

“green
alliance...”

Smart and green

Joining up digital and
environmental priorities to
drive the UK's economic
recovery

Executive summary

“As the country seeks to recover from Covid-19, UK businesses need all the help they can get to remain competitive.”

Economic recovery from the impact of coronavirus is an opportunity to create a more resilient and prosperous economy. This means gearing up businesses and communities for the new realities that will shape the future. Action on global warming and nature decline should be central to that, in line with the UK’s net zero target and environmental goals. But such a recovery should also build on the wave of new digital technologies revolutionising the way businesses operate, to enable them to modernise their operations and compete internationally.

Over the course of its two year exploration, Green Alliance’s Tech Task Force has identified numerous opportunities for digital technology to provide environmental solutions in the high impact sectors of transport, energy, buildings and food.

These solutions include speeding up the deployment of clean technologies, for example by integrating electric vehicles into the national energy system and allowing the energy efficient retrofit of homes in one step. Digitalisation also supports industry to cut costs by enabling better energy and resource use; for instance, using digital technology to enhance resource efficiency, building techniques and asset maintenance could add £38 billion to the construction sectors’ bottom line by 2027. And it can also help the public to switch to lower carbon options, such as through the use of smart mobility apps and shared mobility.

As the country seeks to recover from Covid-19, UK businesses need all the help they can get to remain competitive. Pursuing greater digitalisation, alongside environmental priorities, will speed up the low carbon economic transition and put UK companies on the best footing to compete in this growing international market.

But, despite the significant opportunities smart solutions have to offer, their uptake so far has been patchy. There are specific barriers, such a lack of skills and capabilities in organisations or failings in data governance. However, over the course of our

“Despite the significant opportunities smart solutions have to offer, their uptake so far has been patchy”

research, we have identified wider policy shortfalls holding back development. For example, leading initiatives to increase digital adoption, such as Made Smarter, the construction sector deal and efforts around the future of mobility, have not realised the full potential of solutions that could have benefited the environment and cut carbon.

Similarly, there has been underinvestment in gathering data and establishing the systems needed to innovate in this area. This includes, for example, a lack of granular information on material flows through the economy and environmental policy based on outdated systems, such as current building efficiency ratings which rely on modelled rather than actual performance.

These shortfalls are indicative of a disjointed approach. They have to be addressed if the UK is to become a robust, low carbon economy that benefits people, businesses and nature for the long term.

Our investigation concludes that the government should:

- 1. Ensure digitalisation and low carbon agendas are joined up in UK recovery plans.** Digitalisation policy should explicitly support climate and nature goals, and environmental policy should make the most of digital solutions. These aims should be reflected in the government’s upcoming strategies, including any updates to the Industrial Strategy, the Digital Strategy, transport decarbonisation plan and the National Infrastructure Strategy.
- 2. Invest in smart, net zero compatible infrastructure.** This will accelerate the deployment of digitally enabled low carbon solutions for better infrastructure delivery, use and decommissioning. The National Infrastructure Strategy should ensure all investments prioritise these, and the government should make sure that any infrastructure that receives public funding embeds smart technology which helps to cut carbon. The government should also invest in the data and digital systems needed to inform and support low carbon activity, backed by ambitious environmental policy.

3. Strengthen skills and capabilities. Businesses and communities across the country should be helped to develop services and products that minimise harm to the environment, enabled by digital technology. This should include a national programme for digital adoption, building on the Made Smarter North West pilot, which explicitly prioritises low carbon and resource efficient development, alongside skills programmes to jointly support the growth of clean industries and digitalisation.

4. Bring people along in the transition, ensuring they can see the benefits of data and technology. This means addressing privacy and safety concerns, and ensuring that data is used for public benefit. This should be complemented by more effort to identify and address what different groups in society need to benefit from and use digital technology.

5. Promote greener digital technology. The climate and resource impacts of using digital technology should be minimised, especially as their use will continue to grow. This means setting the highest energy and resource efficiency standards and investing in infrastructure and business models to support them.

Why the digital revolution should be green

“Digital technology could transform the environmental agenda.”

