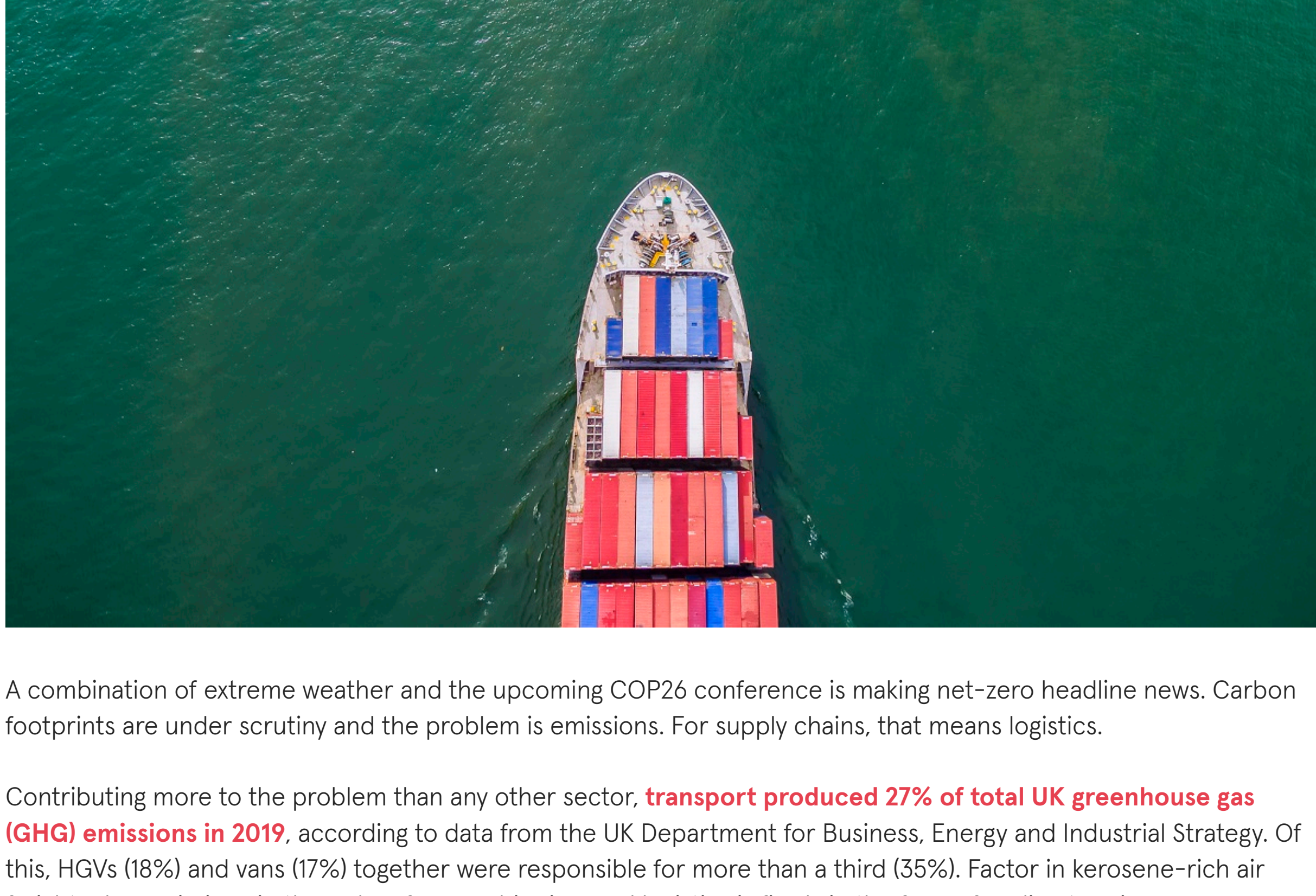


# On the road to net-zero logistics

Decarbonising logistics is as critical to our net-zero ambitions as it is difficult to achieve, but there are signs of innovation emerging to address the problem areas of HGVs, air freight and shipping

Sustainability

Aug 19, 2021 Jim McClelland



A combination of extreme weather and the upcoming COP26 conference is making net-zero headline news. Carbon footprints are under scrutiny and the problem is emissions. For supply chains, that means logistics.

