

# Making the UK a digital clean tech leader





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The climate crisis has never been more evident and the need to address our carbon emissions and energy consumption has become urgent.

While techno-fixes to the carbon crisis are no silver bullet we know that digital technology can play a vital supporting role in the complex systems transformations that achieving net zero requires.

Analysis for this report by Deloitte suggests that digital technology already in the field can enable a reduction of 7.3 million tonnes of UK carbon emission by 2030, 15% of what's needed. At the same, we can unlock GVA benefits of £13.7bn by enabling other sectors to be flexible, automated, and efficient

And with new use cases and applications being trialled and piloted we know that we can help to enable even deeper cuts in carbon.

We are already seeing this play out in some of the sectors which are more advanced in their 2050 transition plans.

In mobility, pilot projects are demonstrating that digital technologies can help bring down the price of charging, making EV more affordable for consumers. For energy, digital technologies can help support flexible and responsive energy services.

**The case is becoming clear that digital technologies can cut the cost of decarbonisation and that the UK is particularly well positioned to exploit these opportunities.**

Yet sometimes even proven innovations struggle to reach scale in the marketplace because of missing competencies, poor understanding of the market, lack of access to data or regulatory barriers.

In this report, we show the prize to the UK economy in pursuing a tech-led decarbonisation strategy, and the potential for the UK's own tech talent to play a part in the emerging digital clean tech market. We outline key barriers our members report in trying to get their own digital clean tech to market and set out some initial recommendations to address these.

A handwritten signature in black ink, appearing to read 'Julian David'.

Julian David  
CEO, techUK

Digital technology is the enabler for our world today. Increasingly, we connect and communicate digitally; monitor and track the world around us; analyse, optimise and predict our interactions and augment and scale our human capabilities.

But digital technology itself does not deliver positive impact. Rather, it's how we develop and deploy technology that matters. In particular, it has the potential to be an essential tool in addressing the climate crisis, which will be the defining influence of our society's wellbeing in the coming decade. That's why we are committed to encouraging the deployment of digital technology for good.

At Deloitte, we place our role in society at the heart of what we do. Our purpose is to make an impact that matters and we embed this ideal in our work every day. We are proud of our contribution, through the support we provide our clients, in enabling the development and deployment of clean technology here in the UK and around the world.

**Through this report, we stand with techUK to call for an acceleration and amplification of the impact of clean technology. The headline messages to government are clear, with benefits to communities and businesses now and in the long-term.**

As this report shows, clean technology is already making a contribution to economic growth and to reducing emissions – and this contribution is projected to grow. But we know that to realise the ambitions of the Paris Climate Agreement and to achieve a sustainable world, there is still so much more to do, and the urgency continues to increase.

Together with our clients, we at Deloitte are committed to help meet this challenge so that we can all enjoy a sustainable future.



Nick Owen  
UK Chair, Deloitte

# Executive summary

Technology must play a significant part in meeting the UK's ambitious 2050 net zero target, and for many sectors investing in digital will be the path of least resistance.

As the UK gets ready to host COP 26 and sets out how it plans to meet net zero, it is right that we look at how the tech sector can help meet this challenge, and meet it in a way that delivers growth, jobs, exports and prosperity.

In 2020, for the first time, Tech Nation identified digital clean tech as an emerging tech sector,<sup>1</sup> with digital devices and software increasingly being deployed to help optimise existing assets and systems, support energy efficiency, and support and accelerate discovery of new solutions to climate challenges.

The UK, with its strong ecosystem of tech talent, is well placed to capitalise on this new market and associated export opportunities: by setting the right policy, regulatory and market framework we can foster and grow companies to play into this market.

Working with Deloitte we have substantiated that digital clean tech already in the field can enable 15% of the emission reductions needed in the UK between now and 2030: reducing 2030 emissions by 7.2 million tonnes and in turn delivering £13.7bn GVA, equivalent to the current GVA of the UK's pharmaceutical manufacturing industry. And, we know the potential is even greater once we roll out 5G and other transformational digital technologies.

In this report, we set out the potential of digital technology in helping to cut carbon and the actions needed to realise that potential, outlined on page 8. These recommendations follow discussions, interviews and roundtables with techUK members and industry experts.



## Our headline messages to government are clear:

- **Seize the economic and carbon prize.** Digital clean tech solutions can draw from the UK's tech strength, deliver £13.7bn GVA for the UK and enable 15% of the emission reductions needed by 2030 (7.2MT).
- **Innovation needs to be pivoted towards net zero.** The UK Research and Development Roadmap is a positive step, but we urgently need to rethink how we can accelerate and adapt our innovation system to meet the challenge of net zero.
- **Create a regulatory environment that embraces digital.** The UK has some world-leading approaches to regulation. We must build on this expertise to create a flexible, agile regulatory system that can deal with the transformation needed to meet our net zero goals.
- **Unlock the value of data.** New sectors, businesses and services can develop from open data, whilst also helping us to achieve net zero. Government must work with industry, citizens and trusted third parties to create an environment where data is shared with trust and confidence.
- **Support the development of the markets of the future.** Moving from invention to widespread deployment can take many decades, yet only three decades remain to meet the net zero emissions goal. We urgently need to agree new market mechanisms to unlock private sector capital.





# Summary of recommendations

techUK through its programmes, groups and events is encouraging ambitious climate action by members and supporting collaboration across sectors for net zero. But there are a number of actions that government can implement that can help the tech sector to deliver on its potential. These are listed below. techUK stands ready to work with government to help deliver them.