To build a resilient economy following the coronavirus pandemic, businesses and communities need to invest in solutions that will prepare them for the future. To meet the significant challenges of the 21st century, and prevent further crises, like global warming and ecological decline, undermining prosperity and security, that future has to be net zero carbon and nature rich. And, in pursuing these goals, digital technologies should be central to enabling UK businesses to modernise their operations, compete internationally and reduce their environmental impact.

The use of smart devices and demand for data and digital services has grown dramatically in recent years and is expected to continue to grow exponentially. Solutions such as the internet of things, remote sensing, distributed ledger technology, data analytics and artificial intelligence are all expected to have significant impact on the economy.¹

Accelerating the low carbon transition

Digital technology could transform the environmental agenda. For example, during the pandemic lockdown, broadband quickly proved that it could support new ways of working with lower carbon impact for a huge number of people. Digital platforms facilitated the redistribution of food supplies from the hospitality sector, avoiding food waste.² Online apps enabled on-demand public transport, ensuring travel options were targeted to the needs of essential workers while limiting unnecessary journeys and costs to operators.³

These are only few examples of what digital technology can do, much more is possible, as our Tech Task Force has identified over the course of its two year exploration. Enhanced connectivity and analytics can accelerate new, low carbon approaches across sectors that have a large environmental footprint, like transport, buildings, industry and food, to the benefit of both the environment and businesses across the country.

For example, our research found that digital solutions can:

- **Accelerate the deployment of clean technologies.** For example, smart charging can facilitate electric vehicle integration into local energy networks, minimising costs to businesses that want to electrify their fleets and saving a potential £270 million a year by 2030 across the energy system.⁴ While, in the building sector, which is one of the UK’s biggest carbon emitters, offsite manufacturing and digital solutions can help to upgrade inefficient housing stock and make it fit for net zero carbon in a single step.⁵
- **Help UK businesses to stop wasting energy and resources.** By providing in-use energy data for buildings, digital technologies can help to mobilise investment in more efficient equipment.⁶ Resource efficiency would also be boosted by electronic ‘product passports’ and materials databases, which could increase understanding of material flows through the economy and enable innovation in new products and services.
- **Help the public to make lower carbon choices.** For example, mobility platforms are developing services using big data and smart sensors, supporting different forms of car sharing and better modal integration. The internet of things could also help consumers to know the environmental footprint of the food they purchase and promote more sustainable choices.⁷

“Roles requiring digital skills tend to command higher than average salaries.”

Boosting business competitiveness and jobs

Digitally enabled energy efficiency could save UK businesses £6 billion a year by 2030.⁸ The Made Smarter review estimated that, by 2027, digital technology could add £38.2 billion to the construction sectors' bottom line, through resource efficiency and digitally enabled construction and asset maintenance. And £13.2 billion could be saved by food manufacturers through more efficient resource use, helping to cut supply chain emissions by nearly a third.^{9,10} Fast forwarding these solutions would improve the performance of these sectors, sectors which are particularly suffering from low productivity and provide significant employment outside London and the south east.¹¹

Scaling up would also help UK businesses to compete better in global markets. World economies are increasingly aware of the opportunities digital technology can bring, particularly in driving low carbon industries. Germany, Singapore and South Korea are already rated as having some of the most effective frameworks to promote industrial digitalisation.¹² The EU plans to boost low carbon industries as part of its Green Deal, with a focus on digitalisation, including scaling up connectivity infrastructure, strengthening its industrial leadership in emerging technologies and the better use of data.^{13,14} And China has announced plans to invest \$1.4 trillion up to 2025 to scale up digitally enabled infrastructure, including connectivity, industrial internet, energy and transport infrastructure.¹⁵

Adoption of smart low carbon solutions will benefit the jobs market. Roles requiring digital skills tend to command higher than average salaries, reflecting better prospects for those industries using smart applications.¹⁶ Digital tools could also support the rollout of upskilling and reskilling programmes across the country, preparing the workforce for emerging low carbon industries, particularly in the short term while on-site activity may be restricted due to the pandemic.



