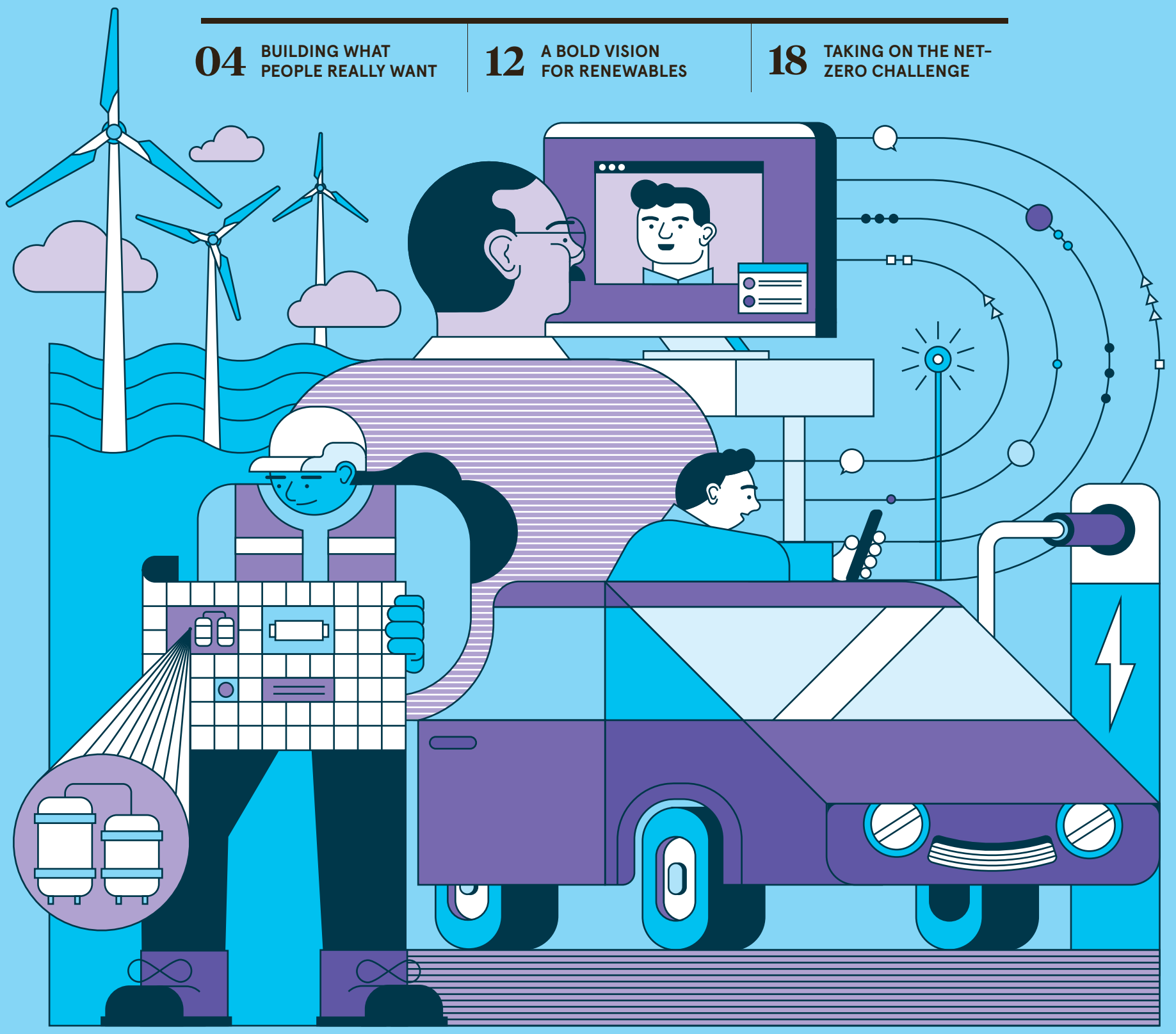
FUTURE OF INFRASTRUCTURE



FUTURE OF INFRASTRUCTURE

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CONNECTIVITY

Connecting to exceed expectations

Unprecedented transformations in healthcare, education and business are showing just how central digital infrastructure is to the future

Marina Gerner

It's safe to say this year has irreversibly changed our professional and personal lives. The infrastructure sector, although often playing a behind-the-scenes role, is now central in delivering the post-pandemic "new normal".

At the beginning of the health crisis, the UK's telecoms infrastructure took the spotlight for an unexpected reason. A bizarre conspiracy theory blamed 5G technology for coronavirus, which led to a series of arson attacks on mobile-phone masts.

In reality, these very masts help to enable our digital connectivity. Our connections to the internet rely on a hardware foundation, via fibre-optic cables, masts and datacentres, making infrastructure the cornerstone of global connectivity.

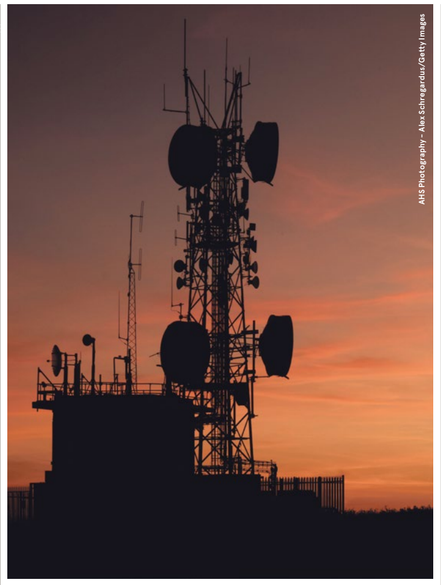
In a survey conducted by Community Fibre, some 60 per cent of London-based small and medium-sized enterprises said high broadband speed and quality are even more critical for their business operations than a functioning supply chain (52 per cent). Earlier this year, government figures showed the country's digital sector contributed £149 billion to the UK in 2018, which amounts to 7.7 per cent of the economy and it's set to grow.

At the same time, there have been geopolitical concerns about the providers of our digital infrastructure. The United States has led a campaign against Huawei, a Chinese provider of telecoms equipment, given China's human rights violations and the control the state holds over Chinese companies. Other countries have voiced similar concerns and followed suit.

The UK government announced a new strategy to diversify the UK's 5G supply chain backed by an initial £250 million in November. "We are taking bold steps to implement one of the toughest telecoms security regimes in the world," says Oliver Dowden, digital, culture, media and sport secretary "A central part of that is combating high-risk vendors and I have set out an unambiguous timetable for the complete removal of Huawei equipment from our 5G networks no later than 2027."

Overall, the government wants the majority of the UK population to be covered by a 5G signal by 2027. It also aims to provide next-generation fibre broadband to 85 per cent of premises by 2025.

What benefits can businesses and end-users expect from greater connectivity? "The point of this infrastructure is that you don't have to worry about it," says Dana Tobak, co-founder and chief executive of Hyperoptic. "In the same way you barely think when you turn on the tap, is water going to come out? And am I going to have enough to brush my teeth? You don't think about it; it just works."


AHS Photography – Alex Schregardus/Getty Images

COVID-19 has radically accelerated digital transformation in education and healthcare. "If I had called a GP surgery and said, 'Hey, can we do a video consultation?' a year ago, they would have laughed at me," says Tobak. Whereas now it has become standard practice that benefits both patients and doctors.

In addition, access to digital devices is important for education. "One of the things that COVID has shown is we don't have equality yet across different economic groups," she says, adding: "What can we achieve when we have ubiquitous connectivity?

"Health and education are the two use-cases I get the most excited about because they're so integral to society. Education provides our ability to continue to evolve, to have an equal opportunity platform for children from all across the country and economic levels. And then also healthcare, I am a fan of nationalised healthcare and I do think the NHS has lots of opportunity for efficiencies."

Hamish de Run, head of Federated Hermes Infrastructure, says benefits of greater connectivity range from a reduction in cost base to efficiency improvements. He too notes societal benefits include "the delivery of higher-quality remote healthcare and education, as well as contributions to wellbeing through reducing isolation and loneliness via increased digital connectivity to others".

Pip White, managing director, UK and Ireland, at Google Cloud, says: "Greater connectivity will improve the efficiency and speed of cloud computing, reduce latency and downtime, and give businesses greater capacity for growth. Complex tasks will be performed quicker with fewer interruptions, allowing employees more time to focus on innovation and high-impact projects."

Which major infrastructure projects are helping us towards a more digitally connected world? "What a lot of people don't realise, though, is that today, 98 per cent of international internet traffic is ferried around the world by subsea cables," says White. "A vast underwater network of cables crisscrossing the ocean makes it possible to share, search, send and receive information across the world at speed."

And still more of these are planned or in development, including Google's recently announced Grace Hopper cable, which will run between the United States, UK and Spain.

"The rollout of fibre to the home, or FTTH, is likely to accelerate, providing more people with faster and more reliable broadband," says de Run. "The upgrade of cellular networks will deliver improvements in access to wireless internet and the stability and coverage of mobile communications. Increasing capacity of datacentres will allow for greater use of cloud computing, improving efficiency and security in a sustainable and environmentally friendly way."

There may yet be a sign of hope to end the year. As Hyperoptic's Tobak concludes: "We have started to see that actually, with the right connectivity, you can do so much more than people expected."

EUROPE'S BIGGEST CONNECTIVITY CHALLENGES

60% of European tech firms, investors and policymakers say that required business infrastructure investment is the biggest challenge with 5G connectivity

53% say the biggest challenge is the increased cost of connectivity

26% say it is the underlying technology

DLA Piper 2020

PEOPLE FIRST

Building what people really want

Truly sustainable infrastructure must be about more than wind turbines and solar panels, it must be designed with the people who live in it firmly in mind

Oliver Balch

Gary Clark is on a mission. With the UK facing an even greater economic recovery than after the Second World War, this expert government adviser believes infrastructure should take centre stage in the campaign to "build back better".

Picture the scene. Residential and commercial buildings, retrofitted to be super energy efficient. Cities crisscrossed by pedestrian-friendly thoroughfares. Roads free of polluting traffic. Urban spaces dotted with new parks and public gardens.

"We must grasp this opportunity of great change and renewal to create a truly sustainable future. The next ten years are critical," says Clark, a science and technology specialist at global design and architecture firm HOK.

Coronavirus has sparked many utopian visions for a post-pandemic reboot. So, is Clark's vision just pie-in-the-sky optimism or could our towns and cities really be on the verge of a major sustainability makeover?

Discussions at the very highest levels of policymaking suggest such ideas may not be as far-fetched as they may seem. Several years ago, the Economic Commission for Europe, a little-known agency of the United Nations, put forward the notion of a "people-first" approach to public-private projects.

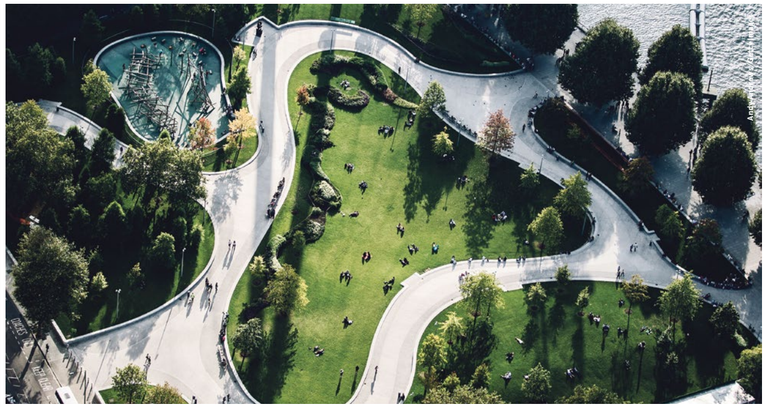
Given its dependency on such projects, the infrastructure sector has proved attentive. Proof came this summer with the publication of a white paper on the future of infrastructure by a working group of the World Economic Forum (WEF).

The report interprets the idea of people-first in infrastructure projects through six key principles; environmental resilience, benefit-sharing, social acceptability, economic and institutional effectiveness, future-proofing and potential for reaching critical mass.

WEF project leader Joseph Losavio sums up the essence of the list as developing infrastructure in a way that "puts the focus on outcomes in people's lives". This socially-oriented approach contrasts with the industry's habitual prioritisation with the physical aspects of infrastructure.

Another way of looking at it is to think less about the "what" and "how" of infrastructure, Lasavio suggests, and more about the "why' – climate security, nature conservation, human wellbeing, and so forth – and the "who"– people, and even planet.