## Innovation

- BEIS' R&D Roadmap should conduct a review of the current innovation system to assess whether it adequately allows for the innovation demanded by net zero.
- UK innovation bodies should run innovation trials and pilots for longer to prove the business model and value propositions, as well as the technology.
- All government departments should run outcome- and problem-based innovation challenges to crowd-source innovative solutions.
- UK innovation bodies need to consider new platforms to share both successes and failures in a more transparent way so companies can glean better insights from funded projects.

## Policy and regulation

- We need a roadmap to net zero: an updated Clean Growth Strategy, Energy White Paper and Infrastructure Strategy needs to be published rapidly.
- BEIS should establish a new net zero delivery office to support greater co-ordination across Government Departments & Regulators to ensure enhanced collaboration and support regulatory alignment across Government.
- The Regulatory Horizons Council should establish a net zero tech taskforce to work with the tech sector to work through regulatory bottlenecks and legislative barriers.
- Regulators should deepen regulatory sandboxing by extending it into other sectors. Extend the funding available to regulators through channels such as the Regulator's Pioneer Fund.
- Government departments should apply digital tech innovation impact assessments to new legislation to prevent any stifling of future innovation.
- Sponsoring departments should create a statutory duty on regulators to have a due regard to decarbonisation.



## Data

- The Regulatory Horizon Council should review regulations that are keeping businesses from sharing and using data.
- The energy sector and government should look at routes to open up energy data to third parties, for example by developing APIs or examining the role of data trusts or other data sharing models.
- Government's ongoing work on a National Data Strategy should reflect the need for open data in the transition to net zero.
- Policy coordination must be enhanced, and transparency increased, as data policy and regulations are being developed across departments and regulators.

## Finance, markets and growth

- Government should launch a call for evidence to explore incentive schemes to stimulate low-carbon investment in businesses, homes and the public sector.
- All departments and regulators should ensure measures are rolled out to overcome access to finance barriers – such as grants, low-interest loans, equity loans or green mortgages. These should be technology agnostic to avoid locking out innovation.
- Government should consider options for VAT reductions, tax offsetting and the entire suite of indirect tax measures that make energy reducing technologies more investable.
- Public financial support mechanisms, like loan guarantees, should be dedicated to new low-carbon technologies to de-risk and lower the cost of capital for early deployment.

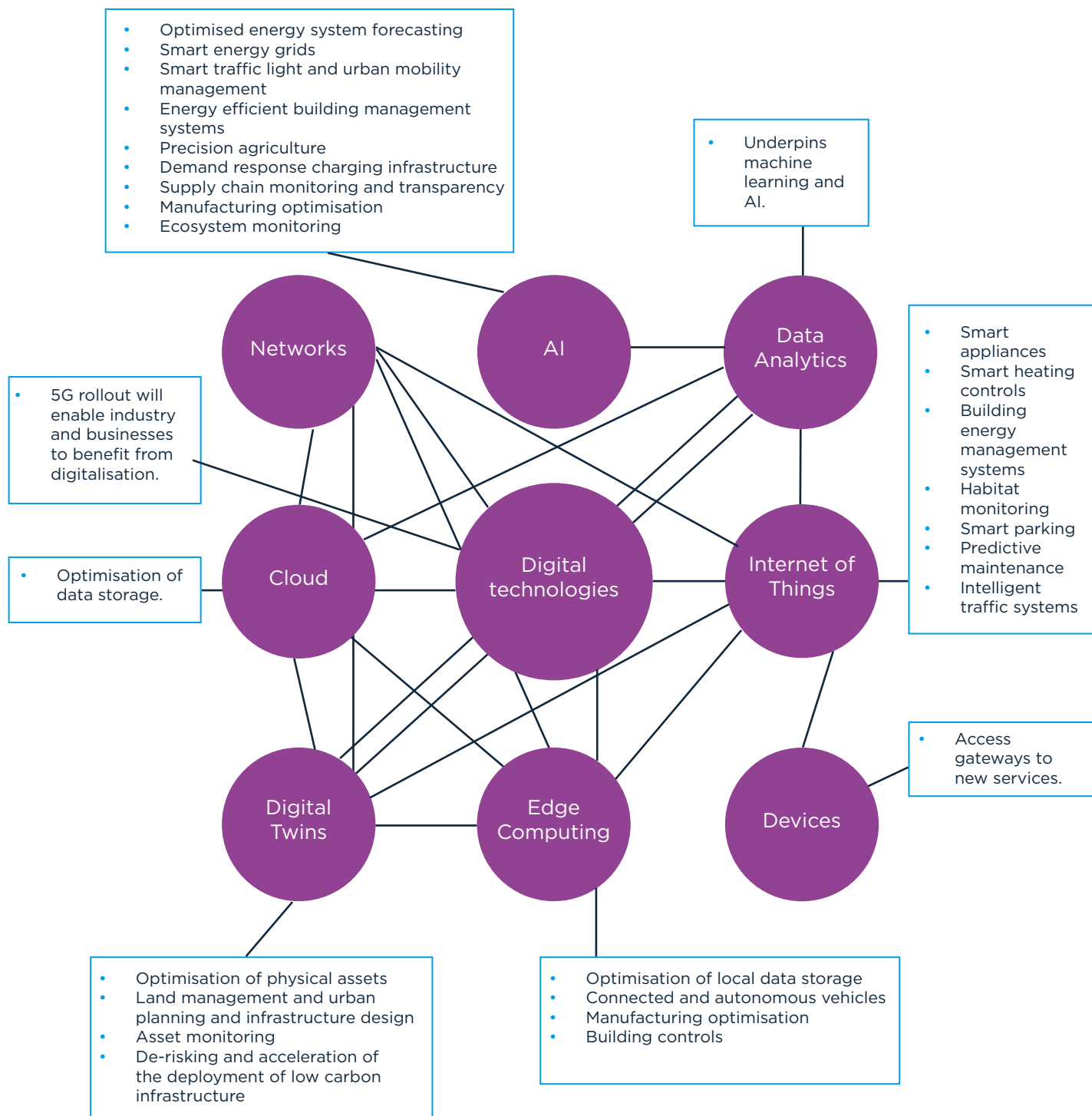


# Section 1 | The potential of tech

## Technologies that can make an impact in cutting carbon

The 'tech sector' is a broad term that can be applied to systems, companies, and industries of all sizes, but most simply, 'tech' refers to networks, digital devices, and software. Even within this simple categorisation, there are a plethora of technologies each of which have promising applications, and which used together can have a potentially transformational effect.

