

A photograph of an offshore wind farm at sunset. The sky is a mix of orange, yellow, and blue, with wispy clouds. Several wind turbines are visible, their silhouettes dark against the bright sky. The water in the foreground is calm, reflecting the colors of the sky.

'Environment & Climate Change' Series

Enhancing Cross-Sector Collaboration:
The UK as a world leader in 'green-tech'



WIG

The Whitehall & Industry Group
connecting the sectors

Foreword

WIG is a charity, independent and neutral. Established in 1984, our charitable purpose is to build understanding and co-operation between the sectors for the greater public good – better policy, better strategy, and society better served.

In this series of reports we have used our unique convening power to offer perspectives on key challenges through a cross-sector lens; illuminating the opportunities for collaboration which will drive progress through the challenging times we live in, and those to come.

We offer these short & easily digestible comment pieces to give a snapshot of current thinking on topical issues across business, government and the not-for-profit sector to support our membership in learning from each other and moving towards co-created solutions.

Simon Ancona

WIG CEO



'Environment & Climate Change' Series

Enhancing Cross-Sector Collaboration: The UK as a world leader in 'green tech'

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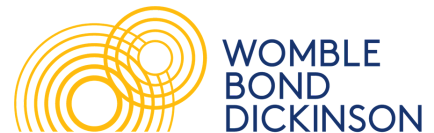
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Enhancing Cross-Sector Collaboration: The UK as a world leader in 'green tech'

Overview

In recent years, the UK has made significant progress on the development of green technologies. Offshore wind capacity has been a particularly notable success for the UK, and in 2020, the government backed the world's first major low-carbon hydrogen projects. However, with the Climate Change Committee's recently published 6th Carbon Budget, we see that the UK will need to reduce its emissions by 80% by 2035, to achieve its current net-zero target. This means that greater ambition and collaboration across the sectors will be vital.

Going forward, to maintain its status as a world leader in green technology and low-carbon innovation, the UK will need to rapidly expand its Carbon Capture Utilisation and Storage (CCUS) capabilities, while turning toward resource-efficient manufacturing. Where a gap currently exists between policy ambition and technological capability, connecting industry and government with academia and the UK's innovation hubs will be key to unlocking the technological development that will enable these advancements.

As host and president of COP26 and the G7 summit, 2021 provides an ideal backdrop for accelerated climate ambition and technological innovation. In this year of international leadership, the UK has the opportunity to rapidly expand its domestic ambitions, while engaging industry, academia, the not-for-profit sector and civil society in every step of the journey to net-zero.

Fig. 1



To deliver its net-zero target, the UK will need to achieve an 80% reduction in emissions by 2035.

Estimates taken from the Climate Change Committee's 6th Carbon Budget, 2020
Full report available here: <https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf>

Beyond the challenges of supporting a growing green tech sector, there is also a great deal of opportunity to be harnessed. Green technologies offer 100,000s of new jobs in offshore wind, electric vehicles, CCUS and new nuclear plants, the retrofitting of homes, and in environmental conservation. As the UK recovers from the COVID-19 pandemic, this is an unprecedented opportunity to replace some of the many thousands of lost jobs, while also supporting sustainable growth and resilient markets. The government's Levelling Up agenda will also need to be closely aligned with a green recovery, as the regions hit hardest by a shrinking fossil-fuel sector look for new opportunities.

This cross-sector report examines the ways in which the UK can cement its position as a world-leader in green tech, focusing on the key challenges and opportunities for policy and decision makers across the sectors. Discussing the UK's strengths and weaknesses, and where there is need for increased collaboration between industry, academia, government and the not-for-profit sector, we have aimed to highlight a number of valuable perspectives from across our membership.

'Environment & Climate Change' Series

Enhancing Cross-Sector Collaboration: The UK as a world leader in 'green tech'

Naveed Chowdhury, Imperial College London

What is your organisation's role in the 'green tech' ecosystem?