To prove the idea's viability, WEF provides various existing case studies. One concerns a $1.51-billion project to build four city hospitals in Turkey. The facilities, all of which were delivered on budget and ahead of time, are credited with making up-to-the-minute health technologies available to the wider Turkish public. They are also fitted with a host of green features, including rooftop solar and seismic isolation technology.



Another illustrative example is a public-private partnership in India that will see 250 million smart electricity meters installed across the country over the coming years. Among the project's defining attributes is its inclusion of end-users in the rollout plan and future pricing structures.

At its core, people-first infrastructure is as much about shifting perspective and "widening one's horizon" as it is about specific practices and protocols, says Jean-Patrick Marquet, former managing director for infrastructure at the European Bank for Reconstruction and Development, and an adviser to WEF.

"It's not only achieving value for money, but also aiming at value for people and value for the planet," he says.

Encouraging as these early signs are, the concept of people-first infrastructure remains in its early days. For the sector's big players to start thinking seriously about the "why" and "who" of large-scale projects, it will take a strong signal from policymakers.

> **It's not only achieving value for money, but also aiming at value for people and value for the planet**

A few promising signs exist. HOK's Clark points to the UK government's latest *National Infrastructure Strategy*. Unveiled last month, the £100-billion plan prioritises a raft of sustainability actions, from investing in renewable energy and flood defences through to installing electric vehicle charging points and cycle lanes.

Announcing the new strategy, chancellor Rishi Sunak made explicit the link to the everyday lives new infrastructure touches, arguing that the barometer of economic success for many is "the change they see and the pride they feel in the places they call home".

The principles of people-first are also evident in the infrastructure elements of the European Commission's €1.8-billion COVID-19 recovery deal. Nearly one third (30%) of this colossal stimulus package is destined to combat climate change, with specific attention also given to biodiversity protection and gender equality.

The central role of infrastructure, especially green infrastructure, in many government recovery packages goes some way to addressing the other big challenge facing this burgeoning agenda, namely finance.

To achieve genuine scale, the private sector also needs to reach into its pockets. The evidence here is less encouraging, although some positive early signs do exist, says Amy Clarke, chief impact officer at the socially responsible investment fund Tribe Impact Capital.

"Investors who are familiar with the intersectional overlap between the UN Sustainable Development Goals are usually keen to see people-centred design factors as part of an approach to infrastructure," she says.

By way of example, she points to investor concerns about the impacts on employment of a transition to low-carbon infrastructure. According to the London School of Economics, 30 per cent of the 2.4 million UK workers employed in construction are in danger of losing their jobs if they fail to reskill.

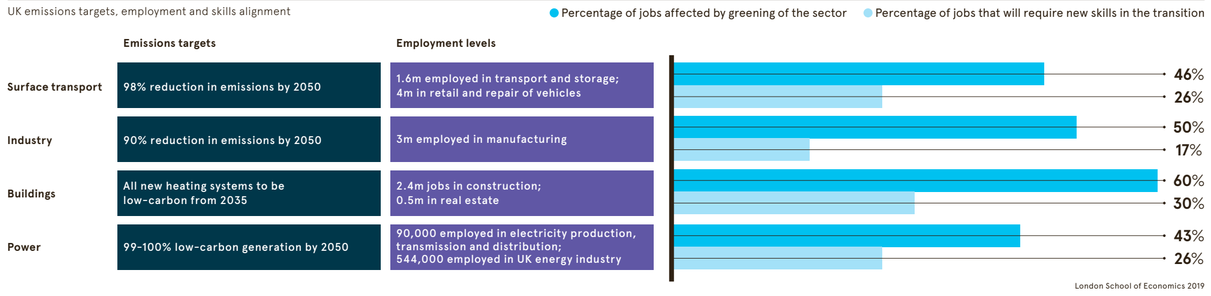
To avoid this and other similar social fallouts, 161 investment firms representing $10.2 trillion in assets under management have publicly pledged to use their financial muscle to support a so-called "just transition".

Arguably, however, the biggest challenge ahead lies in changing the prevailing mindset of infrastructure firms. For one, it involves prioritising the "priorities of life" over the "priorities of money", says Richard Threlfall, global head of infrastructure at KPMG and a member of WEF's working group.

Harder still could be the industry's perceived latent elitism. As opposed to infrastructure firms presuming what people need, a people-first approach would involve talking to communities first. That way, says Threlfall, they can find out "what people really want". ●

NEW GREEN JOBS IN PEOPLE-FIRST INFRASTRUCTURE PROJECTS

UK emissions targets, employment and skills alignment

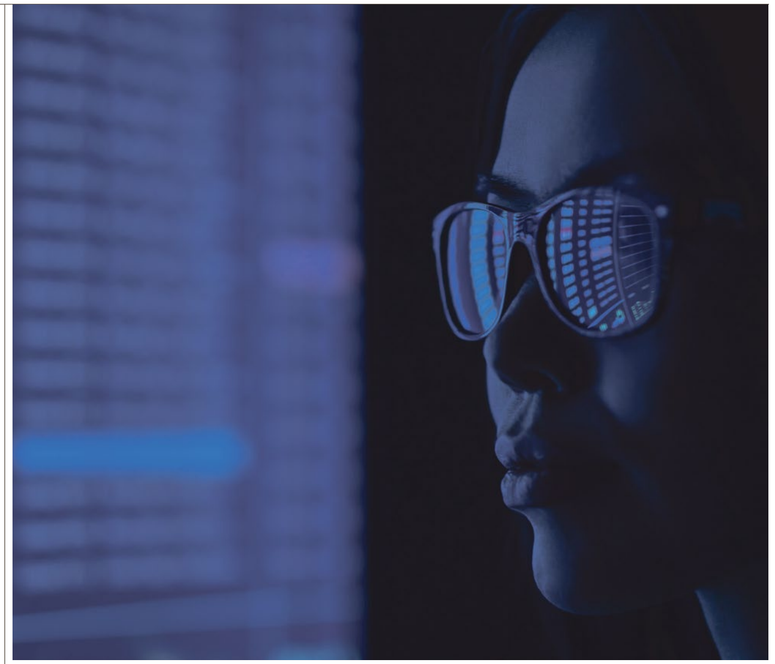


London School of Economics 2019

Commercial feature

Decoding productivity

How digital will transform infrastructure to deliver better outcomes for all



The ways in which we live and work, travel and socialise, connect and communicate are evolving rapidly, driven by exponential growth in technology. At the same time, an explosion in population growth and the spectre of climate change is creating unprecedented challenges for society and the lived environment. At the heart of this is the infrastructure sector.

"Infrastructure helps to create the lived environment," according to Philip Hoare, president of Atkins, a global design, engineering and project management consultancy, and part of the SNC-Lavalin Group. "It shapes our lives in profound ways, helping to define our quality of life, our health and wellbeing, and a sense of trust and belonging in our communities."

But there is a challenge, he continues: "There is no doubt that our sector does critically important work, every day; brilliant, dedicated people working on things that really make a difference in people's lives. But we are also one of the least digitalised industries in the world and as a result we have lagged behind other sectors in productivity. I see this as a huge opportunity; there is clearly room for improvement and that's exciting."

And it is hard to argue with this when you look at the facts. According to McKinsey & Company, the construction sector is one of the least digitalised industries globally. But leaders like Hoare see that as an opportunity. "The good news is that our industry is already full of data; it's just invariably disconnected and fragmented," he says. "Valuable insights, which could be used for making better decisions, are often lost. And with that goes productivity and growth."

In 2016 McKinsey estimated that major projects took 20 per cent longer to complete than planned and were 80 per cent over budget. "This is often, unfairly, the way infrastructure is portrayed to the public," says Hoare. "They read stories about mega projects being delayed and budgets increasing. The reality is these are complex projects, with multiple stakeholders and intricate supply chains. We believe this is where a connected ecosystem for infrastructure delivery will be a game-changer."

Atkins' vision is to completely integrate infrastructure delivery across the whole life of a project, harnessing efficiencies and insights from all stakeholders in the ecosystem to drive value for clients and better outcomes for society. It is doing this by investing in three key areas, each a different stage of the asset life cycle.

The starting point is the design stage. Data must be built in from the beginning, creating a rich virtual environment to enable collaboration. The company currently uses digital platforms which allow designers and clients to simultaneously access the same data environment in real time. This increases the pace of project delivery, improves productivity and facilitates unprecedented collaboration across disciplines. It also means all stakeholders are working on the same thing.

Atkins claims that most clients accept the need to move away from manual processes in the design phase. "A number of our clients have embraced digital design and we've embarked on a journey together with data at the very heart of what we do," says Hoare. "For example, shared digital common data environments have allowed us to carry out 'digital rehearsals' of projects prior to construction, a kind of virtual road test which saves time and money."

In another example, its digital content library recently provided 50 per cent of the project components for a major highways scheme, straight off the virtual shelf. Additionally, by automating elements of design, services can be delivered more efficiently and solutions discovered much faster. Modifications in bridge designs can be made using elements of past designs, piecing them together to optimise use of materials. This 'design once, use often' approach embraces the best elements of digital and ensures faster delivery without comprising quality.

The second stage is in the actual construction. Hoare cites one client who told him: "We collect a lot of data, make a lot of decisions. But how can we use this data to make better decisions around programme delivery?" Getting the first stage right is key, but it is then crucial to ensure data continues to be used through tools, apps and dashboards to improve project pathways, increase predictability and ensure modifications do not create delays.

Finally, the use of digital twins will become the norm for the company. The future of the asset will become the heart of the design process, embedding digital twins into projects from the planning stage, through construction and then throughout its life cycle. Earlier this year, Atkins launched a digital twin survey platform, enabling clients to access, analyse and develop ultra-high resolution 2D and 3D models of their assets.

> **A number of our clients have embraced digital design and we've embarked on a journey together with data at the very heart of what we do**

50%

of the project components for a major highways scheme were provided, straight off the shelf, by Atkins digital content library

75%

of buildings already built will still be in use in 2050

"Much has been written about digital twins," says Hoare. "In infrastructure, they are critical. Imagine a future where digital twins not only help to construct an airport, a hospital or a train line, but are used to more efficiently operate them afterwards?"

He believes digital twins will be an important digital tool in helping nations to minimise the impact of the lived environment from a sustainability perspective. "To meet the Net Zero targets, we have to change the way we build, power and move the world in the future," says Hoare. "But we also need to remember that 75 per cent of buildings already built will still be in use in 2050. That means we have to find ways of ensuring they also contribute."

To help tackle this, Atkins has teamed up with Cardiff University to develop a digital twin programme that will also seek to drive digital transformation across the UK's existing built environment. Part of the focus will be on creating digital twins of existing buildings, infrastructure and cities to help optimise how they operate.

Hoare believes we are on the cusp of a new revolution. And the benefits seem to be obvious. With global infrastructure spending expected to be more than £70 trillion between now and 2040, a mere 1 per cent increase in productivity would reap enormous rewards for the industry.

And what of those broader societal outcomes? Hoare is very clear on this. "What we do helps to shape the lived environment for the future," he says. "We have a unique opportunity to ensure it works well for the communities it serves, allowing people to live healthier, more prosperous and happier lives for generations to come. By harnessing the power of data and technology, we believe we can help our clients to design, deliver and maintain infrastructure that helps create a world that works better for all."

For more information please visit atkinsglobal.com

SNC·LAVALIN ATKINS Member of the SNC-Lavalin Group

BREXIT

Smart ports key to trade success

Ports are a major focus for UK infrastructure innovation, but whether this will be enough to boost British trade post-Brexit remains to be seen

Jonathan Weinberg

On January 1, the Brexit transition period comes to an end and the UK will have finally severed links with the European Union to trade independently. So could technology and digital transformation be the key to empowering a new trade infrastructure in a post-Brexit Britain?

As an island nation, maritime trade and shipping could be a significant sector to exploit. According to the government, £500 billion of trade passes through UK ports each year, but many experts agree it is an area lagging behind parts of the globe.

To achieve such trade infrastructure success, the UK could look to Italy for inspiration, where the port of Livorno has been dubbed "The 5G Port of the Future" by networking and telecommunications giant Ericsson.

A mix of the internet of things, artificial intelligence (AI) and augmented reality has been installed there to enable the mass collection of real-time data and analytics, with humans working alongside robotic systems and automated vehicles to more effectively track, load and offload cargo.

Nick Chubb, former navigator on commercial ships and founder of Thetius, an organisation enabling innovation across the maritime industry, says: "The UK ports sector is behind many European ones when it comes to advanced technology adoption. That said, in the North East, the Port of Tyne has established an innovation hub that is in the early stages of building an ecosystem and testbed for new technology, which is very promising.