In this section of the report, we outline some of the most promising applications and how they might be applied in systems. We outline the impact some are already having and share case studies and programmes active in realising the potential of yet-to-market possibilities.





## What impact can digital tech play in meeting net zero?

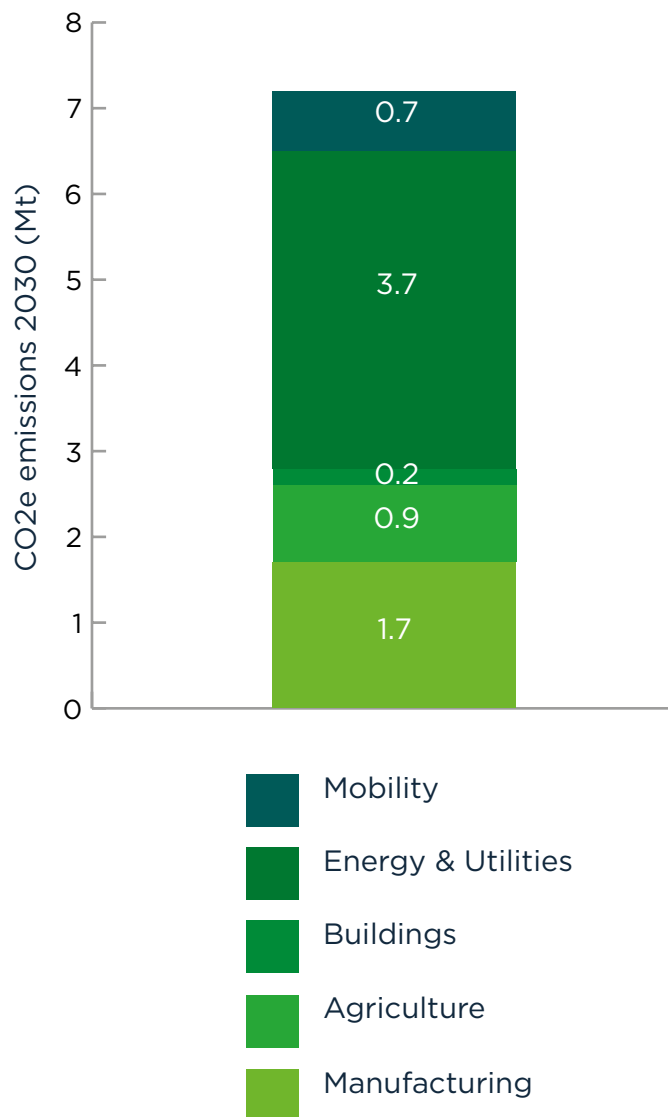
Government has estimated that between now and 2030, greenhouse gas emissions must fall by 48 Mt CO<sub>2</sub>e, equivalent to 11% of total UK CO<sub>2</sub>e emissions in 2018. Analysis by Deloitte for this report estimates that digital technologies already being deployed can deliver 15% of this decrease, reducing UK 2030 emissions by 7.2 million tonnes of carbon dioxide. This is in line with other estimates assessing the role of digital technologies in helping to mitigate emissions of greenhouse gases<sup>2</sup>.

While the rebound effect<sup>3</sup> may reduce this depending on the application and sector, this annual saving is equivalent to taking 3.36 million cars off the road<sup>4</sup>. This figure does not take into account the sector's own footprint.<sup>5</sup>

This analysis is based only on digital technologies that are already in the field and proven.

The vast majority of this comes from the application of smart grids to energy networks, followed by the use of Industry 4.0 technologies in manufacturing. Remaining carbon savings come from agriculture, mobility, and smart building technologies.

In future, we expect further, deeper gains to be realised as piloted programmes and trials demonstrate proof of concept, incentives for businesses to invest in digital technologies strengthen, and as innovation accelerates through industry initiatives and public-private partnerships. In the following pages we illustrate the potential role digital technologies can play in underpinning our response to net zero in the energy system, mobility, buildings and in climate modelling and simulation.



## **An International Centre for AI, Climate and Energy**

The ability of AI in helping the world deliver on its climate ambitions is more tangible than ever. Work by PwC and Microsoft along with increasing academic analysis shines a light on how AI could be a key enabling technology in supporting a more affordable transition to a low carbon economy.

Some estimates suggest AI can cut global emissions by 4% by 2030 with a corresponding uplift to global GDP of 4.4%.

Given the necessary speed of change required, a coalition of techUK, tech firms, industry leaders, civil society and academics have signalled their support for a UK-based International Centre for AI, Climate and Energy to encourage collaboration, address technical barriers and support rapid deployment of the most promising solutions.

## **Digital with Purpose**

GeSI and Deloitte, in their keynote analysis Digital with Purpose, examined the causal relationship between the development and deployment of digital technology and progress against the SDGs, including Climate Action. The report concluded the ICT sector has the potential to enable the reduction of seven times the increased carbon it is expected to emit up to 2030. In an optimistic scenario, the report found that by 2030, the ICT sector will enable emissions reduction equivalent to 15% of total world emissions.

