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MIDLANDS
ENGINE

Building back
stronger, better
and greener in
the Midlands

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Foreword Sir John Peace

We must be ready, with bold and ambitious plans, if we are to drive forward recovery from the Covid-19 crisis which continues to threaten the global economy. As we do so, I recognise that the UK has both a challenge of scale and an opportunity to capitalise on - to re-consider what Britain needs, to build our region's economy back stronger, better and greener. With this firmly in mind, I was delighted to host a virtual roundtable, starting a powerful Green Recovery conversation which brought together some of the top industry leaders and academic minds - alongside public sector partners, to consider together how we align our immense and proven capabilities to enable and accelerate Green Recovery in every part of the Midlands Engine.

I was struck by the focus on innovation in our discussion, the thought leadership brought by our partners, and energised by the sheer potential of our region, illustrated so clearly within our conversation. As you will see from this report, many of the areas identified as being crucial to Green Recovery are areas that the Midlands Engine is already working in, indeed - leading on.

Energy research, including battery technologies, hydrogen opportunities and storage innovation, featured heavily in our discussion - reflecting the strengths of our region - including world leading industry and powerful collaboration across our Universities; and transformational programmes such as the Energy Research Accelerator and the Midlands Engine Development Corporation. Our region's capabilities in cutting edge innovation in sustainable transport, planning for low carbon journeys and repurposing technologies to achieve net zero - these are just some of the examples, amongst so many, which demonstrate the importance of both building on our strengths and of regional co-operation, as the Midlands Engine seeks to accelerate a truly green recovery.

It was my pleasure to work with valued partners Browne Jacobson on this event, who brought to bear their significant expertise in this field, selecting the impactful topics around which to begin our discussions; Energy Generation and Storage, Digital Connectivity and Skills Transition, all key focus areas.

This report is not an end in itself, but rather the start of a much wider conversation and I look forward to seeing the impact of this initial discussion, with its real potential for policy shaping, as we continue to champion the many strengths of our Midlands region and drive forward economic growth, in partnership.



Sir John Peace
Chairman, Midlands Engine

Our pan-regional partnership, across Midlands Engine, presents a material opportunity to accelerate activity across shared priorities - and partners have made it clear that green recovery is a collective high priority. There has never been a stronger rationale for collective action to bring about change, than the threefold challenges we face today: the stubborn, structural challenges in our regional economy as highlighted in our Independent Economic Review; the severe impact of the Covid-19 pandemic - fiercely exacerbating regional inequalities, and the undeniable level of threat posed by the climate emergency.

I look forward to continued, powerful collaboration with our partners across industry, academia and the public sector as we drive forward a green recovery and level up our region, in partnership.



Rachael Greenwood
Director, Midlands Engine

Foreword Browne Jacobson LLP



Peter Ware
Partner,
Head of Government

It was a real privilege for Browne Jacobson to partner with The Midlands Engine for this event, working together to connect a leading range of talent from Industry, Government and Academia.

In hosting the roundtable we have established an ongoing forum for experts from across our region to shape and define the way we can emerge strongly from the Covid crisis. In the weeks following the round table we have been working hard to bring together this paper which we believe can play its part in informing where we as a region can identify and drive forward the opportunities arising from a green focused post pandemic recovery.

Our long history working with clients across the public and private sectors gives us the real confidence to say that now is the time for all of us interested in new job and opportunity to grab the agenda. We are on a burning platform which necessitates a change to the way in which we all live, work and play in order that we can start addressing the climate crisis now. Whilst this will require mindset changes and investment, the narrative needs to and indeed is rapidly changing as both government and industry together recognise that Green is no longer the back-drop for job loss, and the stifling business but in fact will be at the centre of future opportunity and local government and industry alike are increasingly putting the environment and a carbon neutral ambition for the future at the heart of their plans for growth . If we can get this right not only can we will positively impact the environment we live in, but help our people and businesses to prosper and excel.

What we have seen from our research and the round table discussions is that cooperation and true alignment will be a critical prerequisite to achieving the best outcome. As you will discover from the report, there are some incredible examples of that happening across our region; we have a wealth of resource and experience that we need to bring together to be a true “powerhouse” for the Midlands and indeed the country’s ambition for an environmentally sustainable post pandemic recovery, whether this is in battery research, carbon neutral homes or hydrogen technology . However, there is still much work to do and we now need to accelerate change if we are to see the full potential.

The Midlands with its unique geographical position and research excellence embodies the importance of connectivity both technologically and through physical infrastructure like HS2. Here in the Midlands we must take advantage of this to ensure that we are at the forefront of the work on bringing people together and facilitating the green recovery. Our green tech companies can not only stimulate the economy, but can do so in a way which helps reach our net zero targets. Whether this is through energy, automotive and transport, or just through advances which allow people to work and play in a more sustainable way, helping our business to achieve must be a priority.