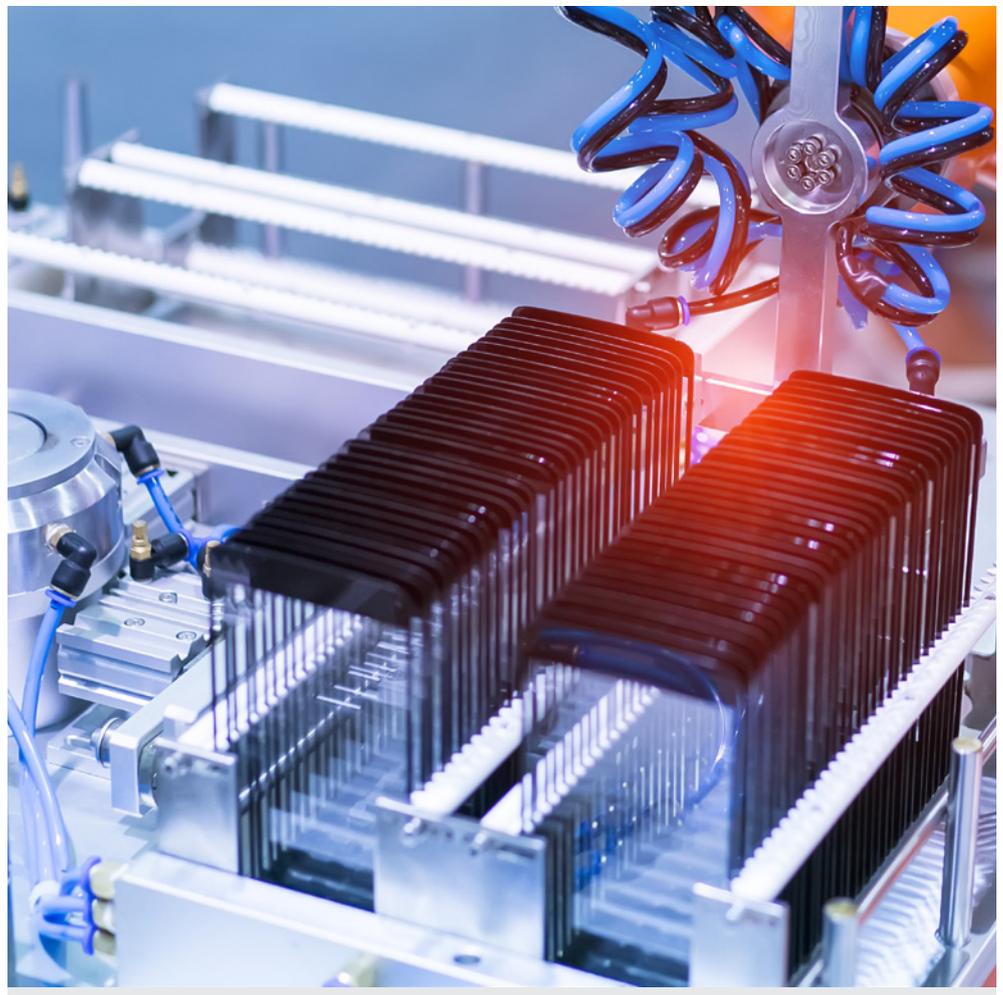
The UK is missing out

“Fewer than one in five manufacturers are making extensive use of digital technology in their operations.”

Despite the significant benefits of digitally enabled low carbon solutions, specific barriers and a lack of policy direction mean their adoption by UK industries has been limited and piecemeal. This lack of policy coherence is not only leading to missed opportunities but could actually promote environmentally damaging activity, if climate and nature priorities are overlooked in the drive for digitalisation. Conversely, efforts to deliver environmental goals could fall short if they do not exploit the potential of new digital capabilities.

Digital adoption is too slow

Although some leading UK businesses have started to use digital solutions, many are not. For example, fewer than one in five manufacturers are making extensive use of digital technology in their operations.¹⁷ Only 42 per cent of UK businesses purchase cloud computing services, compared to 65 per cent in Finland and 56 per cent in Denmark.¹⁸ Three in four construction firms believe their sector is not digitalising fast enough.¹⁹ Shared mobility options and integrated transport platforms are still limited outside London and major UK cities.²⁰ And many businesses are not using widely available digital technology to control their energy use.