"In the last 12 months, $85 million has been invested in UK start-ups building technology to support maritime trade, as data from our technology intelligence platform shows. Similar to fintech five or ten years ago, the global trade space is ripe for innovation."

Future-proofing digital trade infrastructure will also come down to adapting many manual legacy processes through robotics and AI.

A major way this can be achieved in a post-Brexit Britain is in the analysis and transfer of documentation and data. As Chubb says, much still exists within traditional manual email chains that take a long time to be processed.

"At the government level, AI will be key to enabling trade to flow freely and securely across UK borders. The UK's supply chains with Europe don't have enough resilience to support the physical delays caused by inspecting goods moving across the border. There simply aren't enough resources at the UK's borders to inspect all goods," he warns.

"As a rule, AI is very good at spotting patterns in massive datasets, so it is an incredibly useful technology for helping customs agents to spot and intercept suspicious traders, while allowing the majority of goods to cross the border unhindered."

> **Similar to fintech five or ten years ago, the global trade space is ripe for innovation**

Some are already achieving this. For example, SEDNA Systems has just closed a $10-million Series A funding round. The software company says it has reduced email volume for one global trading company by up to 95 per cent. Another, Marine Transport International, is a UK company using secure blockchain-based automation to transfer data between supply chain stakeholders.

Such security is certainly another aspect that will be crucial to digital trade infrastructure. Russell Haworth, chief executive at Nominet, the company that handles all .uk domains, believes that to become a strong trading powerhouse post-Brexit, Britain's digital trading infrastructure must be secure by design.

He says: "If the UK has a reputation of being secure and safe for businesses to store data, there is a greater chance it will cement its position at the heart of this sector of the future and compete on the global stage, playing to our strengths as a high-skilled, high-tech economy."

Developing our services economy too could play a key role in the infrastructure of the future. A post-Brexit Britain could become a centre for global trade facilitation technology given its strength in exporting knowledge from the insurance, finance and legal sectors.

Dr Vaggelis Giannikas, associate professor at the University of Bath, is researching the use of digital technologies in supply chain management with a focus on intelligent logistics systems at the Centre for Smart Warehousing and Logistics Systems.

He says for a post-Brexit Britain to harness new enhanced digital trade infrastructure, moving away from a reliance on outsourcing jobs overseas would be key.

Giannikas explains: "The UK can develop something for their own use and then use their experience to sell either the infrastructure itself or their experience to other countries. In Greece, for example, they are trying hard to digitalise the public sector and have learnt a lot from the Estonian model.

"It isn't that you can only export the actual digital infrastructure – hardware and software – you can export the know-how, the services based on the people who developed the infrastructure itself.

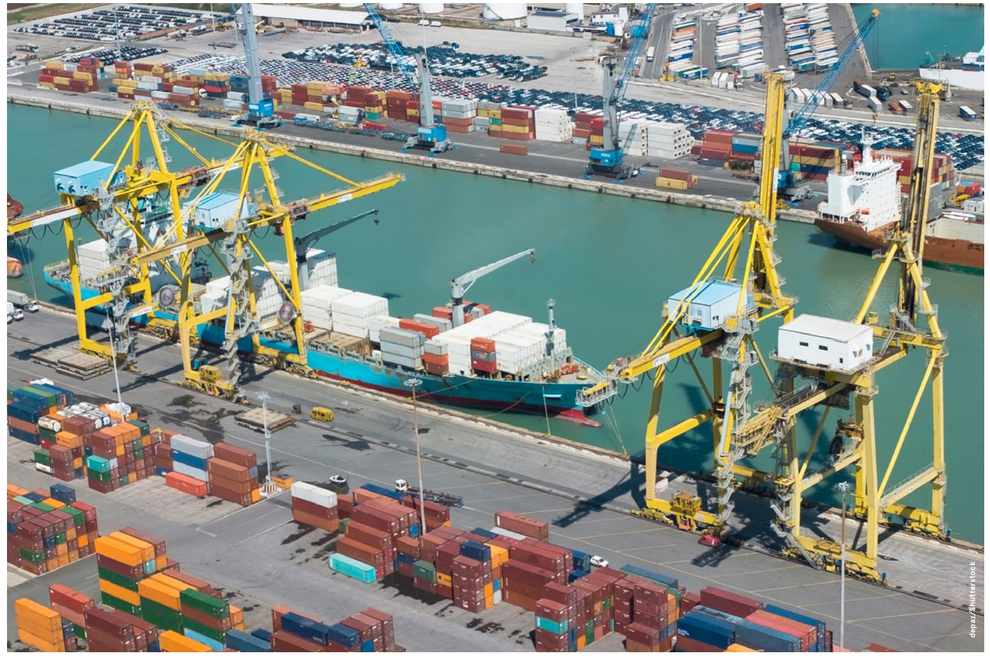
"The benefit then comes both in terms of better utilisation of resources within the UK, by using the infrastructure, and in terms of exporting knowledge expertise to others, by selling your services and the developed technologies to other countries.

"Adopting digital technologies in the upstream parts of the supply chain has the potential to create big economic and environmental benefits at the system level."

Many also believe the key to the future of digital trade infrastructure in a post-Brexit Britain will be how much we invest in people and not tech investment alone.

Gerry Buggy, chief strategy officer for Anglo-Irish software company Kx, says: "A focus on, and investment in, data literacy and skills should go hand in hand with investments in digital technologies.

"There's no point building the infrastructure to support and nurture technological innovation if you haven't got the necessary skills to unlock new business ideas in real time for continuous improvement. The UK can't afford to get left behind."



Port of Livorno, Italy

depas/Shutterstock

SMART PORTS HAVE SMART OUTCOMES

8%
reduction in emissions per terminal operation, using smart technology in the Port of Livorno

€2.5M
reduction in cost from optimising vessel berthing

20-25%
increase in productivity by using automated quay cranes

Ericsson 2020

Commercial feature

Building back better, faster and greener

The private sector is ready to help build and finance a cleaner, more connected country, says **Leigh Harrison**, head of Macquarie Infrastructure and Real Assets, Europe, Middle East and Africa

Given the extraordinary global health crisis we are living through, it would be easy for the decarbonisation and digitalisation of public infrastructure to slip down the political agenda. However, here in the UK, it's been really encouraging to see these challenges being prioritised by the government.

In November, prime minister Boris Johnson announced a ten-point plan to make the UK a nation rich in green infrastructure investment opportunities and jobs. This was swiftly followed by the publication of a broader *National Infrastructure Strategy* that has called for a radical improvement in the quality of the UK's infrastructure.

The government had already created a legal commitment for the UK to reach net-zero greenhouse gas emissions by 2050. But by delivering a strategy and a set of goals to help take us there, ministers have made a powerful statement of intent and direction. As an unprecedented and unpredictable year draws to a close, I am greatly encouraged by this sense of momentum and the important role for the private sector and private finance in delivering it.

Infrastructure investment will help to accelerate the nation's recovery from the pandemic. But with government spending already stretched, the prime minister has made it clear that the £12-billion state financing pencilled in for the green industrial revolution must be tripled by private sector investment, to the tune of £42 billion. We should be confident we can achieve this and more. The UK has already proven itself more than capable of catalysing private finance to build green public infrastructure.

Take offshore wind. Long-term, effective public-private planning and financing, including Macquarie's own Green Investment Group, which started life as a government initiative, has helped the UK become the largest offshore wind market in the world. It is because of strong policy frameworks that we have seen the cost of offshore wind fall by two-thirds in the past five years. It's a tremendous success story for the UK and bodes well for the goals ahead of us.

To meet the government's ambition to quadruple the UK's offshore wind power capacity by 2030, we estimate it will require £50 billion in investment to achieve this goal alone. It's bold, but the investment and regulatory frameworks have been established. The stage is fully set for this huge investment to happen.

We see a significant opportunity to repeat this success in other technologies and sectors. There are a host of exciting new investment opportunities that could prove transformative for the nation's economic and environmental future, and deliver real regional development benefits in almost every corner of the UK.

At Macquarie Infrastructure and Real Assets (MIRA), we see high potential in low-carbon hydrogen fuelling UK homes and businesses. Heating for homes and businesses accounts for half of the UK's energy consumption and one third of its carbon emissions. While we don't believe hydrogen is the only low-carbon heating solution, it is a key piece of the net-zero puzzle. One of our own businesses, national gas distributor Cadent, is currently demonstrating the feasibility of blending up to 20 per cent hydrogen into the UK's natural gas network.

Carbon capture and storage (CCS) technology is another complementary method to cut the nation's carbon output. Right now, Cadent is planning a new hydrogen pipeline and the creation of the UK's first CCS infrastructure in north-west England. As emerging technologies, both hydrogen and CCS will need clear, long-term government support to draw in consistent private investment. The good news is we have the investment frameworks already in place.

> **The UK has already proven itself more than capable of catalysing private finance to build green public infrastructure**

Alongside decarbonisation, the UK government also has digital ambitions to achieve a gigabyte-capable economy by 2025. For those who have migrated to working or studying from home this year, the case for full-fibre, high-speed coverage across every part of the UK has never been stronger; Ofcom reported an increase in daytime broadband traffic of up to 60 per cent during the first lockdown. Each month, we are reaching new internet traffic peaks. The average UK adult, according to Ofcom, now spends a daily average of at least four hours online.

Regional digitalisation projects are already underway, delivering significant returns for investors and for the communities they serve. Hull, for example, is home to the UK's fastest internet network, with average speeds of 94.7Mbps. This is the result of internet provider KCOM's seven-year investment programme, which saw the city become the first in the country to have fibre laid down in every street. Crucially, the investment led to £469 million of incremental economic activity in the area. Earlier this year, under MIRA's ownership, KCOM announced a £100-million investment to further expand its network to underserved communities in England's north.

60%
uplift in daytime broadband traffic during the first lockdown

Ofcom 2020

£50bn
investment required to quadruple the UK's offshore wind power capacity by 2030

Macquarie 2020

These are just a handful of opportunities for the private and public sectors to create flexible, well-connected and low-carbon infrastructure across the UK. So how do we realise them?

The priority for all of us is to build on the momentum and direction set by the government in the past month. This will take strong partnerships across government, the private sector and the communities who will be the ultimate beneficiaries of these investments. "Build, build, build" is the right message. It now needs to be backed up by a team effort to "plan, collaborate and get it done".

The stakes are high. Done well, infrastructure investment stimulates job creation and helps deliver better work, health and financial outcomes for the entire country. It provides real assets, not just in the financial sense of the term, but in solid, tangible improvements to our everyday lives, whether that be through ultra-fast internet access or through cleaner air and power.

The scale of private capital required to deliver this new era of decarbonised, digitalised infrastructure will be huge. However, I am positive that further private investment can and will come. The government is pushing on an open door: the public wants a cleaner, more connected country and the private sector wants to be part of the solution.

You can learn more about MIRA's work at mirafunds.com

MACQUARIE

ELECTRIC VEHICLES

Road to making the electric dream a reality

Demand may finally be on the rise, but the uptake of electric cars has been sluggish. A new rollout of charging infrastructure could accelerate sales

Mark Hillsdon

In the 2000s, when electric vehicles (EVs) first began to be taken seriously as an alternative to the internal combustion engine, range anxiety was rife. Fear of being stranded with a flat battery was stopping people from making the switch. EVs were seen as a novelty, good for a trip to the shops, but only the foolhardy would venture outside city limits in one.

Gradually, the technology improved and a network of charging points began to appear, first at service stations and more recently on urban street corners. But the UK response remained slow. Now, however, the stakes have changed.

According to Bloomberg, investment in charging infrastructure in the United States and Europe alone will top $60 billion by 2030, before rocketing to $192 billion by 2040. The UK is set to phase out the sale of new petrol and diesel cars and vans by 2030, in a bid to accelerate the transition to the EVs.

Alongside this, the government is investing £1.3 billion in a charging infrastructure that is fit for purpose, in a bid to convince UK drivers that EVs are not just a green option, but a convenient and cost effective one too.

One reason the rollout of a public charging infrastructure has been so slow is that the majority of charging is done at home, says Alexander Lewis-Jones, senior analyst at management consultants Delta-EE.

"So, while public infrastructure rollout may appear sluggish, a private infrastructure rollout has been growing rapidly across the nation's driveways," he says. For every public chargepoint a further five private ones have been installed, and by 2030 there could be more than three million residential chargepoints, Lewis-Jones predicts.