Ultimately, all of this comes down to people and we must make sure that people are improving both their skills, their environment and their decision making to ensure the green revolution properly begins. The Midlands Engine and its partners are exceptionally well placed to facilitate this happening and we at Browne Jacobson are delighted to be supporting and connecting others to this vital and exciting agenda.



Declan Cushley
Head of Commercial
and Technology

The roundtable	04 - 05
Executive summary	06 - 11
Midlands Engine - driving collaboration to achieve green recovery	12 - 14
Energy generation and storage	15 - 21
Transport	22 - 33
Digital connectivity	34 - 39
Skills transition: fossil fuels to clean energy	40 - 42

The roundtable

Chaired by Sir John Peace, Chairman of the Midlands Engine, and hosted by Peter Ware, Browne Jacobson, attendees included:

Sir John Peace



“ The global Covid-19 pandemic offers a rare opportunity for the UK to reassess its needs, and to build back stronger, better and greener.

Rachael Greenwood



“ Collective action in partnership is key to accelerating green recovery.

James Stephens



ASTON MARTIN

“ Electrification is the silver bullet that slays many of our carbon demons.

Carl Arntzen



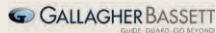
“ It's frustrating that we're still not building new homes to carbon zero standard.

Will Morlidge



“ A lot of the onus is on us as individual consumers to insist on low carbon when we buy a house or car, or whatever.

Simon Pemberton



“ We've seen a significant push to make sure our investment in the green sector is in line with expectations.

Prof. Tracy Bhamra



“ There is not enough resource to make the number of batteries we need for all vehicles even just in the UK, increasing this resource must be a priority for investment moving forward.

Charlotte Horobin



“ Co-locating different businesses in order for them to share resources in a smarter way has to be the aim of businesses across the Midlands.

Laurence Marzell



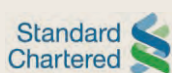
“ We haven't yet grasped what smart city technologies means economically and operationally getting that right is a critical first step.

Robert Mason



“ One of our challenges is... how do we make sure we get the right people in the right places at the right time.

Tracy Clarke



“ Climate change, the transition to zero carbon is a real imperative for all our key stakeholders.

Julian David



“ It has become clear that digital skills are spreading across virtually every area.

Anthony Walker



“ There's a huge opportunity for the Midlands to build on the gigafactory... and really try to source a lot of materials locally.

Prof. Martin Freer



“ Hydrogen will have a big role to play in the future transport economy.

Peter Ware

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“ We are at the start of an exciting journey, making sure our first steps are the right ones has never been more important.

Declan Cushley

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“ Now is the time to connect and consolidate our green credentials and in doing so we will create strong partnerships.

Richard Barlow

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“ Everyone in the Midlands must make their contribution in rising to the environmental challenge.

Laura Hughes

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“ To be successful, the green recovery will need to be driven from the regions.

Anja Beriro

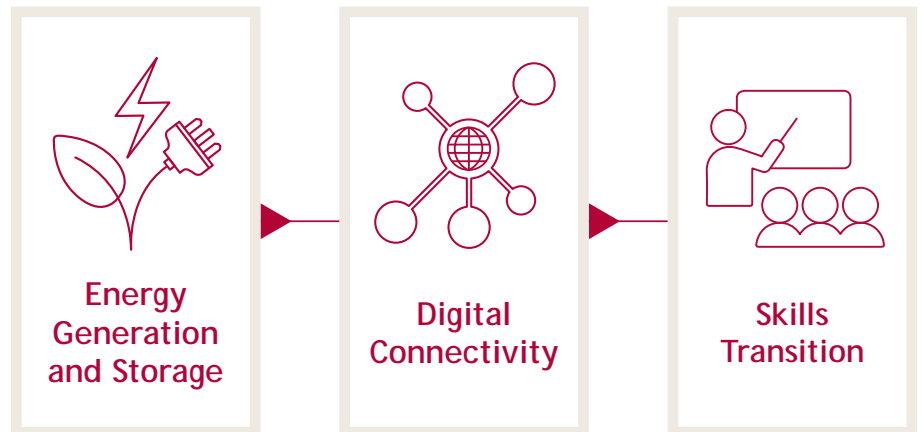
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“ Central government needs to collectively invest in upskilling: fewer, larger pots of money with more flexibility for local delivery.



Browne Jacobson and the Midlands Engine hosted a roundtable event on the green recovery. This brought together stakeholders from across the Midlands, including industry, academia and the public sector.

Three topics which are material to a green recovery for the region's economy and communities were selected. These topics were used as a means to focus discussions:



Executive summary



“The global Covid-19 pandemic offers a rare opportunity for the UK to reassess its needs, and to build back stronger, better and greener, to help address the deepening climate and environmental crises. Global lockdowns have led to dramatic reductions in economic activity and travel, resulting also in significant reductions in fossil fuel usage and falling pollution levels. At the same time, the priorities of business and communities have shifted, with predictions that the way we live and work may change forever. As pressure grows on the Government to seize this moment to pursue an ambitious green recovery, this also presents the Midlands and its significant regional capabilities, assets and strengths, with a demonstrable opportunity to take the initiative, as the leading region driving green recovery and growth.”