Read more here: <https://gesi.org/platforms/digital-with-a-purpose-delivering-a-smarter2030>

## **Microsoft - A focus on biodiversity**

We do not know enough about species, biodiversity and ecosystems that are vital to our health and prosperity. We can't solve a problem that we don't fully understand. Assessing the planet's health must become a more sustained, integrated practice that allows us to understand exactly what is happening in time to enable smart decision-making. That's why Microsoft launched the Planetary Computer to aggregate environmental data from around the world and put it to work through computing and machine learning to help inform the work of organisations focused on environmental decision-making, revolutionise environmental assessment practices and accelerate a more environmentally sustainable future.

To learn more about Microsoft's commitment on the topic of climate, head here: <https://news.microsoft.com/climate/>

## **Microsoft - AI for Earth**

In every corner of the world, researchers and organisations face unprecedented challenges to develop solutions that address climate change. For small organisations, the rapid collection and analysis of diverse data sets needed to create these solutions is a daunting task. AI for Earth is Microsoft's initiative for environmental innovation, through it we support organisations that are applying AI to environmental challenges, by helping them harness the full power of cloud computing. Working with a variety of partners and awarding over 500 grants to projects with impact in 81 countries to date, Microsoft is committed to creating a better future for everyone.

To learn more about Microsoft's commitment on the topic of climate, head here: <https://news.microsoft.com/climate/>

## Smart energy

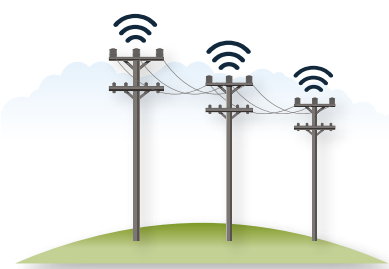
Smart energy systems can intelligently link supply, storage and use of power and heat in new ways that can dramatically improve efficiency and optimise energy use. In future, smart grids underpinned by digital technologies and enhanced asset monitoring and control capability will be required to detect local changes in usage, and manage supply and demand accordingly, in turn helping to integrate more renewables on to the grid without the need for carbon-intensive back up generation. Data centres have the potential for playing a much greater role in grid balancing in future by becoming prosumers.

### Digital Energy Systems

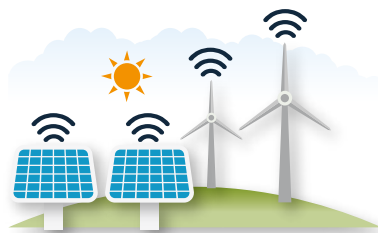
Transmission



Distribution



Generation



- Reliable power can be delivered across the electrical network through advanced analytics using machine learning, communications and controls.
- Digitally enabled demand response models, either automated or driven by incentives such as dynamic price signals, can reduce energy consumption in line with fluctuations in renewable power generation.
- Smart storage systems not only store unneeded energy generated from on-site renewables but can have a valuable role in supporting grid balancing.
- New tools such as blockchain could help to facilitate peer-to-peer electricity trade within local energy communities.
- Through earth observation and advanced analytics using machine learning, network operators will be able to forecast energy from renewables with precision.
- Digital twins will make it easier for operators to monitor assets using real time data.

### Technologies already in the field can deliver:

- Annual reductions in consumer bills by 2030: **£354m**
- Reduction in energy intensity of the energy system: **2%**
- Carbon savings by 2030: **4 million tonnes**



## Case studies

### Octopus Energy | Incentivising green tech markets

Octopus's innovative range of tariffs - underpinned by data, smart technology, and renewables - are incentivising uptake of green technologies including solar, EV and energy storage. The company was one of the first UK suppliers to really harness the potential of smart meter technology with Agile Octopus, a time of use tariff with half-hourly rates allowing customers to adjust their consumption to times when the wholesale price of energy is cheapest. Now it is using its smart technology to track what is going on and off the grid, paying for excess energy supplied by solar panels in homes. EV drivers can benefit from cheaper fees by smart charging at night, whilst helping to balance the grid. Homeowners can also get support in optimising home energy storage.

### OpenClimateFix | Using machine learning to support PV forecasting

OpenClimateFix is a new non-profit research and development lab focused on reducing greenhouse gas emissions as quickly as possible using computers. It takes a three-pronged approach: collating and releasing data, running a collaborative global research competition and then supporting deployment. Its initial focus is on using machine learning to improve solar photovoltaic forecasting to support grid balancing. In the UK, better PV forecasts should save £1-10 million per year (Taylor et al, 2016), and about 100,000 tonnes of CO<sub>2</sub> per year.

## Smart mobility

Smart digital technologies can support advanced smart public transport, intelligent traffic monitoring to ease congestion in urban areas, and enable seamless public transport use through e-ticketing and information platforms. In future, vehicle to grid and smart charging of electric vehicles could help to bring more of these vehicles on the road without undermining the grid, supporting mobility-as-a-service business models and more efficient autonomous vehicles. Smart train controls can also help to improve efficiency and cut carbon in future.

### Mobility Services and Transport



#### Technologies in the field can deliver:

- Annual financial savings by 2030:  
**£1bn**
- Annual carbon savings by 2030:  
**1 million tonnes**

## Optimise Prime | Smart EV infrastructure

Optimise Prime is the world's biggest trial of commercial EVs with project partners UK Power Networks, Hitachi, Uber, Scottish and Southern Electricity Networks, Centrica and Royal Mail, and funding from Ofgem's Network Innovation Competition. It seeks to understand and minimise the impact the electrification of commercial vehicles will have on distribution networks and the operation of corporate fleets.

