Why the future of transport is ELECTRIC

Corporates power up the race to replace the internal combustion engine

- Biden net zero plan targets auto industry
- Hydrogen vs electric for trucking
- The push for sustainable aviation fuels
The collapse of the global economy as countries went into lockdown last year saw CO₂ emissions drop 6%, the largest decline in history, according to the International Energy Agency.

And although transport accounts for about a quarter of global CO₂ emissions, it was responsible for about half of the improvement. The use of oil for road transport and aviation fell away as hundreds of millions of people complied with stay-at-home orders, flights were grounded and international trade was disrupted.

But early in March the IEA revealed how short-lived the impact had been: figures for emissions in December were even 2% higher than in December 2019 as countries returned to what the IEA’s executive director Fatih Birol described as “carbon-intensive business-as-usual”.

He warned that governments must put clean energy policies at the heart of their pandemic recovery packages or risk a “substantial rebound” of emissions this year.

Of all the economic sectors contributing to CO₂ emissions, transport emissions are the fastest growing. According to the World Economic Forum, emissions from mobility are on track to double by 2050, with 70% of transport emissions led by the growth of passenger vehicles. Country after country has set targets in the next 10 to 20 years to end new sales of internal combustion engines, including the UK, host of the COP26 conference in Glasgow at the end of this year, which recently brought forward its ban on the sale of new internal combustion engine (ICE) vehicles to 2030.

In this issue of The Ethical Corporation, the first
since we moved to a quarterly format, we assess global progress to tackle transport emissions, starting with Mark Hillsdon’s report on how cities around the world are planning to keep a lid on transport emissions as people and businesses return to city centres, after the steep drop-off of public transport use during the pandemic.

In the U.S., where transport emissions account for 28% of emissions, the new Biden administration is seeking to push the auto industry towards electrification as part of his pledge for a net-zero emissions economy by 2050. Diana Rojas reports from Washington, DC, on how Biden has given government agencies until April to review fuel efficiency standards, ordered the electrification of the entire federal fleet, and is incentivising the building of some 500,000 new public charging stations.

With two-thirds of new vehicles bought by companies, corporate fleets have a big role in a speedy take-up of electrification. Mike Scott reports on the Climate Group’s EV100 initiative, and how a coalition of UK fleet operators, including Centrica, BT, Royal Mail and DPD UK, are working together to help deliver the UK’s accelerated targets.

As the world’s biggest holder of reserves of lithium for lithium-ion batteries, Chile is a critical player in the transition to electric vehicles. Caroline Palmer reports on how the South American country is seeking to address concerns about the metal’s environmental and social impacts from indigenous and green groups – and the international car industry.

She also looks at the plethora of initiatives seeking to repurpose and reuse redundant EV batteries. Angeli Mehta, meanwhile, assesses the prospects for green hydrogen to be used to decarbonise long-distance trucking and shipping, with companies like Nikola Motors in the U.S. backing hydrogen for long-haul trucking, and Volkswagen’s Scania concluding that battery-electric is the best route to decarbonise the sector’s emissions.

The pandemic has been a setback for the aviation industry, but even with the downgrading of air traffic forecasts, the sector will be transporting around 10 billion passengers a year by 2050, more than twice 2019 levels, according to the Air Transport Action Group.

Several airlines, including 13 in the One World Alliance, have made commitments to reach net-zero by 2050, but meeting even the existing industry-wide commitment to cut CO₂ emissions by 50% by 2050 is expected to be extremely challenging, requiring the rapid and worldwide scaling up of sustainable aviation fuel and new energy sources. Catherine Early reports on the new collaborations that have sprung up in the past year to accelerate zero-carbon aviation.

And I report on how Indonesia’s move to rapidly increase the consumption of palm oil for biodiesel in road transport and aviation fuels is stoking fears that the country’s success in bringing down deforestation rates could be reversed, putting millions of hectares of rainforest and peatlands at risk.

There will be more about deforestation risk in the next issue of The Ethical Corporation, in May, which will look at prospects to decarbonise food and land use. In September, we will do a deep dive into efforts to cut emissions in the built environment, and finish this critical year for climate action by looking at the energy and utilities sector.
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The transportation industry is in flux. Disrupted by COVID-19, technology, and the energy transition, it is going to change more in the next 5 years than ever before.

Ridership Week connects the leading national, state and city officials with the C-Suite in transit and mobility from largest technology, infrastructure, OEM and mobility companies on the planet.
Travel in the low-carbon city

In the wake of the pandemic, and the steep decrease in public transport usage, cities are rethinking their approach to cutting emissions.
Before London went into its first lockdown last March, around 11.5m journeys a day were being made on the city’s tubes and buses. On 12 February this year, the figure was fewer than 3m. In New York, passenger numbers on the subway have regularly dropped by more than 90% during the pandemic.

Similar stories of people deserting public transport have played out in cities around the world as mass transit has brought the fear of mass transmission. Given the option, the vast majority of people have either chosen to work from home, or climb back into the car to complete the daily commute.

But as cities start to edge back to some sense of normality, will decades of work pulling together integrated public transport networks and encouraging people to ditch the car be undone by a fear of getting back on the bus?

Globally, according to the International Energy Agency (IEA), emissions from road vehicles amount to 3.6 gigatons a year, or nearly three-quarters of all transport CO₂ emissions. While the pandemic saw this figure drop dramatically in the first half of 2020, a rebound in transport-related emissions, particularly in emerging countries, towards the end of last year prompted a warning early in March from the IEA that “many economies are now seeing emissions climbing above pre-crisis levels”.

THE 15-MINUTE CITY

One antidote being trialled in some cities is the concept of the 15-minute city. Hélène Chartier, head of zero carbon development at C40 Cities, says this is about “supporting thriving local life so that people can access everything they need within a short walk or bike ride”.

It is about decentralising city life, she says, and reconnecting people with their neighbourhoods, but also developing strong physical and digital links with other parts of the city.

“We need good public transport so that people can have more social and economic opportunity,”

The 15-minute city is about supporting local life so that people can access everything within a short walk or bike ride

HÉLÈNE CHARTIER, C40 Cities

In London, journeys by public transport have dropped to around a quarter of pre-Covid rates.
she says, while safe, affordable and high-quality city transit in is also key to achieving cuts in emissions and cleaner air.

The 15-minute city aims to cut out unnecessary and unwanted travel, such as taking the car to the out-of-town supermarket. But Chartier also believes that changes to the way we work could actually help to safeguard public transport. Flexible hours, different start times and days working from home may have called time on the traditional rush hour.

“The problem with public transport is that everybody takes it exactly at the same time,” she says. “The only time when public transport becomes dangerous is when it is too overcrowded.” Cut out the crowds, and suddenly public transport becomes attractive again.

A digital road infrastructure can help ease congestion, which in turn improves air quality. Smart roads can also make sure buses run on time

Fifteen global cities are now working on variations of the 15-minute concept, with Portland and Melbourne among the most developed. Minneapolis and Ottawa are among the latest to sign up.

Others are also making city-level transport a part of their green recovery. In Mexico City, more than 100km of public transport corridors, and four new cable car lines, will be opened by 2024 in order to provide better access to services for low-income communities. In Milan, which has long embraced the idea of the 15-minute, more than 100km of street-side space is being reallocated for cycling and walking by the end of 2021.

Not to be outdone, the Finnish city of Lahti, this year’s European Green Capital, has made the headlines with its innovative take on active transport, a ski-sharing scheme. City planners have also developed a number of cross-country ski trails across the regularly snow-bound city centre.

Another important innovation for cities, and the future of their public transport networks, is the intelligent road, stretches of highway that can speak to the vehicles that use them, and which could prove a boon to transport planners.

