CLIMATE ACTION

ADAPTATION AND RESILIENCE

Clear and present danger: why it's time for firms to batten down the hatches

As increasingly severe floods, droughts and wildfires take their deadly toll all around the world, the onus is on businesses of every size and sector to protect themselves against the very real consequences of global warming

Cath Everett

The latest scientific warnings about anthropogenic global warming and climate change are stark. A report published by the United Nations just before its COP27 conference in November stated that, without concerted action this decade, there is no credible way to prevent the planet from experiencing a devastating and irreversible temperature increase.

To keep the Earth from warming to no more than 1.5°C above pre-industrial levels – as called for by the UN's 2015 Paris accord – countries would need to cut their greenhouse gas emissions by 45% within seven years and achieve net zero by 2050.

More than 70 nations, including the UK, signed up to this pledge. But, according to the UN's *Nationally Determined Contributions Synthesis* report, their governments' commitments and actions so far have fallen well short of what's required. In fact, the aggregated national plans of the 193 parties involved in the Paris accord would, as they stand, cause global carbon emissions in 2030 to be 11% higher than they were in 2010. To make matters worse, COP27 has been viewed widely by climate experts as a failure, given that it produced no new government commitments to phase out fossil fuels.

Despite the key role it has to play in combating climate change, the private sector has also made disappointing headway. Here too, net-zero pledges are rarely reflected in action, with many firms moving slowly at best and simply greenwashing at worst.

Despite humankind's sluggish response, climate change is already manifesting itself in extreme weather, leading to ever more disastrous floods, droughts and wildfires. And matters will only get worse.

That's the view of Professor Matt Gitsham, director of the Ashridge Centre for Business and Sustainability at Hult International Business School. "Climate change is here, so we need to adapt to it now," he warns. "Because there's a time lag between carbon entering the atmosphere and when it shows an impact, even if we manage to limit emissions now, the situation will worsen and adaptation will still be necessary, no matter how well we do on decarbonisation."

> **Because there's a time lag between carbon entering the atmosphere and when it shows an impact, even if we manage to limit emissions now, adaptation will still be necessary**

In other words, it will not be enough for enterprises to rely on climate mitigation measures – including familiar strategies such as shifting to sources of renewable energy – to tackle the long-term problems posed by global warming. Although such changes are important, companies must also take climate adaptation measures to address the shorter-term threats and ensure their resilience to these.

Of course, because the impact of climate change will vary from sector to sector, each business will inevitably face different kinds of disruption. This means that there is no handy one-size-fits-all approach available.

It's therefore up to each firm to assess and manage the climate risks affecting its unique set of assets and operations. This includes weighting and scoring such risks and assigning appropriate budgets for tackling them based on their severity.

Depending on the nature of the business concerned, possible adaptation methods could include introducing natural defences, such as reed beds and mangrove thickets, to help against flooding (and filter out pollutants). Other countermeasures might involve changing industrial processes to cut their water consumption in drought-affected regions or, as heatwaves become more common, introducing more efficient cooling systems to enable workers and machinery to remain productive.

Small to medium-sized enterprises have tended to make relatively few advances in the climate adaptation stakes, notes Claire Benson, founder and director at sustainability consultancy SDG Changemakers.

She reports that organisations in this bracket are "still struggling just with decarbonisation. My assessment is that they aren't understanding climate change, so they're not yet at a stage where they are dealing with adaptation and resilience."

Benson attributes part of the problem to the complex terminology that's widely used in the sustainability field, which many non-experts struggle to understand. This in turn makes it hard for them to choose the most effective course of action, which means that their approach "often becomes simply a tick-box exercise", she says.

The fact that SMEs often have few resources to devote to climate adaptation doesn't help either, particularly as a global recession approaches.

Most large businesses, on the other hand, are "already adapting to some extent" and even changing elements of their business models, reports Angela Hultberg, global sustainability director at management consultancy Kearney.

"Some adaptation is happening. It's definitely being discussed at board level," she says. "Those without serious risk analysis systems in place are running to catch up."

Some corporate boards even have begun to discuss how to achieve the advanced goal of climate resilience, which is about ensuring that "the company stays in business for another 100 years", Hultberg says. "This is not something that has reached the tangible 'roadmaps' stage, but it's definitely starting to be a topic of conversation."

The companies that have come the furthest in adaptation terms have tended to be national infrastructure providers. BT Group, for example, is running a raft of decarbonisation projects in parallel with adaptation- and resilience-related activities as part of its wider sustainability drive.

To embed adaptation into its operations, the company has created five "risk hubs", one of which focuses on climate change, says Tiffany Chow, BT Group's head of climate change. The company's 16 nominated "risk owners" monitor the situation in their sections of the business – including finance, operations and the supply chain – and meet quarterly to report on it.

BT also completes a detailed scenario analysis and planning exercise every year. This focuses on the potential climate impacts on physical assets and operations both domestically and globally. The aim is to come up with suitable mitigation and adaptation actions for each business unit. Such actions can also generate opportunities for the business, Chow notes.

"When we adopt newer technology, such as switching from copper cable to a full-fibre network, it's not only helping us to reduce our emissions (and those of our customers); it's also improving our service," she says.

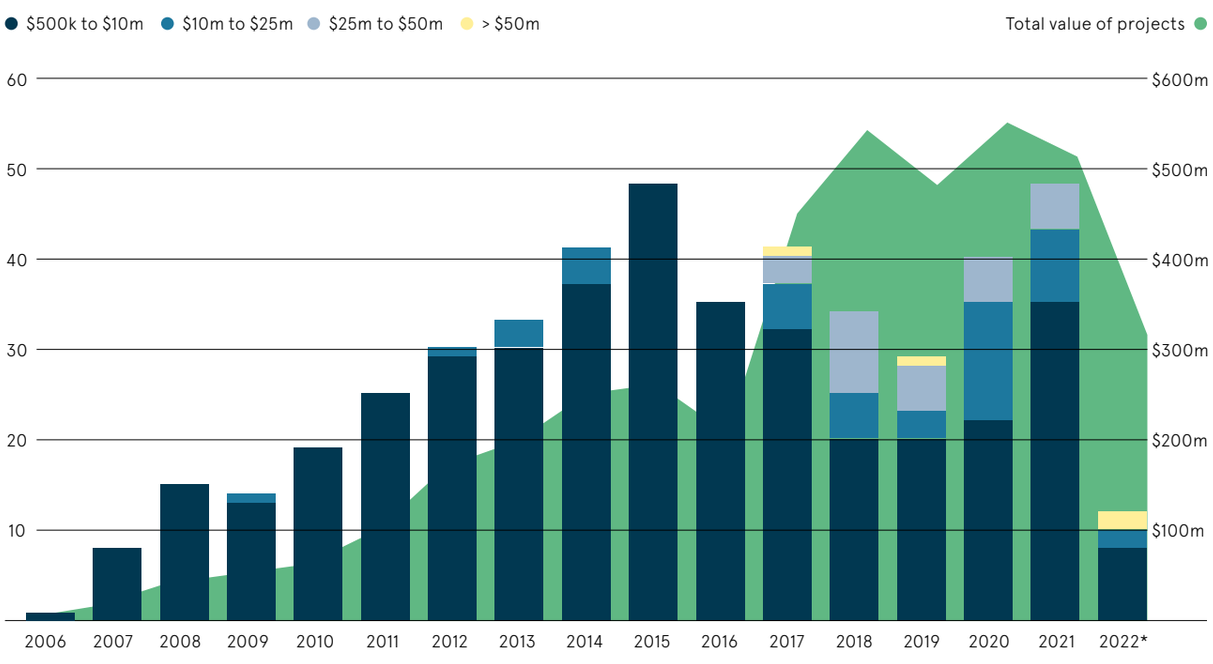
BT is also working with third parties to come up with collective solutions. For instance, it joined three other providers of critical national infrastructure – Thames Water, National Grid and Network Rail – to assist an inquiry conducted by the parliamentary joint committee on the national security strategy. The committee's goal was to evaluate the resilience of these vital systems to climate change. It published its recommendations in October.

Such exercises will become commonplace as the stark ramifications of the climate crisis become ever more apparent.

"Adaptation and resilience will become increasingly important. Climate change is not going away, so there will be more and more attention paid to these issues," Chow says. "Organisations are really going to have to start preparing themselves."

GOVERNMENTS HAVE RAMPED UP INVESTMENT IN CLIMATE ADAPTATION, BUT FOCUS IS DRIFTING

Number and value of new adaptation projects supported through international climate funds



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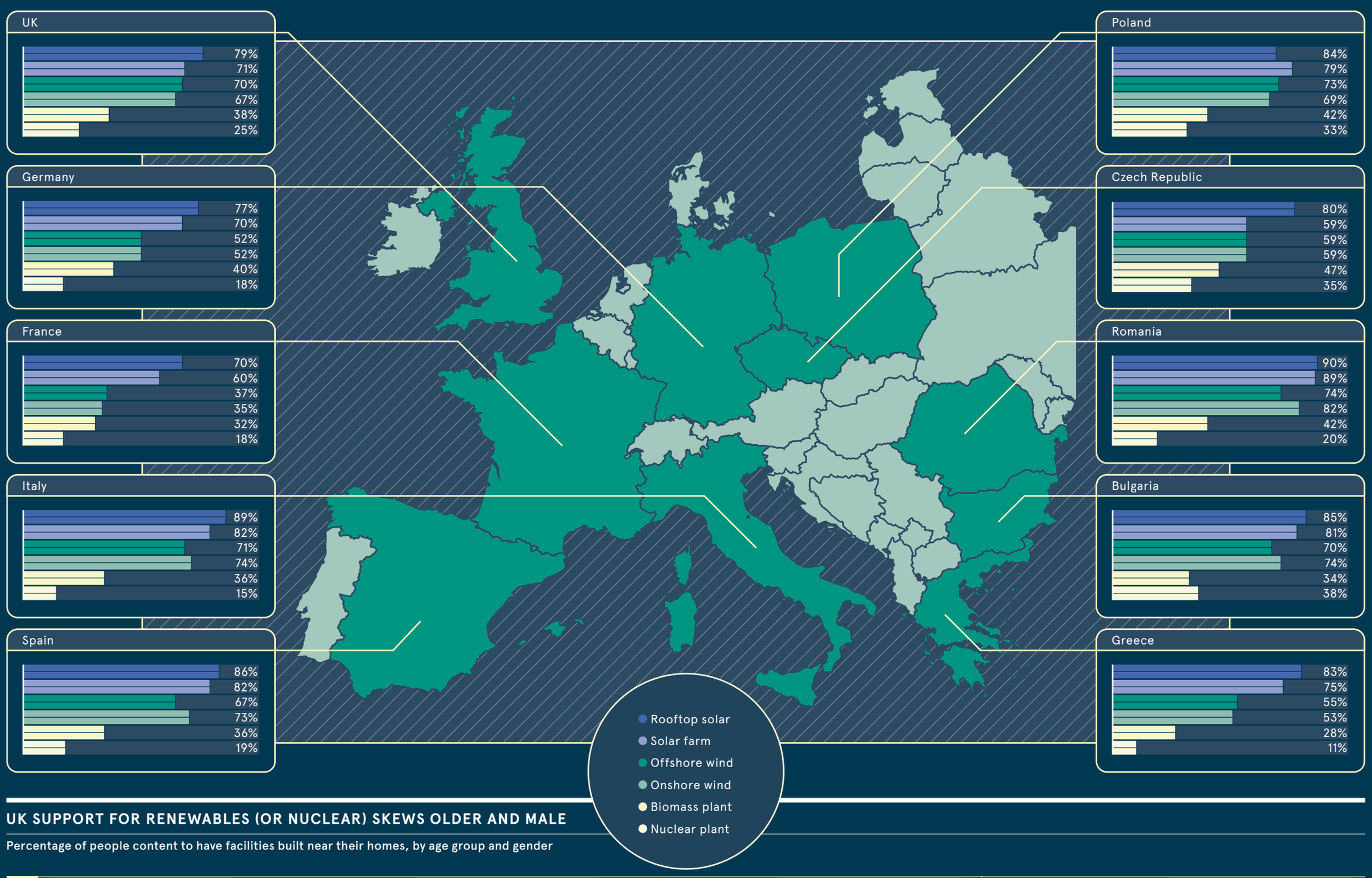
BRITAIN'S NIMBY PROBLEM

The emergence of deep divisions in the government about ending its moratorium on building onshore wind farms has once again highlighted the problem of Nimbyism. This 'not in my back yard' attitude stands accused of killing off many promising projects to generate green energy. Yet surveys indicate that public attitudes to renewables in the UK are broadly positive – and in line with those of our European neighbours. Given that the Nimby lobby is relatively small, is it perhaps time to override its objections in the democratic interests of hitting the nation's net-zero targets?