At its heart is data capture: modelling and understanding the implications of different charging technologies, their impact on the grid, and then developing technical and commercial solutions to cut customer costs (estimated to £207m savings by 2030). The aim is to enable a faster transition to electric for commercial fleets and private hire vehicle operators and help to inform how best to develop the UK's overall EV infrastructure. Accelerated adoption of commercial EVs will save 2.7m tonnes of CO<sub>2</sub>.

## BT | Smart streets and buildings

Working with Plug and Play, the world's leading innovation platform headquartered in Silicon Valley, BT has launched a new Green Tech Innovation Platform to uncover the latest technologies from UK-based tech scale-ups that could support BT and its public sector customers transition to net zero. The partnership will explore three areas:

**Smart streets:** Insights from environmental monitoring and traffic optimisation sensors which can be easily integrated into 'street furniture' like the next generation of BT Street Hub units.

**Smart buildings:** IOT capable solutions supporting energy and water management in social housing and other public sector buildings.

**Remote working:** Uncover ways 5G can be used to support innovative products and solutions that will reduce travel, e.g. using video, augmented reality or virtual reality to carry out remote repair and diagnostics by health and other public sector workers.



## Smart and connected homes and buildings

Smart lighting systems and temperature control systems can help to increase energy efficiency through optimisation of energy usage for light and heating, and hence reduce CO<sub>2</sub> emissions. In smart offices, automated processes can control the building's operations such as heating, air conditioning, lighting or security, and can improve employee comfort and increase employee productivity. In future, through smart meters, connected homes and buildings can be integrated into local energy grids, both taking energy off the grid, selling energy back, and using energy when it is cheapest to do so.



### Technologies already in the field can deliver:

- Annual carbon savings by 2030: **223,000 tonnes**
- Annual UK productivity gain in 2030: **1%**
- Annual UK GVA savings by 2030: **£289m**

## **Hitachi | Smart Spaces: Isles of Scilly**

Targeting one of the UK's most carbon intensive communities, a partnership between local government, landowners and tech firms has been working on the Isles of Scilly to cut residents' energy bills by 40%, meet 40% of energy demand from renewables, and transition 40% of the island to electric vehicles by 2025. Previously, the islands have been highly dependent on mainland electricity and imported fossil fuels, such as petrol, bottled gas, and heating oil. With funding support from the European Regional Development Fund, the Smart Energy Islands project is deploying a range of cutting-edge digital technology – AI, IOT, smart energy management systems, air source heat pumps, smart energy storage, smart charging and V2G (vehicle-to-grid) – delivered by Hitachi, Moxia and PassivSystems – to reduce the carbon footprint of the island while optimising locally-produced, renewable technology.

## **HPE | Data fuelled smart energy**

HPE deployed data analytics and IOT to help CenterPoint Energy leverage innovation using smart meters and smart grids, to improve its services to its customers and boost operational efficiency. The result was a 10% improvement in customer satisfaction due to faster resolution of power issues and usage questions, and thousands fewer truck rolls annually since implementing smart meters and analytics.

## Climate modelling and digital twins

It is difficult to quantify the impact of advanced climate modelling and the future role of digital twins. However, the role of observation tools, machine learning and artificial intelligence in developing models and stimulations in mitigating climate change, monitoring its impacts and supporting resilience to a changing climate is becoming increasingly recognised.

Digital twins are dynamic virtual representations of physical objects or systems that use real-world data, simulation, or machine learning, combined with data analysis, to enable understanding, learning and reasoning. The scaled deployment of digital twins will be key to realising climate objectives across the lifecycles of numerous assets, processes, and systems. From prototyping and testing climate-efficient products cost-effectively, to optimising the operation of live systems, right through to the decommissioning of polluting assets and systems, digital twins can de-risk and accelerate clean innovation. In the longer-term, the integration of digital twins at a national level could provide a strong foundation for dynamic and adaptive climate policy-making.

As it stands, the scaled deployment and integration of digital twins is still a work in progress. It is being held back by the traditional lack of commercial incentives for different stakeholders to invest in high quality data infrastructure, and to share information with others. However, digital twins could prove enormously beneficial in enabling companies to present insights in an intuitive way and in helping to build a clearer picture of future scenarios associated with climate change.

### Digital Twins





## **HPE Advanced climate modelling**

HPE are helping rollout supercomputers in the US and the UK to run advanced modelling and simulations across energy, science and climate/weather as well as helping scale-up renewable technologies. In the UK, HPE and Fujitsu were selected to help build Isambard 2 for the GW4 Alliance, housed at the Met Office, which will push the frontiers of scientific research by supporting the development of powerful new algorithms, paving the way for sophisticated climate modelling driving faster weather and climate change predictions. By using scaled up high performance computing, these calculations can be done at multiple times the performance of existing systems without expanding energy use, with one such deployment seeing the environmental footprint of the infrastructure rollout reduced by 66%.

## **Space4Climate**

Space4Climate is a group whose members span government, industry and academia, working in partnership to raise the profile of, and support, the UK's world-leading climate community in delivering, sustaining and making use of trusted climate information from space. Space4Climate builds on the UK's trusted expertise in climate data. The group's activities enable a seamless supply chain of climate data from space assets, help identify climate services user requirements and facilitate climate services development for global economic and societal benefit.

## Section 2 | How well placed is the UK to benefit?

The UK's net zero emissions goal will require unprecedented levels of innovation and a profound transformation of our lives and the economy.

The UK is one of the most vibrant places in the world to start and run a tech company. In 2019, the UK was Europe's top scaling tech nation and third in the world for investment in emerging technologies. In 2019, there was a record £10.1bn investment in UK tech companies.<sup>6</sup>

We can also be a leading nation for digital clean tech.