The Grantham Institute - Climate Change and the Environment, looks to contribute to, and lead on, world-class research, training, and innovation towards effective action on climate change and the environment. The Centre for Climate Change Innovation is part of this, and is looking to accelerate the development of technologies, networks and policies that help the world transition to a new economy. It is looking to nurture a new generation of climate change pioneers, and speed up the process of turning ideas into impact.

We have been supporting very early-stage cleantech start-ups since 2012, with c.95 start-ups passing through our accelerator. They have gone on to raise more than \$1/4bn of investment and have created >1,000 jobs.

We are currently developing exciting plans for a new cleantech innovation programme to start in 2021, with more information to be revealed soon.

What challenges and opportunities do you currently see in this space?

COVID-19 is the obvious challenge, given (rightly) the focus on public health challenges and the economy, making cultivating new commercial relationships challenging. The situation is more challenging for 'scale-ups' vs 'start-ups', given that the former will have grown to the point where they have a relatively large fixed-cost base, as well as client obligations.

Fundraising is another related challenge to some extent, though a huge amount of capital has been raised by investors over the past few years, and much remains uninvested – as a result, funding



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Naveed Chaudhry runs the Climate-KIC Accelerator and Climate Launchpad Incubator at the Centre for Climate Change Innovation at Imperial College).

Prior to this, Naveed was an Executive Director at MCM Partners, a tech-focused merchant bank. Naveed is an advisor to the Greentech Alliance, and serves as a mentor at the Techstars fintech accelerator, Antler (a tech incubator), and SparkLabs Energy, and at Founders Advisors. Naveed also serves as a Non-Executive Director at Optivo, one of the largest housing associations in the UK.

opportunities are still available for the strongest teams, with many of our youngest companies raising over the past quarter.

Brexit is a potential challenge to the ecosystem – for example, it is solely EU-financing that allowed us to support c.100 cleantech start-ups over the past 8 years. However, it's an opportunity for government and private sector corporates / investors to plug a financing gap in an ecosystem with vast experience and expertise, and help develop it further.

As we come out of the pandemic, I think there will be significant opportunities for cleantech businesses. There is increasing evidence that consumers are becoming increasingly

environmentally conscious in the ways they live their lives, and when making spending decisions. This presents an opportunity both for non-cleantech incumbent businesses that can get ahead of their competition in 'greening' their operations and offering, as well as for new start-ups looking to disrupt certain sectors – we are seeing this already with our startups.

What impact will the UK's recovery from the COVID-19 pandemic have on the green agenda?

The current agenda is rightly focused on saving lives and is moving on to wider human impacts and the economy. It is critical that those worst affected are given the right tools and support to move on in the new environment.

The fact that the recovery coincides with the build-up to COP26 makes me optimistic that the green agenda will come to the fore, and there is much to consider, including the nature of the economic recovery – there is increasing evidence available that makes the case for a green recovery having a greater economic and jobs potential than a non-green recovery would. Unemployment has risen dramatically over the course of the pandemic, and it is vital that we create rewarding, sustainable jobs to replace those lost, throughout the country.

The UK needs to prioritise the cleantech sector in the recovery. We have witnessed a significant groundswell of ideas and motivated entrepreneurs looking to tackle the climate crisis over the past couple of years, and this needs to be nurtured and supported further as part of a wider plan for a sustainable recovery.

In what areas would you like to see enhanced cooperation with government?

I think we need to see a combination of enhanced and well-defined policies in relation to a 'greener' economy, and investment incentives / support for the cleantech sector. We should also recognise that cleantech is a broad term, with applicability to many sectors. Prioritising certain areas in our goals will lead to more effective results.

Many cleantech initiatives like ours are at risk due to Brexit, and the UK government needs to step in to plug these gaps and support more initiatives too.

Additionally, we need more support for dedicated cleantech funds. BEIS' support of the recently launched Clean Growth Fund is welcomed, but we are fortunate in that there are various sources of early-stage risk capital available. The real funding challenge is at the scale-up stage (Series A – C), the point at which companies start to have significant impact and create new jobs. We need more capital here, as well as a deeper tie-in with entities like the DIT to showcase and support UK cleantech worldwide.