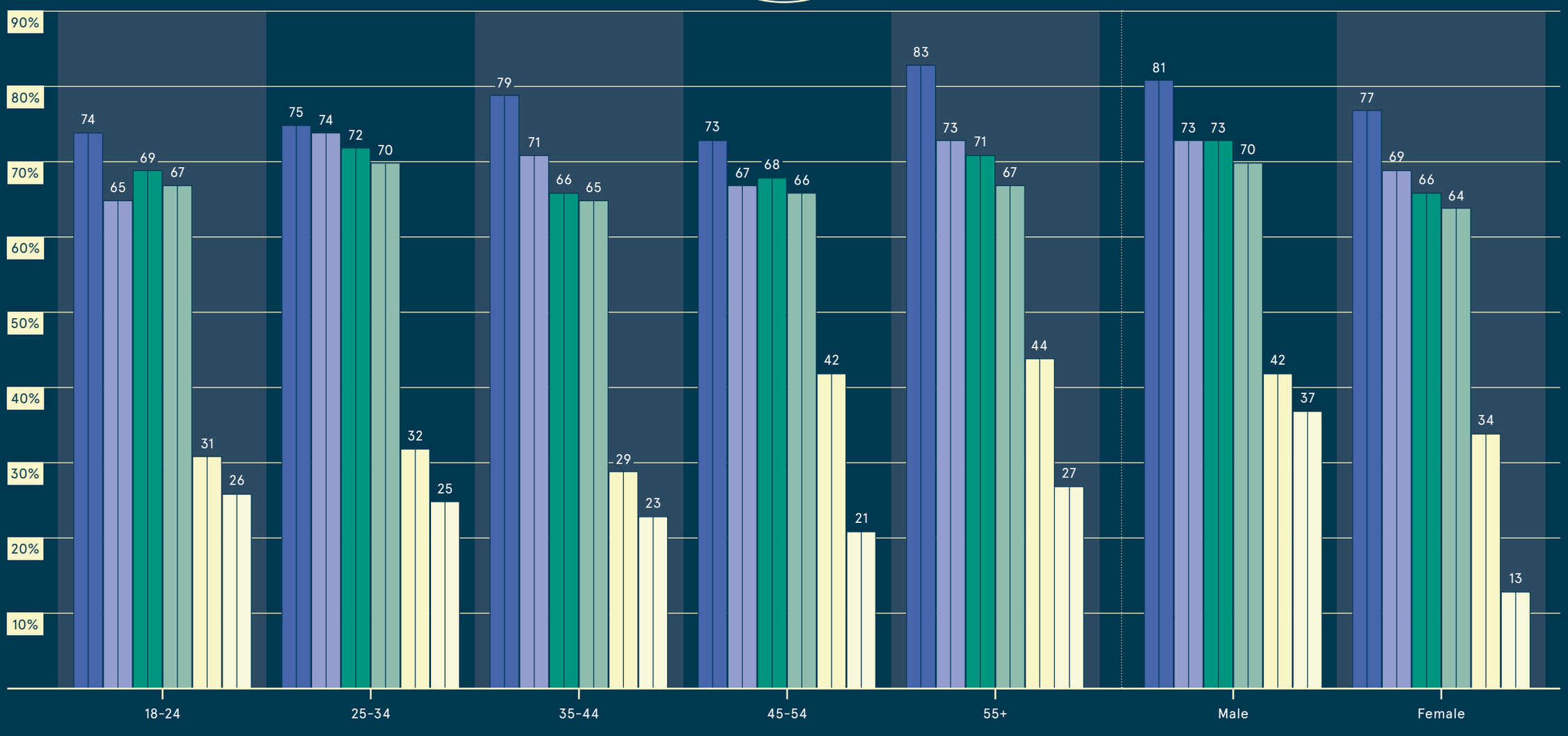
THE BRITISH PUBLIC BROADLY AGREE WITH THEIR EUROPEAN COUNTERPARTS ABOUT LOCAL GREEN POWER PROJECTS

Percentage of people who would be content to have renewable (or nuclear) energy generation facilities built near their homes



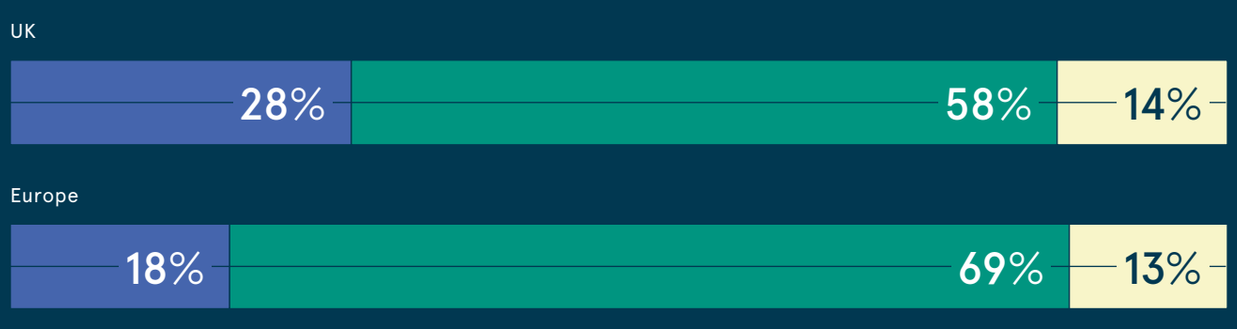
UK SUPPORT FOR RENEWABLES (OR NUCLEAR) SKEWS OLDER AND MALE

Percentage of people content to have facilities built near their homes, by age group and gender



BRITS ARE MORE WILLING TO CUT THEIR GOVERNMENT SOME SLACK OVER CLIMATE ACTION

Responses to the question: "Do you think your government is doing enough to tackle climate change?"



34% of UK adults are "very concerned" about climate change

70% would support regulations requiring all new buildings to include solar panels as standard

10% of people in the UK live near an onshore wind farm

YouGov, European Climate Foundation, 2021

Taking impactful investment to the mainstream

All investment involves a degree of risk, but climate change has raised the stakes, dumping toxic stocks and stranding assets. With ambitious net-zero initiatives to meet, how does smart money make it happen?

The transition to net zero will require significant sums of capital investment, with estimates ranging from $120tn to $275tn by 2050. As governments and organisations plot a course to reduce emissions and meet their net-zero pledges, socially responsible and environmentally sound investments have been thrust into the spotlight.

In the UK alone, Legal & General Capital estimates that by 2030 up to £80bn will be needed for additional renewables infrastructure, plus at least £25bn more for assorted new technologies and assets, such as heat pumps and electric vehicle charging infrastructure.

The energy transition away from fossil fuels requires ambitious, long-term and holistic investment to move the dial on climate change while delivering the social benefits of a more sustainable economy.

Rising demand for low-carbon homes

The residential market in the UK is in the spotlight at present, as much for economic reasons as for environmental. With inflation driving up monthly mortgage payments and the cost-of-living crisis putting household budgets under pressure, the rise in domestic fuel bills is a hot topic in every sense.

YouGov research commissioned by Legal & General Capital, a leading energy transition investor, surveyed the consumer appetite for energy-efficient housing. The study revealed that homebuyers are willing to pay a 'green premium' for energy efficiency and performance in spite of - or even because of - the current economic squeeze.

Increasingly, sustainability and cost-efficiency are expected to fall in lockstep. Buyers looking for a new home are willing to pay a 10.5% surcharge for a low-carbon property, with prospective Gen Z purchasers willing to pay as much as 20%. When asked why they would buy or rent a low-carbon home, 65% cited environmental factors such as shrinking their carbon footprint or tackling climate change. Over a third would like to reap the cost savings from cheaper energy bills.

The clear-cut consumer engagement around the climate agenda is helping to cement the business case for investors and developers to commit to low-carbon homes, argues John Alker, head of sustainability at Legal & General Capital. He explains: "Climate change and energy efficiency have clearly risen right up the agenda for many people when choosing a home. With buyers and renters now prepared to pay a premium, spending smarter on sustainability may make a material difference to revenue and returns for investors."

Transitioning the residential sector towards net zero

At present, housing remains part of the problem rather than the solution.

According to official Office for National Statistics figures, households are a major contributor to greenhouse gas emissions, accounting for some 26% of the UK total on a residency basis. The electrification and decarbonisation of heat are particularly critical.

Investors have a crucial part to play. Legal & General Capital, for example, is committed to ensuring all new homes it invests in will be operationally net-zero carbon from the end of the decade. But in a world where greenwashing is increasingly in the news, bold intentions demand consistent validation and innovation.

To tackle climate concerns on an infrastructural level, Legal & General Capital's partnership model underscores the need for collaborative approaches to spark change.

In 2020, Legal & General Capital invested in the Kensa Group, the UK's largest manufacturer and installer of electric ground source heat pump (GSHP) technology.

Not only does GSHP technology represent one of the most reliable and efficient ways to provide heat, but the units installed can also be used to offer affordable cooling. This dual function, coupled with Kensa's deployment of networked heat pumps on a street-by-street basis, mimicking the gas grid model, will play a critical role in helping the UK deliver homes with zero operational carbon emissions as the country faces record energy prices and highs and lows in temperature swings.

Partnering with the UK's only dedicated manufacturer of GSHP technology also enabled Legal & General Capital to invest in the creation and growth of green jobs and skills in the domestic economy.

Continuing its investment into the housing sector in January this year, Legal & General Capital led an investment raise alongside Hodge into industry-leading digital business Sero Technologies, which works to design and deliver cost-effective low-carbon solutions for new and existing homes. Sero's work with housing associations also creates synergies between positive benefits in terms of both environmental impacts and social outcomes. As a result, homeowners and landlords can meet net-zero goals efficiently and affordably.

This more joined-up and holistic approach to sustainability aligns with the concept of 'just transition', a sweeping shift that delivers on climate goals in a fair and equitable way.

According to Alker, Legal & General Capital sees biodiversity and nature as the next frontier in supporting the transition within real estate and is actively exploring how to generate maximum value for both people and nature across its investment assets.

Modular efficiency

Modular housing is another investment proposition with enormous potential to benefit people and the planet. By being manufactured off-site, these residential units promise better thermal performance and reduced energy-use intensity per square metre of floor space. For the homeowners and people living in them, this translates into improved energy efficiency and, ultimately, lower fuel bills.

For example, Bristol's Legal & General Capital-backed Bonnington Walk development includes modular homes designed for maximum energy efficiency. This modular made scheme will be EPC A-rated and 62% cheaper to run. In the future, this scheme will also offer Net Zero Regulated Carbon homes which will be 73% cheaper to run than a standard new build home.

26%

of all greenhouse emissions in the UK are generated by households

Office for National Statistics

This means that even with the energy price cap put in place by OFGEM, Bristol residents at this scheme could save up to £1,788 a year in energy bills.

The science of sustainability

Legal & General Capital's synergistic approach is indicative of the broader sustainability vision underpinning the business's investment strategy, explains Alker. "Our ambition is that for every pound or dollar we invest, we deliver both positive social and environmental impact. Furthermore, we seek to do this across the board — not in some strand of 'impact investing' that sits separate to the core," he says. "The sustainability driver runs throughout everything we do. This is not about ticking boxes on ESG; it is a strategic imperative. As an investor with long-term patient capital, this is something we are able to drive through the whole investment cycle."

For example, Legal & General Capital aims to demonstrate, with scientific rigour, an absolute reduction in Scope one and two emissions for its housing investments. Scopes one and two cover direct emissions from sources controlled or owned by an organisation and indirect emissions from how the energy it purchases and uses is produced. This puts the science of sustainability into action and allows investment to walk the talk.

To accelerate its ambitions, Legal & General Capital seeks partners and investors to work alongside it, driving forward change through pioneering new technologies. This collaborative approach allows profits and purposes to co-exist.

Working together towards the energy transition

As an energy transition investor, Legal & General Capital is committed to making a deliberate and ongoing shift into assets that can help tackle greenhouse gas emissions and support the transition to net zero. The company is part of the well-known UK institution Legal & General Group, which was established in 1836 and now has over £1.3tn in total assets under management.

Beyond innovations in housing, the clean energy lens at Legal & General Capital is focused on broad renewable energy infrastructure and clean-technology growth businesses. These span a spectrum of investment opportunities, from grid-scale to community level and mature to early-stage solutions.

Wind and solar power are proven and investible, with a range of mainstream players already active in this space, many of whom seek to satisfy the demands of environmental, social and governance (ESG) investment criteria.

As a true energy transition investor, though, the approach at Legal & General Capital is unique, according to John Bromley, managing director of clean energy, Legal & General Capital. "When we invest in a company, we work as partners. Our team does not simply view an investment from afar. We take a genuine interest in strategic decision-making, setting our sights on the successful long-term growth of the business," he says.

"This means we gain a deeper understanding of the role that each business and its talented teams could play in the energy transition. It also opens the door to opportunities, from assets and infrastructure to innovations and ideas. Delivering on net zero involves the entire ecosystem of sustainable solutions available to decarbonise the economy and meet societal needs," Bromley concludes.

In investment terms, the face of the future of the energy transition is changing.

Record-breaking renewables

In growth equity, Legal & General Capital has made various crucial investments over the past six years, focusing on decarbonising power, transportation, and the built environment.

In 2015, Legal & General Capital began investing in NTR Asset Management Europe, a sustainable infrastructure manager specialising in the construction and long-term operation of wind farms, solar plants and battery storage assets across the UK and Europe. In addition to investing directly into the management business to incubate its growth, Legal & General Capital has provided cornerstone capital for three significant fund raises. This ambitious model, which Legal & General Capital is looking to replicate in other areas, presented the opportunity for a range of investors to fund a blend of renewable energy assets and accelerate the transition.

> **This is not about ticking boxes on ESG; sustainability is a strategic imperative**

Similarly, Legal & General Capital's continued investment in companies such as Cambridge Electric Cement, Rovco-Vaarst, Brill Power, Tokamak Energy and Oxford PV, also provides a firm example of its policy of seeking innovations and technology that can accelerate progress to a low-carbon economy while offering strong potential returns for investors.

Oxford PV, for example, is a pioneer in solar photovoltaics and a University of Oxford spin-out. It has been working to commercialise a low-cost solar cell material called perovskite, which can help solar panels generate a lot more electricity from sunlight and accelerate the deployment of solar energy.

Investing in partnerships that ignite change

Whether addressing the chronic under-supply of climate-ready new housing, scaling the development of clean power infrastructure, or backing innovative start-up businesses and entrepreneurs, the challenge lies in decoupling economic growth from rising emissions.

Being an energy transition investor, therefore, can mean smart and sustainable solutions come in many shapes and sizes. But they all have one thing in common: purposeful partnerships that effect change.

For more information, visit www.legalandgeneralcapital.com

Legal & General

Strategic support moves electric vehicles forward

When Legal & General Capital partnered with the electric vehicle (EV) charging business Pod Point in 2019, the EV revolution was barely off the ground in the UK. This was a year before the UK government's groundbreaking announcement that it would effectively ban the sale of new petrol and diesel cars in the UK by 2030.

The involvement of Legal & General Capital so early in the sector boosted the capabilities, sending out a strong market signal in support of the scale-up of EV charging infrastructure in the UK.