Sir John Peace, Chairman, Midlands Engine

In 2018 the Midlands emitted

64,368 kt CO₂

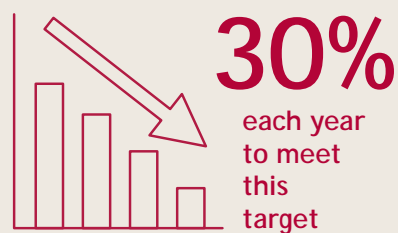
This is a reduction of just **0.8%** over the previous year and whilst this is a step in the right direction, it compares poorly to a

1.6% average reduction across England

As a region, if we continued to reduce emissions based on the past three year average we would reach net zero in the year **2433**

In order to reach the Government’s target of net zero emissions by 2050, there is urgency to act and the need to crystallise a level of ambition not previously seen.

We need to prepare, plan and act collectively to reduce our emissions by not less than



This paper builds on a roundtable discussion which brought together thought leadership from experts across our region, starting a Midlands Engine green recovery conversation, first exploring a number of issues which partners prioritised. It provided an opportunity too to place a spotlight on the immense related capabilities of our region, and the potential to drive an accelerated green recovery across the Midlands Engine.



Energy generation and storage

A natural focal point for our regional green recovery is the generation and demand for energy in the Midlands, together with our expertise and innovation in energy storage. The Midlands Engine has the capabilities and necessary academic leadership in these areas and can provide a path to helping the Government achieve the net-zero carbon emissions target by 2050.

Drawing on the expertise and capabilities of the region in enabling green recovery will also significantly stimulate economic growth, through the creation of high value, high skills jobs and attraction of inward investment.

World leading technologies, developed by Midlands firms are shaping change now - including hydrogen fuel enabled heat decarbonisation, alternative fuel sources for transportation and innovation in battery technology. This illustrates well how pioneering firms, leading academics and regional capabilities are being levered today as we work to deliver the transformational scale of change now needed. It represents tangible evidence that across the Midlands, partners understand that the journey towards net-zero, to address climate change, is urgent.

The Midlands Engine is already an internationally recognised centre of excellence for energy research and development, with exemplary public/private/academic sector partnerships in place which have significantly expedited delivery, such as the Energy Research Accelerator. Further targeted investment would return impact at pace in this already proven environment.

In order to effectively work towards a green recovery, multiple sources of renewable energy generation need to be promoted and invested in. Integral to a green recovery is the need to repurpose redundant facilities and technologies; the closure of fossil fuel power stations across the Midlands Engine creates an opportunity to exploit existing connections, such as to the grid, to transport networks and opportunities to redevelop brownfield sites as a focus for clean energy generation and storage.

Multi sector partnerships and expertise exists within the Midlands Engine, ready to lead on accelerating innovation in energy generation technologies, including hydrogen, wind, nuclear and solar. However, without Government support, the private sector is deterred from, or not able to invest in green energy due in part to the high risk profile of developing such technologies. Midlands partners already recognise the need for investment across a broad a range of energy technology sectors and are ready to collaborate thematically - such is the level of recognition of the climate change imperative that we face.

To achieve net zero, there needs to be shared investment and a collective approach to shared risk. Such an approach will drive gains in all areas and facilitate widespread economic stimulus, the latter is the cornerstone on which public sector investment can rest.

As well as generating and storing energy, we fundamentally need to change the types of energy we use and the way we use them. Heat decarbonisation is one of the most serious challenges facing the UK. Ambitious policy levers and incentives, collective investment at scale and a shared delivery plan are all vital if we are to enable the retrofit of housing stock in our region. Immediate action is also needed to ensure every new home in every part of our region is built efficiently and with low carbon heating so they don't need to be retrofitted in the future. We must be ambitious. Incremental and steady change over time will not suffice. There is an opportunity for the Midlands to take leadership in this area, and drive standards and behaviour change across the region.

Actions and recommendations:

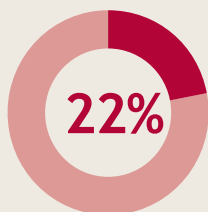
- Investment is needed in a broad range of energy technology sectors. The Midlands Engine is very well positioned to enable impact at pace from investment in this area
- Investment and policy change is essential to require and enable the retrofit of the existing housing stock in our region. Policy change is needed to ensure ALL new homes are built efficiently, to net zero standards now - with low carbon heating
- The Midlands Engine should be empowered take leadership in energy, acting as a catalyst to establish shared standards and drive partnership led behaviour change across our region

The Midlands is home to almost

11 million people



The Midlands is responsible for



of England's exports¹

The Midlands generates



£234 billion
for the UK economy²

Key strategic industries for the region include:

- Advanced manufacturing
- Energy
- Agri-tech
- Med-tech

Academic excellence is driven by



major universities across the Midlands

¹ 2018 data on exports

² Midlands Engine Observatory Independent economic review April 2020

Transport innovation

Emerging as a key topic of debate at the round table, transport is a key emitter of carbon across the UK and the Midlands. Decarbonising transport will play a significant role in a green recovery and in delivering on the Government's net zero target. The Midlands is right at the heart of the UK transport network; 80% of all UK freight passes through our region and the environmental impact of our logistical strength needs accelerated mitigation at scale.