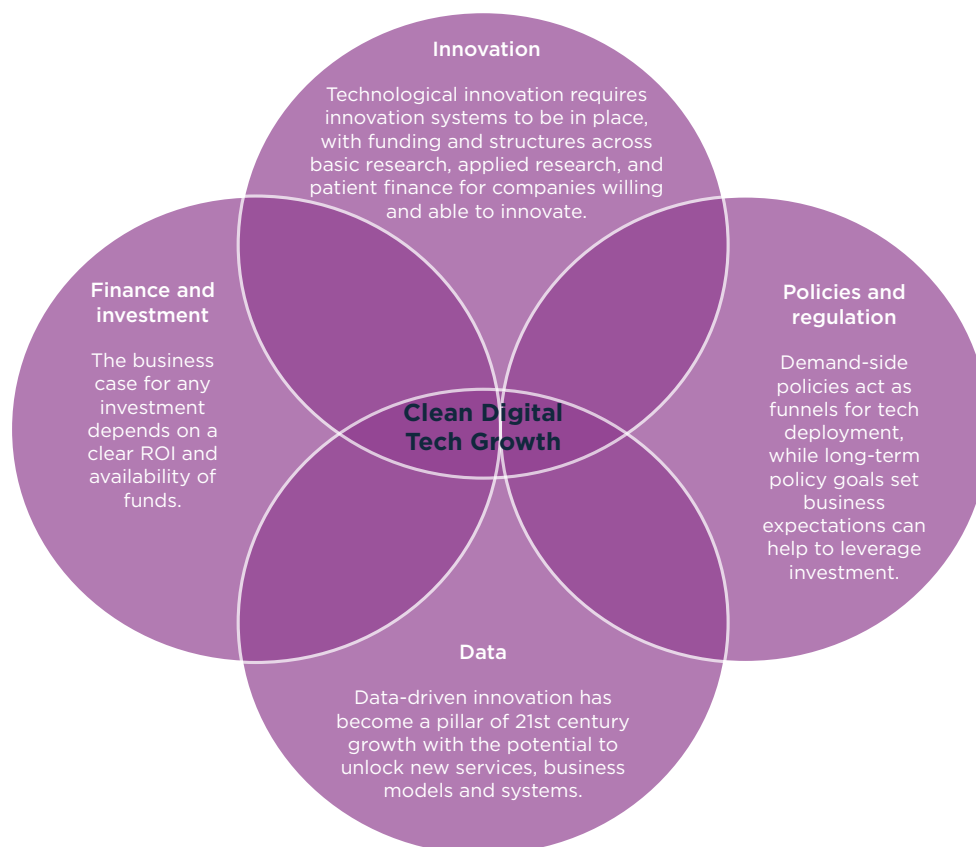
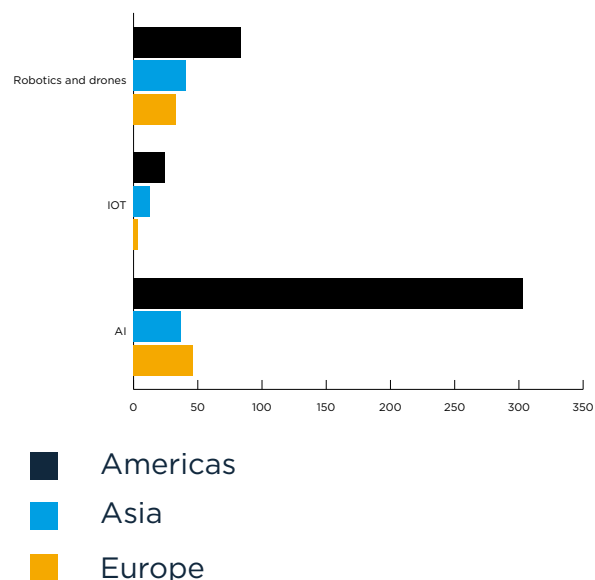
Digital clean tech was identified as an emerging sector by Tech Nation after gathering £17.93bn in investment in 2019.<sup>7</sup>

Artificial Intelligence applications in particular are attracting significant venture capital investment, particularly in the USA, where they are being used for climate modelling, deforestation mapping as well as energy efficiency and optimisation.

The UK is well placed to have a bigger stake in this growing market. Tech companies feel confident that the UK can become a clean tech leader, with the UK having an excellent base in renewables, technology businesses and cultural awareness of environmental issues. That said they are facing a myriad of barriers to entry. We have identified four key levers to cement this growth: innovation, policy and regulation, data and finance and investment strategies.

We discuss each in turn in the next section of the report.

VC investment in technology applications to Cleantech by global region in 2019 (£M)





# INNOVATION

## Feedback from techUK members:

- **The UK's excellent academic credentials and strong research base is attractive. However, members feel this could be improved and approached in a more strategic way.**
- **The tech sector feels it is not challenged enough by government and innovation bodies to see how it can help address climate issues.**
- **Short-term pilots, competitions and trials mean that potential is untapped: lessons are not routinely shared and long-term value is not properly valued.**
- **Innovation should be seen as an enabler of decarbonisation.**

The UK government has made clean growth a cross-cutting theme in the Industrial Strategy, the R&D Roadmap and brought attention to low-carbon missions across sectors, actors, and disciplines.

However, despite the excellent work of bodies, such as the Energy Systems Catapult, the mission of net zero has not fully been absorbed by the UK's innovation ecosystem. Further, UK investment in R&D as a share of GDP is lower than other major economies, though the new R&D roadmap sets out a pathway to meet the 2.4% of GDP target.