The piecemeal roll-out of charging infrastructure nationwide had been identified as a potential roadblock to UK progress on the decarbonisation of transport. But, Pod Point offered an attractive investment prospect with its smart solutions for keeping vehicles topped up at home and destinations like supermarkets and workplaces.

Building on this promising partnership, Legal & General Capital soon increased its stake to about 23% in February 2020, forming a joint venture strategic partnership with energy giant EDF. The following year, Pod Point floated on the London Stock Exchange in a move that marked the maturing of both a dynamic young business and the UK charging market.

Going public also opened up the opportunity for many more investors to participate in the rapid growth of the electric vehicle market and help move the UK forward on its journey towards net zero.

> **Delivering on net zero involves the entire ecosystem of sustainable solutions available to decarbonise the economy and meet societal needs**

Commercial feature

Q&A

Why we need a diverse approach to decarbonisation

Achieving net zero is critical but how can economically vital industries continue to operate during the transition? The answer involves providing the right power solutions at the right time, explains **Jennifer Rumsey**, president and CEO at Cummins

Q **Many businesses see decarbonisation as too big a challenge, at least in the short term. As a global power technology company, how are you turning these challenges into opportunities?**

A We recognise that the markets we serve play a role in contributing to the problem of climate change, and we have an opportunity and a responsibility to be part of the solution. Our strategy to reach net-zero emissions by 2050, Destination Zero, is a growth opportunity and our entire business plays a role in executing it. We have a dual path approach, focusing in parallel on reducing CO2 emissions from engine-based solutions while also advancing alternative solutions that can reach zero CO2 emissions. Cummins' estimated impact on the planet of progressing this plan means an additional 1.4 gigatons of cumulative carbon reduction – the equivalent of removing all trucks from the road for three years.

We're leveraging the key capabilities that we've built up over decades, from innovative technologies to collaborative relationships with stakeholders and partners. We'll use these skills to lead the industry and our customers through the energy transition, offering them the right solutions at the right time. We can't do it alone. It will take all of us working together to address a challenge of this magnitude, as decarbonisation of our economy is critical to our way of life and a sustainable future.

Q **What are the biggest barriers to making progress on climate-change goals? What are the solutions?**

A First, significant infrastructure, charging and refuelling capabilities, are key for adoption, and that infrastructure must be decarbonised. Second, pure economics – the costs today are high. This requires both scaling up as well as advancing technology further in many cases. Third, acceptance – most customers understandably want assurances that these new solutions can meet their needs reliably and allow them to continue to operate their business and meet payroll for their employees. Lastly, regulations will drive progress across these areas, both with stricter emissions rules, but also by potentially narrowing the economic gap, helping to make zero-emissions solutions more affordable for the customer and the manufacturer.

Q **What should your customers be doing now? Can you give some examples from your own portfolio of products and services?**

A We power some of the world's most demanding and economically vital applications, from large articulated trucks moving products across the country to delivery trucks bringing packages to your front door and buses taking our kids to school and our neighbours to work. We also power trains and ships moving goods around the world and provide critical backup power to hospitals, data centres and banks. Our customers look to us to leverage our expertise and provide them with the right solution to power their needs throughout the energy transition.

To provide economic value to our customers, we offer a combination of solutions that can both serve their needs today and pivot in the future as technology and infrastructure evolve. We recognise that Euro 7 advanced diesel engines and hydrogen internal combustion engine technology can be part of the solution to reducing emissions.

We have been awarded significant government funding through the Advanced Propulsion Centre (APC) programme for the development of a zero-carbon, hydrogen-fuelled engine in Darlington. This technology will be a critical, early and practical step towards decarbonising the commercial vehicle and construction machinery segments that we serve.

> **There isn't a one-size-fits-all solution for all our diverse markets, which is why with Destination Zero, we're investing in a broad portfolio of power solutions**

Q **There's currently a lot of focus on emerging hydrogen technologies – how do you see this translating into practical solutions?**

A We're in a period where these pacing factors really impact the viability of emerging technologies. There isn't a one-size-fits-all solution for all our diverse markets, which is why with Destination Zero, we're investing in a broad portfolio of power solutions, leveraging our deep understanding of our customers as we work to decarbonise our industry in a way that is best for all stakeholders. We've developed a company with the broadest combination of zero-emissions technologies dedicated to the commercial vehicle industry: fuel cells, battery systems and fuel storage technologies – a vast global footprint and world-class talent.

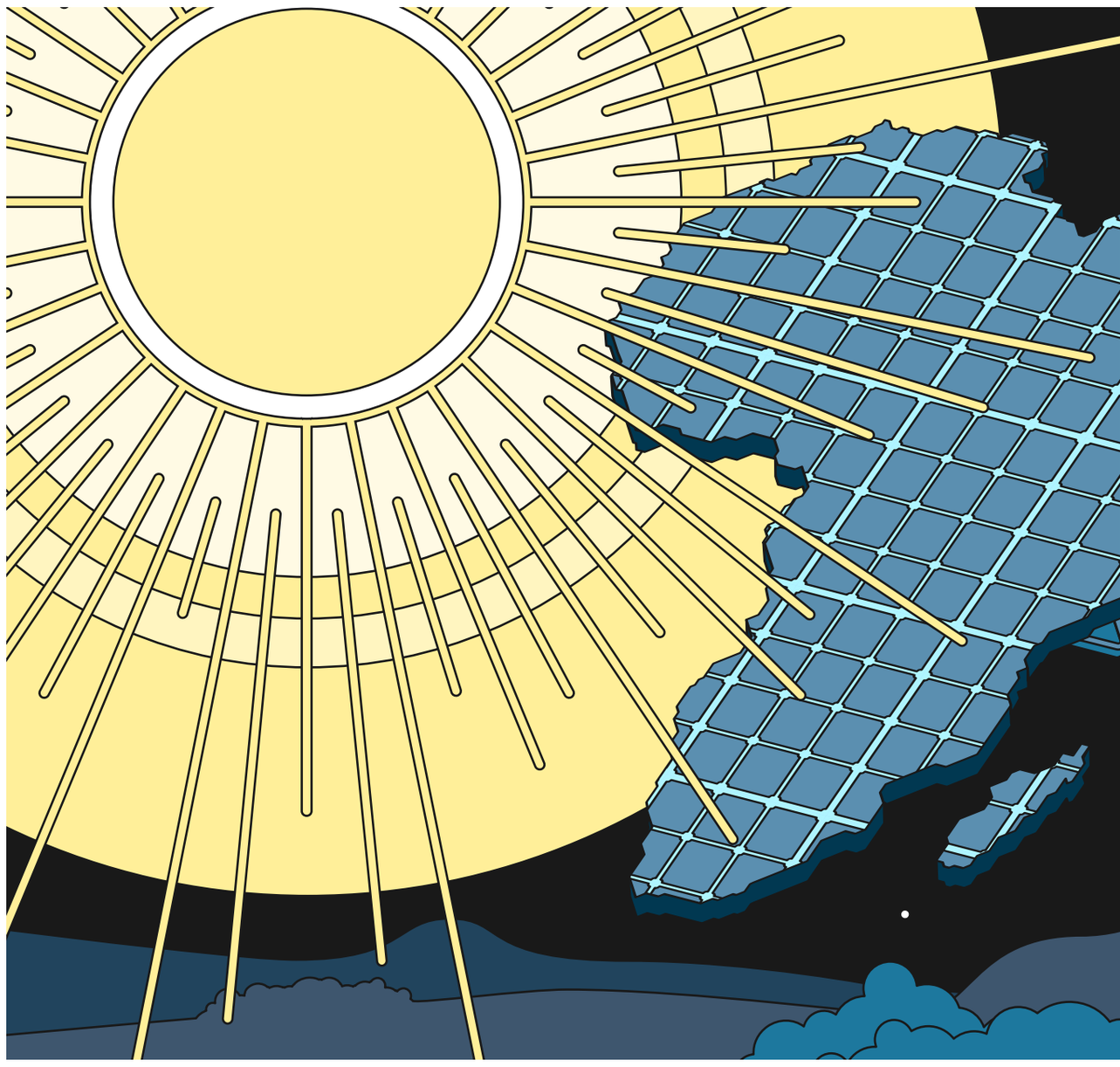
Q **Partnerships will be essential to reach net zero. Can you tell us something about your recent partnerships or acquisitions? What's been the thinking behind these collaborations?**

A Achieving net zero will require all parties – government, non-profit and civic organisations and industry – to work together. We need governments to incentivise zero-emissions solutions to drive their adoption. We also need the investment to build out and decarbonise the infrastructure that is required for these zero-emission solutions. We'll leverage our partnerships with our suppliers, our customers and other stakeholders to create this change. We're building partnerships with prominent original equipment manufacturers (OEMs) such as Daimler, Versatile and Tata Motors and end customers as we focus on new technologies and infrastructure to support the decarbonisation journey. We have made significant investments to rise to the decarbonisation challenge, including the recent acquisition of Meritor and connected, subsequent acquisition of Siemens' Commercial Vehicles business, a leading global supplier of high-performance electric drive systems for commercial vehicles.

Our business is only as healthy as the communities in which we operate, and Cummins creates impact by identifying opportunities in which we can use the unique knowledge and skills of our employees. Through our Water Works programme, for example, we are working to address water stress, one of the primary effects of climate change, by partnering with leading water experts and investing and engaging in sustainable, large-scale, high-impact water projects around the world.

We have an opportunity and the responsibility to leverage our expertise to develop sustainable solutions that positively impact our communities and protect our planet for future generations.

To learn more, visit cummins.com



TECHNOLOGY

The climate tech startups fighting for Africa's future

Tech entrepreneurs in Africa could solve some of the continent's biggest problems while helping to save the planet. But they still need to bridge the 'capital gap', report founders and investors

Clara Murray

Climate tech is one of the hottest categories for European and US startups and scale-ups, with more than $111bn (£97bn) raised globally last year. Hundreds of companies are developing innovative ways to slash CO_2 emissions and remove carbon from the atmosphere, accelerating rich nations towards net zero.

But green tech fulfils different needs in the world's poorest continent. Africa is responsible for less than 4% of the world's greenhouse gas emissions and most of its people have a minuscule environmental impact. Its main challenge is adapting to an already changing climate while developing the economy sustainably – and it's one that a new crop of tech founders is tackling head-on.

"People are starting to connect the dots on how technology can help them navigate the impact of climate change," says Brian Bosire. A serial entrepreneur at 27, he has founded three technology-led companies in his native Kenya.

The newest of these, HydroIQ, addresses the problem of unreliable water supplies. Kenya is in the grips of its worst drought in 40 years – and poor infrastructure means that half of its piped water is wasted. As a result, millions of people in the capital, Nairobi, are paying water bills that average 11% of their household incomes. Despite this, "there is no water coming out of the taps two or three days a week", Bosire says.

To remedy this, HydroIQ's technology monitors water networks to identify leaks, predict demand and give utility companies and consumers more accurate billing data. Backed by Techstars, Partech Partners and Google for Startups, it has already expanded to Central America (Guatemala), with Nigeria and South Africa lined up next.

"Water is a critical resource and it always elicits some emotions, especially when you're trying to change how things are done," Bosire says of the regulatory hurdles he's faced along the way. "But there is something special that comes with designing a solution for a problem that you have lived with all your life."

Inspiration was also hard-won for Ghana-born Nthabiseng Mosia, co-founder and chief commercial officer of solar energy company Easy Solar. She experienced regular rolling blackouts while at high school in South Africa. "The first time you realise something is a privilege is when you don't have it," she says.

Mosia went to graduate school in the US to learn how to build large-scale energy projects, but changed tack when she met her two co-founders, one of whom had lived and worked in Sierra Leone. In 2015, 95% of the country's non-urban population did not have access to electricity.

"We thought that was just not OK. We truly believe that energy is a universal human right," she says.

With the economy struggling to recover after the ebola epidemic, grid electricity was a distant prospect. "There had been promises of electricity coming into villages for 10 years," Mosia says. "A lot of people had seen projects come and go. There was a deep sense of distrust."

Easy Solar stepped into that gap by selling modular 'plug and play' solar kits. These range from simple torches right up to rooftop panels that can power fridges. Most equipment is sold on a rent-to-buy basis. Customers often start with a basic kit and then add upgrades as they pay it off.

> **There is something special that comes with designing a solution for a problem that you have lived with all your life**

The firm is expanding into neighbouring Liberia and has already brought energy access to 720,000 people. With 60% of Africa's population still without electricity, it's a potentially huge market and one that several similar companies in other countries, including SolarNow in Uganda and Oolu in Senegal, are addressing.

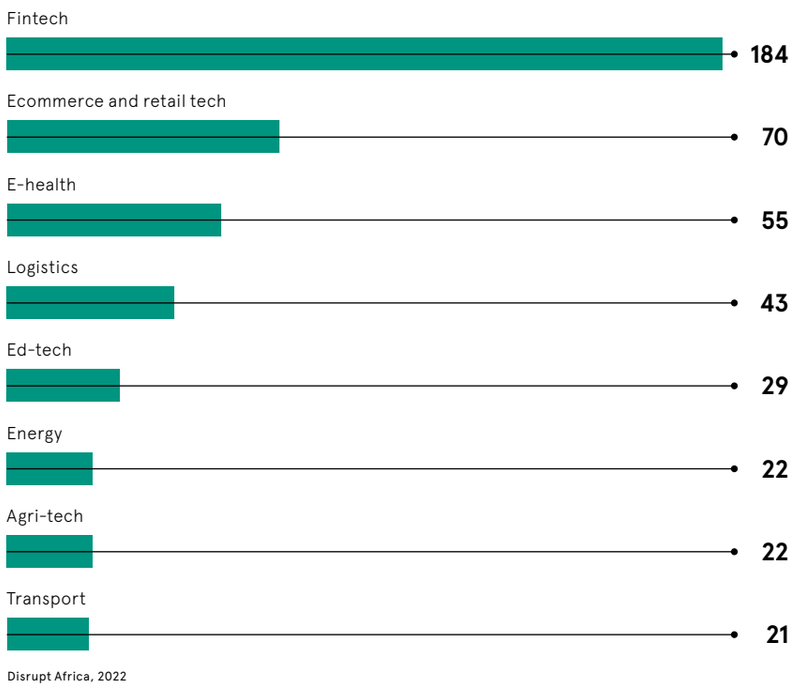
Could this be a sign of Africa leapfrogging the West in developing a low-carbon economy? Mosia is unsure: "I feel that we have the benefit in Africa of looking forwards and backwards at the same time. But it's unfair to expect us to follow a model that nobody has ever done and rise above a problem that we didn't create. Not every African country can build [solar] projects at scale, while there are also entrenched interests here in oil and gas. Instead of being frustrated with that, I look at what is the fastest, least costly way to ensure that no one's left behind. And that happens to be solar. So it's a win-win."