The public network that does exist in the UK is patchy at best. "A lot of EV operators got in early and set up their own systems," says Bernard Magee, director of emobility infrastructure solutions at Siemens. "That's why we have this patchwork of networks.

"But while the private sector kicked things off, there is a lot more government money now coming in to try and scale. We're at that inflection point and the government is helping to push things along to the next stage."

Sanjay Neogi, UK and Europe head at technology consultants the Enzen Group, says: "For a viable EV charging investment you need a lot of things to fit together: the right level of capital expenditure, favourable regulations and the potential to scale.

"Incentives will be key. Industrial policies on car charging are one option, but we also need to look at subsidising new energy vehicles and rewarding the construction of charging piles. Another promising idea is to establish a joint venture of car manufacturers, sellers and major electric power companies to fast-track EV infrastructure."

Munich-based IONITY is creating an extensive high-power charging network across Europe. Each country has its own issues, explains managing director Dr Michael Hajesch, from regulatory frameworks, to market maturity and grid capacity. But government support is vital. "To have clear vision and targets is definitely something that helps," he says.

Companies such as IONITY can also help governments achieve wider goals. By working with local suppliers, for example, they can ensure charging stations use 100 per cent renewable electricity, helping to decarbonise transport, but also achieve broader emissions targets, says Hajesch.

Coronavirus is having an influence, says André ten Bloemendal, vice president for sales in Europe at California-based ChargePoint, another company concentrating on installing fast EV chargers outside cities. "A lot of government programmes to support the economy in the COVID era push for sustainable solutions, so grants and funding are available," he says.

"The EV dream is all about making electric a superior experience to that of the combustion engine," says Lewis-Jones and, when it comes to convenience, inspiration should be taken from the Netherlands. Early Dutch adopters were offered the right to plug, he explains, with chargepoints installed close to their home so they could recharge overnight, without needing a driveway or garage.

It's something that's been taken up by Westminster City Council, which has launched Electric Avenue, in collaboration with Siemens and ubitricity. Twenty-four lampposts have been turned into EV charging points for local residents, with a further two adjoining roads due to be added to the network.

Siemens research had shown that while 36 per cent of UK motorists planned to buy a hybrid or EV as their next car, 40 per cent also said a lack of charging points stopped them from doing so sooner.

"It's such a no-brainer," says Magee at Siemens. "We can convert a lamppost in an hour into an EV charging point. It's low cost, low disruption and you're helping those people who don't have access to off-street parking. It's more of this type of thinking that we need: things you can scale quickly."

With the right to plug comes the right to roam. "All Dutch public chargepoints must be accessible with any public charging card, allowing for unlimited roaming," says Delta-EE's Lewis-Jones. "This sounds sensible, but is not the standard across many EV markets, especially the UK's."

This lack of roaming, says ten Bloemendal, is holding the UK back. What is needed is an open network, where you don't need to pay a subscription just to access a charging station, he insists.

Vehicle technology is changing too, with new models that can charge at very high power levels. Chinese EV manufacturer NIO, which is scheduled to launch in Europe in 2021, has developed a 100kWh battery with a range of more than 600km, as well as some less conventional methods of vehicle charging. These include swap shops, where drivers can exchange their flat batteries for a freshly charged one, and a valet service that sends a van with power banks to charge cars at home.

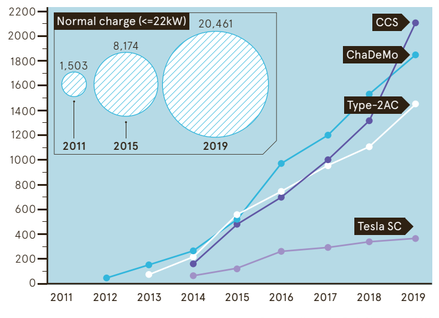
"We need to convince and provide certainty to the customer," says IONITY's Hajesch, "so at the end there is no reason not to go for an EV as their next choice of vehicle." ●


Martin Rickard/Getty Images

> The EV dream is all about making electric a superior experience to that of the combustion engine

CHARGING STATIONS SLOWLY ON THE RISE

For electric vehicles to realise their full potential, there must be not only more charging infrastructure, but a consistent type of charging station available.
(Number of charging stations)



European Alternative Fuels Observatory 2020

OPINION

'Infrastructure investment will lay the foundation for a sustainable recovery from the pandemic'

After such a difficult year for many, including those involved in infrastructure, it is pleasing to be able to end 2020 with a sense of optimism. We will enter 2021 with the prospect of a Biden administration committed to "Build Back Better" and unlocking the political impasse on US infrastructure; the European Commission has set out its plans to deliver its Green New Deal and the UK has published its long awaited *National Infrastructure Strategy* as a vital step towards delivering on its net-zero targets.

Here in the UK, private capital has helped to develop new energy infrastructure for decades, illustrated by the largest installed capacity of offshore wind in the world, with nearly £19 billion invested in UK offshore wind energy between 2016 and 2021. With a legally binding commitment to reach net-zero emissions by 2050, the UK appears strongly placed to attract the investment required to decarbonise not just its energy sources, but all sectors of the economy, including buildings and transport.

Infrastructure investment will also lay the foundation for a sustainable recovery from the pandemic, delivering on the "levelling-up" agenda. This is because infrastructure investment delivers multiples of the original investment in terms of its wider economic returns, with projects distributed across the country.

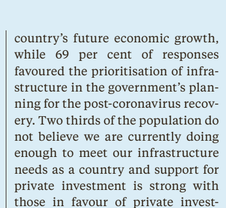
However, PwC's new report *Unlocking Capital For Net Zero Infrastructure*, commissioned by the Global Infrastructure Investor Association (GIIA), identifies £400 billion of investment will be needed over the next ten years to achieve net-zero commitments, twice the current rate of investment. That is why the UK government and regulators need to think hard about how to create the right investment environment to attract the international capital necessary to deliver such an ambitious programme.

And, according to the latest *Global Infrastructure Index* – a survey of 20,000 people from around the world, published by Ipsos MORI in partnership with GIIA – the general public agrees. The 2020 survey found that public sentiment supports the positive role private investors can play in renewing and rebuilding our infrastructure.

In the UK, 82 per cent of those surveyed agree that investment in infrastructure is vital to the country's future economic growth, while 69 per cent of responses favoured the prioritisation of infrastructure in the government's planning for the post-coronavirus recovery. Two thirds of the population do not believe we are currently doing enough to meet our infrastructure needs as a country and support for private investment is strong with those in favour of private investment if it means the country gets what it needs, outnumbering those against by seven to one.

To ensure investors have the confidence to deploy private capital in UK infrastructure, it is critical the government sets out a clear, sector-by-sector roadmap and strategic regulatory guidance from which investment can be steered cohesively towards achieving long-term policy objectives, while at the same time striking the right balance between consumer interests today and in the future. GIIA's recent report *The Future of Regulation* sets out some recommendations which we hope will be helpful in shaping that future regulatory framework and building on what has been a tremendous success for the UK over the last 40 years.

The much-anticipated release of the *National Infrastructure Strategy*, including the creation of a new National Infrastructure Bank, is a welcome step forward. There are exciting times ahead for those with an interest in financing and managing sustainable infrastructure for the benefit of future generations and there's no time to lose. ●



Jon Phillips
Corporate affairs director
Global Infrastructure
Investor Association

GIIA is the membership body for the leading infrastructure investors around the world that collectively have close to $1 trillion in assets under management across more than 50 countries

Commercial feature

Investing in Europe's future charging infrastructure, now

To the general public, the concept of widespread electric vehicle adoption seemed a pipe dream three years ago. Today, it is no longer a case of when and where EVs will gain traction, but how?

How will electric mobility operate in the future? How will charging infrastructure support the ever-increasing demand for electric vehicles (EVs)? And how do we make sure energy from renewable sources is available at any time to meet the enormous demand?

In the next five years alone, 400 battery-powered EV models will hit the market. As such, the industry is witnessing a growing conversation around charging infrastructure, its scope, extent and attractiveness.

Traditionally, pure availability of charging infrastructure and range anxiety were causes of concern for consumers still unsure about making the transition. But within the past two years, demonstrating the speed and size of the market, the landscape has changed. Range anxiety has faded, while questions of convenience, reliability, location and the all-round charging experience have taken precedence.

Future-proofing a rapidly expanding HPC network

Since IONITY's first charging station opened in 2018, its high-power charging (HPC) network has grown to account for more than 300 stations, with over 1,200 individual charge points across a targeted European footprint of 24 countries.

Michael Hajesch, chief executive of IONITY, says: "Intense research and heavy investments into the locations of IONITY's charging stations have been complemented by the development of state-of-the-art technologies, to ensure a future-proof and sustainable network."

The resultant award-winning chargers offer up to 350kW of 100 per cent renewable energy and multi-brand compatibility, by using the European standard CCS (Combined Charging System).

Hajesch says: "This benchmark in terms of charging capacity can't even be met by any presently available vehicle in the market. But considering the industry's speed of trajectory, there is a need to be ready for future market growth and advancements in battery technology."

Unlike traditional vehicles, EVs can be charged anywhere, at home, workplaces and throughout cities. From the start, IONITY has focused on what the company believes is the missing piece of the puzzle for widespread EV adoption: charging along motorways.

As a result, just three years after IONITY was founded, the challenge of long-distance travel has mostly been overcome.

Customer-centred design for everyday charging

"Location is key to establishing EVs as a viable alternative, incorporating factors such as site layout or digital services for payment."

"These aspects need to be taken into account to fulfil a very real ideal that the charging experience improves our consumers' journeys."

> It only just started. With new EV sales forecast to reach 44 million vehicles a year by 2030, investment opportunities become clear

While the company keeps building more stations across Europe, IONITY has started to develop a strategic growth path on how to improve and perfect their 'energy stations' of the future. Hajesch explains: "The beauty of emobility is it can be seamlessly integrated into everyday life and that's one of our main focuses."

"The other is all about quality. This means excellence in operations and perfecting the user experience: reliability, ease of use and a variety of payment options."

IONITY's ambitions and commitment to establishing a reliable EV charging infrastructure will pave the way for this transition from availability to habitual comfort of a network that customers will become familiar with in the years to come.

Hajesch continues: "The future of passenger road transport is 100 per cent electric. Now, the quality and quantity of charging infrastructure is key to convince customers this future is not only achievable, but has already begun."

As IONITY continues to build and expand Europe's leading HPC charging network, the constant increase in EV adoption means its work is only just starting. With new EV sales forecast to reach 44 million vehicles a year by 2030, investment opportunities become clear.

Hajesch concludes: "It's an exciting time for IONITY. We're a driving force behind the transition from installing EV charging infrastructure where needed, to it being so integrated in everyday life that it becomes second nature."