Multiple alternative fuel sources need to be developed in tandem in order to reduce CO₂ emissions as quickly and cost effectively as possible. Inter and intra-regional transport links need to be improved with sustainable connectivity in focus, which in turn will increase access to jobs, encourage use of public transport and move freight from road to rail, demonstrably reducing emissions. In fact, road to rail represents up to a 76% reduction in CO₂.

Green recovery through transport means more than a move to zero emission vehicles. Easy and affordable inter-regional journey planning, integration of transport systems and green modes of travel all have an important role to play - including walking, cycling, e-scooters and other forms of micro-mobility.

There must be a determined effort to keep research, manufacturing and assembly of zero emission vehicles in the UK to meet domestic demand. This could be achieved by investing in gigafactories and hydrogen generation plants near transport production centres, improving supply chains and transport links across the UK. The Midlands is naturally well positioned to enable this. Action is also needed to decarbonise the existing transport fleet, and multiple alternative fuel sources need to be developed in tandem to reduce carbon emissions as quickly as possible. Diversity of fuel sources will both capitalise on a range of technologies and aid early delivery of cost effective solutions for the consumer.



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Actions and recommendations:

- Research, manufacturing and assembly of zero emission vehicles should be retained in the UK, and support for this sector should be a priority
- Urgent decarbonisation of the existing transport fleets should be prioritised, with a focus on innovation, re-purposing technologies and infrastructure where possible
- Significant investment is needed in sustainable transport enhancements both within Midlands and connections from the Midlands to the rest of the UK to in turn drive growth and jobs
- Other green modes of travel need to be fully deployed, responding to changing consumer behaviour, including active transport, cycling, walking, e-scooters and micro mobility

Digital connectivity to power growth

The shifts in ways of working forced by the Covid-19 pandemic have powerfully highlighted the environmental gain from enhanced digital connectivity, and underlined the need for targeted, accelerated investment. World class digital connectivity and meaningful investment to expedite innovation across associated technologies will underpin green recovery in the Midlands Engine.



Enhanced connectivity supports business growth, boosts productivity and increases collaboration and knowledge sharing. Roll out of 5G alone is worth £5 billion over the next 5 years to the Midlands economy - connectivity will drive transformational economic impact, productivity gains and play a central role in levelling up our region. Increased online connectivity can result in significant reductions in fossil fuel usage, as inevitably reducing travel dramatically lowers pollution.

The Midlands lags behind much of England, and compares badly to European regions with poor connectivity and a lack of targeted infrastructure roll-out planned. Firms cite poor connectivity as an active barrier to growth. Targeted investment must now follow, to deliver accelerated infrastructure roll-out, and support for businesses and communities as they maximise potential for innovation-led growth, increased competitiveness and enhanced quality of life opportunities which connectivity brings.

Broadband, full fibre, mobile connectivity and 5G must all form an integral part of new greener working patterns, enabling effective remote working and allowing businesses to respond to rapidly changing working patterns. This connectivity will also support businesses to grow, enhance competitiveness of Midlands firms and foster collaboration intra and inter-regionally. Investment in digital infrastructure is vital to deliver full coverage in EVERY part of our region and so that so no Midlands businesses or communities are left behind.

With sector leading testbeds based in the Midlands, 5G and the expansion of the Internet of Things are poised to revolutionise industry, and the Midlands Engine can lever expertise already developed and learning from networks built; with potential applications including smart heating and lighting of premises, more efficient manufacturing and smart traffic management. These applications allow a greater level of automation, greater efficiency and will go part way in driving consumer behavioural changes, resulting in a consequent reduction in waste and emissions. Policy change and collective partnership action by both the private and public sectors will be needed if the opportunities ahead are to be fully capitalised on.

Smart cities continue to be recognised as an appealing prospect and a future opportunity. The reality is that few locations globally have been able to fully embrace the intent and deliver the full range of significant benefits. Numerous barriers exist that stop smart cities and smart places from being properly realised, so significant research and investment will be needed to make them a reality.

Actions and recommendations:

- Investment is required in digital technology infrastructure to ensure consistent and full coverage that will support businesses and communities
- The Midlands Engine must see increased 5G investment to drive faster roll-out, ensure full leveraging of learning from 5G testbeds and rapid expansion of benefits
- Policy change is needed alongside collective investment to enable rapid adoption of advanced solutions and their promotion to support for consumer behaviour change (e.g. Smart Meters cannot be installed where connectivity is poor)

Skills for business - transition: fossil fuels to clean energy

It is no surprise that the pandemic has had a significant impact on our economy. With many businesses forced to temporarily close, too many downsizing and some ceasing trading for good - quarter 4 2020/21 will see a forecast 517,000 more people unemployed in the Midlands Engine.