Huawei has recently developed a new test facility in Wuxi, China, where a connectivity layer of cameras and radar equipment is embedded under the tarmac on a 4km stretch of road, relaying information to autonomous vehicles, including the buses that use it. Ultimately, explains Edwin Diender, Huawei’s chief digital transformation officer, the technology will provide “a traffic management system that makes predictions about what is going to happen”.

At the moment, he says, a vehicle “can only see in a straight line, it cannot see around corners”. But by integrating information from other systems about traffic flow and the status of traffic lights, it’s possible to create a 360-degree view.

This can help to ease congestion, which in turn improves air quality. Smart roads can also make sure buses run on time, and will even be able to change traffic lights in buses’ favour. This in turn supports an integrated city transport system, with improved punctuality ensuring seamless connections.
Europe’s latest attempt to address this issue was announced in December, with the launch of the EU’s Sustainable and Smart Mobility Strategy. It lays out how Europe could achieve the green and digital transformation of its transport system over the next four years, ultimately cutting emissions by 90% by 2050.

The future of city travel, says the Commission, is at least 30m zero-emission cars on European roads by 2030, helping 100 cities to become climate-neutral. There will also be a major push on developing new cycling infrastructure, while digitalisation and innovation will make smart, connected travel a reality, allowing more passengers to buy tickets for multimodal journeys.

Electric scooters, already growing in popularity, will be an important part of this city transport revolution. Micromobility for Europe (MMfE) is a new coalition of businesses promoting e-scooters, as well as other small, light electric vehicles, such as e-bikes and cargo-bikes, as cleaner forms of transport.

With members already operating in cities across Europe, the goal is to help tackle urban travel’s two greatest problems – congestion and tailpipe emissions, says co-chair Catriona Meehan.

**IN NUMBERS**

- In February this year, 3m journeys were made on London’s tubes and buses – from 11.5m in March 2020. Meanwhile, passenger numbers on New York’s subway have dropped by more than 90%.

- Emissions from road vehicles amount to 3.6 gigatons a year globally, or nearly 75% of all transport CO₂ emissions, according to the IEA.

- In Mexico City, more than 100km of public transport corridors, and four new cable car lines, will be opened by 2024, while Milan is planning to allocate more than 100km of dedicated space to walking and cycling by the end of 2021.

- The European Commission is aiming to have at least 30 million zero-emission cars on Europe’s roads by 2030, helping 100 cities to become climate neutral.

- Uber has electric vehicles running in more than 1,400 cities in North America. The company has committed to becoming a fully zero-emission platform by 2040, and to run 100% electric fleets in the U.S. and Europe by 2030.
“For Europe to meet its ambitious emissions targets, more will need to be done at a sustained pace.”

Meehan believes that micro-mobility is establishing itself as an alternative to personal car ownership. It also has the potential to encourage people to use different modes of transport in one trip, using an e-scooter, for instance, to move from bus depot to tram stop or train station.

Taxis are poised to benefit if people continue to shun public transport, and are offering more green alternatives. In North America, Uber now has electric vehicles running in more than 1,400 cities, including Washington DC, Houston and Miami. Last September, the company committed to become a fully zero-emission platform by 2040, and to run 100% electric fleets in the U.S. and Europe by 2030. It has backed this with an $800m commitment to help hundreds of thousands of drivers transition to EVs globally by 2025.

According to Lois Van Der Laan, a global corporate communications manager at Uber, the business is also increasing partnerships with local governments. These include Paris and London, where the company helps its drivers to buy their own EVs. Uber has also joined Tesla and 26 other companies in launching the Zero Emission Transportation Association (Zeta), a new organisation advocating for national policies that will enable 100% EV sales by 2030.

Meehan says it is crucial that Europe avoids a private-use car-based recovery. “Public transport is the backbone of a local transport ecosystem,” she says. “The current pandemic has generally decreased the level of transport activity in Europe and across the world... (but) this is an opportunity to rethink how we move and organise our cities – to the benefit of all.”

CATRIONA MEEHAN, Micromobility for Europe
Public transport is traditionally funded through a blended approach that mixes local taxes, government subsidies, tolls and fares. But with the latter dropping off so dramatically, new ideas are needed to plug the gap.

Heavier tolls on car drivers is a potential income stream, although whether politicians are willing to further tax car owners is a moot point. Hikes in fare prices could also backfire, hitting those on lower incomes – and those who need public transport the most – the hardest.

According to C40 Cities, the transit systems that are faring best are those that are less dependent on fares, with a larger proportion of revenues coming from dedicated taxes, like in Paris or Tallinn, or commercial revenues, like in Hong Kong.

TransLink, metropolitan Vancouver’s transport network, is looking at raising funds through development cost charges – a "tax" on certain kinds of property development – and vehicle levies. Los Angeles Metro has looked into using congestion pricing revenues to support fare-free transit, while Swiss authorities are discussing Mobility Pricing, and ways in which to unify all the ways people pay to get around, both by car and on public transit. A similar plan, Smart Move, is being studied in Brussels.

Green bonds could also offer an answer, although many of these funding mechanisms have been developed to cover the cost of infrastructure projects and developing low carbon technologies, rather than paying for the day-to-day running of transport systems.

In the UK, community municipal investments (CMI) are a low-risk way for local people to support green infrastructure in their area by investing directly with their council. Developed by ethical investment platform Abundance, they have already proved popular with both Warrington and West Berkshire councils, where they have been used to fund green energy schemes.

Bruce Davis, managing director of Abundance, says: “CMIs have the potential to fund the investment in public and active transport which is needed at a local level if we are to make a dent in one of the more stubborn areas of the transition to net-zero. Transport planning can be a very polarising issue for communities, and the power of the CMI approach is that local residents are placed at the heart of the process.”

Mark Hillsdon
Biden’s EV plan puts charge through U.S. auto industry

Diana Rojas reports on how lack of charging infrastructure and labour concerns will be key challenges as the new administration seeks to cut transport emissions

Americans love their cars, and President Joe Biden is no exception: he bemoaned having to park his 1967 Corvette Stingray, which gets 12 miles to the gallon, since presidents are not allowed to drive.

But only eight days after being sworn in, Biden signed an executive order that promises to help transform the vaunted national auto industry by ordering the electrification of the entire federal fleet – some 645,000 vehicles, including some 225,000 U.S. Postal Service trucks.

“There is little time left to avoid setting the world on a dangerous, potentially catastrophic, climate trajectory,” he wrote in a wide-ranging order aimed at addressing the climate crisis in all corners of government. “It is the policy of my administration to lead the nation’s effort to combat the climate crisis by example.”

The Biden administration has pledged a 100% clean energy economy and net-zero emissions by 2050, and there is little question why the auto industry is a priority. The Environmental Protection Agency estimates that transportation accounts for 28% of U.S. GHG emissions.
Far from leading on electrification, as in many other countries, the government-owned fleet has been a laggard. As of July 2020, only 3,215 federal vehicles were electric, or half a per cent, compared with the nationwide figure of 2% of auto sales.

Biden has also given government agencies until April to review fuel efficiency standards after Trump dumped an Obama-era fuel-economy requirement for new vehicles to increase by 5% each year, instead requiring them to rise by 1.5%.

Biden's executive order predicts that the electrification of the federal fleet will catalyse private-sector investment and accelerate the development of America's industrial capacity to supply EV to the domestic market.

They are lofty goals, given that only three automakers – Tesla, Ford (Fusion) and GM (Chevy Bolt) – manufacture EVs in the United States, and none is using at least 50% American-made materials, as called for in the Biden plan. U.S. carmakers also face stiff competition for components from China, which by 2023 is expected to manufacture some 62% of the lithium-ion batteries needed to power the cars.

In a recent white paper on EVs, the United Auto Workers (UAW) union warned of the implications of increased EV production for home-grown jobs, noting that EV powertrains are significantly simpler to manufacture than internal combustion engines.