We need greater cooperation in leveraging London's ecosystem for the benefit of the country as a whole – for example, setting up other innovation hubs that leverage region-specific characteristics, and greater support for London companies to grow and create jobs in other parts of the country (as many of our start-ups have already done).

What role can large tech companies play to support innovation?

Some possibilities include:

(i) A commitment to engage with external innovation channels, without a direct 'economic interest'. Tech companies could work with venture philanthropy, grant-based accelerators, and other equity-free innovation programmes focused on cleantech. They could provide financial support, in-kind support (cloud computing credits etc), and a commitment to engage with the start-up from an operational & expertise perspective. It would be fantastic to see a consortium-led approach here.

(ii) By investing in innovative technologies & solutions – we have seen some interesting announcements from large tech companies recently (Microsoft's \$1bn Climate Innovation Fund; Google's SDG accelerator; and Jeff Bezos' \$10bn Earth Fund), and it is important that these are

implemented as soon as possible.

(iii) Fostering internal innovation – I would like to see more encouragement of ‘innovation from within’. Employees will have a stronger understanding of their business operations, and how they can be optimised in relation to the climate – encourage and implementing these ideas is important.

Additionally, it’s important that they lead by example – this could be done in various ways, including ‘greening’ their own operations (and having dedicated sustainability teams to focus on this); and subsequently also ensuring that their scope 2 & 3 emissions are minimised.

How can the UK continue to cooperate with European colleagues around 'green-tech'?

Much depends on the terms of Brexit. It’s critical that the UK’s entrepreneurs receive the widest possible support to develop cleantech businesses. Climate change is a cross-border crisis that needs more, not less, cooperation, and the government needs to ensure that our startups can continue to access European financing and expertise. One concrete way would be to negotiate participation in the EU’s forthcoming €10bn Innovation Fund for low-carbon technologies, as well as continuing existing Horizon Europe and Erasmus+ participation. Although the UK is considering additional UK-specific funds, these represent significant additional pools of capital for our companies.

Private-sector investors in the UK (both corporates and standalone-funds) should establish (or strengthen) collaboration channels with other cleantech-focused European investors. For the best ideas to scale, it would be remiss to solely rely on UK sources of funding; other sources of capital offer diversification benefits while also helping enable geographic expansion, allowing the best ideas to have the widest possible impact.

Policy collaboration is also important for cleantech – if we are aligned with Europe on our climate-related goals and objectives, it will motivate entrepreneurs to come up with solutions that they know will have wider applications

How can the private, public and academic sectors better collaborate to support the UK's development as a world leader in green tech, particularly in the run up to COP26?

The UK has a fantastic grounding in the cleantech space, and in fact is highly dependent on the green economy – for example, the ONS states that the low carbon and renewable energy economy accounts for c.225k jobs, and is worth £47bn. It’s important that we build on this.

The private, public, and academic sectors can better collaborate to encourage, support, and implement clean-tech ideas in the wider ecosystem. Many fantastic ideas are generated by our universities (spin-outs, student-led startups etc), which need practical & financial support, as well as real-world implementation. It’s important that both public and private sector organisations have dedicated staff committed to working with universities to help practically implement these ideas, while financial resources will allow new businesses to form. COP26 will be a fantastic opportunity to demonstrate our cleantech ideas, particularly if we can integrate them into the physical fabric & landscape of the event (subject to COVID).

Overall, I would like to see industry-led collaboration across the various sectors, rather than a company-led approach. This should comprise both public and private sector organisations, and work to establish sector-specific aims and goals which could be shared at COP26. They could collaborate with academia to help research potential alternatives too.

'Environment & Climate Change' Series

Enhancing Cross-Sector Collaboration: The UK as a world leader in 'green tech'

Richard Cockburn, Womble Bond Dickinson

What is your organisation's role in the 'green tech' ecosystem?