As it stands, the government's Grand Challenges mission on clean growth, as set out in its 2017 Industrial Strategy, has goals to halve the energy use of new buildings by 2030, to establish the world's first net zero carbon industrial cluster by 2040, and to put the UK at the forefront of design and manufacturing for zero emission vehicles. While at the time bold, these goals, or missions, need reframing in the context of the enormous challenge to reach net zero.

With net zero emissions now thirty years away there should be a focus to pivot the UK innovation ecosystem towards decarbonisation and long, meaningful trials that help UK firms scale-up. This requires both programmes that enhance early stage technology development and a clear route to market for promising innovations.

We need to refresh institutional structures, redefine roles and develop new tools to rapidly accelerate existing innovations and catalyse new ones. Company cultures also need to be shaped for digital, which can prove to be stumbling blocks in technology adoption.

Complex systems change requires a complex group of collaborators, including citizens, who do not naturally work together. Innovation leaders will need to catalyse these collaborations until benefits have been proven. New platforms to share both successes and failures need to be established so outcomes of pilots and demonstrations are shared freely and predictably.





## Recommendations:

- BEIS' R&D Roadmap should conduct a review of the current innovation system to assess whether it adequately allows for the innovation demanded by net zero.
- UK innovation bodies should run innovation trials and pilots for longer to prove the business model and value propositions, as well as the technology.
- All government departments should run outcome- and problem-based innovation challenges to crowd-source innovative solutions.
- UK innovation bodies need to consider new platforms to share both successes and failures in a more transparent way so companies can glean better insights from funded projects.

## POLICY AND REGULATION

Feedback from techUK members:

- The high-level travel on climate is good and this will translate into increased investment in clean technologies in the long term.
- Despite high level political commitment, regulators are very cautious and slow to adapt to the opportunities of digital technology, even when the case is clear.
- Policy officials frequently overlook, or limit, the potential of innovation.
- Policy needs to move out of silos and into systems of systems thinking.

Government has signalled its support for digital technologies in supporting the UK's net zero transition. In energy, through its Smart Systems and Flexibility Plan and by backing the recommendations of the Energy Data Taskforce, and in mobility via the government's decarbonisation plan and Future of Regulation review.

However, industry is still awaiting the Energy White Paper and infrastructure strategy; two documents that will be crucial in setting out the policies used to reach net zero. The existing Clean Growth Strategy also needs to be updated to reflect net zero.

This is urgently needed. techUK members consistently highlight that regulatory barriers and outdated standards are creating logjams, barriers to entry and risk stifling innovation. Regulators remain cautious of digital innovation or, in some cases, overlook entirely its potential in supporting and driving system changes.

History has shown that the UK can overcome these challenges. The UK has previously led the world in adopting innovative regulation, with techniques such as Ofgem's regulatory sandboxes. Regulatory sandboxing is seen as a gold standard in innovation, kick-starting a wave of regulator-led initiatives, supporting new products and services in coming to market.

Another great example is the Better Regulation Executive's recently established Regulatory Horizons Council to help government deal with the "pacing" problem. That is the speed of innovation which exceeds the rate at which regulation can adapt, and the "convergence" problem, where innovations blur the lines between sectors and cut across traditional regulatory and jurisdictional boundaries. Both of these issues are pertinent to the net zero challenge.

We have the potential to take these examples of good practice, develop them further and establish world-leading legislative and regulatory frameworks to lead the transition to net zero. To deal with the transformation ahead, we need legislation, policy makers and regulators to be agile and risk reflective and for legislative design to avoid innovation blockers.





## Recommendations

- We need a roadmap to net zero: an updated Clean Growth Strategy, Energy White Paper and Infrastructure Strategy needs to be published rapidly.
- BEIS should establish a new net zero delivery office to support greater co-ordination across Government Departments & Regulators to ensure enhanced collaboration and support regulatory alignment across Government.
- The Regulatory Horizons Council should establish a net zero tech taskforce to work with the tech sector to work through regulatory bottlenecks and legislative barriers.
- Regulators should deepen regulatory sandboxing by extending it into other sectors. Extend the funding available to regulators through channels such as the Regulator's Pioneer Fund.
- Apply digital tech innovation impact assessments to new legislation to prevent any stifling of future innovation.
- Sponsoring departments should create a statutory duty on regulators to have a due regard to decarbonisation.

# DATA

Feedback from techUK members:

- **Companies have been slow to respond to the recommendations of the Energy Data Taskforce.**
- **Departments and regulators are developing their own data strategies and initiatives but these risk being uncoordinated.**
- **Companies are not thinking about the role of data as part of their own corporate net zero strategies.**

Data will be a key enabler for net zero because smart systems rely on its open provision. The work of the Energy Data Taskforce, for example, has shone a light on the significant energy system benefits that can be achieved through a more open data environment.

However, to unlock the data needed – whether it be system data (metadata), personal data, non-personal data or open data – we need to build trust and confidence in how it is accessed, managed, used and shared. Recognising, addressing, and balancing privacy concerns, commercial value and system efficacy benefits will need concerted effort and transparency.

This is not insurmountable. In the financial sector, open banking has allowed services to be offered in a previously closed, heavily regulated ecosystem. The subsequent growth of the UK fintech sector, and new services for consumers, has been a success story for the UK.

To fully realise the potential of open data it is critical that appropriate and relevant data governance is in place that is robust and inspires confidence from regulators, policy makers and industry, and that government incentivises and facilitates sharing and reuse of data across organisations and between sectors.

There are several models that can be pursued. To facilitate open banking a joint Open Banking Implementation entity was created with the banks, government, and regulators to develop standards for interoperability, build secure platforms and govern how data is transferred and managed. Another model is 'Data Trusts'.<sup>8</sup> This is a governance framework which centrally manages how data is shared and under what conditions.