The union called on the industry and policymakers to “re-tool plants and re-train workers to maintain employment levels and allow American workers to make advanced technology vehicles”, producing batteries, advanced braking systems, electronics and other components.

Kristin Dziczek, vice president of industry, labour and economics at the Center for Automotive Research (CAR), said in an interview that while she expects large first-tier suppliers will use their existing facilities to build EV components, she worries that smaller firms and their workers will get left behind.

“It seems we’ve reached the tipping point for electrification, and planning for how to minimise structural unemployment is the challenge for this administration,” said Dziczek.

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Above:
President Biden has ordered the electrification of the entire federal fleet, including 225,000 U.S. Postal Service trucks.
In a sign of the times – or perhaps just a reading of the political tea leaves – U.S. automotive giant GM (the fourth-largest automaker globally) announced in January that the company would phase out the manufacture and sales of gasoline vehicles by 2035. In the meantime, it will improve the emissions and efficiency of all its vehicles.

Ford followed soon after, announcing that it would add $11bn in new EV spending through 2025, and another $7bn for driverless vehicles.

As reported in the second of our series in The Sustainable Business Review on the top 250 greenhouse gas emitters, GM’s move was a stunning volte face, given that it had lobbied for four years for looser mileage efficiency standards, before last March joining (along with Toyota, Subaru, Fiat-Chrysler and others) the Trump administration’s litigation to limit California’s ability to issue stricter fuel efficiency standards than the federal standard.

Some 2.9m EVs are forecast to be built in the United States between 2021-24, and another 3m from 2025-27

By contrast, Ford, BMW and Honda had secretly negotiated with the state to tighten those standards. California, which accounts for the largest proportion of U.S. car sales, plans to ban the sale of gas-powered cars by 2035.

But with BloombergNEF predicting that EVs will achieve price parity with internal combustion engine vehicles in 2022 for large cars and SUVs, and 2024 for small and medium cars, GM’s move seems less about a drive to decarbonise, and more about financial survival.

Dziczek notes that some 2.9m EVs are forecast to be built in the United States between 2021-24, and another 3m from 2025-27. Model choices are also expected to rise exponentially from 12 in 2020 to 70 by 2024.

CHARGING BARRIER

But one critical barrier of EV rollout will be charging infrastructure, with most EV owners in the U.S. currently charging their cars overnight at their own homes.

The Biden administration’s EV plan includes the building of some 500,000 new public charging stations, a more than five-fold increase from the estimated 90,000 chargers at some 28,000 charging stations today, according to the Department of Energy.

BloombergNEF estimates the planned charging station build-out will cost more than $5bn, and meet 57% of the country’s EV charging needs by 2030. That will still leave the U.S. far behind the European Union, which expects to grow its charger stocks from fewer than 200,000 currently to 1 million by 2025.

Unlike in Europe, the building of charging infrastructure in the U.S. is being undertaken by utility companies and municipalities, which are beginning to include mandates on EV charging capacity at multi-family buildings and in public spaces.

Leading the charge is California, with Governor Gavin Newsom having signed an executive order to ban the sale of new gas-powered cars and trucks by 2035. In a scorecard on states’ support for EV in February by the American Council for an Energy-Efficient Economy (ACEEE), the country’s most
California is the only state to have set targets for electrifying transit buses, trucks, and commercial vehicles.

“But EVs don’t need to be perfect to be a part of the solution to cleaning up transportation – they just need to be an improvement over gasoline vehicles,” he said.

Already EVs emit half the greenhouse gases over their lifetime compared with gasoline vehicles, something that will improve even further as the U.S. electricity grid gets greener.

Diana Rojas is a freelance writer based in Washington, DC, and a regular contributor to The Ethical Corporation, focusing on environmental policy and sustainability issues. Diana is fluent in Spanish and Portuguese.
UK firms lend heft to getting electric vehicle revolution on the road

Centrica, BT, Royal Mail and DPD are among a Climate Group-convened coalition of fleet operators that is supporting the UK’s transition to EV by 2030. Mike Scott reports
The electric vehicle (EV) market is at a tipping point, which makes for some interesting and apparently contradictory statistics. While the market for low-carbon vehicles has grown by 128% in the past two years, EVs still make up just 2% of the UK market, according to telematics group Masternaut.

There is no doubting the direction of travel, though. The UK government’s recent move to bring forward its ban on the sale of new internal combustion engine (ICE) vehicles to 2030 is just the latest signal that the future of transportation is electric.

One of the key drivers of a speedy roll-out of EVs will be the corporate fleet market, says Sandra Roling, head of the Climate Group’s EV100 initiative, a global initiative that now numbers 101 companies that have committed to switch their fleets to EVs or install charging stations for customers and staff by 2030.

“Two-thirds of new cars are bought by companies, so the decisions they make will have a big impact on the overall market, as well as feeding through to the second-hand market. If we convince one company to go electric, that can mean a few thousand vehicles,” Roling says.

Companies are switching to electric transport because they want to demonstrate climate leadership, recognise the need to tackle air pollution and want to reap the reputational benefits available for early adopters, she says.

Alberto De Monte, director for sustainable...
mobility at Masternaut, says drivers for UK fleets include “the increasing pressure on companies to reduce emissions from transport, the introduction and extension of ultra-low emissions zones and the start of the corporate car incentive in April 2020”. Deloitte calculates that the new tax rules for company cars can reduce the total cost of ownership to an employee by an astonishing 95% if they choose an EV.

**GROWING CHOICE**
At the same time, manufacturers have put more models on the market, increasing choice and helping to drive down prices. BloombergNEF predicts that from next year the first EVs will cost the same as ICE vehicles, with price-parity for the average car coming in 2025. “Once you reach that point, buying an EV is a no-brainer,” Roling says.

But fleets are already electrifying because EVs are cheaper now in terms of the total cost of ownership. Amazon, which has pledged to buy 100,000 electric delivery vans, has started testing vehicles, while IKEA says all its deliveries will be electric by 2025. Early in March, FedEx announced that all of its 200,000 delivery vehicles will be electric by 2040. That move follows President Joe Biden’s pledge to replace 650,000 U.S. federal government vehicles with electric models (see Biden’s EV plan puts charge through U.S. auto industry).

Jason Mathers, director of vehicles and freight strategy at the Environmental Defense Fund, explains why such commitments are so important. “Even though delivery trucks and tractor trailers make up only about 4% of vehicles on U.S. roads, they are responsible for nearly half of the nitrogen oxide emissions and nearly 60% of the fine particulates from all vehicles, and about 7% of all greenhouse gas emissions in the U.S.”

In the UK, BT joined forces in the Climate Group to form the UK Electric Fleets Coalition, which includes the four biggest commercial fleets: Centrica, BT, Royal Mail and DPD UK.

Such announcements send a clear message to policymakers and manufacturers, says Penelope Guarnay, carbon programme manager, digital impact and sustainability at BT. The group has already achieved its first aim, which was to bring forward the UK phase-out of petrol and diesel vehicles to 2030, from its original date of 2040.

Although manufacturers such as Ford, GM and Volvo have announced plans to accelerate their rollout of EV models (see GM comes from behind to vie for pole position in electric vehicle race), the coalition wants to see a zero-emission vehicle mandate requiring all manufacturers “to ensure an annually increasing percentage of zero-emission vehicle sales to underpin the internal combustion engine phase-out”.

**Our engineers’ vans carry a lot of kit, which affects the range of the vehicles. Unfortunately, battery technology and availability of charging are not yet there to make EV suitable for all our engineers**

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**PENEOLE GUARNAY, BT**

It also wants to see grants for vans extended beyond 2023, as they are not set to reach price-parity until the late 2020s. One key sticking point in corporate fleets leading the way in the electrification of transport is that many of the vehicles in those fleets are vans, and there is a limited supply and choice, in part because of the particular challenges of electrifying commercial vehicles. As a result, progress has been slow.