Womble Bond Dickinson has been advising clients across the energy sector for more than 30 years. We have a strong track record advising on the full span of renewable energy technologies, power projects, acting for developers, investors, operators, the supply chain, regulators and all energy stakeholders. We also advise companies in the oil and gas industry on how to utilise existing and developing decarbonisation technologies (e.g. wind, solar, CCUS, hydrogen and low carbon heat) to further their decarbonisation agendas.

Our role as trusted adviser to our clients enables them to ensure that they maximise the commercial and ESG benefits of green technologies and we support those outside the renewable space on their own energy transition. Womble Bond Dickinson has been recognised by the FT Innovative Lawyer Awards Europe 2019 as one of the Top 50 Most Innovative Law Firms.

What challenges and opportunities do you currently see in this space?

The energy transition away from carbon-intensive energy production is accelerating rapidly. This is driven by a number of factors including the need to get to Net-Zero and the legislative targets associated with that, environmental, social and governance (ESG) requirements, pressure from workforces and the recruitment market, investor pressure (as investors see low carbon investments starting to perform better than fossil fuel investments) and economics as low carbon energies become self-sustaining. In the UK, we do not yet have clear roadmaps for all of that energy transition – for instance, we know that we need a smarter electricity grid with greater capacity to



Richard Cockburn is a partner in WBD's energy and natural resources group.

Richard has worked with developers and contractors in the renewable energy sector on projects ranging from onshore and offshore windfarms to renewable heat, solar, wave, tidal, CCUS and other projects.

In addition to being an energy and natural resources lawyer and a commercial lawyer, Richard has many years of experience in competition law, state aid and public procurement.

accommodate more EV charging but there needs to be more of a coordinated EV strategy to allow for identification of the most efficient investments to meet EV needs. We know that hydrogen and carbon capture, utilisation and storage (CCUS) have very important roles to play in the energy transition but we are still on a journey to a clear national strategy and action plan for both technologies, albeit we are getting there much more quickly than before.

What impact will the UK's recovery from the COVID-19 pandemic have on the green agenda?

The UK's move towards Net Zero will speed up. National and devolved governments alike are talking about rebuilding towards a Net-Zero

economy and, whilst the UK and Scottish governments have underlined their support for the UK's oil and gas industry as it battles Covid-19 and a low price shock, both administrations have underlined an accelerated commitment to achieving Net Zero as a condition of such support. Whilst the UK's renewables sector has suffered some turbulence from the pandemic, mainly in the form of slowed or delayed project development or consenting and enforced changes to working practices, the consensus is that this is a temporary disruption. Indeed, the International Energy Agency has opined that renewables will be the only part of the global energy sector to grow in the short term. Investors seeking to avoid the cyclical risks of the oil and gas sector are looking increasingly to renewables for a more stable risk profile.

In what areas would you like to see enhanced cooperation with government?

A particular feature of the energy industry in the UK is how closely it engages with governments at the national and devolved levels, whether directly or via representative bodies such as Renewables UK and Oil and Gas UK. This leads generally to considered decision-making although it is not without its frustrations as UK CCUS stakeholders are only too aware after a couple of previously failed cycles of CCUS development in the UK. It appears that the revised CFD (contract for difference) support mechanism will include support for onshore wind and for solar and this is welcome after industry-wide demands for that change. Other areas needing faster development are CCUS and hydrogen, where roadmaps are evolving quickly but the UK is already a long way behind some other countries in respect of these technologies and needs to catch up if it is going to develop world-leading supply chains that can export internationally. Overall, forward guidance from Westminster as to the nature, amount and timing of regulatory and revenue support to be expected for different renewable and green technologies would act as a catalyst to private sector investment activity.

What role can large tech companies play to support innovation?

Often new smaller suppliers with interesting new technology or processes get 'crowded out' by the larger, tier one, suppliers which – understandably – only want to offer their customers proven solutions or solutions in which they have invested heavily in-house. Smaller suppliers or sub-contractors can struggle to find a voice and larger customers, in particular, can be unwilling to take the risk of looking past their tier one partners to the smaller players in the background. Larger tech companies can assist here, scouting out these novel solutions within smaller suppliers, helping to develop and commercialise them and, ultimately, using their corporate muscle to get a hearing at the larger customers' table. At WBD, we have developed WBD Accelerate – effectively, an incubator for high-growth start-ups which offers mentoring, simplified legal support, training and horizon scanning – and this is the perfect vehicle for those looking to scale up new solutions to sell into the energy market.