Laila Ayman, the 23-year-old Egyptian founder of BioPre, spotted another potential win-win while working in agriculture after graduating from the Malaysian campus of the University of Nottingham with a degree in biomedical sciences. She discovered that much of the huge volume of waste produced by Egypt's farms simply gets incinerated. The country is also one of the biggest plastic polluters in its region.

Ayman developed a method to extract polymers from discarded materials such as corn husks and turn them into biodegradable packaging. She explains: "The vision is

MOST STARTUP FINANCE IN AFRICA GOES TO A HANDFUL OF INDUSTRIES

Number of African tech startups funded in 2021, by sector



Disrupt Africa, 2022

to make bio-based materials that challenge the dominance of conventional plastic. I'm passionate about waste management and recycling, a completely closed loop where everything has another life."

BioPre is planning to pay small farmers for their waste. "I'm hoping that we can alter the narrative to match developing countries and people who do not know what big words such as 'sustainability' and 'biodegradable' mean," Ayman says. "We want to use a different tone of voice: 'Your waste has a role to play and it can make you money.'"

Unsurprisingly for a continent where 61% of people work in farming, agriculture is the focus for many of Africa's tech entrepreneurs. It's also at the sharp end of climate adaptation efforts: as the weather becomes less predictable, people's income and food come under ever greater threat.

Mali-based insurer OKO is one of several startups working to smooth out the changing conditions. It uses satellite and sensor data to track weather patterns and automatically compensate smallholder farmers for crops ruined by flood or drought.

"Farmers who have insurance are more climate-resilient," says Simon Schwall, the company's Luxembourg-born, Tel Aviv-based CEO. "After a bad season, when they don't have the income that they expected from their harvest, they can count on an alternative source of funding."

To date, OKO has paid about 3,000 farmers in Mali, Uganda and Côte d'Ivoire who might previously have been forced to sell equipment, borrow money or pull their children out of school to make ends meet.

Its platform is built on mobile payments technology, which lets people without bank accounts or internet access pay for goods using even 'dumb' phones. The technology is booming in many African countries to the extent that ATMs are being removed from the streets in Kenya, the home of market leader M-Pesa. But Schwall emphasises that there is still a long way to go on technology uptake in OKO's impoverished markets.

17%

of the world's population is African.

But only

3%

of global carbon emissions come from Africa.

By 2100, the continent will be home to

1/3

of all people

United Nations, 2022

"The fact that insurance is available does not mean that people know what it is," he says. "Many farmers in Mali are illiterate, so we need to combine this tech with a human presence. We have field agents who go from farm to farm. It's a demanding task because we must educate people first."

But it's not only potential customers who need educating. Although OKO has raised £1.7m from the EU, the Israel Innovation Authority and Techstars, Schwall says that attracting finance has been a struggle: "A lot of investors aren't comfortable investing in Africa. They don't have the metrics to analyse companies here and they don't know what level of risk they're taking."

According to PwC, only 0.2% of global climate tech deals in 2021 were inked in Africa, compared with 93% in Europe, the US and China. Outside the big four markets of Egypt, Kenya, Nigeria and South Africa, attracting funding is even harder. In some cases, startups may partner with multinationals to help improve their supply chain sustainability. Beer giant AB InBev works with both OKO and HydroIQ, for instance. Money can also come through climate finance pledges or institutions such as the African Development Bank.

> **It's unfair to expect Africa to rise above a problem that we didn't create**

But there remains "a massive capital gap that funders across the capital spectrum need to step up to fill," says Scott Onder, chief investment officer at Mercy Corps. The humanitarian NGO established an impact investing wing in 2015 to address issues such as climate resilience, backing firms in sectors including flood forecasting (Cloud to Street), reforestation (Open Forest Protocol) and crop insurance (Pula).

Onder agrees that many foreign investors don't understand Africa well. "You really do need to have local investors that appreciate the tech infrastructure, the market conditions, the regulations and how these differ from market to market," he says.

A few Africa-focused funds exist, including Africa ClimAccelerator and Growth Africa, but Bosire confirms that "getting financial support locally is challenging. Investors are still more into traditional businesses rather than new technologies."

But what of the UN's COP27 climate conference in November, which had a stated focus on Africa? Has it changed anything for the continent's climate startup market?

Ayman reports that none of the Egyptian cleantech startups she knows received an invitation to Sharm el Sheikh. Fintech is attracting most of the attention – and cash – in Cairo's startup community, but that is starting to change.

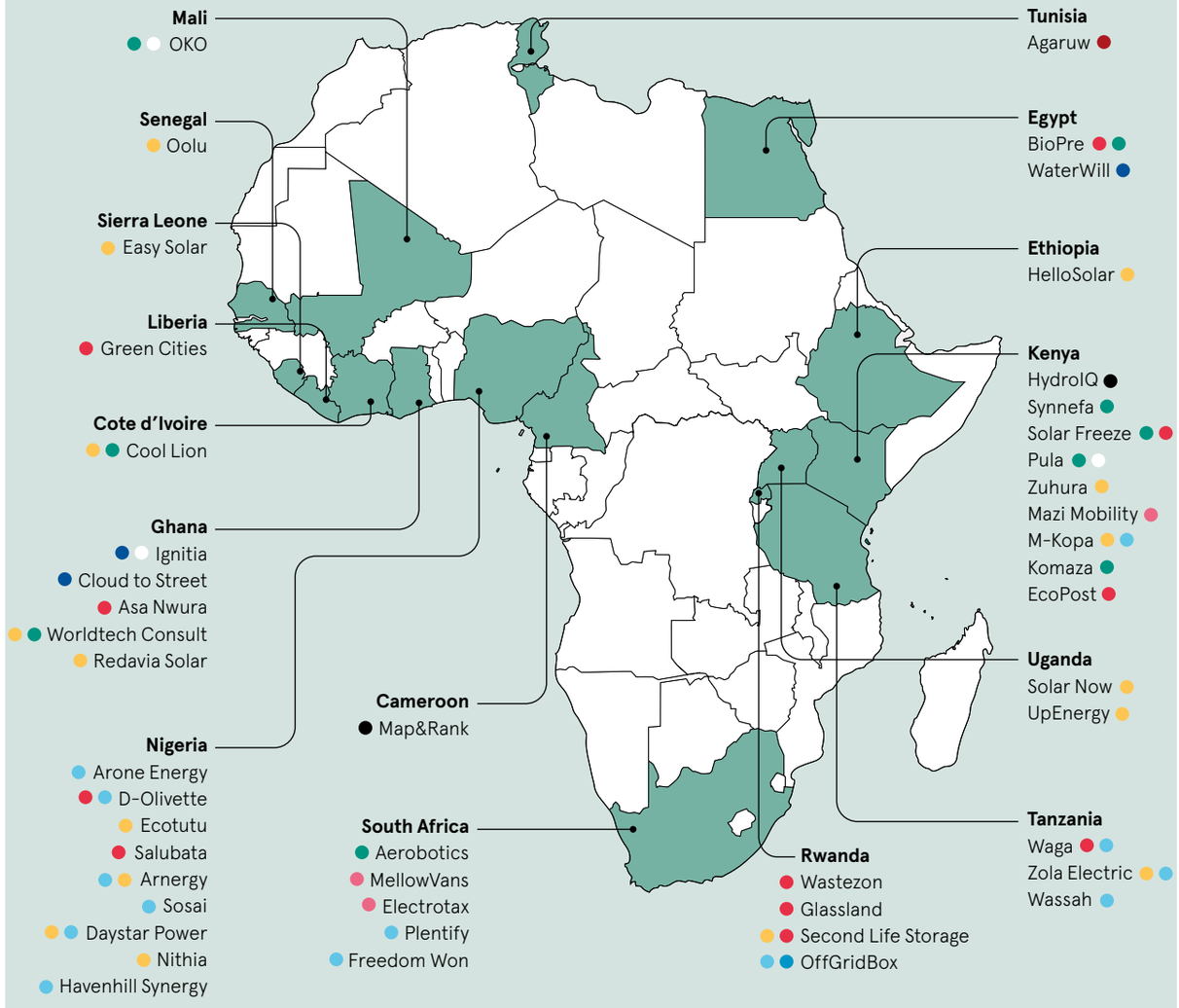
"I'm finally starting to see incubators and business accelerators that have a section for green or clean tech startups," she says.

Schwall notes that the trend-led nature of many startups can sometimes be beneficial when he pitches to investors. Whereas fads like electric scooters or rapid grocery delivery may come and go in the West, in Africa "we're dealing with a huge market of millions of people who need a solution".

He continues: "This is not going away any time soon. We need to produce more food; we need to secure the incomes of rural populations. So, even if it might look like a small business today, the potential is almost unlimited."

GREEN TECH STARTUPS IN AFRICA

Distribution and focus of leading new enterprises



THE STATE OF THE UK PUBLIC'S RELATIONSHIP WITH CLIMATE CHANGE AND SOLUTIONS

The UK public is aware of the threats of climate change

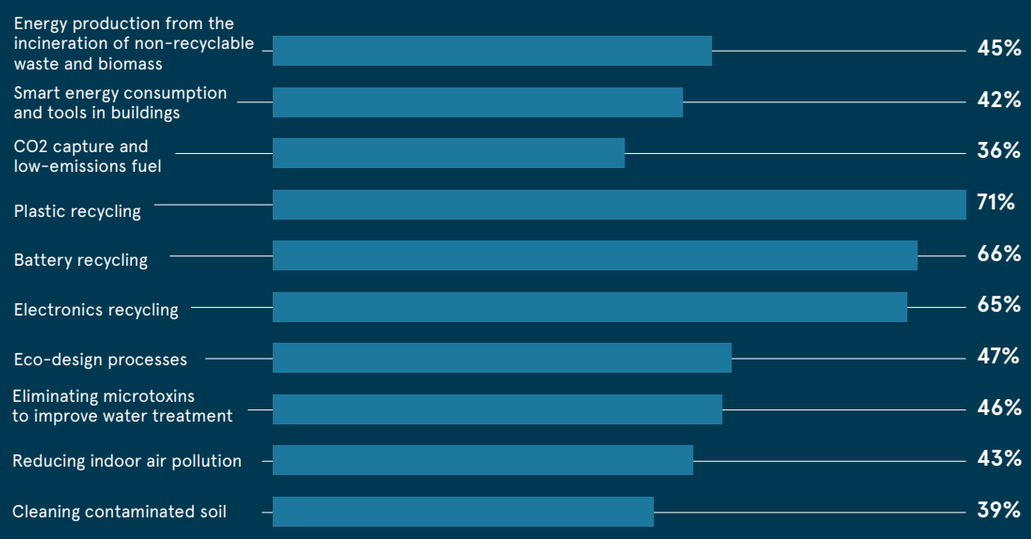
77% believe that the risk of climate disruption is serious and immediate

51% think that the future is still in our hands; we can still limit climate disruption and pollution

63% are certain the cost of climate disruption will be more important than the investment needed for ecological transformation

SOME OF THE SOLUTIONS TO CLIMATE CHANGE ARE STILL UNKNOWN TO UK RESIDENTS

The percentage of the UK public that is aware of climate actions



PEOPLE ARE MOST WILLING TO CHANGE THEIR DAILY RECYCLING HABITS

Willingness of the UK public to make change

#01 Sort your waste more

#02 Buy food packaged in recycled materials

#03 Buy everyday products made from recycled materials

The First Barometer of Ecological Transformation - Veolia Elabe, 2022

Squaring the circle: sustainable growth in times of crisis

Shifting to circular economy principles can help business leaders to reconcile their economic growth and sustainability goals, while also improving resilience

The war, rising energy costs, labour shortages, a cost-of-living squeeze, supply chain disruption...the list of crises that businesses face grows by the day. And then, of course, there's that planet-sized elephant in the room: climate change. But what if there was a way for the c-suite to deliver better economic and environmental performance while also improving organisational resilience to world events?

In fact, there is: the circular economy. It involves moving away from a linear 'take, make and dispose' model and toward a 'reduce, reuse, repair and recycle' one that keeps existing resources in use for as long as possible. For businesses, it offers a path to a more sustainable future; and crucially one that is financially sound and resilient to disruption.

Firms that take the first steps along this path are likely to be rewarded by the public. A recent survey by the leading resource management company, Veolia revealed that while 77% of people in the UK think the risk of climate disruption is serious and immediate, only 11% think it's too late to change course. For business, over 80% of respondents also said they would buy everyday products packaged in or made from recycled content.

"The behaviour of consumers is very important for businesses, and over the last few years we've seen a big increase in pledges to change and adapt – to improve the eco-design of packaging, for example," says Tim Duret, director of sustainable technology at Veolia UK, which champions ecological transformation. "Obviously it can have a cost (but not always) for industries, but over the long term it will provide savings."

The shift to circular practices is essential for both businesses and the environment. "The public are increasingly conscious of their impact and are ready to embrace the environmental solutions needed" says Gavin Graveson, senior executive vice-president, Northern Europe zone, at Veolia. "It's now up to businesses and governments to push faster towards ecological transformation because we can't rely on fossil fuels or virgin materials. The time is now, we need to invest in resilience because we can't afford – both financially and environmentally – to do nothing."