Contributing more to the problem than any other sector, **transport produced 27% of total UK greenhouse gas (GHG) emissions in 2019**, according to data from the UK Department for Business, Energy and Industrial Strategy. Of this, HGVs (18%) and vans (17%) together were responsible for more than a third (35%). Factor in kerosene-rich air freight, plus emissions in the wake of cargo shipping, and logistics is firmly in the frame for climate crimes.

As a result, the UK regulatory net is tightening. With a ban on sales of new diesel lorries due by 2040, the sustainability squeeze is on and logistics must decarbonise, fast.

## Going green on electric avenue

In road transport, the green agenda is having a positive impact at regional and local level. M&H Carriers, for example, just invested £500,000 in 10 new e-vans to electrify its Highland delivery fleet – a first for the north of Scotland. Such stories of rolling electrification are appearing almost daily.

Of course, the electric avenue is not the only route to carbon reduction. Hermes UK has ordered **another 70 delivery trucks fuelled by compressed natural gas (CNG)**, taking the firm's total CNG fleet up to 160 and making it the largest in the parcels sector. Each new Iveco S-way model can cut CO2 emissions by more than 80% compared to a diesel vehicle that complies to the current Euro 6 emissions standards, which were set in 2015.

Rather than embarking on a radical modal shift, say from road to rail, a simple fuel change often makes short-term greening affordable, says Andrew Willson, CEO of fuel supplier Coryton. "Switching to sustainable fuels is a drop-in solution, requiring no significant investment in infrastructure or vehicle architecture and capable of delivering near net-zero operating CO2 emissions."

Willson adds a caveat that lifecycle analysis always beats a tailpipe focus. His note of caution is timely, given new research from **Cornell and Stanford University** that reveals blue hydrogen to be more carbon-intensive than using diesel, natural gas or even coal directly for heat.

## Hydrogen economy set to make waves

Heat aside, though, hydrogen is still a hot prospect. According to the 2021 BloombergNEF *New Energy Outlook* report, shipments of electrolyser to split water for clean hydrogen are set to double in 2021 and quadruple in 2022, with China the dominant player.

The UK government's 10-point plan for a green industrial revolution, launched last November, included a preliminary target of **5GW of low carbon hydrogen production capacity by 2030**, with those ambitions expanded upon by the new hydrogen strategy, released this August.

Mainstream adoption, however, remains some way off, explains Benjamin K Sovacool, professor of energy policy at the University of Sussex Business School and co-author of a **new research paper exploring applications of hydrogen in industry**. Use of hydrogen for short-haul trucking could be feasible within six to eight years, he posits, although its use as an alternative fuel in shipping is likely to take longer – potentially up to 15 years.

## Hybrid aircraft technology offers an alternative that sits between fast, carbon-intensive air freight and slow, lower carbon-intensive surface transport

According to his findings, delivery times might be halved if hydrogen were prioritised by industry and policymakers. And while hydrogen for shipping may take longer, its impact could be greater. Hydrogen and hydrogen-derived fuels could meet more than 70% of final energy demand.

A co-director of the new £20m Industrial Decarbonisation Research and Innovation Centre, funded by the NGO UK Research and Innovation, Sovacool believes ammonia will be key for shipping. "Maritime transport is likely to benefit from renewable hydrogen-derived ammonia as its primary decarbonising fuel option in the medium term. Falling electricity prices from renewable and nuclear energy will lower production costs of green ammonia, bringing it in line with fossil-derived hydrocarbon fuels."

## Ship emissions in the dock

Shipping was responsible for more than 1 billion tonnes of CO2 emissions in 2018, representing 2.9% of total global human emissions, according to the **2020 GHG study from the International Maritime Organisation (IMO)**, with international shipping responsible for 740 million tonnes.