For more information please visit ionity.eu

IONITY

MIND THE GAP

Some $15 trillion of additional investment is needed worldwide over the next two decades if economies want to keep pace with the infrastructure needs of tomorrow. This infographic explores where those gaps will arise, and which sectors and countries are in need of the most investment

$79TRN
will be spent worldwide on transportation, energy, water and telecoms infrastructure between 2016 and 2040, equivalent to 2.99 per cent of GDP as of 2015

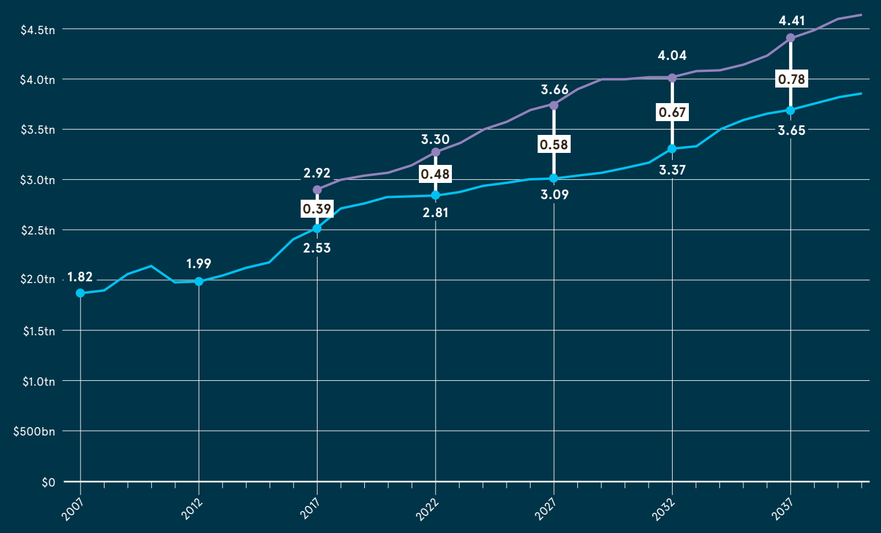
$94TRN
is required to meet predicted infrastructure needs, equivalent to 3.55 per cent of GDP

$15TRN
estimated additional infrastructure investment required to meet needs

Global Infrastructure Hub 2018

INVESTMENT GAP IS SET TO WIDEN

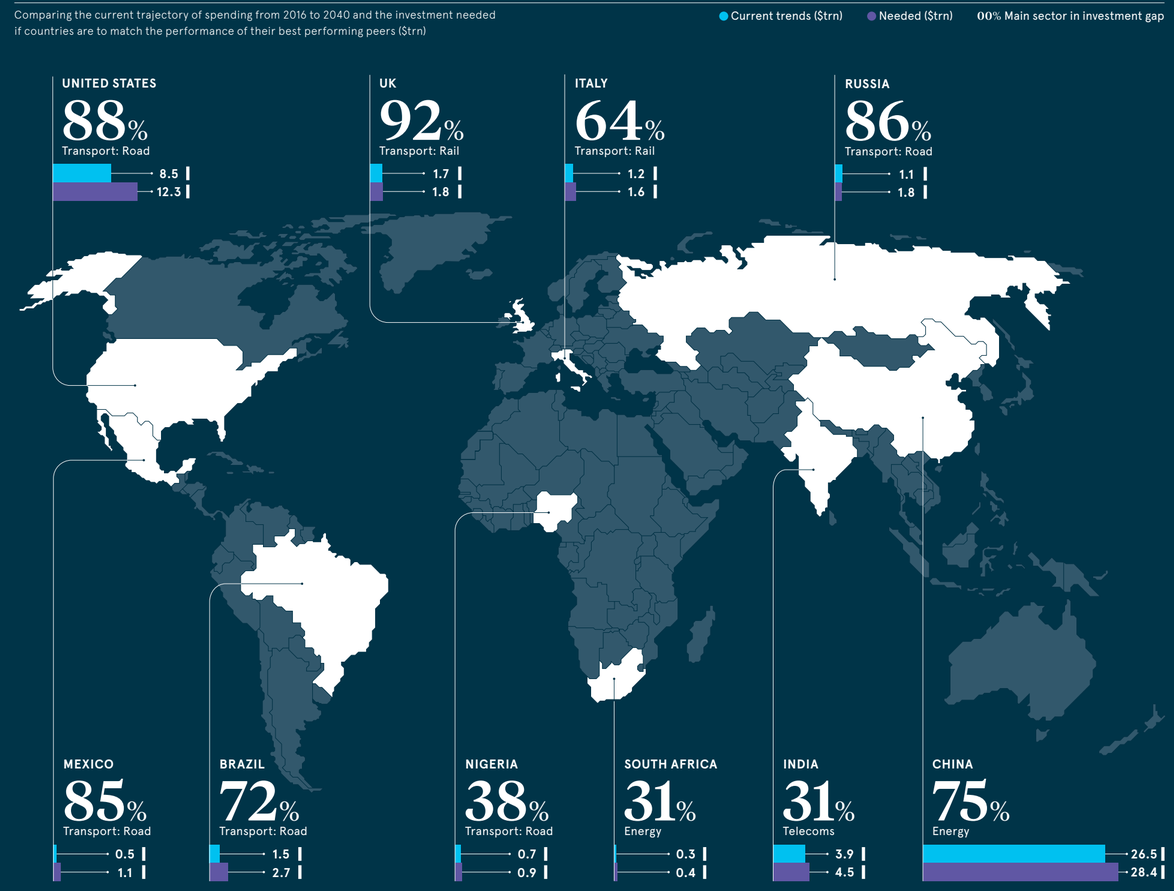
Comparing the current trajectory of spending from 2016 to 2040 and the investment needed (if countries are to match the performance of their best-performing peers).
56 countries were used in the analysis



Global Infrastructure Hub 2018

WHERE INVESTMENT IS NEEDED

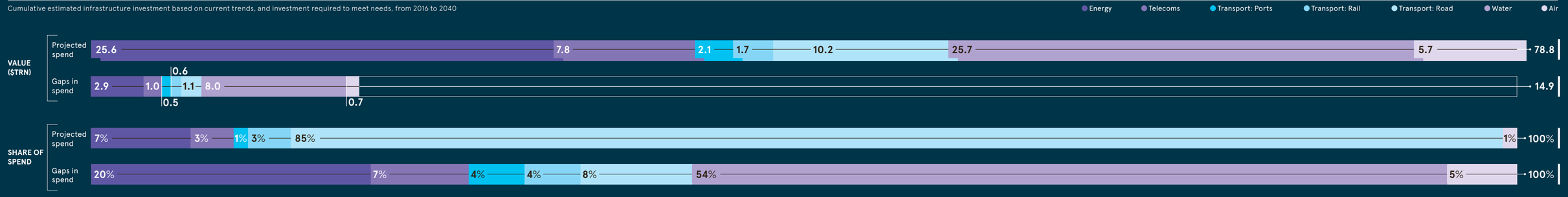
Comparing the current trajectory of spending from 2016 to 2040 and the investment needed if countries are to match the performance of their best performing peers ($trn)



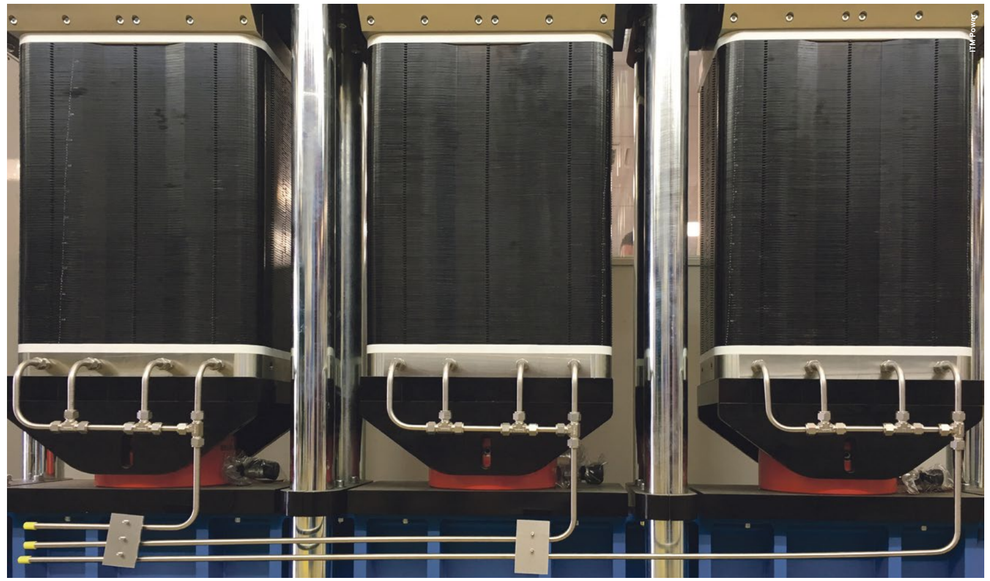
Raconteur analysis/Global Infrastructure Hub 2018

PROJECTED SPEND WORLDWIDE AND WHERE THE GAPS IN SPEND ARE, BY SECTOR

Cumulative estimated infrastructure investment based on current trends, and investment required to meet needs, from 2016 to 2040



Raconteur analysis/Global Infrastructure Hub 2018



> People have been talking about hydrogen for years, but what's been missing is how it can be implemented at a town or city level

GREEN HYDROGEN

Bold vision for renewables

Reaching net zero will require a major infrastructure overhaul, but for those working in the UK's emerging hydrogen fuel industry, it represents a huge opportunity

Sam Haddad

The UK government last month unveiled a ten-point plan for a green industrial revolution. It is a bold response to the twin challenges of the climate crisis and the coronavirus economic chaos by building back better, supporting green jobs and accelerating the UK's path to carbon net zero. The proposals, which include driving the growth of low-carbon hydrogen, require significant renewable energy investment and necessitate a major infrastructure overhaul.

Some of the funding will come from the government, but much more from the private sector, with many fund managers excited at the prospect. As the former Bank of England governor Mark Carney says: "The transition to net zero is creating the greatest commercial opportunity of our time."

Hydrogen fuel cells are a clean and efficient source of energy. They were invented in 1839 and have been used by Nasa for decades, so why is it suddenly being earmarked to play such a key role in our future infrastructural needs?

"It's the reduction in cost of renewable power and net zero," says Dr Graham Cooley, chief executive of ITM Power, a Sheffield-based business that has been making electrolysers for 20 years. "In the UK, at the last auctions, wind came in at under 4p per kWh; the solar record was recently beaten in Portugal with €.01.1 cents per kWh, which means you can make green hydrogen at a lower cost than natural gas. Green hydrogen is the only net-zero energy gas that can replace methane."

ITM Power has just moved into the world's biggest electrolyser factory which has a capacity of 1GW a year. "The UK government has set a target of 5GW of hydrogen production capacity over the next decade. The European Union target is 40GW by 2030, Chile's target is 25GW by 2030, all the targets are at the gigawatt scale and ITM Power is the first electrolyser company to design, build and move into a gigawatt factory. We are world leaders in the UK," says Cooley.

Amer Gaffar, director of the Manchester Fuel Cell Innovation Centre at Manchester Metropolitan University, says the centre's laboratories produce hydrogen from fuel cells in pure science terms, but they also work with local businesses to drive engagement with renewables, help companies make the transition to net zero and make investment in hydrogen more attractive.

"We're not just interested in blue-sky research," he says. "The centre was constructed to work with businesses and to support a potential hydrogen fuel cell supply chain." These businesses range from companies developing hydrogen-capable boilers, to those working on transport in hydrogen towns.

What excites Gaffar the most from a hydrogen perspective? "It's the energy vector that probably has the most ability to drive change towards decarbonisation," he says. Gaffar and his team have produced a phased hydrogen and fuel cell strategy with Greater Manchester, starting with public sector HGVs running on hydrogen fuel and moving onto large volume hydrogen supply to the population by 2026.

He suspects things might move more quickly away from oil and gas after the government's vote of confidence in the technology. "People have been talking about hydrogen for years, but what's been missing is how it can be implemented at a town or city level," says Gaffar.

One ambition from the government's ten-point plan is to create a hydrogen town by the end of the decade. At the end of November, a pilot scheme to heat and power 300 homes in Fife with green hydrogen was announced, with funding from energy regulator Ofgem and the Scottish government. The pilot will begin at the end of 2022.

Again, Gaffar says things don't need to happen overnight and the transition phase to hydrogen-powered energy generation can be managed by integrating hydrogen into the current gas network. "Tests have been going on for quite a while to see how our current gas network operates with hydrogen injected into it. From a tech usability perspective, you can inject up to 20 per cent hydrogen from the gas network and the current appliances into your home would work fine," he advises. Beyond that we'll be looking at a mass rollout, with pipework needing to be replaced.

Alongside transport and domestic energy demands, green hydrogen could also play a major role in decarbonising industry in the UK, especially when combined directly with a renewable power supply, such as a wind farm.

Or you could build an electrolyser on the ground, plugged directly into that renewable power supply, as ITM Power are doing in Humberside as part of the Gigastack project, which seeks to power the Phillips 66 refinery with green hydrogen produced by Orsted's offshore wind farm. The project received a £7.5-million boost from the UK government last February to take it to its next phase.

Along with the Gigastack project, ITM Power has an 8 megawatt-project in Teesside, their largest hydrogen bus refuelling station in Birmingham, a new strategic collaboration with Scottish Power Renewables, and a new gigawatt factory in Sheffield. "The Northern Powerhouse is alive and kicking," says Cooley. "It's part of the levelling-up agenda which I fully support."

Gaffar asks: "How do we decarbonise those heavy energy-intensive industries? By clustering the heavy energy-intensive industries together." He is working with the North-West Energy and Hydrogen Cluster, which has received some government funding. Teesside also has a cluster, called Net-Zero Teesside. And the Humber region has set an ambitious target of becoming the world's first net-zero industrial cluster by 2040.

"They're all inadvertently competing against each other to become the UK's first low-carbon industrial cluster. But they are also presenting their portfolios, an investor-ready set of projects, that are ready to go or even already being implemented," says Gaffar.