“Our engineers’ vans carry a lot of kit, which makes them heavier than the average load and affects the range of the vehicles,” says Guarnay. “Unfortunately, battery technology and availability of public charging is not yet there to make an EV van suitable for all our engineers. They are great in cities, where average daily mileage is below 60 miles, but in rural areas they might have to do a few hundred miles a day. To do that, they not only need adequate battery range but also to accommodate ultra-rapid charging, which is something that is not yet standard in all EV vehicles.”

Having taken delivery of its first electric van in February, BT plans to have 250 electric vans on the road by the end of March 2021 and one third of all vehicles in its Openreach unit, which
comprises about 80% of its fleet, to be electric by 2030.

Centrica, an energy services company with 9 million customers, mainly in the UK and Ireland, says it has been working on electrifying its fleet since 2012. The company put 1,000 vans on the road last year and has just placed an order for 2,000 more, with the aim to be fully electric by 2025. “The major factor has been the availability of EVs, especially appropriate vans for our payloads and operational model,” says Lucy Simpson, head of product for EV enablement, UK and Europe, at Centrica Business Solutions. “But new models are coming on the market all the time.”

ON-STREET CHARGING
That means that one of the biggest remaining barriers is the availability of charging points. BT and Centrica are installing chargepoints both at their own premises and at the homes of their engineers. But sometimes, drivers will need to charge on the street, either while they are on the job or because they do not have off-street parking at home.

A recent report from the National Audit Office said that the government “has not yet focused sufficiently on chargepoint availability for people who do not have a driveway”.

More chargepoints are also needed in hotels, supermarkets and leisure centres, as well as in workplaces. “EV-friendly workplaces are essential in the roll-out of electric mobility, especially as more employees return to the office once restrictions are lifted,” says Adam Hall, head of electric vehicles at Drax Group. “Most EV drivers want to charge their vehicle while they’re at work, as this is a convenient time. Therefore, their employers should make sure that the right charging infrastructure is available. Without it, employers are at risk of deterring their employees from making the switch.”

Another issue is that the cost of charging varies widely. Research from What Car shows that the average cost of charging at home is around 14p/kWh while the cost of charging a BMW iX3 varies between £40.66 in parts of central London (which includes a £10 one-off charge) to £11.91 using Pod Point’s facilities.

Network capacity also varies and in areas where it is constrained it can be very costly to upgrade it, says Guarnay.

However, a number of companies, including Centrica and Drax, have started offering services that can help companies to speed up their switch to electric, from installing and maintaining chargepoints to integrating them with renewable power sources such as solar and batteries.

“We want to help fleets get the best value out of their vehicles and batteries,” says Simpson. “We are accelerating our own EV transition and very much want to support other fleets across the UK in their transition.”

Adequate chargepoints remain one of the biggest barriers to electric vehicle rollout.
Can Chile avoid resource curse from lithium?

Caroline Palmer reports on how the South American country is seeking to address concerns about the critical metal’s environmental and social impacts from indigenous and green groups – and the international car industry.
In April the people of Chile will get the chance to choose the 155 representatives who will write the country’s new constitution. The vote represents a peaceful resolution to 2019’s unrest, which saw more than a million protesters take to the streets, angry at the country’s inequalities.

For Cristina Dorador, a biologist at the University of Antofagasta in Chile, who studies microbial life in the Atacama desert, it will offer the opportunity to push urgent environmental issues to the top of the agenda. She has long been a critic of the way the government has managed its resources, in particular those that lie beneath the Atacama’s spectacular salt flats in the north of the country. This is not only where some of the richest deposits of lithium in the world are found, but they are nesting and breeding sites for the region’s rare breeds of flamingos.

This sparsely populated area is also where indigenous people have lived and thrived for generations, raising llamas and growing quinoa. But their world is changing: flamingo numbers are reportedly dwindling and conservationists say they are competing with the mining companies for freshwater – though this is disputed by lithium producers.

“I have decided to stand as a candidate for the constitutional convention because I want to put the scientific point of view. I want the science around environmental protection to be a part of any decision-making in the country,” Dorador says.

Chile is a critical player in the global drive to reduce transport emissions through a shift to electric vehicles, powered by lithium-ion batteries. Chile, Argentina and Bolivia make up South America’s “lithium triangle”, and together hold more than 75% of the world’s lithium reserves.

Indigenous farmers in South America’s ‘lithium triangle’ are increasingly competing for scarce water resources.
beneath their salt flats, although Australia, which holds 18.1% of reserves, surpassed Chile in 2018 to become the largest producer by metric ton, according to BP’s Statistical Review of World Energy.

In a report last year, the World Bank forecast that the production of key minerals, including lithium, would need to increase by nearly 500% by 2050 to provide components for critical clean energy technologies.

While global lithium supply and demand at the end of last year was nearly even, depressed by Covid-19, according to data from Benchmark Mineral Intelligence, by 2025 demand is expected to outstrip supply by nearly 228,000 tonnes, pushing up prices, and pressure on countries with reserves to exploit them.

If unsustainably produced, could lithium become a resource curse, in the same way as oil and gas has been to many developing countries?

Dorador points to the unique biodiversity that exists in the brine, from which the lithium is extracted, and what she says is the governmental sleight of hand to downplay the consequences of using water in a desert region that is one of the driest places on Earth.

“Under environmental laws the brine is considered a mineral, not water, even though it is water with salt. So, when the government says that only 3% of water is used in mining, they are only referring to fresh water.”

Juan Carlos Jobet, Chile’s minister of energy, accepted in an interview during the Reuters Next conference in January that water was “a challenge” for the lithium industry in Chile, but said it would be addressed as part of a lithium roadmap, which is being developed based on a consultation with more than 100 representatives from the sector.

The government says it wants to lay down a timetable and framework to create “integrated and intelligent mining” that is both green and safe.

Chile’s minister of science, technology, knowledge and innovation, Andrés Couve, has been quoted as saying: “Above all, the mining industry must develop in a way that protects and respects the environment.”

The two big mining companies that have licences to operate in Atacama, Chile’s SQM and U.S. based Albemarle, deny that the 2,000 litres of saltwater that are extracted every second to produce lithium are affecting freshwater levels. Eric Norris, who runs Albemarle’s lithium business, told the same Reuters event that the company’s operations were not threatening water supplies or ecosystems.

On the contrary, he says, “the environmental impact is very positive. “Each kilogram of lithium that is produced enables orders of magnitudes of avoided greenhouse gas emissions ... through green miles driven by electric vehicles.”

George Miller, an analyst at Benchmark Mineral Intelligence, believes the mining companies have made “excellent” efforts to reduce water usage and to make the extraction as efficient as possible, including SQM’s move to set up a website where its water usage can be tracked in the wake of a
number of legal disputes between the miners, the regulator and indigenous and environmental groups.

Dorador disagrees. “We are lacking investment in scientific data on exactly what the impacts of mining are. If a mining company proposes a project, they bring in their own consultants to look at the impact. There is no government data. If any problems are identified they are allowed to mitigate them by, for instance, building a road or a school. This is already a terminal ecosystem. The water is evaporating all the time. Even without mining it will only last another 100 to 200 years.”

In Bolivia, political upheavals, a wetter climate and local opposition have all acted as barriers to exploiting its considerable lithium deposits.

But in Argentina, which ranks fourth in production behind China, the lithium industry is in the grip of a “white gold rush”, says Richard Kent, a researcher on business and human rights at Amnesty International, which has been documenting violations of the human rights of indigenous peoples living near lithium mines in Argentina. In a 2019 report, the NGO said licences for lithium exploration in the Salinas Grandes salt flats had been granted without proper consultation with indigenous communities affected.