In response, the **initial GHG strategy from the IMO** envisages a reduction in carbon intensity of international shipping by at least 40% compared to 2008 by 2030, striving towards 70% by 2050.

Many environmental impacts of international shipping actually occur when vessels are moored up, rather than out at sea. So, the Port of Hamburg has introduced green berthing areas in the Elbe River, with solar-powered mooring systems built by Straatman.

When it comes to rethinking ship design, the True Zero Emission concept from British company Windship Technology promises more disruptive innovation. Dubbed 'the Tesla of the seas', its triple-wing rigs harness the power of the wind, with the look of a 21st-century clean-tech clipper.

## Collaborate to cut carbon and save money

Beyond the transport itself, logistics is also overhauling operational processes and systems, particularly in light of the environmental impacts of ecommerce growth during lockdown.

Engaging customers can also help shrink carbon footprints, says Dr Vaggelis Giannikas, associate professor with the School of Management at the University of Bath: "Retailers and providers should examine technologies that allow for greener logistics, while at the same time developing mechanisms to motivate sustainable consumer behaviours."

According to Giannikas, who is also director of the Centre for Smart Warehousing and Logistics Systems at the university, some companies have already found innovative ways to decarbonise, including incentives to consolidate orders into fewer deliveries, avoiding unnecessary use of fast and ultra-fast options. As well as packaging that limits empty space, they are prioritising a reduction in returns, even offering items for free. Direct communication with customers – for instance, via text to arrange for an attended delivery – helps optimisation, too.

Collaboration between actors in retail and logistics can also open doors, with the UK click-and-collect agreement between the Post Office and leading logistics carrier DPD a prime example.

## Switching to sustainable fuels is a drop-in solution, requiring no significant investment in infrastructure or vehicle architecture and capable of delivering near net-zero operating CO2 emissions

In addition, areas are emerging for synergistic innovation around decarbonisation in partnership with other major growth markets for electrification, such as buildings and real estate.

Power management company Eaton has developed an approach called Buildings as a Grid that unites the power needs of both property assets and EVs to optimise charging, using onsite renewables such as solar PV, plus energy storage.

Working with French postal services group **La Poste**, Eaton tested the approach on electric vans delivering mail south-west of Paris. In year-long trials, 59% of electricity demand for two EVs was covered by solar power, saving, on average, 1.52 tons of CO2 compared to a diesel vehicle.

## Digital efficiencies enabled by AI

Like many industries seeking performance improvements, logistics is necessarily embracing digitisation as well. Coupled with AI, it can help eliminate mistakes and offer complete visibility throughout a product journey. Not only can firms speed cargo from A to B, they can assess traditional routes and methods of transit to improve efficiency.

Working smart in this way offers a potential win-win in the short term, suggests Sam Tyagi, supply chain expert and CEO of customs clearance platform KlearNow: "This relatively simple process of sharpening operations across import and export markets will have a significant impact on reducing carbon emissions, while solutions are found for more complicated challenges like air freight."

Given the sheer scale of the decarbonisation task ahead, the reality is that the industry will need all these initiatives and innovations, and more, on the road to net-zero logistics.

# Drones, electric planes, hybrids and airships

Air freight is the logistics of choice for higher-worth goods such as perishables needing to be delivered fast. Although it accounts for less than 1% of world trade shipments by volume, the global cargo airline industry was **valued at well in excess of \$100bn** in 2020.

According to the UK government's **Jet Zero consultation**, however, the sector's climate trajectory is a concern. While aviation might contribute only between 2% and 3% of global greenhouse gas emissions today, it is forecast to become the second-highest residual emitter in 2050. Innovation is a must.

Supporting big advances in small packages, a three-month drone trial funded by a £200,000 grant from Aerospace Cornwall will see a Flylogix unmanned aerial vehicle make daily flights between Land's End and the Isles of Scilly. These machines consume just 2 litres of fuel per hour, as opposed to between 20 and 200 litres for traditional aircraft making a comparable journey. The drone will carry time-critical items such as medicines and blood samples.