How can the UK continue to cooperate with European colleagues around 'green-tech'?

Although the UK has left the EU, energy projects across the UK continue to have a strong European element and this will not change. In UK offshore wind, for example, Orsted (Danish), Vattenfall (Swedish) and Iberdrola (Spanish) (via its subsidiary Scottish Power Renewables) are three of the biggest players. To offset cost, these players are constantly seeking new technological solutions and Vattenfall, for instance, completed the European Offshore Wind Development Centre, just offshore from Aberdeen, to test new turbines, foundations and cabling set-ups. Vattenfall has also been working closely with ORE Catapult, the UK's technology innovation and research centre for offshore wind, wave and tidal energy.

How can the private, public and academic sectors better collaborate to support the UK's development as a world leader in green tech, particularly in the run up to COP26?

There is no 'one size fits all' answer to this question. Taking CCUS and hydrogen as examples, as governmental strategy starts to crystallise, the private, public and academic sectors can continue to work together to plug any technological gaps or to work up new business models. This is already happening and, in CCUS for instance, the UK government has been consulting across the sectors on the best business models. In hydrogen, the UK government recently announced the Phase 2 award of grants from its Hydrogen Supply Competition to allow candidate projects to develop new products and solutions. Taking one such project, the Acorn Hydrogen Project, led by Pale Blue Dot, won £2.7 million to evaluate an advanced reformation process, including investigation of Johnson Matthey's low carbon hydrogen technology. Such cross-sector initiatives need to continue and accelerate.

'Environment & Climate Change' Series

Enhancing Cross-Sector Collaboration: The UK as a world leader in 'green tech'

Jo Coleman, Shell

What is your organisation's role in the 'green tech' ecosystem?

Shell has had a home in the UK since 1897, with various UK subsidiaries currently employing around 6,000 skilled staff in this country, making a vital contribution to its energy security and economy. Shell fully supports the goal of the Paris Climate Agreement and the UK's 2050 net zero target, and, in April 2020, Shell announced that it aims to be a net-zero emissions energy business by 2050, or sooner if possible, in step with society and with our customers [1].

Shell has a strong history of fostering open innovation and technology development through vehicles like Shell Research Connect (fundamental research), Shell GameChanger (early-stage technology development), Shell Ventures (our corporate venture capital group) and Shell TechWorks (innovation centre). We have also announced our new programme for energy start-ups – Shell StartUp Engine UK – in partnership with Unreasonable Group. The initiative complements Shell's wider efforts on building an entrepreneurial ecosystem locally and globally.

What challenges and opportunities do you currently see in this space?

Shell considers the UK an important market as we build the low carbon businesses of tomorrow. Shell UK is delivering 100% certified renewable electricity to homes and businesses. We are installing charging points for electric vehicles on Shell's forecourts and at customers' homes. And Shell Energy Retail has launched (with partner PassivSystems) a smart, lower-carbon hybrid heating system which uses electric-powered heat pumps.



Jo Coleman is Shell's UK Energy Transition Manager. Prior to this, Jo was Strategy Director at the Energy Technologies Institute and has 10 years' experience developing low carbon technologies, energy transition pathways and business strategies.

Jo is an independent member of the Government's Net Zero Innovation Board and also advises the Energy Futures Lab at Imperial College, Harwell Energy and the British Geological Survey.

Jo was awarded an OBE in 2018 and is a Chartered Engineer and Fellow of the IMechE.

We are actively looking to invest further in offshore wind, CCUS and hydrogen, as we are already doing in other countries. With the right policy frameworks in place, investment by companies could be unlocked more rapidly.

A key challenge, in the absence of an economy wide carbon price, is that there needs to be a robust policy framework which creates a market "pull" for new technology developments in key areas (e.g. decarbonisation of heat) if technology is to be deployed.