Farn (Fundación Ambiente y Recursos Naturales), an Argentinian NGO, says: “There are now around 46 different projects of lithium extraction at different stages [in Argentina]. However, little consideration has been given to ... [impacts on] human rights and the social and environmental sustainability of the projects.”

This conflict between cleaner forms of transport and the consequences of lithium mining is causing concern in Europe and the U.S., where policymakers are becoming nervous about being reliant on imports of such important minerals and seek the security of being able to produce their own.

This is already a terminal ecosystem. The water is evaporating all the time. Even without mining it will only last another 100 to 200 years

CHRISTINA DORADOR, University of Antofagasta

In February, U.S. President Joe Biden signed an executive order to review the supply chains of four key products, including batteries, used in electric cars, to ensure their security (see Biden’s EV plan puts charge through U.S. auto industry).

The U.S. isn’t immune from the environmental and human rights consequences of developing its own mines. A Nevada rancher is reported to be suing regulators over the approval of a lithium mine on federal land that he says would violate environmental laws and threaten fish and wildlife. However, there are also reports of local tribal groups welcoming the prospect of much-needed jobs.

Tesla chief executive Elon Musk told shareholders in September that he had secured the rights to mine his own lithium in Nevada.
In Nevada the lithium is extracted from rock using more traditional mining techniques, but toxic chemicals are used in its extraction. Pollution from a Nevada mine has been blamed for fish deaths downstream and in 2016 a similar incident devastated fishing stocks in Tibet.

Car companies, meanwhile, are keen to show that their commitment to the environment and human rights spans the entire supply chain of their vehicles. BMW, for example, has commissioned two U.S. universities to conduct a scientific analysis of water consumption in the lithium-extraction process.

The carmaker already sources lithium directly from two mines in Australia, where it is produced from ore mining rather than brine water, via the Chinese lithium supplier Ganfeng.

It says it may also enter into contracts with other lithium producers, provided they “are fully compliant with our stringent sustainability standards”.

“Water consumption will be a further focal point in this context,” a BMW spokesperson says. “It has not yet been clarified what effects the mining of lithium actually has in individual regions in South America. This is why we have commissioned the study.” Its results are expected early next year.

Meanwhile Volkswagen, which sources from Ganfeng in Australia as well as Chile, sent a fact-finding mission to Chile in March to “gain a better understanding of how living conditions in the Atacama desert are changing in order to analyse how end users like Volkswagen can contribute to sustainable conditions for lithium production in Chile”, a spokesman said.

“The situation in Australia is different as lithium is mined from hard rock with less water consumption and Australia has comparatively strict mining environmental laws and policies.”

Some question whether the environmental cost of lithium extraction is too high to be sustained at scale. Jonathan Stacey, an ecologist at mining consultancy Levin Sources, says: “We are dealing with climate change issues and an emissions crisis. Is there enough lithium to take us through this transition to another technology such as hydrogen, with less environmental impact?”

Dorador stresses the importance of transparency about the social and environmental impact of lithium extraction. “It is also important to look at wider policy. How many electric vehicles do we really need? People are suffering.”

Caroline Palmer is a freelance journalist specialising in business, health, sustainability and the artisan economy. She has worked for the Financial Times, the Guardian and the Observer.
The recently launched Global Battery Alliance (GBA), which brings together 70 organisations across the battery value chain – including carmakers, the public sector, civil society and relevant initiatives – is working on its framework for a battery “passport”, which would create a standard for sustainability across the supply chain and promote circularity.

Mathy Stanislaus, the GBA’s interim director, says one of the key factors here is extending the battery’s life for first use. At the moment an EV battery’s life is usually in the region of 10 years.

According to an October report by Greenpeace East Asia, 12.85m tonnes of EV lithium-ion batteries are due to go offline between 2021 and 2030, mainly in China, which has led the world on EV deployment.

Repurposed for energy storage, they could meet the entire world’s energy storage needs as early as 2030, the report says, while recovered metals could help replace the 10.35m tonnes of lithium, cobalt, nickel and manganese that will need to be mined for new batteries.

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regulatory and non-regulatory measures to promote sustainability.

Ada Kong, who wrote the Greenpeace report, is disappointed that Chinese carmakers and EV battery manufacturers are missing from these groups. One of the barriers she sees to the repurposing of EV batteries for energy storage is “at the moment there is no guarantee of the quality, security and safety of the batteries. We need credible standards.

A report by McKinsey in 2019 underlined the importance of standardisation, saying that a key challenge “is the large number of battery-pack designs on the market that vary in size, electrode chemistry, and format”, with up to 250 new EV models expected to exist by 2025, featuring batteries from more than 15 manufacturers.

Most EV makers are working on their own recycling and repurposing schemes, while the Faraday Institution’s ReLiB project brings together several UK universities to develop alternative recycling routes for EV batteries.

In Japan, Nissan has gone into partnership with Sumitomo to reuse battery packs from the Nissan Leaf for utility-scale storage systems.

In January, VW opened its first plant for recycling EV batteries in Salzgitter. It will recover raw materials including lithium, nickel, manganese and cobalt, together with aluminium, copper and plastics, with the aim of achieving a recycling rate of more than 90% over the long term.

It only recycles batteries that can no longer be used for other purposes, such as energy storage systems, including its flexible rapid-charging station or mobile-charging robot.

VW is also one of the investors in a €1bn venture between Northvolt and Norsk Hydro to build a huge EV battery recycling plant in Norway.

In Japan, Nissan has gone into partnership with Sumitomo Corporation to reuse battery packs from the Nissan Leaf for stationary distributed and utility-scale storage systems. One innovative scheme is Nissan’s Blue Switch project to use its Nissan Leaf car to deliver power in disaster areas hit by extreme weather.

According to the company, a fully charged LEAF e+ can provide enough electricity to power an average Japanese home for up to four days or charge 6,200 mobile phones.

Renault has initiated several projects in Europe using second-life battery technologies as part of its Advanced Battery Storage scheme. It has created two large stationery storage systems, one in France and one in Germany, and the SmartHubs project in the UK. The latter uses batteries from Renault vehicles alongside other technologies as part of a local energy system to help provide cleaner, lower cost energy for use in social housing, transport, infrastructure, private homes and local businesses. 

(See also Why V2G holds the key to the electric vehicle revolution)
High hopes for GREEN HYDROGEN

The potential for the zero-carbon fuel to decrease transport emissions is being explored in partnerships around the world. Angeli Mehta reports

Fatih Birol, executive director of the International Energy Agency (IAE), recently observed that “everyone loves hydrogen” during a recent conference called to discuss an element that has long been used in industry but is now seen as essential in the race to net-zero.

From Namibia to Canada, Chile to the EU, policymakers are looking at hydrogen as never before. The world is on track when it comes to decarbonising the electricity sector, says Birol, “but the issue is clean energy transition, not clean electricity transition”.

The IEA believes hydrogen has an important role to play in decarbonising heavy transport, shipping and aviation, sectors that are difficult to electrify, but to get anywhere, demand will have to grow seven-fold from today, and that will require policy and infrastructure to kickstart the industry.

Julia King, a cross-bench peer and engineer who chairs the Carbon Trust, told the same conference that hydrogen would inevitably be more expensive than methane or electricity. “It’s only when we have the driver of the commitments governments are making to net-zero, and the requirement to decarbonise processes that we can’t electrify, that hydrogen becomes really essential in bulk for energy purposes.”
An entire industry must be created because hydrogen doesn’t exist on its own in nature. It has to be made either from fossil fuels, which creates carbon dioxide (so-called grey hydrogen), or by using renewable energy to electrolyse water, splitting it into hydrogen and oxygen (green hydrogen).

In Europe, sectors such as chemicals already use some 10m tonnes of hydrogen a year, with about 4% being produced by electrolyser.