Cross-industry impact

As practically every industry produces a waste stream, the shift to a circular economy could have a deep and wide-ranging impact. In the petrochemical industry, for instance, sulphuric acid – one of the most widely used chemicals in the world – can be regenerated to give it a second life. Valuable solvent components can also be extracted from mixed waste streams, sent for solvent recovery and reused, thereby reducing both the need for virgin solvent and the financial impact of purchasing raw materials.

Wastewater is also a potential source of energy, biosolids and other resources such as nutrients. This, as the World Bank says: "Represents an economic and financial benefit that contributes to the sustainability of water supply and sanitation systems and the water utilities operating them." And while recycling and remanufacturing are already practised in the automotive industry, car manufacturers are now launching dedicated circular economy initiatives to generate higher revenues and reduce material sourcing costs.

Electric vehicle (EV) battery circularity is of increasing importance too. An anticipated 350,000 tonnes of end-of-life EV batteries are predicted to be in the UK by 2040 – a source of vast amounts of valuable resources like lithium, nickel, copper and cobalt.

> **We can't rely on fossil fuels or virgin materials. The time is now, we need to invest in resilience because we can't afford to do nothing**

Veolia's recently announced electric vehicle battery recycling facility in the West Midlands will have the capacity to process 20% of the UK's end-of-life electric vehicle batteries by 2024. "As the demand for electric vehicles increases, we will need this facility to ensure we don't hit a resource crisis in the next decade," says Graveson.

The plant will discharge and dismantle batteries before the mechanical and chemical separation recycling processes are completed, enabling the valuable minerals they contain to be reused.

"When we go from a linear economy to a circular economy, one of the things we are doing is increasing our resilience," says Duret. "Batteries, for example, require lithium – and we have minute levels of lithium in the ground in the UK."

Recovering lithium and metals such as copper and aluminium from EV batteries – a process known as 'urban mining' – could also cut greenhouse gas emissions from battery production by 50%. As an estimated 500,000 gallons of water are required to extract one tonne of lithium using traditional mining processes, it will also drastically reduce water consumption.

Securing supply chains

Critical mineral scarcity could impact everything from mobile phones to televisions and medical devices. Today's supplies are predominantly overseas, meaning UK industry is highly vulnerable to market shocks, geopolitical events and supply chain disruptions. The fact that these minerals are also an essential component of wind turbines means they are also vital for boosting renewables and improving the UK's energy security.

"Again, it's about providing the recycled materials from the UK to manufacture new products without having to import raw material from around the globe." says Duret. "It provides a greener economy but also a more stable economy, because when the source of the material is within the UK, then we don't have to worry about transportation, and we don't have to worry about geopolitical disruption abroad. So, it's good for the planet, and it's good for the economy too."

Food waste is another potential source of domestic energy, as it can be used for the production of biogas. But the Department for Environment, Food, and Rural Affairs' Environment Act, which will make it a legal requirement in England for companies to recycle food waste, should start to tip the balance toward an even more circular model.

"It will help companies like Veolia to collect more [food] waste and transform it into either organic fertiliser for the farmers or compost for the general public, but also energy [in the form of biogas]," Duret says.

Can the circular economy really deliver better economic and environmental performance while also improving organisational resilience to world events? "One hundred percent," says Duret. "It's a win for the environment, for businesses and for society."

For more, please visit www.veolia.co.uk/raconteur

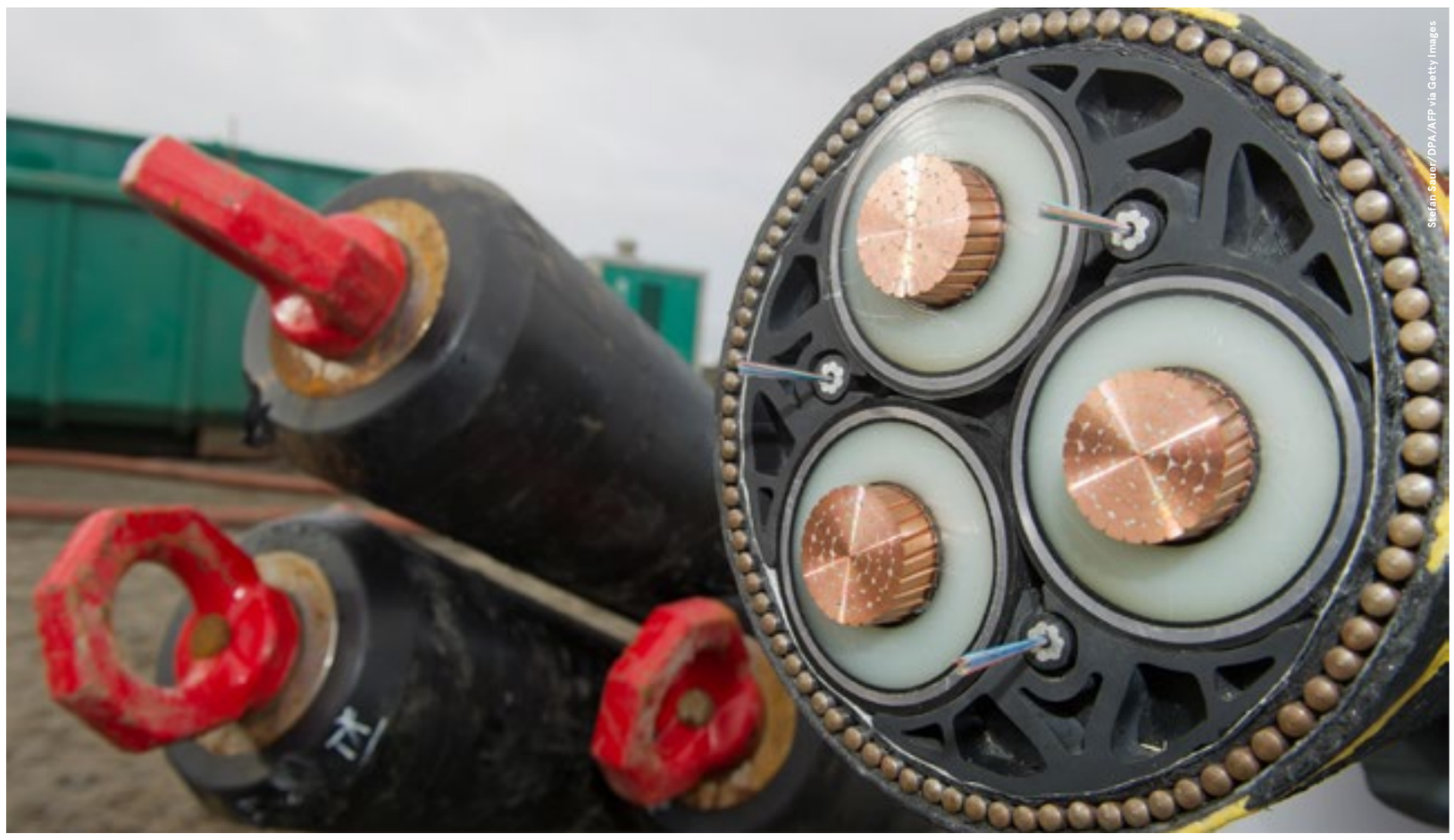
VEOLIA

ENERGY

20,000 megawatts under the sea

Several ambitious projects are afoot to lay submarine cables that will enable renewable electricity producers to export clean power to consumers hundreds, if not thousands, of miles away

Natasha Khullar Relph


Stefan Sauer/DPA/AFP via Getty Images

In the Guelmim-Oued Noun region of southern Morocco, plans are in place to construct a 10.5GW solar and wind farm. More than a third of the power it's set to produce will be sent to homes and businesses in the UK.

If all goes well, the £18bn Morocco-UK Power Project, which is scheduled to be up and running by 2030, will feed the national grid via four 2,400-mile subsea cables. This supply should deliver enough electricity to power 7 million homes, meeting almost 8% of the UK's electricity demand at a substantially lower cost than power generated by burning fossil fuels.

The project's developer is a company called Xlinks, founded in Billericay, Essex, in 2019. It points out that a solar array in the north-western Sahara can generate up to five times more power than a UK-based equivalent between January and March, given that even the shortest winter day there is likely to offer more than 10 hours of sunlight. The prevailing trade wind that blows from the desert into the Atlantic is particularly reliable too. This means that the project should not only provide cheap renewable energy, but also improve the UK's security of supply.

To hit the government's 2050 net-zero target, this country must fully decarbonise its electricity generation by 2035, notes the project's director, Richard Hardy.

"While renewables in the UK will be the cornerstone of this transition, reliable generation is what's vital," he says. "Locating this in an area such as Morocco gives access to a far more consistent generation profile."

Morocco has become a leader in renewable energy over the past decade, developing innovative projects as part of its domestic strategy and its plans to become an international green energy hub. During its construction phase, the Morocco-UK Power Project will contribute nearly 10,000 jobs to that burgeoning industry, of which about 2,000 are expected to become permanent.

While harnessing the power of the sun and wind is nothing new, transferring this abroad via undersea cables is. Hardy reports that similarly ambitious projects are starting to emerge.

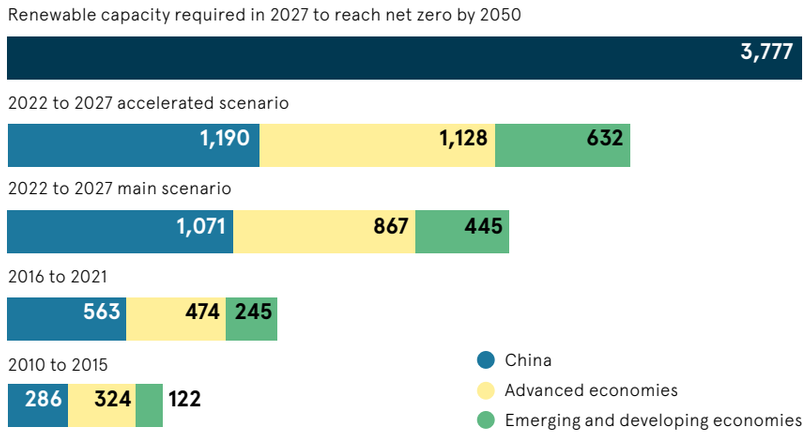
The ability to lay such long power lines "enables increased access to regions with better solar and wind resources", he says. "This means that a country is no longer dependent on meteorological conditions within a relatively limited area."

Another scheme is set to lay a cable under the Mediterranean that will be able to carry 3GW of solar power from Egypt to Greece. The £3bn Gregy Interconnection, as the project is called, has been deemed a "project of common interest" by the EU and is therefore eligible to receive public funding. Again, security of supply is a key objective, as the initiative should help Greece and other EU member states to reduce their dependence on Russian fossil fuels.

DEVELOPING ECONOMIES HAVE A BIG ROLE TO PLAY IN INCREASING RENEWABLE CAPACITY

International Energy Agency, 2022

Renewable capacity growth in the International Energy Agency's main and accelerated cases, 2010–27 (gigawatts)



> **It's pretty crazy that a cable to Morocco is looking like it would cost less than building a nuclear power station here in the UK**

The UK has also signed a deal with Germany to connect their grids with a link under the North Sea. Italian cable manufacturer Prysmian started producing the 450-mile NeuConnect line in October. Once laid, this will allow 1.4GW of electricity to pass in either direction. The UK will then be able to tap into Germany's vast energy infrastructure and also send excess electricity from its wind farms the other way.

And, in what is being touted as the world's biggest clean energy project, Australia will soon be transporting power more than 3,100 miles under the sea to Singapore. The project, which will feature the world's largest solar farm and battery storage facility to date, is expected to cost £18bn and cut about 11.5 million tonnes of CO_2 emissions every year – roughly the equivalent of removing 2.5 million cars from the road.

David Griffin is the founder and CEO of Sun Cable, the company running the project. He envisages that "this will be the first of many. The need for a supply of renewable energy from resource-abundant regions to large growing loads will become more and more intense as years go by."

As the demand for renewable energy grows globally, many emerging markets are positioning themselves as leading exporters of clean electricity. Above even Morocco is Indonesia, where five solar power export projects have been proposed in recent months.

Jack Richardson is senior climate programme manager at the Conservative Environment Network, an independent forum for eco-conscious Tories. He believes that it's inevitable that there will be more schemes of this type.

This is partly because of the "need to transition away from oil and gas markets, which are controlled by the Opec cartel and countries such as Russia", and partly because renewable power is so cost-effective, Richardson says. "It's pretty crazy that a cable to Morocco is looking like it would cost less than building a nuclear power station here in the UK."

Alongside the potential benefits associated with such schemes, there are inevitably significant concerns to address, including the need to protect delicate marine ecosystems – which was covered when planning the Morocco-to-UK link, Hardy confirms. One of the key questions to consider is whether large-scale export deals will enable wealthier countries to achieve their climate goals at the expense of emerging markets.

Take Indonesia, for instance. Although the country is planning to install 17GW of new solar generation capacity, less than a third of that has been earmarked for domestic use, which would still leave the country dependent on coal for its electricity needs.

Similar concerns have been raised on Morocco's behalf. A research report published by German environmental think-tank the Heinrich Böll Foundation recently questioned whether such an export-heavy approach would limit the country's own ability to shift to renewable energy. This is precisely why the government of Malaysia has banned exports of renewable energy until the country is in a good enough position to achieve its climate goals.

Despite this, many experts believe that, if emerging economies can strike the right balance between generating export revenue and ensuring their own transition, the net result is likely to be positive.

"I think there's a real opportunity here," Richardson says. "It's a chance to work with, and invest in, developing countries and deliver for the environment, while eroding the ability of petrostates and dictators to do us harm via the fossil-fuel markets." ●

INSIGHT

'To get going on sustainability, businesses must lead with strategy'

Piecemeal efforts to reduce emissions are doomed to failure if they aren't part of an actionable business strategy, says **Mike Peirce**, executive director of systems change at Climate Group

Q What's hindering businesses from taking more concerted action on sustainability?

A Hundreds of leading companies have committed to act on climate change, whether that's by adopting a comprehensive net-zero strategy or by attempting more targeted action on key emission sources, from the energy they buy to the materials they procure.