Ethics is another key consideration. Designing APIs and other forms of data sharing need to have ethics and privacy built in at the concept stage.

Government action can also drive confidence by setting expectations and providing coherence: a myriad of data compliance governance codes risks creating confusion in the market. The UK has been working on the development of a National Data Strategy. This is welcomed. It is an opportunity to champion the success of the UK's data driven economy and to identify challenges and issues that may be holding back the use of data. It is also an opportunity to promote why the development of a strategy for unlocking the power of data should be a priority for every organisation.





## Recommendations:

- The Regulatory Horizon Council should review regulations that are keeping businesses from sharing and using data.
- The energy sector and government should look at routes to open up energy data to third parties, for example by developing APIs or examining the role of data trusts or other data sharing models.
- Government's ongoing work on a National Data Strategy should reflect the need for open data in the transition to net zero.
- Policy coordination must be enhanced, and transparency increased, as data policy and regulations are being developed across departments and regulators. .

## FINANCE, INVESTMENT AND GROWTH

Feedback from techUK members:

- **The investment appetite is strong and whilst there are policy and regulatory issues, the net zero target has focused minds and set a clear direction of travel on climate.**
- **Scaling-up is difficult for clean tech start-ups. The UK has an excellent clean tech start-up scene. However, getting these companies to scale-up to become mid-size and large businesses is difficult. This is applicable across the start-up scene.**
- **Launching new climate products remains a challenging space even for larger businesses.**

Moving from invention to widespread deployment can take many decades, yet only around three decades remain to meet the net zero emissions goal. The challenge for policy makers is to effectively catalyse the rapid innovation needed for net zero on a short timescale. Investments in successful novel systems will need to be implemented and scaled. While there is clear appetite for supporting demonstrators there are not obvious, proven models for financing them in the longer term. Cooperation with investors financing businesses and projects, and incentives for companies to invest in them is needed to unlock capital.

New markets creation mechanisms and investment incentives must now be created to fully commercialise early-stage, low-carbon technologies.

Targeted public investment can create new markets and stimulate investment. Carbon Brief analysed green spending measures following COVID-19<sup>9</sup>: the EU is spending tens of billions on a 'green recovery' including a €32bn just transition fund and public sector loan facility. South Korea will spend \$11bn on greening infrastructure, industries, and energy. Germany has announced a €6000 subsidy for switching to hybrid and electric vehicles, along with major investments in labour intensive EV infrastructure and modernising transport. They have also announced tax credits for private investment on R&D as well as an export strategy for its hydrogen technology sector.

A UK fiscal stimulus, such as the £2bn allocated to kick-start domestic energy efficiency announced in the summer economic statement, is a promising start. But we need to see momentum building, and looking at policies announced elsewhere is a sensible option.

Consumer incentives also have a role. For example, time-of-use pricing for electricity will create cost benefits for consumers who shift demand to off-peak periods and help to ensure more electric vehicles can be rolled out without jeopardising the integrity of the grid.





## Recommendations

- Government should launch a call for evidence to explore incentive schemes to stimulate low-carbon investment in businesses, homes and the public sector.
- All departments and regulators should ensure measures are rolled out to overcome access to finance barriers – such as grants, low-interest loans, equity loans or green mortgages. These should be technology agnostic to avoid locking out innovation.
- Government should consider options for VAT reductions, tax offsetting and the entire suite of indirect tax measures that make energy reducing technologies more investable.
- Public financial support mechanisms, like loan guarantees, should be dedicated to new low-carbon technologies to de-risk and lower the cost of capital for early deployment.

## Further reading and notes

techUK has written or contributed to several other publications relating to climate change and energy and these can be accessed below.

- [2017 | Technology Enabling CO<sub>2</sub> Reduction](#) - How is tech being used to reduce emissions in other sectors
- [2018 | Is Staying Online Costing the Earth?](#) Measuring the energy impact of the tech sector
- [2019 | Attributing Carbon to the Cloud](#) - Models to determine the carbon impact of an individual company cloud services
- [2019 | Data Centre Energy Routemap](#) - How data centres sector can address energy usage

## The rebound effect

The rebound effect is when energy saving technology creates new behavioural patterns or productivity gains that result in a reduction of the positive efficiency savings. Examples include a factory becoming digitised to the point it produces a lot more, or remote/home working means a switch to less efficient domestic energy and heat consumption. The net impact of the rebound effect is still subject to debate and will vary from measure to measure<sup>10</sup>.

## The tech sector's own carbon footprint

Globally, the total life cycle carbon footprint of the ICT sector is approximately 700 million tonnes carbon dioxide equivalent (Mt CO<sub>2</sub>e) per year. This is equivalent to 1.4% of global carbon emissions and around 4% global electricity use<sup>11</sup>.

The tech sector is taking a leadership position in tackling its own emissions. A new international standard for the ICT sector has recently been published<sup>12</sup> that outlines the pathway needed to meet the commitments outlined in the Paris Agreement. These guidelines are the first targets specific to the ICT sector that have been approved by the Science-Based Targets Initiative. It requires cuts of 45% by 2030 and sets out a roadmap for meeting net zero carbon emissions by 2050.

A shift to renewable energy is expected to account for most of the sector's reductions over the next decade. Companies will also achieve greater energy efficiency and deepen relationships with suppliers to drive reductions through the supply chain. The latter is vital, especially for short-lived user devices, as supply chain emissions can represent two thirds of a companies' full footprint<sup>13</sup>.



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3. For more on the rebound effect, [please see notes at the end of the report](#)
4. 7.2m divided by the emissions generated by average car use each year, 2.14 tonnes CO<sub>2</sub>e
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