ITM Power secured a new round of funding in October to further their goals. "The City of London is incredibly well informed about green hydrogen," says Cooley. "What we need is the policy from the UK government with ten years of incentives to encourage the switch from natural gas to green hydrogen, and policy stability, and then it will unlock all the investment. We're currently world leaders, but we will be left behind if we don't have a bold vision."

Hydrogen power electrolyser stacks

WHAT ARE NEW APPLICATIONS FOR HYDROGEN?

Global energy leaders and stakeholders cite their top uses for renewable hydrogen power

World Energy Council 2019

Commercial feature

Q&A

Investing in hydrogen: building a new economy

Hydrogen is key to the UK achieving net zero by 2030. Deloitte's **Daniel Grosvenor**, UK renewables leader and author of *Investing in hydrogen: Ready, set net zero*, and **Nick Prior**, global head of infrastructure and capital projects, discuss how to establish a hydrogen economy

Q Why hydrogen? What role can it play in the UK reaching net zero by 2050?

DG Hydrogen has the potential to replace natural gas in heating and industrial processes and petrol and diesel for hard-to-electrify transport. Domestic gas boilers can be shifted to hydrogen using the existing or an upgraded network to create a hydrogen grid. If that's achieved, then hydrogen will play a significant role in achieving net zero. However, most hydrogen is made from natural gas and therefore this scenario is dependent on carbon capture and storage to deliver a low-carbon solution, known as blue hydrogen. Our analysis shows blue hydrogen is significantly cheaper than green, which uses renewable energy and electrolysis to produce hydrogen. But we are likely to need both to deliver net zero.

Q How can the cost of the technology be driven down?

DG Innovation can drive the cost down, increasing efficiencies and the economics. Ultimately, we need to build at scale. The offshore wind sector is a success because it installed thousands of turbines and continually made the process more efficient each time with incremental innovation. The same is needed for hydrogen.

NP Part of that falling cost has been the cost of capital. Investors are desperate to compete, therefore the capital ploughed into offshore wind is much cheaper now than it was at the beginning. Similarly, the cost of government and private sector borrowing for capital expenditure has never been lower and is likely to stay that way for the next few years.

Q Besides solid business and market frameworks, how else can the government incentivise investment in low-carbon infrastructure such as hydrogen?

DG A possibility is a workable carbon tax. Some estimates suggest a carbon price needs to be as high as €200 a tonne to make projects economically viable under a net-zero environment. However, the current price would most likely shut down the UK's steel and metal industry and make car manufacturers uncompetitive. Therefore, it's important to manage that transition and to not lump costs on industries before they can afford them. Furthermore, penalising behaviours through increased taxes on consumption can often impact most those least able to afford it, so it's important the process is carefully planned to ensure fairness and avoid an increase in fuel poverty.

> In the same way everybody now accepts electric cars are the only way forward. We need to get hydrogen in the same position

Q Next year the UK will host the 2021 United Nations Climate Change Conference, or COP26. What effect could this have on hydrogen policy?

DG The geopolitical environment on net zero is really coming together; there's a real opportunity to make COP26 all about net zero. The government can create an economic backdrop to give the private sector the confidence to invest in hydrogen solutions in the same way everybody now accepts electric cars are the only way forward. We need to get hydrogen in the same position.

Q What's the game-changer that's going to make hydrogen and, in the longer term, net zero happen?

DG Definitive decisions from government on what a net-zero UK will look like. This will then drive investment frameworks so the private sector can invest with confidence. The scale of the challenge requires the best of the public sector and private sector working and collaborating together. Step one is a political statement that people genuinely believe as the future. The ten-point plan is a good start, but the government needs to keep going and create the regulatory environment to shore up investor confidence and importantly deliver at a low cost of capital. If the government gets it right, the UK will be a very attractive destination for investors. We have the benefits of a sophisticated financial system, skills and expertise, and a very well respected, stable legal system to underpin investments and infrastructure. And we still have a government that has credit people will bank on. Therefore, if the government gets the policy environment right, for sure the investment will follow.

For more information please visit deloitte.com/uk

Investing in hydrogen: Ready, set, net zero
deloitte.co.uk/investinginhydrogen

Deloitte.

Infrastructure for economic stimulus and achieving net zero by 2050

Governments grappling with containing and recovering economically from coronavirus must also plot a path to achieve net-zero emissions by 2050 to mitigate another great existential threat, climate change.

Confronted with the coronavirus recession and climate change, many governments have identified an obvious opportunity: invest in infrastructure to stimulate the economy and draw down greenhouse gas emissions. Yet a highly constrained public purse means to do this it is paramount to spend both strategically and wisely, as Deloitte outlines in its new report *Infrastructure as an economic stimulus*.

The UK government's own, newly announced *Ten Point Plan for a Green Industrial Revolution* is, as it says, a huge opportunity to stimulate the economy and create jobs while decarbonising key sectors. The plan outlines infrastructure investments in hydrogen, electric vehicles, public transport, offshore wind, and carbon capture and storage. These investments will be backed by £100 billion of capital expenditure in the first year, a *National Infrastructure Strategy* and a new UK Infrastructure Bank.

However, as comprehensive as it is, the programme is only the first phase of what needs to be achieved and represents a mere fraction of the actual investment opportunity. Deloitte estimate the true level of financing needed to deliver the UK to net zero is around £1 trillion up to 2050.

Owing to the complexity of the challenge, government money alone will not suffice, private sector expenditure will also be pivotal. Yet, while the investment metrics for offshore wind and others are now well established and thus already attractive to investors, for less-established technologies it's much more challenging. Therefore, it is essential for the government to outline clear market frameworks and compelling business models for these nascent technologies, such as low-carbon hydrogen, and carbon capture and storage.

To overcome the understandable capacity constraints within the civil service to deliver these frameworks, the government should invest in qualified and highly competent resources to expand capability, particularly within the respective departments, and utilise devolved governments to also drive the agenda. This will ensure it can create the right framework, with the right investment signals around retraining, skills development, resources and infrastructure, so the private sector can take up a chunk of the workload.

Deloitte's framework for infrastructure investment can help every pound the government spends create returns of up to 2.7 times the initial outlay. Along with the new National Infrastructure Bank, implementing these methodologies will give the government a strong chance of succeeding in building back better, as it says, while cementing the pathway to net zero by 2050.

EMERGING MARKETS

Investment opportunities post-COVID

As countries around the world strive to rebuild their economies after the fallout of the coronavirus pandemic, many developed nations are turning their attention to infrastructure projects overseas


Credit: In Touch Imaging Ltd / NurPhoto via Getty Images

Finbarr Toesland

Despite the ongoing coronavirus pandemic causing many promising investment projects to break down, emerging economies are continuing to drive demand for infrastructure investment. Reinsurance firm Swiss Re estimates that infrastructure investment in emerging markets presents an annual opportunity of $920 billion for investors, highlighting the potential of this expansive asset class.

With such a large number of infrastructure projects in the pipeline across the world, identifying which nations hold the most potential is no small task. Dr Nuno Gil, professor of new infrastructure development at Alliance Manchester Business School, believes no single nation scores better across the whole spectrum of infrastructure investment, but rather different countries may offer particular opportunities in distinct sub-sectors.

"Brazil, and Latin America more generally, has been offering opportunities in the renewables sector for a while, and will continue to do so in the future. But African nations with a burgeoning, if small, upper class, such as Nigeria or Egypt, may offer opportunities in healthcare, although the pandemic may have changed things," he says.

Until the dust settles by the end of 2021, according to Gil, it may be difficult to see clearly where opportunities lie. However, the rise of infrastructure investment in Asia will continue, with the International Finance Corporation predicting 60 per cent of global infrastructure spend until 2040 will be in Asia, in part due to the rapid population and economic growth in this region.

Urbanisation in Africa is also driving infrastructure investment on the continent, especially as forecasts show its urban population will grow from 40 per cent in 2015 to 60 per cent in 2050. "Africa as a continent has enormous potential for infrastructure investment across a range of sectors, from telecoms through energy to transport. The need is clearly immense, though of course the same can be said for the challenges," says David Williams, partner at international law firm Simmons & Simmons.

It is clear that emerging and developed economies alike will be prioritising infrastructure investment in the post-COVID landscape. According to the recent Global Infrastructure Investor Association (GIIA)/Ipsos MORI Global Infrastructure Index, close to 70 per cent of respondents said they expect their government to make infrastructure investment a priority when planning a post-COVID recovery, while 68 per cent supported private investment.

Developed nations, too, are focusing on how infrastructure investment can play a central role in rebuilding their economies after COVID-19. "It will be interesting to see to what extent the Biden presidential election victory will have in terms of catalysing infrastructure investment in the United States. It must be hoped that there is now opportunity for very substantial investment, public and private, in infrastructure generally and 'green' initiatives in particular," says Williams.

Wind turbines generate electricity in Punniyavalanpuram, Tamil Nadu, India

3.9%
of GDP invested by emerging markets in infrastructure over the next 20 years

$929BN
investment opportunity presented by infrastructure in emerging markets

54%
of emerging market spend will be accounted for be China

Swiss Re 2020

> **Africa has enormous potential for investment... the need is immense, though the same can be said for the challenges**

While governments target inclusive and green infrastructure investment strategies, as well as recent Linklater research finding that infrastructure funds expect to grow green assets by more than a fifth by 2022, private sector capital has an important role to play to meet the scale of investment required.

Daniel Watson, head of sustainability at Amber Infrastructure Group, a specialist international infrastructure investment manager with $8 billion under management, has seen how global investors are increasingly seeking out environmental, social and governance-linked investments with governments now having a real opportunity to seek the "right type" of economic growth as nations recover from COVID.

"By clearly linking infrastructure investment opportunities to global sustainability frameworks, for example the United Nations' Sustainable Development Goals, the public sector has a chance to leverage significant private capital sources to finance the infrastructure society needs to thrive over the long term," says Watson.

Private capital firms are constantly searching for infrastructure investment projects in emerging markets that are likely to offer solid returns. But identifying potential investments is difficult to achieve when enterprises are usually based in developed nations, far from the emerging markets where they are investing.

Williams believes local engagement is key to uncovering hard-to-find opportunities. "It is really important to have either a strong local presence or a strong local partnership, people on the ground who can spot opportunities and then undertake due diligence, develop, execute and monitor projects from close at hand," he says.

Possessing local knowledge provides insight into how to navigate often complex financial ecosystems, especially when host countries differ dramatically to the nations where investors are based. Specialist investors, including India's National Investment and Infrastructure Fund and the World Bank's International Finance Corporation, can also play an important role in creating partnerships with private capital on infrastructure investment.

Many infrastructure investments made by private capital firms in emerging markets result not only in profits for the investor, but also in improvements to the lives of local residents. This win-win scenario can offer powerful economic, social and environmental benefits to host nations. Jon Phillips, director of corporate affairs at the GIIA, points to cases of investment that are delivering innovative infrastructure which is both environmentally and socially responsible.

"Examples include CLP India which, on a macro level, is supporting India's decarbonisation and renewable energy agenda, but also helping on a local level through the provision of healthcare facilities which provide medical care to more than 58,000 people," Phillips adds. The rise of corporate social responsibility has impacted how capital is deployed across the world, with profit maximisation increasingly balanced with environmental and societal concerns.

Even when private infrastructure investment is made without particular consideration of the impact it will have on local communities and development, social gains can still materialise. Constructing new roads can open up business opportunities for everyone from farmers to entrepreneurs who have been cut off from markets and building hospitals can foster the creation of a healthcare ecosystem.

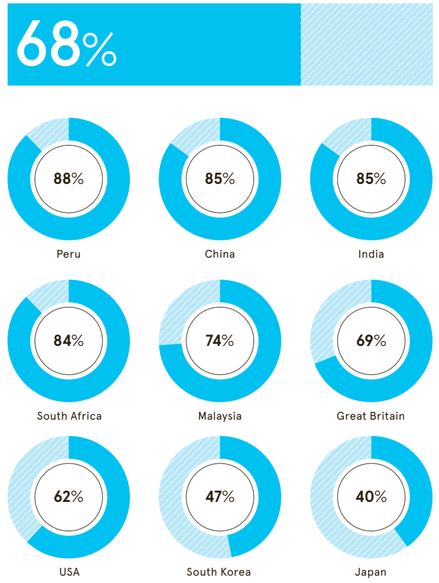
At every stage of the infrastructure investment process challenges must be overcome. Williams says: "In the developing world, there may be a host of projects available, but considerable uncertainty in terms of execution, given political or economic uncertainties and questions of certainty of the local system. In developed nations, on the other hand, the political, economic and legal climate may be more predictable, but there will be more competition for deals and so potentially lower returns, even assuming you can access those opportunities."