More businesses still need to take this step, but it's clear that the barriers to progress lie more in the doing than in the commitment. In short, this is about how to get organisations going and how to accelerate their action.

Earlier this year, alongside Oliver Wyman, we interviewed 30 corporate climate professionals and surveyed climate practitioners from more than 100 companies. What emerged from this study is that getting to grips with strategy is imperative and that, in its absence, the task of reporting can actually overwhelm the task of transition.

Reporting matters, of course, and metrics can provide the impetus for change. But, without a clear strategy, the changes needed can be too fundamental for this to work. Going without a strategy risks shifting an organisation's focus to near-term incremental efforts that won't achieve what's required.

Q What's the alternative to conventional carbon footprint measurement?

A There are increasingly sophisticated options available for defining and measuring climate impact, from science-based targets to more focused assessments on key issues such as the use of renewables, energy efficiency, materials procurement and supply chain emissions.

Yet alongside better measurement, to get going businesses must lead with strategy. Focusing on how a company contributes to the transition, rather than its emissions outcomes, is vital for orchestrating the big shifts needed.

Instead of the climate agenda being viewed as the responsibility of specialist sustainability teams, it must be embedded across organisations and seen as part of business as usual.

Q What are the key drivers of action in the companies that are leading on these issues?

A Business transformation calls for strategic direction. Our interviews with the climate professionals uncovered four core enabling factors that make progress possible.

First, climate action needs to be given attention across the organisation at all management levels. The case for taking it should be framed in commercial terms.

Second, it's about creating an inspirational vision for the business – something that everyone can get behind and feel positive about. It's like putting a flag in the sand and showing everyone the direction of change.

Third, the vision must be embedded into the reality of the company's operations. This can be done by creating a 'glide path' to break down the vision into manageable, actionable steps while keeping the end goal in sight.

Lastly, it's about instilling accountability to incentivise the actions needed. Set out shared but clear responsibilities across the organisation.

Q What might a more effective sustainability strategy look like?

A The most successful of the companies we surveyed are breaking down their sustainability strategies into manageable, actionable steps. For instance, PepsiCo has calculated its route to net zero by finding the annual reductions that must happen up to 2030, as set out by the Intergovernmental Panel on Climate Change, and then multiplying those to reflect its desire to lead the industry. These targets are then broken down by sector, with each CEO being held accountable for their business unit's reductions.

Another effective approach is to foster a learning environment that creates a network of champions. To this end, Novo Nordisk has set up an employee education programme called Circular for Zero. The learning path is based on the participants' level of expertise, depending on where their part of the organisation is on its climate journey.

These are only a couple of examples – we've heard many stories of what makes climate action possible. No matter what approach a firm takes, though, it's worth remembering that climate change is a collective problem. The sooner we all act, the better, because every fraction of a degree counts. ●

To read the full findings of the study, visit theclimategroup.org/getting-going

Mike Peirce
Executive director of systems change, Climate Group

IMPLEMENTATION

Getting serious: what business can take away from Sharm El Sheikh

As the dust settles on the COP27 summit, how should companies be preparing themselves for the challenges of climate change?

Amy Nguyen

It was to be "the implementation COP" – the time for governments to buckle down and get things done – declared Frans Timmermans, executive vice-president for the European green deal, before the United Nations' COP27 climate conference in November. His prediction proved largely inaccurate.

The summit, held in Sharm El Sheikh, Egypt, did have its moments, from a pledge on methane emissions signed by 150 countries to historic announcements committing loss-and-damage funds. But the heavy presence of oil and gas lobbyists and the event's failure to agree on the phasing out of fossil fuels were a huge disappointment to climate campaigners.

What can business leaders do to take up the net-zero slack? Here are five key points to take from COP27.

> **Transparency helps external stakeholders to monitor progress, which lends credibility**

Focus on the credibility of your net-zero claims

A series of new resources were released at COP27 to help companies track their progress towards net zero. The *ISO Net Zero Guidelines*, for instance, provide standardised definitions of key climate concepts and a detailed guide to alignment, prioritisation and reporting.

Elsewhere, the UN High-Level Expert Group on the Net Zero Emissions Commitments of Non-State Entities (HLEG) issued a seminal report called *Integrity Matters*. This sets out the importance of delivering on near-term emission reduction targets and verifying these through scientific and third-party climate accounting.

"We must have zero tolerance for net-zero greenwashing," declared the UN's secretary-general, António Guterres, on the report's publication.

The UK's Transition Plan Taskforce (TPT), created by the government after the COP26 conference in Glasgow, also provided valuable resources for businesses at COP27, including a disclosure framework. Jacques Morris, team leader at the TPT Secretariat, says that this was "intended to enable companies to develop and communicate credible, robust transition plans".

The TPT encourages companies to implement stronger governance and accountability mechanisms, as well as specific measures to address material risks. For instance, a firm's board is a crucial internal governance mechanism, Morris argues, chiefly in "designing, approving and monitoring delivery of the plan – and in ensuring that remuneration policies incentivise delivery".

Develop a strategy on biodiversity

For the first time, a COP cover decision officially recognised the importance of nature-based solutions. This put biodiversity in the spotlight, alongside the commitment to zero deforestation issued by Brazil's new president, Luiz Inácio Lula da Silva. The importance of biodiversity was further emphasised in the final communiqué from the G20 summit in Indonesia, which took place during the closing days of COP27.

Businesses also need to account for natural capital and the value of ecosystems within their climate strategies, targets and metrics in anticipation of the outcomes of the 15th conference of the parties to the UN convention on biological diversity (COP15) in Montreal. As this report goes to press, global leaders will be there, finalising targets for halting nature loss by 2030.

Some big companies already recognise the value of nature in their climate plans. "Climate change and biodiversity are two sides of the same coin", says Michael Alexander, global head of environment for drinks giant Diageo. "We've recently launched a regenerative agriculture pilot and a water preservation strategy, as well as deforestation guidelines for our supply chain."

Implementing nature-based solutions demonstrates a holistic approach to climate challenges. The HLEG report has underlined the importance of this concept: reversing nature loss is not only an environmental issue; it's also a social issue. Healthy ecosystems are key to achieving the UN's broader sustainable development goals too.

Double down on decarbonising supply chains

The global supply chains of only eight sectors – including food and fashion – account for more than half of all greenhouse gas emissions, according to the Boston Consulting Group. It's therefore no surprise that calls for tangible action to decarbonise supply chains and focus on scope-three emissions rang clear at COP27, just as they did at the 2022 World Economic Forum in Davos.

Businesses including Unilever and Ikea issued a joint declaration at COP27 urging other multinationals to put their supply chains under greater scrutiny. The HLEG's *Integrity Matters* report reiterated the urgency of a "deep reduction of emissions across their value chain". It noted that, while high-integrity carbon credits have a place in the net-zero transition, these cannot be counted towards non-state actors' interim reduction targets – a move that has been welcomed as a step in the right direction to decrease dependence on carbon offsetting.

Moving away from offsetting will be a vital element of instilling trust with stakeholders, according to Morris.

"Investors want to know whether a management team is taking the necessary steps to seize any opportunities that this transition raises or mitigate any risks it may pose," he explains.

Pushing for reductions in scope-three emissions throughout the supply chain and recalibrating procurement strategies towards renewable energy sources would also help on this front.

Embrace transparency to avoid 'greenhushing'

While greenwashing refers to the practice of making misleading environmental claims, COP27 highlighted the rise of so-called greenhushing. This is when organisations deliberately fail to report their sustainability or ESG performance for fear of the repercussions.

Research by the Planet Tracker think-tank has found that businesses typically greenhush to minimise regulatory risks or to maintain a sustainable image and so attract investors, even when their performance doesn't warrant it. Instead, managers should focus on being transparent about their progress towards climate targets, advises Planet Tracker's co-founder and director, Mark Campanale.

Accountability is a central pillar of the TPT's new disclosure framework, while radical transparency is one of the main principles outlined in the HLEG report. Morris stresses that helping external stakeholders to monitor a firm's progress lends credibility to its transition plans.

Adhering to reporting standards such as those issued by the Task Force on Climate-Related Financial Disclosures, the Sustainability Accounting Standards Board or the Global Reporting Initiative can help organisations to ensure that all bases are covered, whether their sustainability performance is good, bad or ugly.

Choose your affiliations carefully

Another important lesson for business leaders to take away from COP27 came before the conference even began. The credibility of the event was undermined in October, when it was announced that Coca-Cola would be a sponsor. According to environmental campaign group Break Free From Plastic, the soft drinks giant is the world's most pervasive plastic polluter and has increased its use of the material by more than 3 million tonnes since 2019.

Organisational affiliations that aren't aligned with a business's sustainability mission can erode intangible assets such as brand reputation, which is notoriously hard to rebuild.

The fact that a corporation with such a negative environmental reputation was associated with the conference did not go unnoticed. In response, more than 250,000 people signed a petition calling on the UN Framework Convention on Climate Change to stop accepting sponsorship money from Coca-Cola.

In a statement, the company defended its position, claiming it shares "the goal of eliminating waste from the ocean and appreciates efforts to raise awareness about this challenge".

Is collaboration the key to a sustainable future?

While the final agreement at COP27 fell short of expectations for many, the conference did reveal the pivotal role that business has to play in keeping the idea of 1.5 degrees alive

Dubbed the 'Implementation COP,' Egypt showed that the private sector was ready to do business and turn pledges into action. Vehicle manufacturers came together through the Accelerating to Zero Coalition to push forward with commitments to make all new car sales zero emission by 2035, and more than 550 financial institutions, with assets of over $150tn, are now partnering in the Race to Zero initiative. A growing number of companies are also setting science-based targets around reducing their greenhouse gas emissions.

Among them, Dekra is the world's largest non-listed expert organisation in the TIC sector which advises businesses from a range of sectors. "Implementing sustainability is not always easy, but businesses can't afford to ignore it," explains Stan Zurkiewicz, the company's chief executive.

No longer relegated to a segregated silo, sustainability is becoming integrated into every business unit as something that can bring economic returns and drive social and environmental impact. The company has a clear and ambitious vision of being the global partner for a safe, secure and sustainable world. On the road, at work and at home, its team is working to increase safety and sustainability across all the key areas of life.

"Delivering greater sustainability can bring strategic advantage too; it's not just about toeing the regulatory line," Zurkiewicz continues. "But to do this, collaboration is vital, not just because the issues are too big to tackle alone, but also because by working together, we can help to improve the sustainability of whole sectors."

Embracing the energy transition

One of the most pressing issues facing businesses today is energy and the transition to greener forms of generation. This push for net zero is leading to new technologies and processes, many of which are being developed at break-neck speed to replace long-established technologies.

The change from combustion engines to batteries and electric vehicles, for instance, or the shift to hydrogen as an energy source, all bring opportunities and advantages but also uncertainties and potential risks which need to be assessed and minimised. Companies adopting these new technologies must be confident that they will perform as promised.

Dekra is part of the testing, inspection and certification (TIC) sector, an industry that is playing a critical role in supporting other companies as they develop their sustainability strategies. "Independent, third-party verification is a new must-have for businesses who want to show stakeholders that they understand their responsibilities and the need for transparency," explains Dekra's chief financial officer, Wolfgang Linsenmaier.

"Using independent testing and validation companies ensures that only technologies that are fit-for-purpose enter the market, and that builds trust along the supply chain," he explains. "It also means individual companies don't have to go to the expense and effort of carrying out their own tests and controls."

Dekra directly supports the solar supply chain through a new state-of-the-art testing lab in Shanghai. China is the world's largest supplier of photovoltaic products. It provides certification services along the entire value chain, from raw materials to photovoltaic modules and PV power plant operation, validations that are supporting major initiatives such as REPowerEU, the European Commission's plan to make Europe independent from Russian fossil fuels.

Dekra also champions the future hydrogen economy, and, through its membership in Hydrogen Europe, it plays a crucial role in monitoring the provenance of green hydrogen. Rather than black or brown hydrogen, which is derived from fossil fuels, green hydrogen is produced using clean energy with water as the only by-product.

Hydrogen's huge potential to impact long-distance transport is behind a partnership with vehicle leasing start-up Hylane. The brand is set to launch Germany's first rental fleet of hydrogen-powered trucks, while BMW is just one major manufacturer that uses Dekra's technology centre in Brandenburg to test its fuel-cell vehicles.

Supporting circularity

As the world's population surpassed eight billion, circularity and how businesses use – and re-use – resources have become a prime concern. "Given the finite resources available to us, and the carbon footprint associated with extracting and processing them, societies must learn to consistently and completely reuse things," says Zurkiewicz.

> **Given the finite resources available to us, and the carbon footprint associated with extracting and processing them, societies must learn to consistently and completely reuse things**

Many businesses are experimenting with circularity and using waste as a resource to develop innovative materials and products. But without independent analysis to ensure their quality, potential game changers risk never leaving the factory.

Using old cooking oil to create biofuels may have never taken off without third-party validators collaborating with energy companies to monitor materials early in the cycle. This helped to guard against quality issues and misuse and protected supply chains from financial and reputational damage.

Independent verification can also make a difference on the factory floor, by evaluating and potentially extending the operating life of machines and systems beyond the forecast of manufacturers. "There is an inherent conflict of interest between manufacturers and operators," continues Zurkiewicz. "The former typically wants to develop and sell new, enhanced equipment, while the latter wants to save costs and maximise returns on their initial investment.

"From a circular economy point of view, extending the service life of equipment is an important factor in conserving resources and energy."

Drawing a redline under greenwashing

The environmental, social and governance (ESG) landscape is in a constant state of flux. Governments and regulatory bodies must continuously adjust and tweak standards and accreditation programmes to reflect changing global needs and stakeholder expectations. Many companies turn to independent third parties to verify complex statements about emissions reduction or progress towards regulatory targets.

"Greenwashing has become a weighty and pernicious term, which can damage a company's reputation and open it up to huge financial risk and uncertainty," says Linsenmaier. "So when companies make a statement or release a report around ESG issues, it needs to be robust, transparent and, most importantly, trustworthy."

