is around 4 hours and these trains only run every 2 hours. Journeys such as this to the Midlands and those to the north of England are ones that many choose to drive rather than take the train. Even central Scotland to London sees a significant number choosing to drive as well as fly.

France and Germany have developed clear strategies to convert domestic air journeys to rail and we need a similar approach from both the UK and Scottish governments, the aim being modal shift from both the car and the plane to rail on Anglo-Scottish routes.

Germany has developed an ongoing programme of upgrades to the rail network to reduce journey times—this is being achieved through a mixture of new build cut-offs and upgrades to existing routes. A similar approach is now required here over the timeframe of the Whole Industry Strategic Plan. Overall, clear interventions should be developed within the timeframes identified, however we do not support a timeframe of 30 years for reduction of journey times to 3 hours from central Scotland to London. We propose that the necessary work should be undertaken in a staged manner for completion by 2035 and this should also encompass routes to and from the Midlands and north of England.



**Breffni Quinlivan**  
**Environment and Sustainability Director,**  
**Skanska Costain STRABAG Joint Venture**

With over 10 years' experience within the infrastructure sector, Breffni has helped to shape some of the UK's largest construction projects, including Thameslink, London Power Tunnels, and the Thames Tideway Tunnel. She recently joined the Skanska Costain STRABAG Joint Venture delivering the HS2 main works (southern section) as Environment and Sustainability Director. Breffni has been recognised by many peers and clients across her career and has been instrumental in establishing and bringing to life sustainability strategies across UK infrastructure projects.

## DECARBONISING THE DELIVERY OF EUROPE'S LARGEST INFRASTRUCTURE PROJECT

With an ambition to be one of the most sustainable high speed railways in the world, HS2 aims to support the UK in making the transition to a net zero carbon economy. Building on the work of the Skanska Costain Joint Venture delivering the enabling works contract for the southern section of the HS2 route, the Skanska Costain STRABAG Joint Venture delivering the main works is redefining what can be done to reduce the environmental impact of infrastructure projects and to set a new benchmark for the industry.

### Planning for success

As the first HS2 main works delivery team to achieve the PAS2080 global carbon management standard in 2018, which recognises organisations that have strategies in place to reduce carbon and develop more collaborative ways of working to promote innovation, the integrated project team hopes to successfully deliver benefits to society and communities while making an important contribution to tackling climate change. Subsequently, HS2 was awarded the standard and has been recently identified in an external review as being one of the best examples of the PAS2080 roll-out seen across the industry.

Building on the approach developed on the enabling works, the main works team has developed the Carbon Opportunities process and matrix, which identifies opportunities to reduce carbon emissions throughout the lifecycle of works. Crucially, it ensures accountability for the environment and sustainability is baked into the delivery of the programme from its inception. Through extensive multidisciplinary collaboration and ongoing engagement, underpinned by data, we have identified opportunities to reduce our carbon footprint across the

whole lifecycle of a project— as part of a broader approach to enhancing biodiversity and sustainability—and designed the programme to enable this to be realised.

Securing the early buy-in of the design, procurement, commercial, engineering, and construction teams allows the filtration of this thinking into all roles and responsibilities. We are looking to build on the success of the enabling works team which used this process on a day-to-day basis to implement a materials management strategy at 20 sites across their programme. The strategy maximises the reuse and recycling of demolition materials on site—in this case removing 35,000 lorry movements from local roads and saving 2,000 tCO<sub>2e</sub>.

### Continually innovating

Innovative methods are increasingly becoming the norm across the industry and being incorporated into the delivery of projects such as HS2. To proactively reduce carbon emissions on the main works, the team conducted holistic carbon modelling across the entire project using an integrated digital system which identifies carbon reduction hotspots. These are then shared across the project team to drive improvements.

So, what does this look like in action? By adopting biofuel technology and more recently HVO, while upskilling the supply chain, the enabling works team successfully removed diesel from 75% of its sites. The Skanska Costain STRABAG team is now furthering this ambition by trialling the removal of diesel from the main works sites, with an ambition to be diesel free by 2023.

The team's approach to reducing emissions includes using fully renewable energy supply to run its site operations wherever possible, using low emission plant (fully electric, hydrogen and hybrid and supporting innovative technologies including hydrogen fuel cells and Hydrotreated Vegetable Oil (HVO).

HVO is expected to play a key part in lowering the project's delivery footprint, with projected carbon savings of 70,000 tCO<sub>2</sub>e during the construction phase. HVO has not previously existed on the scale required to meet the needs of major projects, however as availability has increased and following significant due diligence on the sustainability of the fuel, its use has been adopted across the main works project. We are also trialling and developing innovations such as low carbon cement, on-site 3D reinforced concrete printing and zero trim piling, which eliminates the need to crop piles. These innovations have the potential to substantially reduce carbon emissions.

### Creating a sustainable legacy

HS2 has also seen a marked increase in environmentally focused jobs, with 55 dedicated environmental roles currently active across the main works project and more in the pipeline. Sustainability is embedded across the integrated project team which works tirelessly to achieve ambitious targets for carbon reduction and drive best practice and innovation across the HS2 supply chain.

To achieve environmental outcomes within the wider supply chain, there is a dedicated carbon sustainability manager to provide strategic leadership and embed this approach across the supply chain. This work is also endorsed by a steering group of senior leaders across the project and by multidisciplinary working groups.

Ultimately, we have learnt that commitment to embedding the principles of carbon reduction and sustainability across the HS2 project is essential to achieving our aims. In line with this, we run an extensive education programme including environmental foundation and carbon literacy courses.

Sustainability and biodiversity are key foundations for the successful delivery of major projects and must be part of all projects from inception—being ahead of the curve is a necessity and sustainability cannot be retrospectively fitted into a programme. Decarbonising the delivery of Europe's largest infrastructure project is only the start as we work towards a net zero future.





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