At the other end of the scale, DHL Express has claimed a world first for sustainable aviation with its order of **12 fully electric Alice eCargo planes** from manufacturer Eviation. Able to carry 1,200kg, the single-pilot aircraft are due for delivery in 2024.

And on a bigger scale still are airships. We may be more used to seeing them in the TV series *His Dark Materials* than in real life, but they offer significant opportunities to reduce emissions.

One such vehicle is the 'hybrid aircraft' the Airlander. Manufactured by UK-based Hybrid Air Vehicles (HAV), approximately 60% of the aircraft's lift is generated by the buoyancy of helium in a traditional airship hull, it would be 100%, with the remaining 40% generated aerodynamically by the flow of air over the wing-shaped hull.

Sustainability is a strong selling point for airships and hybrids, explains Tom Grundy, CEO of HAV. Aircraft using lighter-than-air technology are fundamentally more efficient, he says. By leveraging 'free lift' provided by buoyant gas, they require significantly less power, which means lower fuel burn and fewer emissions.

"In logistics, therefore, hybrid aircraft technology offers an alternative that sits between fast, carbon-intensive air freight and slow, lower carbon-intensive surface transport."

HAV plans to airlander 50 in service by 2025. With a 50-tonne payload and 30m cabin length, a fully electric (and amphibious) Airlander 50 could be available by 2033. It would cut CO2 emissions by 1.15kg per tonne of freight per km, compared to conventional aeroplanes.

Lighter-than-air technology looks set to do some of the heavy lifting in logistics.

# Trucking down the e-highway

When it comes to electric vehicles and battery storage, HGVs have long been held up as the acid test, given their heavyweight power demands and long-haul range. Now, though, **innovation is emerging worldwide**, via manufacturers such as Scania and Volvo, plus the Tesla Semi due soon.

The business case has also been boosted by **research from Lawrence Berkeley, UCLA and University of California Berkeley** that found medium- and long-haul electric trucks in the US are 13% cheaper to own than diesel alternatives today and could be almost 50% cheaper by 2030. So, while total truck numbers on the road remain small, we might be reaching a technology tipping point, suggests Sandra Roling, head of transport at environmental services company Climate Group.

"Falling battery costs, technology transfer from other vehicle sectors (notably electric buses), growing interest and investment from manufacturers, plus supportive policy, have all accelerated development of medium- and heavy-duty zero emission trucks," she says. "Today, there's a growing range on the market in practically all weight and duty classes."

Indeed, the Climate Group's **EV100** initiative has more than 100 major global businesses committed to switching more than 5 million vehicles to electric by 2030. Plus, collective initiatives are under way to find common solutions to issues of range anxiety and charging infrastructure.

In Germany, meanwhile, a consortium including TU Berlin, the Fraunhofer IVI and Bosch is engaged on a three-year project called eHaul, designed to determine whether large swappable batteries for heavy goods vehicles offer a sensible alternative for daily trips of more than 300km.

In the UK, the government has committed £2m to a plan for overhead cables to be installed on a 20km stretch of the M180 motorway near Scunthorpe in Lincolnshire, with a potential three-phase rollout of these e-highways planned nationwide. The project is being led by Costain, with trucks from Scania and electric technology from Siemens – both of which have already collaborated on trials in Germany and Sweden.

Electric highways can accelerate progress towards net zero, explains William Wilson, CEO at Siemens Mobility: "Just introducing the trucks and vehicles alone won't help us hit decarbonisation targets and, as a country, we need to go faster and harder if we're to meet the 2050 goal.

"E-highways are a tried-and-tested way of making it possible for clean, efficient, electric HGVs to run on motorways. They also answer the burning question of not having charging infrastructure."