Parallels may exist between the issues that arise when making infrastructure investment in developed and emerging markets, namely political and regulatory uncertainty to varying levels, but less developed countries offer unique obstacles. While emerging economies are not a monolith, challenges around contract enforcement, corruption, weak institutions and poor-quality information relating to investments are common themes investors have to deal with. As more investors engage with emerging markets, these risks become more predictable and manageable.

Rapid urbanisation and unprecedented demographic changes are powerful mega-trends which can be expected to alter the lives of citizens in every country. Yet, rising to the challenges brought about by these transformative events will require infrastructure to be built, modernised and replaced so it is able to better support people across the world.

GLOBAL INFRASTRUCTURE INVESTMENT WILL DRIVE POST-COVID RECOVERY

Percentage of the global public who agree with the statement "I expect my government to make investment in infrastructure a priority when planning for the post-COVID-19 recovery"

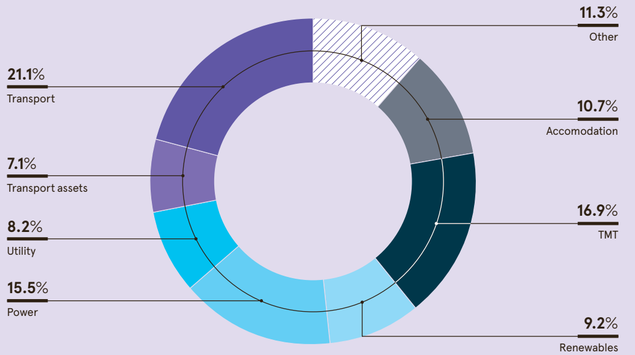


Global Infrastructure Investor Association 2020

Commercial feature

INVESTING ACROSS INFRASTRUCTURE SECTORS

Sequoia Investment Management Company 2020



Infrastructure's a safe haven for investors

During a hugely turbulent year, investors have found much-needed calm and stability in infrastructure funds, says **Steve Cook**, director and head of portfolio management at Sequoia Investment Management Company

Q How has infrastructure as an asset class evolved over the last ten to fifteen years?

A Asset classes like renewable energy have become more mainstream as the cost of capital has come down and the ways in which they get financed have become more sophisticated. With renewables, electricity supply can fluctuate depending on weather conditions, so you need ways to add back-up capacity to the grid, and therefore assets like standby generators, battery storage and peaking plants have also become important. Electric vehicles, meanwhile, create the need for chargepoints. New asset classes have also emerged in the technology, media and telecom (TMT) sector, including mobile-phone towers, datacentres and subsea data cables. We are not just seeing all these new asset classes emerging, but also some other asset classes beginning to fade out. Coal-fired power stations, for example, are being decommissioned at a rate of knots. They become stranded assets, with withdrawals of capital through environmental, social and governance considerations.

Q Why has infrastructure debt become such an attractive opportunity for investors?

A Virtually all infrastructure lending used to be done by banks, but the financial crisis of 2008 led to a retreat. Some banks closed, including big infrastructure lenders with more than $100 billion of infrastructure debt. Other banks just got smaller or focused only on their domestic markets, and regulatory changes made it more expensive for them to lend long-dated debt and subordinated debt. Yet clearly the need for capital didn't go away, and it's growing further as governments seek to advance their TMT infrastructure and meet ambitious goals around net-zero carbon. To fill the void, institutional lenders' debt funds have stepped in, along with insurance companies and pension funds. It presents great opportunities for investors, not just in the asset class growth, but pricing too. More demand for capital than supply means very robust returns on infrastructure debt.

Q How have infrastructure investments fared during the coronavirus crisis?

A Overall, they've performed really well. Part of the investment thesis for infrastructure is the stability of the assets. They're essential assets, sometimes regulated, with huge barriers to entry, so they tend to be non-cyclical and defensive. Some parts of our portfolio have actually outperformed this year, including the TMT sector which has benefited from more people working at home. We expect this to continue with the roll-out of 5G and as the world becomes increasingly connected. Clearly there have been a few pockets that have had a difficult year, such as aviation, but for the most part we've found a lot of the affected assets bounced back really quickly. Almost entirely across the board, we have seen great resilience in the infrastructure sector. Relatively speaking, it's been an oasis of calm and a safe haven through the chaos seen in many other sectors.

Q What approach does Sequoia take in this area and, geographically, where do you see the best investment opportunities?

A Our high-yield Sequoia Economic Infrastructure Income Fund is one of only two listed infrastructure debt funds on the LSE. We are also the Investment Adviser on Sequoia Infrastructure Debt Fund, a private euro investment-grade/crossoverfund investing in core Europe. We take a global approach to the market, and we have found the withdrawal of banking capacity and capability has created huge opportunities, especially in those newer infrastructure asset classes in TMT, grid stabilisation and renewable energy. We invest in numerous developed markets, but our jurisdiction of choice is the United States. It's a very large jurisdiction that's naturally diversified and it's where we see the widest range of investments and generally the best valuations. There's a shortage of capital, but a massive forward demand for US infrastructure spend, arising not just through new asset classes, but also maintaining core infrastructure. The American Society of Civil Engineers estimates the United States will require $4.5 trillion to upgrade its existing national infrastructure by 2030 and only around $2.5 trillion of this has been identified. That large shortfall is a significant opportunity for investors.

For more information please visit seqimco.com

SEQUOIA INVESTMENT MANAGEMENT COMPANY

DIVERSITY

Building a better infrastructure sector

A career in infrastructure can be fulfilling, fun and financially rewarding, so why are so many young people deciding not to work in the sector?

Magda Ibrahim

Bolstering economic productivity, tackling the effects of climate change, developing connected communities: truly transformational change through infrastructure needs a laser focus on diversity and inclusion (D&I).

An infrastructure project pipeline worth hundreds of billions, coupled with a skills shortage facing the sector, means there is an urgent need to tap every talent pool.

Traditional stereotypes of the infrastructure industry must be dispelled forever as a new paradigm, embracing the full potential of every current and future employee, emerges, say sector leaders.

"There is a huge pool of talent ruling themselves out," warns structural engineer Roma Agrawal, who has worked on projects including The Shard and was awarded the MBE for services to the industry.

"Working in infrastructure is fun and important; you see the effect on people's lives whether that is power networks, sewage systems or roads," she says. "It is also pretty well paid, so it is sad when young people won't even consider a career because of outdated stereotypes."

Last month, the government launched its *National Infrastructure Strategy*, focused on economic recovery, levelling up regions and achieving net-zero greenhouse gas emissions by 2050.

The strategy also pinpointed the need to diversify Treasury-sponsored agency the National Infrastructure Commission (NIC) and will recruit additional commissioners reflecting diverse talent.

Diversity at the highest levels of policy and decision-making is critical to avoid "implicitly building a world that excludes a large proportion of the population", says Ann Zhang, an economist at PA Consulting and chair of the NIC's Young Professionals Panel.

"As so much infrastructure is publicly funded, we are also asking people to pay for a world that doesn't meet their needs," she says. "We have seen a shift in the infrastructure industry where clients want to see diverse teams with diverse networks, so it is essential to align with the wider market sentiment. Ultimately, it could hit the bottom line and that is powerful."

The NIC launched its first D&I strategy in September, setting ambitious targets for itself and the wider industry.

It is measuring success against achieving 50 per cent women, 14 per cent BAME (black, Asian and minority ethnic) and 13 per cent disabled people working within the NIC by 2023, to better reflect society at large.

As well as hitting those targets, the organisation wants to foster an inclusive work environment, by adopting a zero-tolerance approach to bullying and harassment, and planning mental health and wellbeing support.

Cissie Liu, senior regulation analyst at energy company SSE, says there needs to be a step-change so non-minorities are invested in D&I. "The burden should not be on minority groups to drive the change," she says. "It should come from the top down."

A major issue impacting the infrastructure talent pipeline is ensuring a more diverse range of people are entering the industry.

At present, only 10.6 per cent of the UK's professional engineers are women, according to latest data from the Office for National Statistics, although this has increased from 7.6 per cent in 2015.

> **Working in infrastructure is fun and important; you get to see the effect on people's lives**

Women make up fewer than a quarter of employees in the water and energy sectors, which also have just 7.1 per cent BAME employees.

The National Centre for Universities and Business found just 15.2 per cent of engineering and technology undergraduates in 2019 were women, highlighting a significant gap in potential new entrants to the infrastructure industry.

Brittany Harris, co-founder and chief executive of construction technology firm Qualis Flow, says visible role models make a difference. "At school, I knew I wanted to work in science, but when I started looking into engineering, every piece of marketing material showed a white male," she says. "It was only after meeting more representative role models that I realised these spaces were open to me."

Concerted efforts are being made by organisations to engage children and young people in the creativity and innovation a career in infrastructure demands.

Network Rail recently ran a nationwide STEM (science, technology, engineering and maths) competition with schoolchildren aged five to fourteen, celebrating the work of female inventors and engineers, and is involved in the annual children's Leaders Award to create innovative designs that shape the future world.

Director of D&I at Network Rail Loraine Martins, who has also been awarded an MBE, says engaging young people is key to capturing "different ideas to help meet big challenges, such as an ageing population, sustainability and the skills shortage we face in the industry."

The next challenge is retention of diverse talent and fostering a culture of inclusivity, allowing employees to be themselves at work, boosting confidence and productivity, and progressing their careers.

Reverse mentoring for executive leaders, where they are mentored by a junior employee from a different background, is dispelling stereotypes around gender, race and sexual orientation at Network Rail.

Six employee networks include Archway, focused on lesbian, gay, bisexual and transgender issues, as well as the disability-focused CanDo, and groups around women, diverse cultures, faith and those with caring responsibilities.

"An unintended consequence of our networks is that we are attracting new employees because we are diverse and inclusive," adds Martins.

Physical improvements to the work environment, such as toilet facilities, are making a difference for Network Rail, while Thames Water has introduced female-friendly personal protective equipment during the coronavirus pandemic.

Overhauling family leave policies and "promoting male role models who work flexibly or take shared parental leave to break down stigma and ensure a level playing field" is part of a drive to improve gender equality at Thames Water, says culture, inclusion and engagement lead Sarah Gosiewska.

Across the wider industry, celebrating diversity in the workplace has snowballed. The Building Equality alliance of construction consultants, engineers, developers and contractors has swelled to more than 40 organisations driving LGBT+ (lesbian, gay, bisexual, trans and related communities) inclusion in the past five years.

Despite slow progress since the government launched its Disability Confident scheme in 2016, around a dozen firms in the infrastructure sector, including HS2, FM Conway and Kier Highways, have now reached the highest leader level, with its requirement to prove they are employing more disabled people.

Thames Water was the first water company to reach Disability Confident leader status as part of wider D&I plans, including attracting women in STEM, advancing ethnic minority talent in leadership and management positions, supporting armed forces communities and becoming a top employer for LGBT people.

"This is not just morally the right thing to do, but also critical to ensuring a high-performing, financially sustainable sector," emphasises Gosiewska.

For Dr Alice Maynard, managing director of consultancy Future Inclusion and former chair of Transport for London's independent disability advisory group, who has a CBE, more transformational change is needed in how leaders approach D&I to avoid it being a tick-box exercise.

"But when people actually get it, this becomes a significant priority and they are very creative and flexible in looking at their systems, processes and culture," she says.

Perhaps the greatest challenge facing all organisations is gathering robust data that allows for identifying diversity gaps and planning a programme of change.

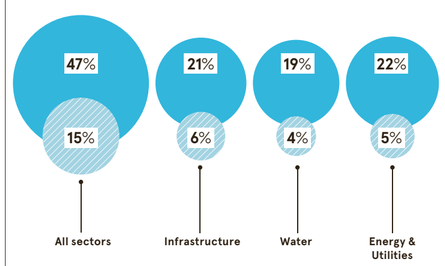
Network Rail's Martins believes "undersharing" is an issue in gathering data on disability and sexual orientation as people are wary of how the information will be used.

"We know the ethnicity of 87 per cent of our workforce, which has allowed us to talk about the ethnicity pay gap, but we need further data on other minority groups so we can change and improve," she acknowledges.