Businesses need a clear picture of the journey their products take from raw material to end-of-life before they can develop a realistic and effective plan to cut emissions and move towards net zero.

Life cycle assessments can address stakeholder concerns about how a company's products impact the environment. They can provide essential data that demonstrates transparency in the development, use and recycling of their products too. For instance, the electrical and electronics sector is already subject to EU regulations that require manufacturers to take responsibility for their products' environmental footprint.

Partnerships for the future

Many businesses that came forward at COP27 did so as partners, and Zurkiewicz believes that this sense of collaboration is so vital for the future.

"We need to see leading companies looking beyond their direct business operations and partnering with their industry peers in new ways," he says. "They need to explore cross-sector and pre-competitive partnerships and start to learn from each other to address the most pressing of the planet's needs. We, as Dekra, want to be such a partner."

To learn more, visit dekra.com/en/sustainability/

DEKRA

Paul Ellis/Pool/AFP via Getty Images

Jeff Bezos told the UN's COP26 conference on climate change in Glasgow in 2021 that he was pledging £1.5bn to the restoration of degraded agricultural land in Africa

PHILANTHROPY

Generous to a fault

Captains of industry are lining up to pledge huge sums to fund environmental projects. But how helpful will the billions committed by Bezos & Co prove in saving humankind?

Sam Haddad

In 2020, Jeff Bezos announced that he would donate $10bn (£8.2bn) by the end of the decade to help tackle the climate emergency. Through the Bezos Earth Fund, Amazon's founder and executive chairman pledged to find ways to reduce the carbon footprint of steel and cement manufacturing, among other measures.

Bezos is not the only magnate who has donated to environmental projects in recent years. Laurene Powell Jobs, the widow of Apple co-founder Steve Jobs, committed $3.5bn to the Waverley Street Foundation, a not-for-profit fund supporting climate action. Mark Zuckerberg, Bill Gates and Michael Bloomberg have also given substantial sums to the cause.

But, given that Amazon's greenhouse gas emissions increased by 18% in 2021 – the year that Bezos blasted off for a 10-minute excursion into space – it's worth asking whether the climate philanthropy that he and his fellow tycoons have indulged in will make a significant difference. And how do these grand gestures measure up against the UK's giving landscape?

In this country, only 6% of philanthropic donations go towards environmental projects (and only 2% to those focusing specifically on climate action), according to Florence Miller, director of the Environmental Funders Network. But she reports that the proportion is at least "on the rise. Environmental philanthropy nearly doubled from £115m in 2015 to £222m in 2018 and it has continued to increase ever since. Yet these are remarkably small amounts, given the scale of what we're facing. Progress has been far too slow."

Miller thinks that donations have been relatively limited to date because of a widespread assumption that successive governments have had the problem in hand. It has only recently dawned on the public that this is far from the case.

"It's hard for people to understand how they can make an impact on something so global in nature," she adds. "But they are waking up to the fact that, if you have money that you can give away, it's an incredibly potent way to achieve change."

Do initiatives such as the Bezos Earth Fund filter down to the non-billionaires among us and encourage more public contributions to environmental causes? Their effect is complex, according to Miller.

"These are powerful announcements, in that they get climate philanthropy into the news as something that you can participate in," she says. "The slight problem comes when someone who's that wealthy says they're donating a lot of money. It can be hard to see how your contribution, which is inevitably going to be smaller, can help. That can be offputting."

Miller points to a weakness that the magnates' well-funded mega-trusts often have in common. "They struggle to get those large amounts of money out of the door quickly enough to support brilliant initiatives that are just getting off the ground or to respond effectively to a crisis," she says.

Although they have less money at their disposal, smaller charities tend to be far more responsive. Miller cites the case of the Carbon Tracker Initiative, a not-for-profit think-tank formed in 2009. This led groundbreaking research into the impact of the energy transition on the financial markets, introducing the terms 'carbon bubble' and 'stranded assets' to the banking lexicon.

"This started as a tiny outfit. Some of the smaller funders in our network were able to give it £25,000 to £50,000 to get things going," she says. "Now it's big and it has done incredible things to shift the narrative surrounding fossil-fuel companies."

Miller considers the way in which Bezos has made his fortune to be "deeply problematic", taking issue with Amazon's aggressive measures to avoid paying tax and prevent unionisation among its workers. The company could also have done much more internally to prevent environmental problems from arising in the first place. But she recognises that the trouble with criticising Bezos and his ilk is that you make every potential climate philanthropist worry that an eye-catching donation will leave them open to accusations of greenwashing and hypocrisy.

"We're all trapped in a dysfunctional system," Miller says. "We can't be expected to live perfect lives [from an environmental standpoint] because we don't have the system for it. But that's what climate philanthropy is meant to be changing."

The ideal scenario, then, would be when captains of industry combine climate philanthropy with sound ESG practices in their own businesses. Yvon Chouinard, founder of outdoor clothing brand Patagonia, is widely cited as an exemplar of this approach.

Chouinard recently announced that he was giving his shares in the firm, valued at more than $3bn, to a trust focused on tackling the climate crisis. Unlike most large-scale donors, he has deliberately structured this contribution in such a way that it doesn't give him tax relief.

Carl Rhodes is professor of organisation studies at University of Technology Sydney and the co-author of *CEO Society: the corporate takeover of everyday life*. He was surprised when the formation of the Bezos Earth Fund was announced, because Bezos didn't have much of a history of charitable giving at the time.

"Suddenly he comes up with this gigantic thing and, as a citizen, you might think: 'Billions to combat climate change must be good, right?' Yet it preserves the system that caused the problem in the first place," he argues. "Those who attempt to make these changes through philanthropy would never admit to being part of the problem. Instead, they present themselves as messiahs coming to solve it. It's hubris in the extreme."

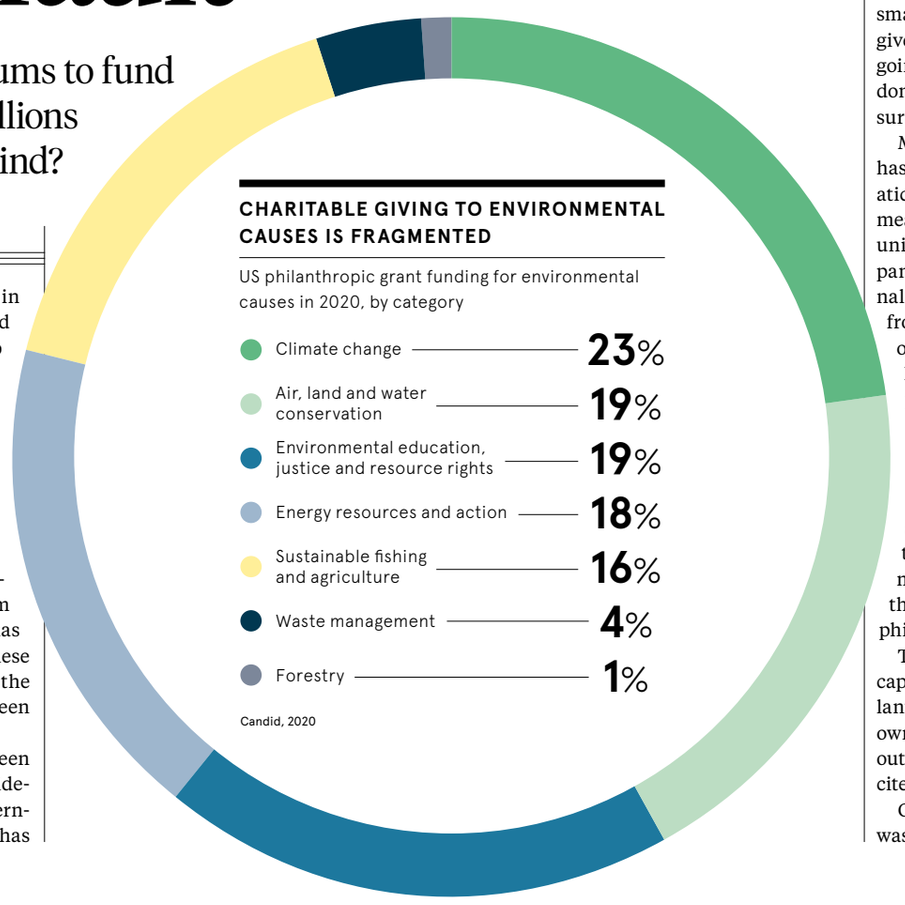
Rhodes, who believes that global crises such as climate change need to be solved by politicians, not philanthropists, adds: "If ever there was a lesson in the importance of government in dealing with big problems, the response to the Covid pandemic was it. Corporations could never have managed it."

> **"Those who attempt to make these changes through philanthropy would never admit to being part of the problem. Instead, they present themselves as messiahs**

Miller argues that philanthropy can be at its most effective when it focuses on lobbying governments and advocating for ambitious climate policies. She cites the examples of Hope for the Future, which helps communities to engage with their MPs and local politicians on environmental matters; and People & Planet, a grass-roots student group lobbying universities to stop inviting fossil-fuel companies to their careers fairs.

"Activism is effective because it starts to shift the conversation and the window in which change can happen," she says. "What is going to motivate governments to sort it out and whom are they listening to? There were 610 fossil-fuel lobbyists at COP27 – and their voices are very loud."

For once, then, strong words from the billionaires in favour of the opposing cause may have more of an impact than their cold, hard cash.



SOLUTIONS

Desperate measures – geoengineering versus global warming

Scientists are weighing up direct interventions in the climate via ambitious geoengineering schemes. But are these proposed projects the right approach?

Emma Woollacott

The grim consensus at COP27 was that our current plans are unlikely to restrict global warming to 1.5°C above pre-industrial levels. As a result, there have been calls for more drastic action. Human attempts to alter the climate – known as geoengineering – could range from removing carbon from the atmosphere to modifying local weather conditions or managing solar radiation. But such interventions are controversial.

The UN convention on biological diversity bans large-scale projects and there have been calls for a total ban on solar geoengineering, on the grounds that its international impacts can't be fully understood.

Meanwhile, the Climate Overshoot Commission – a group of experts and policymakers chaired by Pascal Lamy, former director-general of the World Trade Organization – is investigating the pros and cons of various geoengineering methods.

What might some of these techniques look like in practice?

1 Bioenergy with carbon capture and storage (Beccs)

Beccs is all about pairing energy generation with carbon capture. It entails burning wood pellets (pictured, right) or the residue of crops to generate energy and then capturing the CO_2 released. The CO_2 is then turned into liquid form, which can be stored underground in naturally occurring porous rock formations. Eventually, it may become chemically locked into the surrounding rock.

Although its applications have so far been limited, the impetus in Beccs's favour is growing. Over the past year or so, more than 50 planned facilities have been announced, including a plant due to be built in 2024 in North Yorkshire, expected to be the biggest in the world.

The site will extract at least 8 million tonnes of CO_2 from the atmosphere each year, according to its operator, Drax. The group's CEO, Will Gardiner, says: "Beccs is a groundbreaking technology. Leading scientists at the UN's Intergovernmental Panel on Climate Change say it will play a critical role in addressing the climate crisis. It's the only technology that can deliver reliable, secure and renewable power while permanently removing CO_2 from the atmosphere."

But there are concerns. Critics say that, to work at scale, Beccs will use huge tracts of land. What's more, intensively farming a limited range of plants for biomass could reduce biodiversity.

THE BRITISH PUBLIC BROADLY SUPPORTS CARBON-CAPTURE TECH – AS LONG AS IT WORKS

Preferred criteria for assessing carbon-capture schemes

R Bellamy, YouGov, 2022

2 Marine cloud brightening

Marine cloud brightening is based on the premise that reflecting more sunlight back into space will reduce global warming. Clouds containing salt are brighter than those without, and it is thought that spraying seawater into the atmosphere could prove to be an efficient brightening technique.

There have been two small tests so far: the eastern Pacific emitted aerosol cloud experiment, which used aircraft to target an area off the Californian coast, and another last summer which saw salt spray deployed over Australia's Great Barrier Reef.

A research team at the University of Washington is examining the feasibility and safety of marine cloud brightening. Kelly Wanser, a senior adviser on the project, says: "Brightening marine clouds in the regions where they are most susceptible could possibly offset most greenhouse gas warming to date. For example, brightening 15% to 20% of marine stratocumulus clouds – covering about 3% to 5% of the ocean's surface – has the potential to offset 2°C or more."

But it will be difficult to establish the precise effects that cloud brightening might have on global weather patterns. There are concerns that it could lead to negative effects elsewhere.

3 Stratospheric aerosol injection

When there was a large volcanic eruption on Mount Pinatubo in the Philippines in 1991, the planet cooled by an average of 0.5°C for two years, because the sulphur dioxide it hurled into the atmosphere reflected sunlight. Stratospheric aerosol injection is designed to mimic this effect by putting sulphur into the stratosphere.

"Releasing particles into this layer of the atmosphere to increase the reflection of sunlight by a small fraction – less than 1% – could offset 2°C or more of warming," Wanser explains.

There has been a fair amount of research into this method, but more work is needed, according to Professor Hugh Hunt and Dr Shaun Fitzgerald at the Cambridge Centre for Climate Repair.

"There are known associated impacts, such as changes to rainfall patterns and the atmospheric ozone. Such impacts are important and have been well studied," they say. "Other lesser impacts, such as whitening of the sky, deposition and acid rain, are perceived to be significant, but are likely to be small in practice owing to the amounts of material being considered."

4 Ocean fertilisation

The concept of ocean fertilisation dates to the 1980s. In short, it's the idea that adding iron to the oceans would encourage the growth of phytoplankton. These organisms ingest and convert CO_2 dissolved in the water, releasing oxygen and retaining carbon. When they die and sink to the ocean floor, much of that carbon would be sequestered.

It has been tried several times, most notably in 2012, when a project led by US entrepreneur Russ George dumped 100 tonnes of iron sulphate into the Pacific off British Columbia. A large algal bloom duly developed. While George is hoping to repeat the experiment on a larger scale, there's no evidence that it sequestered any carbon. There are also concerns that adding nutrients to one part of the ocean could have negative effects elsewhere.