Reasons for this include:

Lack of skills and internal capabilities. Over 11 million people across the UK lack basic digital skills, especially those aged over 55.²¹ Research for the Made Smarter review identified this as one of the main barriers to the business use of digital technology.²² And while, overall, the UK is leading the way on public sector digital programmes, public sector organisations have skills and capacity shortages.^{23, 24}

Concerns around cybersecurity and privacy. Concerns around the use of data are holding up business adoption, as they may be exposed to cyber attacks. There is also low public trust in data privacy and security, potentially undermining the ability to scale up useful digital applications.^{25, 26} For example, many consumers still perceive that the risks of smart home energy technology outweigh the benefits and only a fraction trust that technology companies are designing products and services with their best interests in mind.^{27, 28}

A failure of data governance. Failure to treat data strategically can slow down innovation by preventing integrated solutions or limiting access to new entrants.²⁹ For example, the Energy Data Task Force identified the absence of a common data repository, limited access to data and lack of common standards as barriers to a smart energy system.³⁰ We found that cities are struggling to move towards integrating their transport systems partly because data from transport providers is patchy.

Underinvestment in infrastructure. Some solutions need specific infrastructure to allow them to be scaled up. For example, the use of smart mobility services relies on good access to different transport options, but is limited by underinvestment in public transport and poor linkages between transport modes.

Ineffective policy drivers. Our research has highlighted that businesses tend to underinvest in new low carbon and resource efficient solutions, largely due to poor understanding of where there are inefficiencies and because true environmental costs are not yet reflected in resource prices.³¹ And there is a lack of policy to change this. In its sectoral explorations, the Tech Task Force identified a number of policy gaps where environmental challenges are not being addressed, which means there is no stimulus to use digital solutions to tackle them. For example, lack of regulation to reduce embodied emissions in construction is failing to encourage the use of smart technology to increase building reuse, rather than new build. Other shortfalls are due to a disjointed approach to digitalisation and decarbonisation, as we outline overleaf.

“Businesses investing in digital could miss out on the chance to simultaneously futureproof their operations for a net zero economy.”

Digitalisation policy does not prioritise environmental goals...

Over recent years, there has been growing awareness within government of the need to support business to innovate and adopt digital technologies. But a number of high profile initiatives promoting digitalisation have not realised its full potential to provide environmental solutions as well.

Made Smarter, the government’s leading initiative to promote business digital adoption was launched to improve business productivity, initially through a regional pilot scheme in the north west of England.³² But it does not explicitly target low carbon and resource efficient solutions, with the result that businesses investing in digital could miss out on the chance to simultaneously futureproof their operations for a net zero economy.

The construction sector deal, launched in July 2018, identified the digital techniques and modern construction methods needed to improve the industry’s performance.³³ However, the focus so far has been mainly on new build, despite the poor energy performance of existing buildings being one of the main challenges to achieving the net zero carbon goal. Buildings are responsible for 18 per cent of the UK’s greenhouse gas emissions. Scaling up digital solutions and offsite manufacturing could help to make existing homes fit for net zero in a single step, similar to the Dutch Energiesprong approach, and also support the increased reuse of existing buildings, as recent Green Alliance reports have highlighted.^{34, 35}

Efforts to position the UK as a leader in the future of mobility have largely focused on new vehicle technologies, such as zero emission cars and connected and autonomous vehicles. But the potential of digital technology to encourage greater sharing and better integration of different transport modes has not been prioritised to the same extent.³⁶ This is despite the fact that the Department for Transport’s (DfT’s) own projections show there will be a significant increase in traffic in the absence of greater car sharing, and that the government’s proposal to ban the sale of new diesel and petrol vehicles, even if brought forward to 2035, will not cut emissions quickly enough, unless coupled with a greater shift to integrated transport systems that reduce car use. In this respect, it is encouraging that the policy paper recently published by the DfT, setting out the context for its forthcoming transport decarbonisation plan, places greater emphasis on getting people out of their cars and the role of digital technology in enabling modal shift and shared mobility.³⁷

Other initiatives, such as the Energy Data Task Force and the National Digital Twin programme have identified steps needed for better visibility, integration and use of data in delivering and managing vital infrastructure, and to address current failings in data governance. Their recommendations need to be fast forwarded and supported by new policy and regulation if the UK is to get on the front foot in managing data better and supporting a low carbon, resource efficient economic transition.