The way we live, work, consume and socialise is yet to show signs of a return to pre-covid norms - and one result of this is an urgent need for new and changed skills for businesses, support for skills transition and responsive skills support delivered when and where business needs it.

Successful green recovery will depend on co-ordinated effort to enable an increase in the capacity and skills of our low-carbon workforce, across multiple sectors. One third of all jobs in the UK energy sector alone, are here in the Midlands Engine today and our region has long been responsible for meeting a significant proportion of the power generation needs of the whole of the UK Transition to clean energy means a wholesale reorientation and reskilling of tens of thousands of employees, in order to meet the needs of our businesses. Part of the solution will be rapid re-skilling of those who become unemployed, alongside targeted action to target-train the emerging graduate workforce. Active support is needed - and must be provided focused on re-deployment and re-employment in green economy and digital skills.

Midlands Engine:

Core strengths underlining our confidence for the challenge ahead.

- Powerful partnerships across industry, academia and the public sectors - in place
- Internationally significant scale and capabilities in offshore wind technologies
- World leading strengths in hydrogen as a fuel source - from fuel cells to decarbonised heat
- Internationally recognised energy research capabilities and capacity
- Extensive academic resources to support skills transition
- Exemplary, innovative business leadership

Retraining the labour market to meet a new green economy's skill needs will benefit the economy and employees alike. The Midlands is well placed to deliver the training required. We bring a proven track record of successful deployment of retraining at scale, across partnerships of academia and industry, for example from the move from manufacturing and heavy industry to a service-based economy. Enabling at-scale skills delivery, meeting the needs of a green recovery workforce, can be successfully achieved in the Midlands, with investment. Funding for re-skilling and upskilling a green workforce needs to be deployed in a targeted and coordinated manner, bespoke to regional needs, in order for there to be significant uptake and impact.

Investment in supply chain resilience and certainty of long term pipeline opportunities must be committed now to ensure businesses and academic institutions working in partnership, have the confidence and capacity to lead and invest today, for the skills of tomorrow.

Actions and recommendations:

- Action on reskilling is needed - and must be provided focused on re-deployment and re-employment in green economy and digital skills
- Strong partnership across academia and industry mean the Midlands is well placed to provide the reskilling industry needs now
- Funding for skilling and upskilling must be deployed in a targeted and coordinated manner, tailored to meet regional needs
- Investment in supply chain resilience and certainty of long term pipeline opportunities must be committed now

Midlands Engine - driving collaboration to achieve green recovery

The Midlands Engine is England's leading pan-regional partnership. It drives economic growth and community prosperity and our partnership work is central to efforts to level up the Midlands economy with the UK. The Midlands Engine partnership is driving forward growth through collaboration, adding value for the whole of the Midlands, and the UK.



Midlands Engine Development Corporation

The Midlands Engine Development Corporation will contribute substantially to inclusive, zero carbon growth and levelling up by initially realising the enormous potential of three key sites - the HS2 Hub at Toton and Chetwynd, the Ratcliffe Power Station and the East Midlands Airport Area.

Proposals include:

- An exemplar carbon zero community at Toton & Chetwynd centred on the HS2 hub.
- Symbolic transformation of the UK's last coal-fired power station into an international centre, which will be critical in achieving decarbonisation and emissions targets and will put the UK at the forefront of applied innovation in sustainable future technologies.

Those projects will contribute substantially to levelling-up the regional economy by driving clean, inclusive growth, significantly improving connectivity, and enabling real-world technologies which open up new markets and give the UK competitive advantage.

The programme is forecast to deliver 84,000 jobs and add £4bn a year to the Midlands economy.

Carbon emissions in the Midlands

In 2018 the Midlands emitted **64,368 kt CO₂** this is a reduction of 0.8% since the previous year compared to a 1.6% reduction across England

28,387 kt CO₂ was from **industry and commercial** (44.1% of total emissions / 36.0% in England)

15,053 kt CO₂ was from **domestic** (23.4% of total emissions / 28.3% in England)

21,460 kt CO₂ was from **transport** (33.3% of total / 37.6% in England)