What impact will the UK's recovery from the COVID-19 pandemic have on the green agenda?

COVID-19 presents an opportunity to accelerate the energy transition in the UK through a “green recovery” and investment in clean technologies to create new jobs in the UK. Shell UK believes that the Government’s stimulus plan should be tied to sustainable reductions in emissions and have advocated for three principles to ensure a green recovery:

- (i) Government should support industries that can both create many jobs relatively quickly and form the foundations of a net zero energy system of the future e.g. implementing policies that accelerate private investment in offshore wind and in energy-efficient housing and launching the UK’s first CCS projects that enable the development of low-carbon industrial hubs by capturing and safely storing CO₂ emissions.
- (ii) Government support for businesses today should be explicitly linked to ambitions to reduce emissions in the future.
- (iii) Government policies to stimulate consumer spending should focus on building demand for cleaner products and technologies such as battery or hydrogen-powered vehicles.

In what areas would you like to see enhanced cooperation with government?

Government has a critical role to play in re-wiring the economy by accelerating policy and technology uptake and cross-boundary collaboration. In particular Government should:

- (i) Promote critical new pre-commercial technologies (e.g. hydrogen).
- (ii) Develop key infrastructures (e.g. electricity network upgrades required for EV charging).

(iii) Frame new market structures that are seen as fair (e.g. for low carbon heating).

For pre-commercial technologies there is a challenge around continuity of funding across Technology Readiness Levels. The UK needs better collaboration across research councils and with Innovate UK, BEIS, and regulators like Ofgem on joint technology challenges to ensure promising research has funding allocated to it for further development without heavy administrative burdens. Equally important is having a supportive and consistent policy framework for the energy transition, including some of the key technology choices (e.g. hydrogen) because the framework will create market pull for technologies, in the absence of a broader economy wide carbon price.

What role can large tech companies play to support innovation?

Large enterprises such as Shell have a critical role to play:

- (i) As the engine for commercial innovation and scaling.
- (ii) Through mass-deployment and integration of new technologies.
- (iii) By providing customers with new possibilities.

To provide 2 examples, Shell Ventures invest in companies that reduce costs, lower emissions, electrify our energy system and help us gain data-based insights. Shell Energy Retail Limited has launched (with PassivSystems) a company called B-Snug to scale smart, lower-carbon hybrid heating system which use electric-powered heat pumps.

How can the UK continue to cooperate with European colleagues around 'green-tech'?

Shell UK encourages the Government to ensure that the UK retains ability to participate in European

funding bids after the EU Exit Implementation Period through Horizon Europe and subsequent programmes. This is not simply about access to funding, but also facilitating the UK's collaboration within the global scientific community, which is essential if it is to retain its world-leading position in the academic sector, as shown in the latest global university rankings. It also important that practical solutions are found in terms of international mobility for the university/start-up sector after 2020 for the UK to remain attractive to top overseas talent. We also encourage the Government to see the export of knowledge, skills, and expertise that are developed in the UK as important goals in and of themselves. There may be technologies we are developing within our UK partnerships that we may not first deploy within the UK itself.

[1] More details on the announcement are available [here](#). It is important to note that as of 27 January, Shell's operating plans and budgets do not reflect Shell's Net-Zero Emissions ambition. Shell's aim is that, in the future, its operating plans and budgets will change to reflect this movement towards its new Net-Zero Emissions ambition. However, these plans and budgets need to be in step with the movement towards a Net-Zero Emissions economy within society and among Shell's customers.

'Environment & Climate Change' Series

Enhancing Cross-Sector Collaboration: The UK as a world leader in 'green tech'

Simon Evans, Arup

What is your organisation's role in the 'green tech' ecosystem?

Arup's market disciplines are extremely broad, from city master-planning and building design all the way through to energy systems and water and waste management. As a result, we are extremely well-placed to understand the challenges we face as a society trying to build a more sustainable and resilient future.