“The government has underinvested in the data and systems needed for more innovative climate and nature solutions.”

...and environmental policy is not making the most of digital solutions

Better use of digital technology can improve environmental outcomes. Yet, the government has underinvested in the data and systems needed for more innovative climate and nature solutions. There are also examples of policy and regulation that rely on outdated systems, which is also holding up progress.

For example, there is still poor information about the journey of materials flowing through the UK economy, preventing the development of resource efficient products and services. Better knowledge of this kind would strengthen the business case for investment in circular economy infrastructure. While the government has said it will support a National Materials Datahub in its Resources and Waste Strategy, no funds have been committed to get it off the ground.

Similarly, despite their clear potential, satellite imaging and digitally enabled environmental monitoring are not being used as they could be to provide up to date, granular information on the conditions of natural ecosystems across the country and data on environmental assets is not effectively used to feed into decision making processes.³⁸ More effective use of these tools and data, in combination with information from on-site surveys, would allow detailed assessment of different land management options and provide insight into the impacts of more sustainable practices.³⁹

There are other cases where policy is failing to make effective use of new digital solutions, discouraging business adoption. For example, the Tech Task Force has highlighted the ineffective energy rating system currently used to assess building efficiency. Given that it relies only on estimated, rather than actual, energy use and emissions, it results in energy being wasted and unnecessary business costs.

Digital technologies also need to be green

There is also a challenge around the energy and resource consumption of digital solutions themselves. Digital tools and services are currently linked to substantial climate and resource impacts. Their production results in vast amounts of waste and many devices have relatively short lifespans due to poor design and inadequate collection systems.

Energy intensive processes are required to support online services, with data centres and transmission networks estimated to consume over two per cent of global electricity demand.⁴⁰ And this will only increase under business as usual as demand for these technologies is expected to grow exponentially in the coming years.

Futureproofing the economic recovery

“This is a unique moment to make cohesive policy and drive business investment in smart environmental solutions across the economy.”

The UK should build on its research capabilities, its thriving tech scene, including some of the world’s leading AI start ups, and ongoing digitalisation initiatives, not only to improve business performance, but also to achieve better environmental outcomes.

The necessary legislative and institutional frameworks already exist to support it, including the Committee on Climate Change, the legal net zero emissions by 2050 target and the forthcoming Environment Act, charting a direction of travel that gives companies the certainty they need to invest. Taking a joined up approach to digitalisation and green growth would help to rebalance the economy, revitalise sectors negatively impacted by the pandemic and renew infrastructure, providing a resilient route to recovery that benefits both people and nature.

To achieve this, we conclude that the government should:

1. Join up the digital and low carbon agendas

The government should ensure that policy for digitalisation explicitly supports low carbon, resource efficient solutions and, similarly, that policy to achieve climate and environmental goals fully exploits the new possibilities enabled by digital and data. Joining up these agendas will require co-ordination across government departments, as they develop and implement a number of key strategies.

An update of the Industrial Strategy is expected in the autumn 2020, alongside the Digital Strategy and a number of other strategies relevant to decarbonisation, including the transport decarbonisation plan, the National Infrastructure Strategy, the Energy White Paper and the Low Carbon Heat Strategy. The National Data Strategy was also launched in September 2020.⁴¹

This is, therefore, a unique moment to make cohesive policy in this area and drive business investment in smart environmental solutions across the economy.

2. Invest in smart, net zero compatible infrastructure

Digital solutions can improve the environmental performance of infrastructure, by supporting better planning and efficiencies in its delivery, management, use and decommissioning.