The use of carbon capture and storage to remove emissions from grey hydrogen, so called blue hydrogen, is promoted as an interim solution until green hydrogen is cost-competitive, but the world’s first at scale CCS project on hydrogen, Equinor’s venture in the north-east of England, isn’t scheduled to begin operating until 2026.

With the cost of renewable electricity tumbling, some in the renewables sector think green hydrogen could be cost-competitive as early as 2025, and certainly before 2030 – a far faster timeline than anticipated even a couple of years ago.

The EU anticipates up to €470bn in public and private sector investment will be needed by 2050, expects that green hydrogen will be used to help decarbonise transport beyond 2024.

Partnerships are being formed across the world to make hydrogen in industrial clusters that will create supply and demand in close proximity; hubs in the UK (see UK’s Tees Valley to be living lab to test green hydrogen for transport) and the port of Rotterdam are examples. Chile, Morocco and South Africa have huge untapped renewable energy resources that could make them players in a hydrogen economy. Already Germany is backing a plant in Morocco to produce green hydrogen. The Orkney Islands, off Scotland’s northern coast, have been producing hydrogen from excess renewable energy and using it to power vans and a prototype ferry.

Hydrogen fuel cell buses are being deployed across China, and pilot schemes are under way in the UK.

In Switzerland, Hyundai and its partners have been working to develop the infrastructure for hydrogen fuel cell trucks. It intends to put 1,000 on Swiss roads by 2023. Customers include supermarket and logistics firms like Migros and...
Camion Transport. The first 50 lorries have arrived, and Hyundai expects deliveries to ramp up quickly. It sees trucking as the best bet to build up hydrogen supply because of the large quantities required for long-distance transport.

Policy has helped the equation: the price of diesel is comparatively high and road tax rises with vehicle weight and distances driven. Zero-emission vehicles, however, don’t pay the tax.

IN FOR THE LONG-HAUL
In the U.S., Nikola Motors is backing hydrogen for its long-haul trucking. While its first vehicles will be battery-electric, it is working on a model capable of travelling 900 miles on a tank of hydrogen. Brewing group Anheuser-Busch will lease hundreds of these trucks as part of a commitment to run its fleet on renewables by 2025.

The challenge of balancing the grid is bigger every month, every year. And hydrogen can be part of the solution

MARK RUSSELL, Nikola Motors

Nikola Motors will also be making the hydrogen fuel. It has struck a “ground-breaking” deal with Arizona’s electricity supplier that chief executive Mark Russell says will enable it to make hydrogen at cost parity with (and perhaps even below) diesel.

Nikola will use excess renewables that would otherwise have been curtailed, for example at night, or when peak solar production doesn’t coincide with electricity demand, but will halt its manufacturing when electricity demand is at its peak. Overnight, nuclear power will also be used to produce hydrogen.

Russell told an end-of-year results conference call, that “we represent the future of the electric grid. If you’re going to get renewable energy, like wind and solar into the grid, and use it effectively, you either need massive storage of some kind … or you can have us do it basically marginally for free – and we’ll pay you for the electricity that you’re not going to be able to develop on the off-peak hours.”

Similar discussions are under way in Europe. “The challenge of balancing the grid is bigger and bigger every month, every year. And hydrogen can be part of the solution for that,” he adds.

However, the Arizona utility still has coal and gas in its generation mix so Nikola’s hydrogen won’t be entirely carbon-free.

Swedish trucking group Scania, which is owned by Volkswagen, has concluded that the best use of hydrogen is not in trucking. Having developed both electric and hydrogen fuel cell vehicles, Scania believes that battery-electric, not hydrogen, is the route to decarbonise the sector’s emissions.

Mats Reimark, Scania’s director of powertrain research, technology and concept development, says the driver for hydrogen has always been that the energy storage requirements in heavy-duty trucks are too large to be supplied by batteries.

“But what we have found in Scania is that pure battery electric is coming to the point where the volume, the mass, [and] the cost of the battery is making it a viable solution for heavy-duty transport. And of course, it’s going to be the shorter distances, initially … but the rate of development of batteries is tremendous right now. And I think many of us, including me, have been surprised.”

A mandatory 45-minute rest time after 4.5 hours

The Orkney Islands produces hydrogen from excess renewable energy and is targeting maritime uses.
We think the use of hydrogen in real life is going to be more appreciated if it is converted into thermal energy rather than being in a fuel cell on a truck

MATS REIMARK, Scania

HYDROGEN-POWERED SHIPPING
For shipping, the equation could tip differently. Shipping accounts for 3% of global emissions, and carries almost 80% of global trade. The Getting to Zero Coalition of more than 140 companies across the maritime, energy, infrastructure and finance sectors wants to get zero-emission vessels into operation by 2030 and expects the sector to generate the demand needed to drive investment in clean energy projects.

Another consortium, HyShip, aims to build a series of prototype vessels running on liquid green hydrogen, beginning with a cargo ferry powered by a combination of battery electric and hydrogen fuel cells. The 14 partners want to have the vessel operating by 2024, taking both cargo and hydrogen fuel to ports and bunkers along the Norwegian coast.

Kawasaki of Japan expects its hydrogen carrier to bring the first cargo of liquid hydrogen (made by the gasification of coal and cooled to -253°C) from Australia to Japan this spring. However, the Australian plant has yet to develop CCS, so the hydrogen is not low-carbon.

The International Council on Clean Transportation (ICCT) calculates that hydrogen could have fuelled 99% of trans-Pacific voyages in 2015. The amount needed would have been just 1% of all hydrogen produced in 2019. Even the space they calculated would be required at ports to produce green hydrogen was “pretty reasonable”, says Elise Georgeff, associate researcher on the ICCT’s marine programme.

But it will not come cheap. More than $1.4tn of capital investment will be needed if the shipping industry is to decarbonise by 2050. This is based
on ammonia (made from hydrogen) being the dominant low-carbon fuel. Ammonia is already moved in huge quantities around the world and, while toxic and corrosive, is easier than hydrogen to ship and distribute.

A joint venture in Saudi Arabia plans to make 1.5m tons of green ammonia a year by 2025 – to be shipped and cracked back into hydrogen for buses and trucks. Hundreds of such plants would be needed to decarbonise shipping. Ammonia has the advantage that it can be burned in an internal combustion engine, although that produces nitrogen oxides, potent greenhouse gases. Methods to eliminate these emissions are being worked on.

The ICCT team also found that any trip made with hydrogen could be made with ammonia, but Georgeff urges careful evaluation of the sustainability of future marine fuels, including renewable sourcing. In the meantime, wind-assisted technologies can help lower ship emissions, and potentially extend the range of hydrogen-powered ships as well as lower costs – something Georgeff is now assessing.

Ammonia and hydrogen are also being explored as aviation fuels (see Sustainable aviation fuels get powerful boost from pandemic). In the UK, Reaction Engines and the Science and Technology Facilities Council (STFC) are working to demonstrate how ammonia could be used for short-haul flights (of up to 2,000km). The system wouldn’t require wholesale aircraft or engine redesign, and more of the energy produced by burning ammonia is utilised compared to kerosene. If the concept is proven, the research team anticipates ammonia-based propulsion systems could be ready to enter service by 2030.

Now all that’s required to develop a brave new hydrogen economy is the collective will of governments, industry and finance to turn that love of hydrogen that the IEA’s Birol talks about into scalable and bankable solutions. Then it can really hit the road and the high seas.

Angeli Mehta is a former BBC current affairs producer, with a research PhD. She now writes about science, and has a particular interest in the environment and sustainability. @AngeliMehta.
The Tees Valley in the north-east of England is to be the UK’s first hydrogen transport hub, with £3m in government funding announced in March to set up a research and development campus in the region, and kickstart a series of trials using green hydrogen to move goods and passengers.