The firm's mission – to Shape a Better World – underlines the group's determination to be a force for positive change. And given the urgency of the challenge we see around us, there is no better time to be working with like-minded clients and partners to design better outcomes for the people whose lives we impact through our work.

What challenges and opportunities do you currently see in this space?

Turn on any news programme and you cannot fail to see a vast array of challenges all around us. Fires, droughts, crop failures, famine, refugees, extreme poverty, mass unemployment, global inequality.

In the face of all this, it is easy to be pessimistic about the challenges we face. Yet the fact is that we have come a long way just in the past couple of generations. Take the climate challenge. Technological advances and the rapidly declining cost curve for renewables have brought a Zero Carbon world within touching distance in a way that was hard to conceive of even just a decade ago.

The same potential is there behind just about every single category listed in the SDGs. We don't lack the imagination, the brainpower, or the resources. We just need enough people with the will to work together to make the change.



ARUP

Simon Evans is
Arup's Digital Energy Leader and a Fellow
of the Institution of Mechanical Engineers (IMechE).

A technology developer and chartered mechanical engineer, Simon has a background in the structural and mechanical design and analysis of offshore structures in the oil & gas and renewables sectors.

He is the author of the digital twin maturity spectrum, an active Council member of IMechE and the Delivery Team Lead for the National Digital Twin programme, part of the Centre for Digital Built Britain.

What impact will the UK's recovery from the COVID-19 pandemic have on the green agenda?

In some ways, the Covid pandemic is playing a similar role to many natural disasters in the past. It has forced people to really re-evaluate how we live.

People are now questioning things that barely registered before the crisis. Societal trends that were slowly shifting anyway, in areas such as remote working, digital connectivity and active mobility, have accelerated dramatically.

It represents a great opportunity for the green agenda and Arup is already working with clients and partners on projects to turn those aspirations into

reality. In cities, we are working with local authorities to make walking and cycling the first choice for transport rather than the poor relation. We are driving forward digital energy networks, and at national level, we are encouraging governments to drive post-Covid recovery by investing in green jobs today, to build green infrastructure for tomorrow. There are also wider agendas, such as the National Digital Twin programme, which are recognised as key initiatives to assist with post-Covid economic recovery.

In what areas would you like to see enhanced cooperation with government?

The UK will face a range of challenges in different areas, so there is a need for a whole-systems approach across each aspect of the current challenge. For example, we know that the pandemic is not over yet, so we have to prepare now to have projects that can get under way quickly when it is safe to do so. That means investing now in the planning and design of 'post-Covid' projects so that we can rapidly kickstart the economy when the time is right.

We certainly don't want to waste scarce investment capacity, so it is critical that business works with government to prioritise projects that are futureproofed to build a strong foundation for economic recovery.

This might mean, for example, investing in re-wilding and flood prevention schemes to enhance resilience in rural areas; investing further in crucial programmes such as the National Digital Twin programme, investing in the digital networks we will need to run electric vehicles in towns and cities; or establishing hydrogen networks to meet our Net Zero ambitions for the future.

What role can large tech companies play to support innovation?

Innovation works best when the entire innovation eco-system comes together. Large tech companies can play their part by investing in the R&D and delivery programmes required to ensure that EVs, hydrogen, smart grids, digital connectivity or

whatever it might be are functional and affordable. But that cannot happen with a supportive policy framework, planning support, professional services, and a really effective and skilled supply chain.

Just as importantly, the public have to be onside, with the confidence that they are not going to be saddled with large bills for obsolete tech.

Large tech companies are already incentivised to provide a superior product, but they have to be backed by considered, long-term policy frameworks that will support long-term investment, and foster collaboration and open data sharing - rather than proprietary or closed ecosystems.

How can the UK continue to cooperate with European colleagues around 'green-tech'?

Irrespective of what happens with Brexit, there is a growing recognition that partners in the UK and EU have a great deal of shared ambition across the green tech landscape.

We would hope that the UK finds a way to maintain links to the Horizon programme through some sort of association agreement or other forms of collaboration, but it would be a missed opportunity if links between the UK and the EU Member States were allowed to wither and weaken.