Land use and land use change accounted for a

reduction of 532 kt CO₂

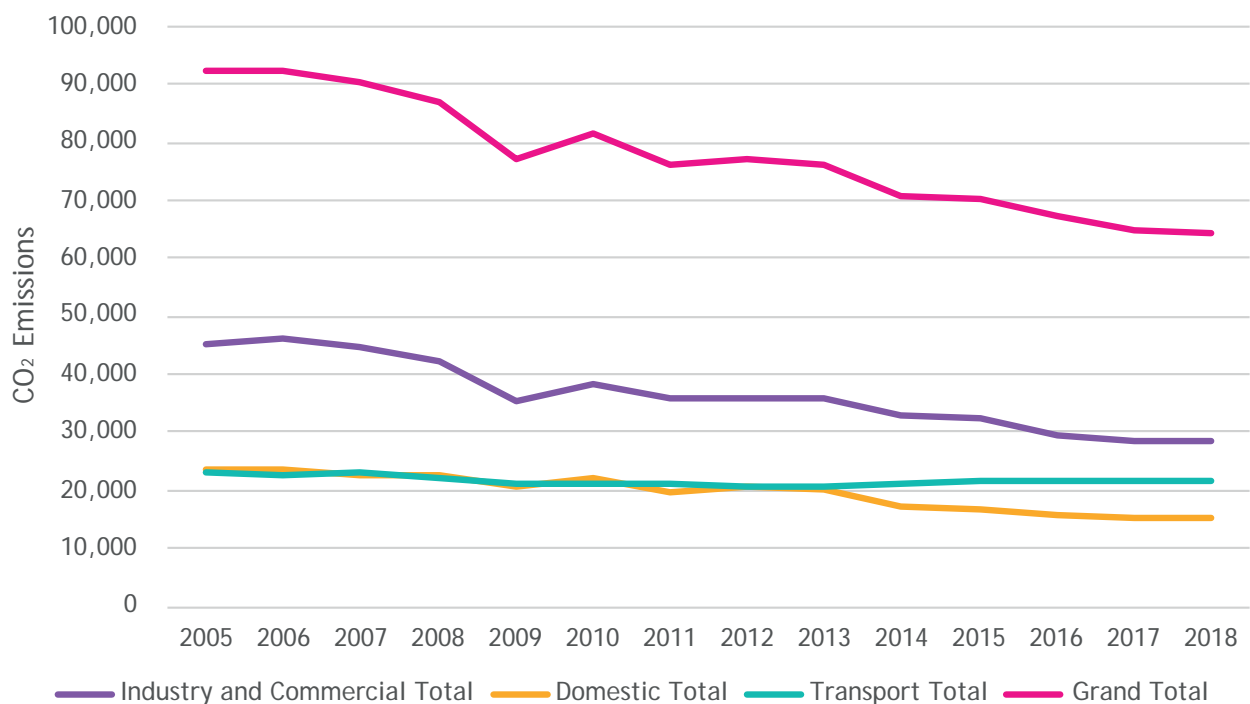
If the Midlands continued to reduce its emissions based on the past 3 year average (-2.8%), we would reach net zero by **2433**

The Midlands must reduce its emissions by **30%** every year to reach net zero by 2050

The graph below shows regional carbon emissions over the period 2005 to 2018 and demonstrates the bullets above - this is a slow rate of decline in emissions being achieved and an accelerated effort is needed in order to achieve a far greater impact.

An active move to sustainable growth will unleash the potential of cutting-edge research, technology, academic leadership and business innovation in the Midlands, capitalising on its strengths and driving sustainable growth. In turn this has the potential to generate more high value, high skilled jobs and accelerate the move to a clean industry.

Midlands Engine CO₂ emissions, 2005-2018



Energy generation and storage

Despite the recent headlines being dominated with Covid-19, one consistent opinion being voiced by government, public bodies, NGOs, members of the public and the private sector is that rebuilding after the Covid-19 pandemic needs to be green and sustainable. Although not everyone has the same views of what a 'green recovery' is going to look like, there is broad consensus that it should include cleaner transport and a reduction in the number of journeys in and out of cities. Undoubtedly, transport, as one of the main culprits of greenhouse gas emissions and a main source of air pollution, has a key role to play in the green recovery and in achieving net zero greenhouse gas emissions by 2050.

Key observations

The key observations drawn from this section are:

- The Midlands is a recognised hub for renewable energy research and innovation. Further investment would be well placed in an already thriving environment. Strong universities, research and technology organisations and growing investment from many leading private enterprises in the sector powers this ecosystem.
- Multiple sources of renewable energy generation need to be both invested in and promoted, to achieve greatest impact as we work towards a green recovery. It will be a combination of numerous sources of sustainable energy and input from the most diverse range of industries which will truly initiate and enable a green recovery.
- Collaboration and engagement from all parties, industry, academia, civic leadership, government and consumer is happening and needs to be built on. This includes engagement beyond simple commercial or academic agreements - rather, powerful partnerships and mutual collaborations which can measurably drive change.

Hydrogen

A main topic of interest throughout the roundtable was the possibility presented by hydrogen fuel cells.

Jaguar Land Rover's operations in the Midlands (JLR) have shown interest in this area. From their headquarters in Coventry they are researching technology which could support the development of hydrogen fuel cells and are currently funded as part of a £73.5 million government investment¹. In order to have an impact, such investment needs to be more widespread - benefiting and accelerating the abilities of multiple corporations. More inclusive investment could also encourage collaboration between organisations, combining resources to develop technologies. One larger scale outcome of this could be the development of a regional transport plan which incorporates hydrogen fuel cells as part of a range of necessary low carbon transport solutions which is explored in greater depth later in the report.