> **Infrastructure is publicly funded, we are asking people to pay for a world that doesn't always meet their needs**

HOW INFRASTRUCTURE IS PERFORMING ON DIVERSITY

The proportion of the UK workforce who are female or BAME



Braithinks and Greater London Authority 2020

NET ZERO

Taking on the net-zero challenge

The UK is committed to achieving net-zero greenhouse gas emissions by 2050, but getting there is not straightforward

Rose Stokes

In 2019 the UK became the world's first major economy to introduce a legal obligation to achieve net-zero greenhouse gas emissions by 2050, in line with broader commitments made as part of the Paris Agreement on combating climate change.

The move signified a clear commitment by the UK government to address Britain's role in mitigating global warming. It also required the government to set out parameters by which the UK creates an equilibrium between the amount of greenhouse gases it emits versus those it removes from the atmosphere, otherwise known as achieving net zero.

While this might sound relatively straightforward, for a country whose emissions rank 36th in the world per capita and 17th overall, reaching this ambitious target will be anything but.

On the face of it, decarbonising the economy is a herculean task that touches almost every single sector and industry. And while early signs of progress are beginning to show, off the back of historical government initiatives, it is clear that without drastic intervention, achieving net zero by 2050 may be impossible.

"You have to do the maths and work backwards from the long-term targets to work out what this means for the next five years or ten years," says Professor Charlie Donovan, executive director of the Centre for Climate Finance and Investment at Imperial College Business School. "And when you do the maths, you find that a dramatic change has to start today or even yesterday."

The central problem is that such challenging targets require a consolidated, cross-sectoral approach to a degree never before seen in the UK. By their very nature, these targets necessitate both updates to pre-existing infrastructure and the development of new systems at the same pace as technological innovation.

Put plainly, when it comes to achieving net zero, the ability of every single sector to meet its targets hinges on the available infrastructure being one step ahead of demand; it's the baseline upon which everything else depends.

According to Donovan, the key challenge in all this is for policymakers. "They must properly price the costs of climate change, manage the risks the private sector cannot manage for itself and provide a strategic direction for all sectors, but especially infrastructure. That's not just long term, but also speaks to the abundance of short-term actions required."

> **When you do the maths, you find that a dramatic change has to start today or even yesterday**

Another significant and unique challenge for infrastructure is that it's a sector that depends predominantly on fixed assets, whether that's electricity distribution, chargepoints for electric vehicles (EVs) or offshore wind farms. Upgrading pre-existing structures therefore needs to be carefully planned to minimise disruptions to the wider economy.

At the same time, new infrastructure must be developed to enable areas of innovation, such as hydrogen, carbon capture and storage, and this infrastructure needs to be underpinned by a regulatory framework set by the government. In many cases, this is still pending.

As a nod to the scale of the task, the government recently set out a ten-point plan for what it calls the Green Industrial Revolution, detailing the key areas of focus and an outline for what needs to be done. According to Donovan, although it provides a good start, the government's guidance has not yet gone far enough and needs more detail. "Do I see sufficient alignment across the various levels of government?" he asks. "Not yet."

So how much will this cost? According to PwC's recent *Unlocking Capital for Net-Zero Infrastructure* report: "£40 billion per year is required, on average, to be invested in new low-carbon and digital infrastructure over the next ten years, with similar levels thereafter, to meet the UK's net-zero target by 2050." In terms of the distribution of any investment, the report identifies the key areas of investment as the power system, transport, industrial and residential buildings, and digital infrastructure.

For Dr Peter Bird, managing director of consultancy BRG, there are two key priorities before anything else. "The first challenge is to replace all fossil fuels with clean energy and the second is to ensure there are enough power-generation facilities to meet the increased demand," he says.

There is perhaps no organisation that plays a greater role in this in the UK than the National Grid, given that clean energy will underpin the success of every other area.

"In the UK, we are in the middle of a transformation, with the energy we use increasingly coming from cleaner greener sources," says Graeme Cooper, project director at National Grid. "The National Grid is at the heart of that energy transformation, investing around £1.3 billion each year to adapt and develop our transmission network to connect new sources of low-carbon and green energy to our homes and businesses."

Donovan says the greatest obstacle is not a lack of available capital, but a need for policymakers to derisk investment opportunities and update the structures in place to match investors with projects. "There's a disconnect between the volume of capital that needs to flow into infrastructure and the way capital markets are set up to do that," he explains.

"We're in a situation in which we're trying to capture what could be the greatest economic opportunity of the century, but the difficulty is infrastructure as a long-term investment prospect poses a lot of challenges for capital markets that are increasingly focused on the short term."

Donovan believes clear strategic policy guidance from the government is needed to achieve this. Bird agrees: "A full and detailed roadmap to net zero has yet to be established and that has to be a first step."

> **A full and detailed roadmap to net zero has yet to be established and that has to be a first step**

None of this innovation will deliver progress without the help of consumers. The greatest challenge of all is ensuring they are incentivised by government initiatives and ease of access to switch to greener sources of power in their day-to-day lives.

Ofgem, the energy regulator, agrees that consumers must be at the centre of any net-zero strategies. "We're working to deliver a greener, fairer energy system for consumers," says Akshay Kaul, director for networks at Ofgem. Their priority, he says, is "making sure the investment made by the monopoly energy networks will deliver cleaner energy at the lowest cost to consumers."

And beyond cost, it also needs to be easy for consumers to use, says Patrick Reich, co-founder and chief executive of Bonnet, a new app with funding from Porsche that aims to address the fragmented charging infrastructure for EVs, making it easier for consumers to charge them.

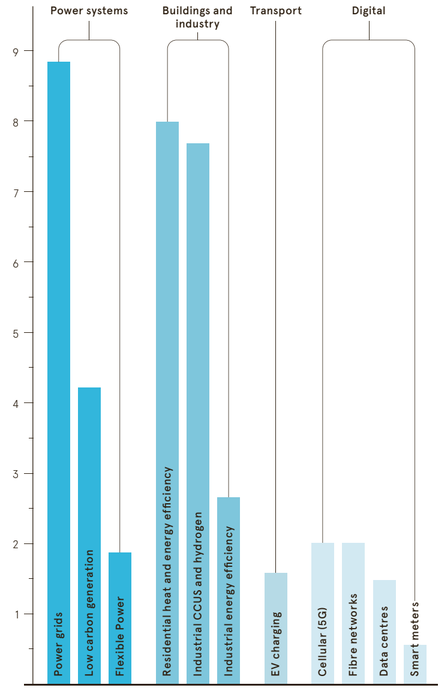
He argues that, as well as being readily available, access to infrastructure must be a transparent and easy process because the more complicated it is, the less likely people are going to use it. In the case of EV charging, Reich believes drivers "should be at the centre of any strategy if it is going to be successful".

One thing is clear, in a fragmented market, the ability of the UK to deliver on its net-zero targets rests largely on the government's ability to draw together efforts in a consolidated way, with close input and oversight between policymakers, investors, tech companies and consumers.

In the context of the sustainable innovation happening all over the UK, the challenge for policymakers is finding a way to draw all these different approaches together in a clear and co-ordinated way. Without this, the country's ability to meet the legal commitments it has made with the net-zero challenge is in peril.

HOW MUCH WILL ACHIEVING NET ZERO COST?

Average funding required by sector to achieve net zero by 2030 (£bn per annum)



Source: PwC 2020

Commercial feature

Q&A

How infrastructure investing can improve sustainable development

Lord Mark Malloch-Brown, senior policy adviser at I Squared Capital, shares insights on sustainable infrastructure investment

Q What role can infrastructure investors play in driving the United Nation's Sustainable Development Goals?

A Infrastructure is the platform on which a lot of the other Sustainable Development Goals (SDGs) deliver. We live in a world with very uneven infrastructure which doesn't reflect population distribution. There is a huge infrastructure deficit in developing regions of the world and in developed regions infrastructure is often not fit for purpose in terms of SDG achievement. We're a world badly in need of an infrastructure surge to correct the existing infrastructure footprint and to build out a new footpath where there is currently just a toehold in many parts of the developing world.

Q Why is infrastructure a better route to sustainable investing than other asset classes?

A Partly because it's an anchor for the rest. You need a new infrastructure platform in the world that addresses green transportation and energy if, for example, you are to achieve climate change goals. Secondly, infrastructure is one of the most financially attractive components of environmental, social and governance investing because it tends to provide attractive cash flows and good returns on investment. There's an infrastructure squeeze; there isn't enough of it to go round, so it secures old-world returns for a new economy purpose.

Q What specific type of infrastructure projects can make the most impact from a sustainability perspective?

A The shift to renewable energy is going to fundamentally reshape the transport network on which we operate, as people move first towards more mass-transit systems and second towards a shared car ownership model. For almost every sector, where people are seeking change in terms of SDG performance, there is an infrastructure role. For example, we're going to see a dramatic change in agriculture and food production with a real focus on cutting down food waste by investing in infrastructure that improves storage, shortens the journey times to market and localises food production in ways not seen before.

Q What are the wider social benefits of infrastructure investing?

A Infrastructure is simply at the core of any development model. People who have not been reached by modern infrastructure are every bit as much in need of it as middle-class city dwellers whose infrastructure is not delivering the benefits they expect it to deliver. When you look at the numbers, there is such a gap between the investment need and the amount of investment going into this sector. But it's not as simple as saying that we need X hundred billion and we're only getting Y, and all you need to do is fill the gap. You need the right financial products and the right public-private mix to address the particular risks of long-term investments of this kind.

Q Where do you see the most need for infrastructure investment to support the UN's SDGs?

A In the developed world, the financing is often easier because the returns are securer. But in economic terms, if you improve, say, railway infrastructure in the developed world compared to installing a mass-transit system in a developing country where there wasn't one before, the economic returns in the latter case are going to be much higher than in the former, but the financial returns are riskier. So at the moment there is an investment bias towards infrastructure in the developed world even though the economic returns to society as a whole maybe considerably less.

> **Infrastructure is key to development. People without modern infrastructure need it just as much as city dwellers who aren't getting the benefits they want**

Q What needs to be done to boost infrastructure investment in developing markets?

A First, designing investment products that satisfy the investor they are taking a reasonable, but not excessive, amount of risk, so that's usually some kind of public-private investment model where a public entity is taking a portion of the risk. The second is structuring deals where the investor is not taking a huge currency risk. Beyond the financial aspects, there's also risk around the quality and capacity of infrastructure projects on the ground, so ensuring there is a trained local labour supply and local managerial capacity is important to make sure projects can be executed as efficiently in a developing country as in a developed country.

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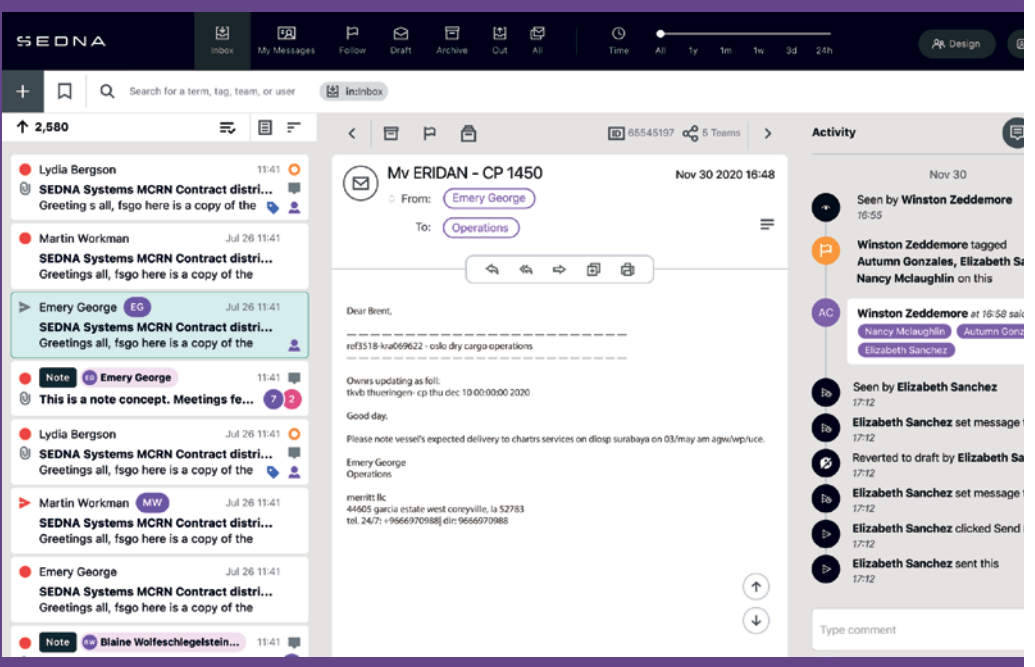

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