According to the masterplan, the Tees Valley, which produces more than half of the UK’s hydrogen, will be a “living lab” to understand what role hydrogen can play in decarbonising the UK’s transport sector and develop a “transferable blueprint” for hubs elsewhere in the UK and internationally. The UK, which will host COP26 at the end of this year, has a goal to cut greenhouse gas emissions by at least 68% by the end of the decade, compared with 1990 levels.

Operational trials are expected to begin in 2025 once production, storage and distribution facilities have been developed, but before then “pop-up” demonstrator projects could see shops, supermarkets, online retailers, warehouse operators and delivery companies trialling hydrogen-powered transport to move goods, and carry out last-mile deliveries.

Local transport operators will also be working to deliver emission-free hydrogen passenger services, such as on-demand regional buses, or zero-emission refuse vehicles.

Transport Secretary Grant Shapps said: “The hub will establish the UK as a global leader in hydrogen technology, paving the way for its use across all transport modes and propelling us towards our net-zero goals.”

The Department for Transport said the government will also provide £4.8m, subject to business case approval, to support the development of a second hydrogen hub in Holyhead in Wales, which will pilot the creation of hydrogen from renewable energy and its use as a zero-emission fuel in HGVs.

Last year, the government’s Hydrogen for Transport programme provided £6.3m for a fleet of hydrogen-powered refuse trucks to be introduced in Glasgow, and a hydrogen-powered train successfully completed its first mainline trials.

Angeli Mehta
With the global aviation industry fighting the loss of billions of dollars in revenue from the Covid-19-induced travel downturn, it is perhaps surprising that momentum on the fight against climate change has sped up rather than fallen away. But even with the downgrading of air traffic forecasts, the sector will be transporting around 10 billion passengers a year by 2050, more than twice 2019 levels, according to the Air Transport Action Group.

New collaborations between governments and industry have sprung up in the past year, with a big focus on ramping up the use of sustainable fuels, which currently constitute less than 1% of total consumption across the industry. These include the UK’s Jet Zero Council, a sector-wide partnership of airlines, airports, research institutions, fuel manufacturers and three ministers from the UK government’s departments for transport, and energy and industrial strategy.

In March, Jet Zero announced a £15m competition to help companies pioneer new technologies to convert materials such as household rubbish, waste wood and excess electricity into sustainable aviation fuel.

Sustainable aviation fuels get powerful boost from pandemic

Aviation industry collaborations across value chains and with policymakers are urgently seeking solutions to decarbonising air travel. Catherine Early reports on progress.
To qualify, solutions will have to offer emissions savings of more than 70% compared to conventional jet fuel.

In January, the World Economic Forum, which facilitates public-private collaboration, launched the Mission Possible Partnership, an alliance of climate leaders focused on identifying breakthroughs that can be achieved in the near term in the decarbonisation of heavy industry and transport. Aviation will be targeted through the existing Clean Skies for Tomorrow collaboration, under which 80 companies are engaging on routes to industry decarbonisation including sustainable aviation fuels (SAF).

In February, airline officials from companies including American Airlines, United Airlines and Delta Air Lines met virtually with White House officials to discuss tackling aviation pollution and urge U.S. support for greener aviation fuel.

Although the industry's current climate targets, set in 2009, call for emissions to be halved by 2050, an increasing number of companies in the aviation value chain are making commitments to reach net-zero by 2050, including the 13 airlines in the One World Alliance, Heathrow Airport, and aircraft engine manufacturer Rolls-Royce.

These efforts are being boosted by large corporates announcing plans to purchase SAF equivalent to all business travel with particular airlines, such as deals between Microsoft and Dutch airline KLM and Alaska Airlines, and similar agreements by Deloitte with American Airlines and Delta Air Lines.

“If you’d told me 18 months ago that this level of interest and dedication was going to be in place across the industry in the midst of a global pandemic, I don’t think I would have believed you,” says Kevin Soubly, project lead for the WEF Clean Skies for Tomorrow programme.

A combination of factors has catalysed action, he believes, including increased demand for more sustainable travel from both the public and corporations, investors and governments. This has...
all come to a head with the pandemic, which has forced people to stay inside and think about what they want things to look like when economic activity returns in full, he says.

“By and large, the consensus is we want it to be more sustainable, we want to mitigate the effects of climate change, and that means changing how we do things and pushing forward increased energy transition,” he says.

COLLABORATING ON SAF
Currently comprising just 0.01% of aviation fuel, SAF costs two to four times as much as kerosene, which is artificially cheap due to the fact that it pays no tax under the Chicago Convention. There is also a lack of supply: current SAF plants in the EU have a maximum potential output of 2.3m tonnes per year, but this meets only 4% of the total aviation fuel demand.

We need the policy signals now, because our challenge is to attract investors to spend hundreds of millions of dollars on first-of-a-kind SAF plants

JONATHON COUNSELL, IAG

In the European Union a ban on using palm oil in biodiesel and aviation fuels from 2030 over deforestation concerns has intensified the search for more sustainable alternatives to fill the gap. (See Indonesian rush to biodiesel sparks deforestation fears)

“We need the policy signals now because our challenge is to attract investors to spend hundreds of millions of dollars to build first-of-a-kind SAF production plants,” said Jonathon Counsell, IAG group head of sustainability, speaking at a recent webinar run by the WEF.

Counsell, who helped broker the One World Alliance net-zero target, hopes that the group’s commitment will catalyse similar action from the rest of industry, which will in turn push governments to create policy to support them. It was industry lobbying that led the UK government to set up the Jet Zero Council, he said.

The European aviation sector is lobbying the European Commission and UK government on how the transition to sustainable aviation fuels (SAF) could be achieved. In October, 15 companies across the value chain published joint policy proposals, the first time such a diverse group had come
together to back such policies. The initiative was led by the WEF’s Clean Skies for Tomorrow coalition.

Recommendations included public-policy support for innovation to advance SAF technologies; government-backed price floors for the early stages of SAF production to boost investment confidence; support for the development of SAF production facilities by directly de-risking investments; and an EU-wide mandate for a minimum amount of SAF to be added to the aircraft fuel to come into effect by 2025, and increase through to 2050.

The European Commission is due to publish its proposals for a SAF mandate in March. Norway and France already have a national-level SAF mandate, while Finland, the Netherlands, Germany, Spain and Sweden are considering various requirements on greener fuel.

Dick Benchop, chief executive of Schiphol airport, told the WEF webinar that it would not be possible to get widespread use of SAF without dialogue between governments and industry on policy and regulation. “Otherwise you’ll get a lot of initiatives – first plants and first developments – but to get it to scale, we need technology, infrastructure and deployment all working together,” he said.

SCALING UP

Jennifer Holmgren, chief executive officer of biofuel manufacturer LanzaTech, understands the importance of collaboration. The U.S. Department of Energy’s Pacific Northwest National Laboratory supported the development of the technology behind LanzaJet, a subsidiary launched in 2020, to specifically target SAF production.

The company is now building a plant to convert ethanol to around 40m litres of aviation fuel in Georgia, U.S., which is due to start operating in late 2022. It has used an innovative financing strategy, under which its investors – Suncor, Mitsui and British Airways – have agreed to finance it all the way from demonstration plant through to commercial scale, when plants will be built in each company’s home country.

“That’s important because then we don’t have to stop, and by 2025 we should have about 400m litres of SAF. It means I feel really good about our ability to contribute to decarbonisation of the aviation sector,” says Holmgren.
We can’t shut down any technology alleys at the moment, we need to explore them all, because we might need two, three or four of them.

**Dave Smith**, Rolls-Royce

Charles Perry, aviation lead for the COP26 Champions, points to the UNFCCC’s transport sector pathways, published in November, which outlines an ambition for SAF to reach 10% of all aviation fuel by 2030, with 20% of airlines by revenue signing up by 2023.