The Midlands has a collection of energy research capabilities which place it in a unique position to develop both hybrid and full hydrogen technologies. There are numerous leading universities located within the Midlands with hydrogen and fuel cell expertise and hydrogen research infrastructure. These universities are involved in research collaborations including the Energy Research Accelerator (ERA). Other examples of academic leadership in this area are the Birmingham Centre for Railway Research and Education (BCRRE) at the University of Birmingham, which is working on different options for fuelling rail vehicles

by developing the UK's first Hydrogen train²; and Keele University, and the HyDeploy³ project, which sees hydrogen injected into the institution's gas network to reduce CO₂ emissions from heating its buildings.

Firms leading innovative developments in hydrogen include Loughborough-based Intelligent Energy, which has invested in advanced hydrogen fuel cell technology products and capabilities. Cenex⁴, located on the Loughborough University Science and Enterprise Park, supports low carbon vehicle projects including utilising hydrogen.

Recently, associations involving the Midlands Hydrogen and Fuel Cell Network have formed a cross-industry group stating their readiness to invest £1.5 billion in hydrogen projects⁵. Further, they have called on the government to invest and place the UK as a leader in developing hydrogen technology. The appetite and expertise for hydrogen technology is clearly demonstrated in the Midlands and this is supported by a willingness across industry to collaborate on hydrogen technologies. Government investment could facilitate, and even be conditional upon, a collaborative approach. Resulting technological advances could create a mutually beneficial competitive advantage for the region, and bring affordable hydrogen technologies to consumers - stimulating growth in the Midlands and the rest of the UK.



¹ <https://www.gov.uk/government/news/735-million-to-boost-green-economic-recovery-in-automotive-sector>

² <https://www.birmingham.ac.uk/research/spotlights/hydrogen-powered-train.aspx>

³ <https://hydeploy.co.uk/why-hydeploy/>

⁴ <https://www.cenex.co.uk/>

⁵ <https://renews.biz/61488/trade-bodies-call-for-uk-wide-hydrogen-strategy/>

Wind

The Midlands also represents a strong opportunity for wind energy generation. Development of offshore wind in the Greater Lincolnshire and Humber region was a particular topic raised during the roundtable discussion. It was highlighted that growing deployment of the coastal wind farms has been a clear success. The Humber Gateway Wind Farm⁶, deployment at scale and effective O&M supply chains are demonstrable capabilities within the region.

Offshore wind has immense future potential, but other areas of the Midlands are by no means exempt from wind energy generation. Further wind farms may have to be more onshore based due to the nature of the Midlands' location, but the roundtable discussion highlighted that the Humber development does provide a springboard for onshore growth and industry specialisation, creating more clean energy jobs and contributing powerfully to a sustainable future.

Indeed, investments in wind such as the Humber Gateway are uniquely impactful because of the important role the region plays for the country as a whole. The Port of Immingham, is the UK's largest port by tonnage and acts as a crucial link for business supply chains (being less than 24 hours from a significant portion the European market)⁷. The Port of Immingham is unique as it has river and in-dock deep-water facilities, allowing it to accommodate a wide range of vessels. However, there are currently acknowledged efficiency losses in the region. Ships enter the port laden with goods but return without any goods in tow. By reevaluating the logistical support in the region, carbon footprint can be greatly reduced. This should be supported with continued investment in the clean energy which has already proved successful.



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Nuclear

In the roundtable discussion, a conversation point on nuclear energy was the limited utilisation at scale in the Midlands, due to the need for nuclear plants to be located close to the sea for access to cooling water. The need for long-term investment has been recognised by the industry itself and the Nuclear Industry Association (NIA) has called for investment stability from the government. By ensuring there is stable investment there is more likely to be support for the development of reactors⁸. Without such investment, companies are deterred from investing in nuclear due to the high-risk profile of such programmes.

The NIA has recently released a report⁹ outlining the benefits which the country has already garnered from the nuclear sector. It further outlines the potential for nuclear in decarbonising the economy and stimulating economic recovery. According to the report, the industry already contributes £6.2 billion in Gross Value Add (GVA) to the economy and prevents 20 million tons of CO₂ emissions in the UK. The latter figure is the equivalent of removing a third of all cars from the road. Such benefits are indicative of a serious opportunity and should not be ignored notwithstanding its challenges and regional (sites at scale) limitations.

However, large scale nuclear energy generation is not the only option for investment in nuclear energy. There is also potential for growth in the effectiveness of nuclear tech itself. The development of Small Modular Reactors ("SMRs") is being led by Rolls Royce. This research could initiate the growth of a series of small reactors across the UK which would notably be more affordable to develop. Furthermore, and in line with the roundtable's interest in hydrogen technology, nuclear does offer (through electrolysis or primary heat) a carbon free alternative to producing hydrogen. Thus, when placed in collaboration with already developing fuel cell technology in the Midlands, this green technology could flourish.