5 Ground-based albedo modification

Like many Mediterranean conurbations, Barcelona gets extremely hot in the summer. Earlier this year, a team of scientists proposed a possible solution: painting the rooftops white. This, they believe, could cut mid-afternoon temperatures by as much as 3.8°C.

Of course, rooftops account for a minute fraction of the world's surface, but scientists are looking at using similar techniques – known as ground-based albedo modification – to have a rather more global effect.

The Arctic Ice Project aims to spread a layer of tiny glass microspheres across parts of the Arctic to make the ice more reflective. The project team claims that this measure could delay polar warming by up to 15 years.

"Once implemented at scale, our approach will provide the much-needed time to complete the global transition to more sustainable solutions," says the project's vice-chair, Dr Steve Zornetzer.

But the project faces fierce opposition, notably from indigenous communities.

Panganga Pungowiyi, climate geoengineering organiser at the Indigenous Environmental Network, says: "Failure to develop and test this research without true, free, prior and informed consent and meaningful consultation is not only unethical; it is dangerous."

It is now on hold indefinitely.

Lendlease's Cobalt Place development reduced embodied carbon by 60-70% through clever engineering design

Engineering the construction industry for net zero

Embodied carbon produced by the construction industry must be tackled if we're to fight climate change. Engineers are leading the way

Every sheet of glass, block of concrete and piece of steel that makes up a building has a carbon footprint. This footprint is known as 'embodied carbon', which is the amount of carbon emissions generated in its creation.

To date though, much of the focus has been on the operational carbon emissions of buildings, typically those generated through the residents' energy consumption. However, even in a well-designed, low-energy project, the embodied carbon can account for more than half of the carbon emitted during a building's lifetime.

So, if we're to meet our net-zero targets by 2050, embodied carbon needs to be tackled now. Indeed, as humanity gets better at reducing operating emissions by decarbonising the power grid and boosting energy efficiency, embodied carbon as a proportion of total emissions looks set to skyrocket.

"The decisions engineers make have a disproportionate influence on embodied carbon in the construction and property sector, accounting for an incredible amount of carbon," says Peyrouz Modarres, a director at UK structural, civil and geotechnical engineering firm Walsh. "By the stroke of an engineer's pen, specifying just a 50mm thicker concrete floor can have a huge impact. Those are emissions which may not be offset in the engineer's lifetime, and that's just on one project.

"As engineers we have a great responsibility," Modarres continues. "The carbon in our atmosphere is cumulative, and the choices engineers make today will affect the climate in decades to come, so change has to happen now."

The scale of the issue is global. Urbanisation is on the rise. Worldwide, building floor area is expected to double by 2060, and so is raw resource use. Steel, concrete and cement are still major contributors to global warming, with construction materials accounting for 9% of global energy-related emissions. Urban growth is also outpacing efforts to tackle energy efficiency and energy intensity.

"It is even more important to tackle embodied carbon today. For the first time, we're in a position of empowerment because we have the data and tools to quantify, analyse and report on embodied carbon at any point in a project's lifecycle. We also know which engineering solutions cut emissions," details Modarres. Walsh, for example, has now calculated the embodied carbon of more than 150 of its projects.

Physical solutions will be particularly crucial as other drivers of change come into play, such as legislation. For instance, the UK government is currently exploring the introduction of embodied carbon targets. Net-zero regulation also has the support of many UK firms and bodies across the construction sector.

ESG – or environmental, social and corporate governance mandates – are also driving change via investors, financial institutions and pension fund backers. There's a raised level of awareness among the general public, who increasingly expect low-carbon solutions to be implemented as standard. Pressure, then, is coming from all sides.

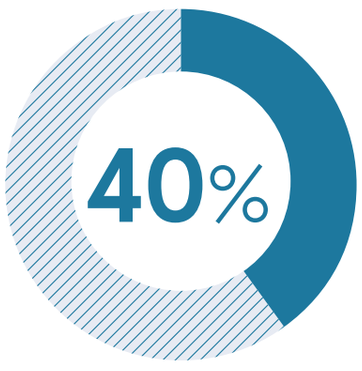
"Through good design, good materials selection and smart project implementation, dealing with embodied carbon doesn't have to cost the earth. Thinking holistically about a building, its carbon lifecycle, as well as engaging on these issues from a project's outset means that cutting emissions doesn't have to be a decision based on price," says Modarres.

"It's really up to the engineers to partner with clients from the construction and property industry, step up to the mark and deliver solutions, which are now in greater demand."

Engineers are looking to other industries for inspiration. For instance, the automotive industry has been shaken up by well-designed electric vehicles, which have now become desirable. A dazzling array of innovations have been unleashed when it comes to mobility, adding value to the market in response to a heady cocktail of regulation, changing consumer behaviour and investment in technology.

"The incredible uptake of electric vehicles, some of which are sold at a premium, shows that there is a market for more sustainable upmarket products. We need to engineer and create buildings that mirror this sentiment," says Modarres. "It is up to designers to articulate this today for the built environment." For instance, Walsh has already worked on upmarket sustainable projects such as The Library of Birmingham and Tottenham Stadium.

> **Engineers have the weight of embodied carbon on our shoulders. We can deliver though because our future depends on it**



of the world's carbon emissions come from buildings and construction

Climate Group, 2019

What's more, corporations are increasingly asking for a minimum level of environmental performance for the spaces they rent or construct, in order to deal with their Scope 3 emissions. This is influencing commercial developers and how they operate. The housing market is only just starting to consider embodied carbon. Future regulation in the property sector is likely to drive wholesale change.

"A three-pronged attack is gathering momentum: finance, legislation and consumer pressure," says Modarres. "Yet dealing with embodied carbon needs to be a well-defined and quantifiable process. As engineers, this is what we are establishing in the market.

"We benchmark what we've done historically, and we also have targets, so we know what we want to achieve by 2040, which is net-zero emissions. We're making reductions to realise this in the buildings that we engineer, shrinking embodied carbon in our designs. All of this is quantifiable over time. We can report on this to our clients. We know what 'business as usual' looks like, we know what good looks like now, emissions wise, and we know what the future must look like."

Thankfully, data and monitoring are now allowing engineers to calibrate embodied carbon more accurately in buildings. Through good engineering, Modarres believes that 20% of this carbon can be eliminated from most projects in the early design stages and that innovation in materials is supporting this.

Retrofitting buildings will also be key in established urban areas, particularly in the UK. Retaining a built asset is vital to reducing embodied carbon. The smart reuse and retention of existing structures is becoming increasingly popular.

"For some clients it is an education. Thinking about how the circular economy can be applied to built assets is vital. If a structure cannot be re-used and, where businesses have a number of future developments elsewhere, materials can be repurposed and recycled. We need to be more imaginative, think holistically and provide practical options. The good thing is that we can share best practice across our client base," says Modarres.

"It also now matters who we partner with. We're asking our suppliers to make commitments to science-based targets and reducing their emissions. They're also on a sustainable journey with us. We have to raise awareness and drive change along the whole value chain. Engineers have the weight of embodied carbon on our shoulders. We can deliver though because our future depends on it."

For more information, visit walsh.co.uk

WALSH

SKILLS

Can the UK's green sector solve its severe lack of female talent?

The UK's net-zero mission will create many thousands of jobs by 2030, but women will take relatively few of these unless the gender gap in STEM skills is closed

Clara Murray

The UK's increasingly low-carbon economy is creating thousands of new vacancies. The energy sector alone will require 250,000 more employees to handle the transition to renewable power generation, according to PwC.

Jobs such as wind turbine technician, heat pump installer and electric vehicle mechanic will abound, then. While that promises a huge boost for employment, there's a serious risk that such work will not be equally distributed. Much of the growth is expected in STEM jobs – fields in which women (and other disadvantaged groups) have historically been underrepresented. For instance, only 16.5% of engineers working in the UK are women, according to Engineering UK. That's a lower proportion than that of any EU country. Women make up 2% of the workforce in construction, 26% in energy and 27% in manufacturing, according to the Office for National Statistics.

Similar percentages are likely to apply to the green jobs of the future if no significant remedial action is taken. Women occupy only 18% of roles in the UK's offshore wind industry and 17% of those in climate finance. Heat pump manufacturer Viessmann reports that 3.8% of the people it has trained in this technology this year are women, while LinkedIn data indicates that two-thirds of people moving into the green sector for the first time are men. The Boston Consulting Group forecasts that women will hold no more than 25% of global green jobs by 2030.

This matters when STEM-based technical work pays more. Innovation charity Nesta has found that the gender pay gap in the green sector (20.9%) is more than double the average for all other industries (9.9%). The likely reason for this difference is that women are far more likely to occupy relatively junior admin and support roles in the green sector.

Emily Jones is deputy director of the Learning and Work Institute (L&WI), an independent research organisation campaigning for social justice and inclusion.

"Women are overrepresented in jobs and sectors that have traditionally paid less and don't offer much scope for pay progression," she points out. "This is absolutely an opportunity to address the gender pay gap."

A lack of female talent could even delay the UK's progress towards net zero, given that it's long been recognised that diversity of perspective is vital for innovation.

Jenny Lieu is an assistant professor at Delft University of Technology, with research interests including gender issues and climate science. She points out that "women have a different approach – it's not better or worse than that of men. It's in the way that women are socialised and taught to accommodate, to facilitate in a more equal way, to have a lot more dialogue. We have different solutions."

This need for new perspectives is not limited to gender. Race, class and disability all play a role too, Lieu says, adding: "When you include the whole community as part of a system, you obtain a very different output from what you'd get when only one part of society is included."

Why are so few women entering these jobs and rising through the ranks? One factor is the male-dominated cultures of industries such as energy and construction. For instance, there were rarely other women in the room when engineer Aoife Duignan started her career in the energy industry in 2007.

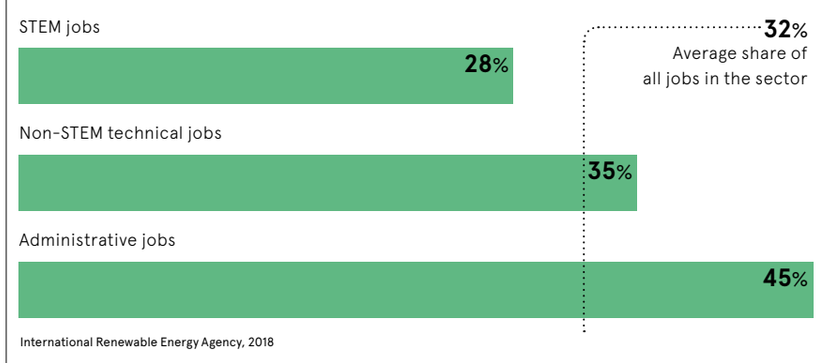
"Going offshore can be a very intimidating prospect for women," she says, noting that workers often live on site for weeks or months at a time.

Duignan regularly found herself in the "nerve-racking" position of sharing cabins and bathrooms with male colleagues. "I didn't want to draw attention to the fact that I was different from everyone else or be seen to be causing a fuss," she recalls.

Now managing offshore cable installations for Danish wind power giant Ørsted, Duignan believes that the renewables sector has started making big strides towards gender equality. Her firm reports that just under a third of the places on its UK wind turbine apprenticeship scheme have gone to women since 2017, while almost a quarter of its senior leaders are female.

WOMEN WORKING IN THE RENEWABLE ENERGY SECTOR ARE MORE LIKELY THAN MEN TO BE IN NON-TECHNICAL ADMINISTRATIVE ROLES

Distribution of women in the renewable energy industry



International Renewable Energy Agency, 2018

With the backing of professional body the Energy Institute, Powerful Women is an initiative working to increase the number of women at the top of the industry in the UK. In April it published research jointly with Bain & Co which revealed that women working in the energy sector – particularly those in senior roles – were unlikely to recommend their company to female friends as a potential employer.

The research report, *Cultivating Female Talent in Energy*, also highlighted a "diversity and inclusion delivery gap". Although most companies covered in the study were operating policies such as entitlements to flexible working arrangements and enhanced parental leave, uptake was low, with respondents describing these as "tick-box exercises". This can have a harmful effect on retention.

> **Women often have a real sense of purpose about transforming their communities and where they live**

Rhian Sherrington, founder of networking group Women in Sustainability, has seen many women in the sector "get to a certain point and leave". And, when they change employer, it's rarely for a step up in seniority, she notes, adding: "We have got to stop seeing the problem of a lack of gender parity in climate leadership as being about 'fixing women'."

Many companies in the industry have put gender-based targets in place, yet they struggle to attract suitably qualified candidates. That problem starts long before women reach the workforce. Trade apprentices are overwhelmingly male, while women are underrepresented on STEM degree courses.

"It all starts with societal expectation," according to Zoë Arden, a fellow at the Cambridge Institute for Sustainability Leadership, where she leads a course entitled 'Women leading change: shaping our future'. She explains: "There is a lack of information for, and expectation on, women considering technology careers. They are not given enough information about what working in the sector involves."

Research findings support her assertion. L&WI recently conducted a survey on how girls and boys perceive and acquire green skills. Jones reports that the poll revealed that "young women were more likely than men to say they were really interested in a green career, yet were more likely to say they didn't know what green skills were".

This is perhaps because girls are less likely than boys to take technical subjects at GCSE and A-level. L&WI recommends that businesses cooperate with schools to build knowledge of green skills and jobs into their curriculums.

Alan Goundry, head of engineering and The Energy Academy at Newcastle College, believes that employers should find ways to show young people sustainable career paths and role models as soon as practicable. This could include arranging for female engineers to give talks in schools or setting up dedicated internship or apprenticeship schemes.

"If we could get more young women into the workplace so that they could see what actually goes on there, it would be an easier sell," he suggests.

Businesses should also promote how they are aiding the energy transition. The vital role of technology and engineering skills in this could encourage more girls to study STEM subjects, according to Arden.

"Women often have a real sense of purpose about transforming their communities and where they live," she says. "If we bring that energy to bear on green jobs and the engineering sector, it really is a fantastic opportunity."