Challenges such as climate change cannot be solved by any single nation, or indeed any single Continent, so it is crucial that we remain allies and find new ways to cooperate through formal collaboration mechanisms.

How can the private, public and academic sectors better collaborate to support the UK's development as a world leader in green tech, particularly in the run up to COP26?

COP26 is an unmissable opportunity for the UK to bring global partners together to take on one of the most pressing challenges we face across the globe - climate change. Providing real climate leadership will demand a commitment to an ambitious Net Zero programme at home, as well as demonstrating

to partners around the world that the challenge can be overcome through global action.

That means working together to establish clear, academically-backed targets for progress. It means developing innovation networks to reduce lifetime costs and increase efficiency. And it means drawing on all the UK's expertise from finance to supply chains skills to demonstrate the power of sustainable and resilient infrastructure in driving progress.

'Environment & Climate Change' Series

Enhancing Cross-Sector Collaboration: The UK as a world leader in 'green tech'

Conclusion

In this report our contributors have shown that organisations across the sectors are developing innovative ways to overcome the barriers to expanding the UK's green tech capabilities, while also ensuring that the vast opportunities of a decarbonised industrial sector are used for the benefit of civil society both at home and abroad.

With COP26 and the G7 summit coming up, there is a lot to be hopeful for, and political appetite for the acceleration of green technology and innovation has never been greater, nor more cross-party. Where there is appetite for key players from academia, industry and the not-for-profit sector to create the kinds of technology that will see both their own emissions decrease as well as those of the nation as a whole, it is clear that this moment in time must be used to establish a roadmap to net-zero. In the process, this will empower non-state actors to contribute to the UK's net-zero ambitions while also providing economic opportunities through the widespread application of green industrial technology throughout the UK.

Though the Climate Change Committee estimate that the investment needed to achieve net-zero sits at less than 1% of GDP per year, there are still significant funding challenges facing the green tech sector. As Naveed Chowdhury notes, this is most significant at the scale-up stage, where companies start to have greater impact and create more jobs. Naveed suggests the solution could include increasing capital flows here, while establishing innovation hubs that utilise region-specific characteristics across the UK. However, this must also be paired with a deepening of ties with DIT, to showcase the UK's green tech

worldwide. Looking ahead, we need to be ready to kickstart new green tech projects as the COVID pandemic declines. This means investing now in the planning and design of these projects, with business working with government to prioritise areas that are futureproofed.

Beyond the funding challenge, Jo Coleman tells us that in the absence of an economy-wide carbon pricing arrangement, a robust policy framework could create a pull for new technological development in key areas (such as the decarbonisation of heat). This includes policies that accelerate investment from cross-sector sources, while linking existing support mechanisms to reductions in future emissions. Turning to consumers, the government must look towards stimulating consumer spending in cleaner products such as battery or hydrogen powered vehicles. Wrapped up in this, is the need to develop key infrastructure, such as EV charging points, and to promote the development of new, pre-commercial technologies, such as hydrogen.

Richard Cockburn highlights that big tech companies can play a significant role here. New, small suppliers with interesting technologies are often crowded out by larger firms, providing tried and tested solutions. Larger tech companies have the ability to scout out novel solutions, helping to expand and commercialise them before using their corporate muscle to deploy them at scale, with large customers. With many of these firms in the start-up phase of their existence, mentoring, legal support, training and horizon scanning are also invaluable forms of assistance that bigger firms can provide.

As Simon Evans warns; fires, droughts, crop failures, famine, refugees, extreme poverty, mass unemployment, and global inequality are on the horizon if we do not mitigate the climate crisis. But technological advances and the rapidly declining cost of renewables has brought net-zero within touching distance in a way that was hard to imagine just a decade ago. International collaboration will now be key, as climate change cannot be solved by one country or continent alone. The UK will need to remain a close ally to the EU, while also using moments like COP26 and the G7 summit to align with the international community. Not only will this enable the UK to show leadership on green tech, but also contribute to global cohesion for the mutual advancement of technological innovation in the fight against the climate crisis.

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