“This is a big step up on the global average from 0.01% now, but bear in mind that it’s a global average; Europe and the U.S. will need to be way in advance of 10% because that would be quite a stretch for developing countries to achieve by 2030,” he says.

Another move policymakers could make to incentivise quicker uptake of SAFs is to implement a cost of carbon. Holmgren says: “You have to include the carbon cost in the cost of kerosene, because the cost of fossil fuels will keep coming down as demand falls.”

Counsell agrees that a global carbon price would aid the decarbonisation of aviation. Together with the falling costs of SAF as more plants are built, this could bring SAF to cost-parity with kerosene in the next five to 10 years, he believes.

Industry commentators believe that other technologies such as hydrogen (see High hopes for Hydrogen) will be needed to truly decarbonise aviation. Hydrogen can be used with fuel cells to create electricity for short-haul flights, or it can be combusted in a gas turbine.

“We can’t shut down any technology alleys at the moment, we need to explore them all, because we might need two, three or four of them,” Dave Smith, director of technology at Rolls-Royce told the WEF’s webinar.

Holmgren agrees that several technologies could be needed, and therefore governments should leave targets and support mechanisms sufficiently flexible so that future innovations can benefit. However, she cautions that getting excited about “the next big bauble” can distract efforts from scaling solutions that already exist.

“We don’t want to forget about the things we can do today, that already make both environmental and economic sense. We cannot bend the curve by thinking about 2030 or 2040, we bend it by thinking about 2021, 2022 and 2023,” she says.

**Catherine Early** is a freelance journalist specialising in the environment and sustainability. She writes for Business Green, China Dialogue and the ENDS Report among others. She was a finalist in the Guardian’s International Development Journalism competition.
Indonesian rush to biodiesel raises fears about spike in deforestation risk

Environmentalists fear more tropical forest could be cleared to expand palm oil plantations as state oil company announces rollout of green diesel for road and aviation fuels. Terry Slavin reports
The recent announcement by Indonesia’s state oil company PT Pertamina that it plans to start producing diesel and jet fuel entirely out of palm oil by the end of this year has raised alarm bells with environmental groups, who fear that Indonesia’s success in bringing down deforestation rates could be reversed by its aggressive drive to ramp up biofuel production, putting millions of hectares of rainforest and peatlands at risk.

By December, Pertamina will be processing 3,000 barrels of palm oil per day to produce biodiesel, and from December 2022, production will double to 6,000 barrels of crude palm oil per day to make both biodiesel and jet fuel. It is also reportedly targeting the production of 20,000 b/d at a second refinery in 2023.

Deforestation rates in Indonesia – home to the world’s third-largest tropical forests and the biggest producer of palm oil – fell 75% in 2020 to record low levels, something the government attributed to moratoriums since 2018 on clearing primary forests and licenses for new palm plantations, but experts said was helped by falling palm prices, more rainfall, and the economic slowdown from Covid-19. The country lost 115,459 hectares of forest cover last year, just over a 10th of the 1.09m hectares of forest destroyed at its peak in 2014-15, according to the Ministry of Environment and Forestry.

But there are fears that such progress will be threatened as the south-east Asian country, which has a population of 270 million, steps up moves to increase domestic consumption of palm oil as a transport fuel, and the three-year moratorium on new palm oil plantations comes to an end.

Indonesia’s energy minister has estimated that 15m hectares (37m acres) of new palm plantations would be needed to meet the nation’s biodiesel goals, according to media reports late last year. Indonesian President Joko Widodo has said the ultimate goal is to mandate biodiesel with 100% palm oil, with a 50% blend reportedly targeted for 2025, up from 30% today.

Both Indonesia and Malaysia have launched World Trade Organization proceedings seeking to overturn a 2019 decision by the European Union that designated palm oil is a high deforestation-risk.
biofuel feedstock, and banned its use after 2030, dealing a blow to its claims to being a “green” fuel.

The move reversed a policy that had led European transport to progressively increase consumption of biofuels from palm oil over the last two decades in a bid to decrease CO₂ emissions. Most palm oil biofuel consumed in Germany, the EU’s largest manufacturer of biodiesel, claims a reportable emission saving of 75-85% compared with fossil fuels, higher than rapeseed or soy. But indirect land use studies for the Commission suggested that substituting palm oil for fossil fuels results in net emissions increases – rather than decreases – in CO₂, estimating that 45% of palm oil expansion encroaches on forests and 23% destroys peatland. Soy oil was also deemed a high deforestation-risk feedstock but, with only 8% of expansion occurring at the expense of forests, it fell below the 10% threshold set by the Commission.

France rapidly responded by removing palm oil from a list of permitted biofuels from this year, while Austria has draft legislation to exclude palm oil from 2025.

But while Europe is slowly turning away from palm oil, its use is accelerating elsewhere, said clean transport expert Chris Malins in a report for Rainforest Foundation Norway last year. The report warned that although there is uncertainty over what path the aviation industry outside of Europe may follow for alternative aviation fuels, (see Sustainable aviation fuels get powerful boost from pandemic) vegetable oils are currently the only fuel pathway currently close to commercial volumes to meet the sector’s commitment to cut CO₂ emissions by 2050.

“If no limits are introduced on the use of vegetable oils and the stated ambition is pursued seriously, there is a real possibility that a very large new demand for palm and soy oils could be created,” the Rainforest Foundation report said.

Combined with biodiesel mandates for road transport from Indonesia and Malaysia, annual demand for palm oil for biodiesel could rise to as much as 61m tonnes, nearly equal to the amount of palm oil currently produced for all uses, while Brazil’s demand for soy in biodiesel could surge to 41m tonnes (75% of all soy consumed today) by 2030, the report said.

Questioned about Pertamina’s plans, Malins said the Indonesian energy producer will be using the same technology that the Finnish company Neste uses for its renewable diesel.

“Neste started out down this road with palm ọ
There is increasing evidence that rogue palm oil producers are continuing to clear-cut rainforests and sell their palm oil to the domestic and international biodiesel market.

Gemma Tillack, Rainforest Action Network

Oil producers are looking to diversify from palm oil to waste oils due to environmental concerns. Total in France and Eni in Italy both have facilities built to run on palm oil but are now actively seeking more sustainable alternatives.

While deforestation rates in Indonesia indicate that the link between palm and deforestation is being weakened, it’s by no means guaranteed that those lower deforestation rates are with us to stay – and pushing palm oil demand up will still inevitably lead to more forest loss.

He added: “In the past, technical limits on biodiesel blending have capped the total use of palm oil (and other vegetable oils) as fuel. If those limits are removed that could create a context for a lot of extra oil palm expansion.”

World Resources Institute (WRI) Indonesia estimates that a 100% palm oil biodiesel mandate would require 56.98 thousand tons of palm oil annually by 2025. If existing plantations did not increase their productivity, those demands could encourage 7.2m hectares of land clearing.

Ricky Amukti, of climate change and energy policy advocacy group Traction Energy Asia, said smaller and independent palm oil producers had yet to benefit from Indonesia’s biodiesel programme, due to being squeezed on prices by middlemen and larger growers.

He said biodiesel producers could buy from mills that use fruit grown by smallholders to limit the threat of land conversion and also increase supply chain transparency.

Gemma Tillack, forest policy director for Rainforest Action Network (RAN), described Pertamina’s fast-track plan to make diesel and jet-fuel from palm oil as “extremely worrying”.

“There is increasing evidence that rogue palm oil producers are continuing to clear-cut rainforests and sell their palm oil to the domestic and international biodiesel market, even after being cut out of other supply chains that are more demanding of deforestation- and exploitation-free palm oil.

She added: "Deforestation-linked biodiesel is not a 'green fuel'. As the climate crisis worsens, we can’t ignore the rising demand and use of deforestation-linked palm oil for biodiesel." (Michael Taylor of Thomson Reuters Foundation contributed to this article)
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