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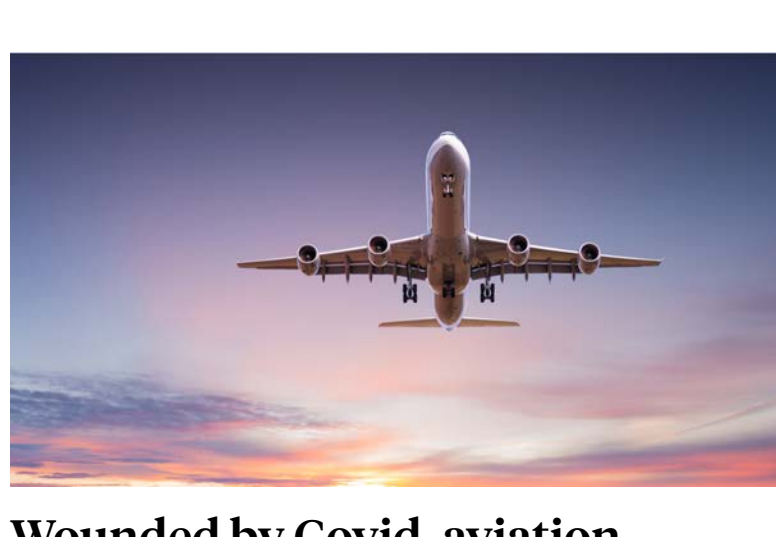
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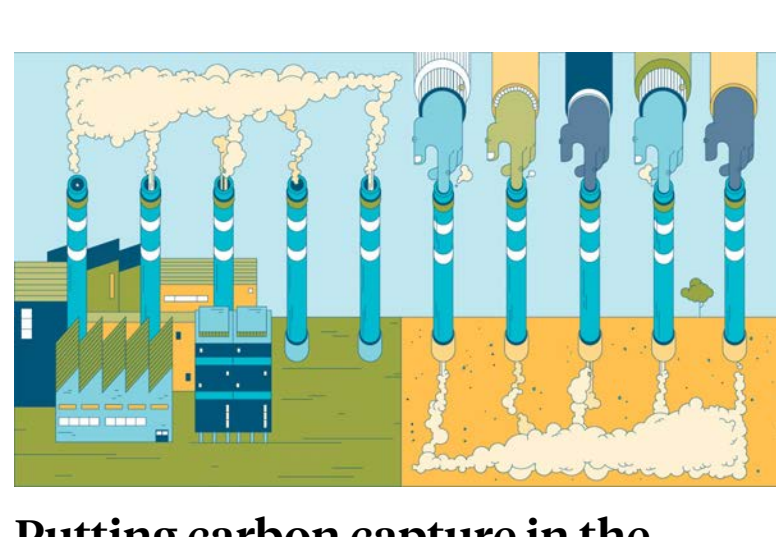
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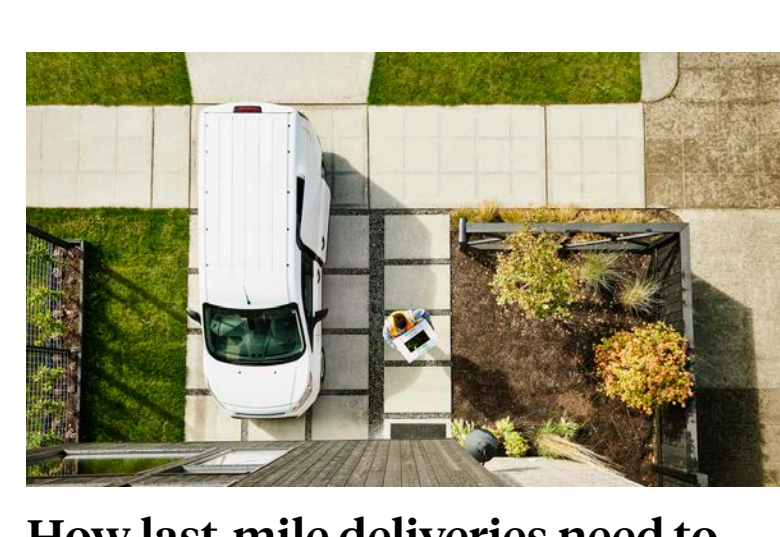
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