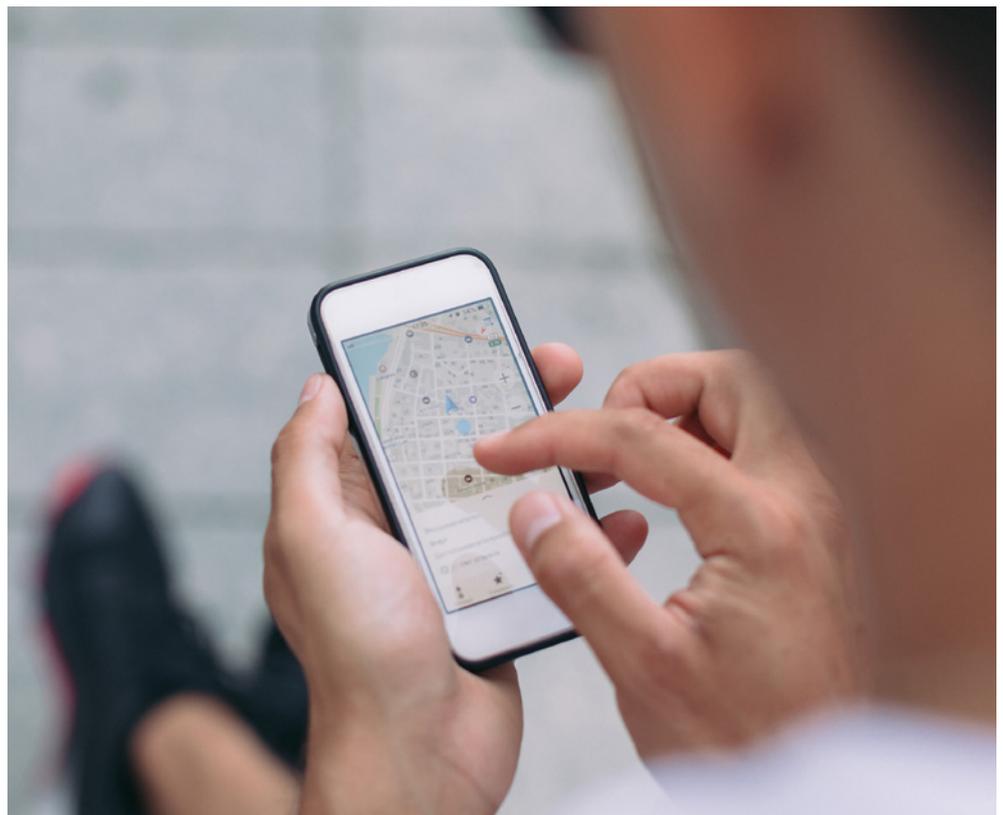
Government plans to invest in public infrastructure, announced by the prime minister in the summer of 2020, should include embedding smart low carbon technology in public building projects such as schools and hospitals.⁴² Furthermore, rather than subsidising the building of inefficient homes that will need to be retrofitted in future, the £12 billion promised for house building should deliver zero carbon homes from the outset, making the most of digital technology and modern offsite construction methods.⁴³ The mandatory use of Building Information Modelling in public procurement has been a great success, leading to three quarters of the construction industry using it. This example should be replicated to speed up the adoption of other smart solutions.

The long awaited National Infrastructure Strategy should put investment in digitally enabled, net zero compatible infrastructure front and centre, particularly for transport, buildings, green infrastructure and industry. Crucially, as the National Infrastructure Commission has said, “Data is now as much a critical component of our infrastructure as bricks and mortar. Data is part of infrastructure and needs maintenance in the same way that physical infrastructure needs maintenance.”

Therefore, the government should ensure adequate investment in the data and digital systems necessary to accelerate the low carbon economy, backed by ambitious environmental policy that encourages businesses to invest in robust novel solutions.

Investment priorities should include:

- **A UK transport data platform.** This should bring together data from public and private transport providers to facilitate integrated transport solutions, as already required in Finland. It should include data on vehicle occupancy levels, to enable better insight into current patterns of usage and support shared mobility and alternative modes of travel.
- **Product passports and the National Materials Datahub.** These are needed to provide near real time tracking of materials across the economy and enable industry, the public sector and consumers to use resources better..
- **Assessment and monitoring of the UK's natural assets.** Satellite earth observation, geospatial mapping and on-site surveys should be used for better data on the country's natural environment, and supported by tools and resources for data integration and use in decision making. This is vital to enable more sustainable land use practices, effective infrastructure planning and to monitor the delivery of the environmental goals set by the government.⁴⁴
- **Faster implementation of Energy Data Task Force recommendations** and the development of the National Digital Twin programme, to promote a smart, low carbon energy system and better delivery and management of infrastructure.



“Targeted support for small businesses could be delivered through a national programme for digital adoption.”

3 Strengthen digital skills and capabilities so businesses and communities across the country can benefit

New low carbon industries, such as housing efficiency, clean energy, product reuse and remanufacturing, all have the potential to create a significant number of new jobs, but their growth relies on reskilling and upskilling programmes.⁴⁵ Importantly, evidence suggests that digital skills are essential at all levels and that most jobs will require them in the 2030s.^{46,47} Therefore, the government should not only set up more training programmes to support low carbon industries, but it should also make sure these include digital skills.

Barriers to digital adoption are generally highest for smaller businesses, particularly those in the construction, manufacturing and agriculture sectors.⁴⁸ Targeted support for small businesses could be delivered through a national programme for digital adoption, building on the Made Smarter North West pilot, but with the explicit prioritisation of low carbon and resource efficiency. This would allow more businesses to benefit from the higher productivity and resilience that smart climate and nature solutions offer, especially in those parts of the country where these sectors are a significant share of the local economy.

Local government should also be helped to bring the benefits of integrated transport solutions, smart energy systems and local digitally enabled clean growth to their communities. These solutions have to be locally tailored and local authorities need sufficient resources to roll them out.

4 Bring people along in the transition

To scale up digital solutions, they have to be designed with people in mind. This means addressing privacy and safety concerns, and ensuring that data is used for the public benefit. This is not only to make sure innovations are taken up, but also to allow access to better data. Research by Nesta has found that three quarters of people would be willing to share their personal data to improve public services, if they could do so in a simple and secure way.⁴⁹

Successful roll-out of new applications requires a better understanding of what different groups in society need to effectively engage with and make the most of them. For example, while the use of car clubs and other transport sharing options are appealing to some, especially younger people, evidence from the Commission on Travel Demand suggests that many people are still reluctant users. Yet, as the commission emphasises, the key is to develop tailored solutions so that a wider segment of society can participate in and benefit from shared mobility.⁵⁰ Developing this knowledge across more sectors is vital, given that the Committee on Climate Change estimates that over half of the emissions reduction needed to achieve net zero will require some degree of change in consumer engagement with new technologies.⁵¹

“High standards should be set to ensure the technology itself is energy and resource efficient.”

5 Promote greener digital technology

As digital solutions become ubiquitous across the economy, high standards should be set to ensure the technology itself is energy and resource efficient.⁵² And infrastructure and business models should support this. Efficiency improvements have already limited growth in energy demand from data centres and transmission networks. Better design and more circular business models could cut the carbon footprint of some electronic devices by up to 50 per cent.⁵³

The update to the 2013 Waste Prevention Plan is overdue. This should set out concrete policies to promote sustainable production and resource efficient business models, and it should be supported by policy that promotes investment in infrastructure for a circular economy, enabling the most efficient use of digital technology.⁵⁴ The government should also set policy, including through its National Data Strategy, to tackle inefficiencies in digital infrastructure and data centres..



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This is the final report for the Tech Task Force, a business led group convened by Green Alliance exploring policy innovation for digitally enabled clean growth.

Tech Task Force members:



Green Alliance

Green Alliance is a charity and independent think tank, focused on ambitious leadership for the environment. With a track record of over 40 years, Green Alliance has worked with the most influential leaders from the NGO and business communities. Green Alliance's work generates new thinking and dialogue, and has increased political action and support for environmental solutions in the UK.

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