Therefore, nuclear power's place is not limited to simply energy generation and it has a much wider potential. Indeed, even if development of nuclear sites is not

conducted in the Midlands, this is not to say the region's role in research and connected technologies will not play an important role. For instance, government funding was recently secured in Derby by Nuclear AMRC to establish a new advanced manufacturing research centre.¹⁰

The Midlands is already invested in the development of nuclear technology and fostering this further would aid a green recovery locally and nationwide. For instance, SMRs could be based at old power station sites across the region, that are able to exploit the already existing grid connections and the benefit of a remote site. With the Government supporting the development of an Advanced Modular Reactor programme¹¹, the Midlands could be well positioned as the region that can help develop the next generation technology.

⁶ <https://www.group.rwe/en/our-portfolio/our-sites/humber-gateway-offshore-wind-farm>

⁷ <https://www.abports.co.uk/locations/immingham/>

⁸ <https://www.niauk.org/wp-content/uploads/2020/03/NIA-letter-to-the-Chancellor-for-the-2020-Spring-Budget.pdf>

⁹ https://www.niauk.org/wpcontent/uploads/2020/06/Fortyby50_TheNuclearRoadmap_200624.pdf

¹⁰ <https://namrc.co.uk/centre/derby-government-funding/>

¹¹ <https://world-nuclear-news.org/Articles/UK-government-support-for-modular-reactor-deployme>



Solar

Enabled by Government incentives for landowners in particular, solar power in the Midlands is of growing interest. Deployment of solar power as an innovative power model within housing development has been trail blazed in the Midlands.

The Royal Institute for British Architects recognised the Trent Basin as a leading housing development of exceptional design¹². Part of the ERA programme, it uses solar panels and stores energy in Europe's largest community energy battery to create sustainable living for its community. Naturally this represents a flagship development for the Midlands and its success highlights a key area of potential growth. It is an exemplar for this type of solar based development and should be used as such for the Midlands and the wider country.

The Midlands region also boasts significant research capabilities in solar energy technologies, both through solar cells and solar thermal technologies. One centre of strength is Loughborough University's Centre for Renewable Energy System Technology¹³.

As raised in the roundtable discussion, the more housing developed now that is not sustainable represents housing that will need to be retrofitted in relatively short timescales. The existing housing stock also poses a significant challenge, with heat decarbonisation being one of the toughest challenges facing the UK and its ambitions to reach net zero¹⁴. A recent paper from the Midlands based Sustainable Energy Association highlights the need to regulate the decarbonisation of heating in homes, as relatively little progress has been made in this area so far¹⁵.

Local government policy can be an effective mechanism for encouraging development in sustainable housing. In similar means to the London Carbon Offset Fund¹⁶, agreements across local government can be set up with developers which ensures savings or financial incentives for sustainable developments. Given the skills and expertise already shown in the Midlands, it is most probable that developers would make use of such an arrangement in the region. Consumers would also benefit from sustainable houses (for which there is increasing demand). Options to develop this approach and integrate into the new proposed planning system should be considered, for example by including requirements in design codes, so that the planning system actively encourages such development.

¹² <https://www.trentbasin.co.uk/stories/riba-recognises-trent-basin-as-exemplar-housing-project/>

¹³ <https://www.lboro.ac.uk/research/crest/>

¹⁴ <https://www.theccc.org.uk/2018/09/10/cleaning-up-the-uks-heating-systems-new-insights-on-low-carbon-heat/>

¹⁵ <https://www.sustainableenergyassociation.com/resources/achieving-net-zero-regulating-the-decarbonisation-of-heat/>

¹⁶ https://www.london.gov.uk/sites/default/files/carbon_offset_funds_guidance_2018.pdf

Storage

Energy generation is not the only issue to be addressed. The roundtable discussion recognised the importance of efficient storage capabilities to ensure both optimal use of the energy produced and effective deployment, matching demand. The growth of this technology has been labelled as one of the eight great technologies in which the UK has potential to become a global leader.

In the Midlands Engine, sector-leading expertise in thermal storage, seasonal storage and a broad range of innovative storage approaches which have potential to provide solutions for a vast array of settings, is a recognised capability¹⁷. Indeed, the Liquid Air Energy Storage approach was developed in the Midlands, and the Centre for Energy Storage is based in Birmingham University¹⁸.

Accordingly, there are examples of energy storage technology development across the Midlands such as the £4 million battery in Walsall¹⁹ available to industry partners to conduct tests. The Energy Research Accelerator (ERA) has provided £20m of funding for the Energy Innovation Centre at the University of Warwick, which means that businesses in the Midlands can access cutting edge battery research technology under one roof - illustrative examples of cross-regional energy collaboration connecting world leading innovation to deliver results²⁰.

Public sector investment in such projects is encouraging but they also provide prime examples of corporate collaboration. Batteries need to become commercially viable as a product first, and when they are the private sector will initiate production. But to get the best out of the current investment in battery research, it is counter intuitive to make such research partisan or too competitive. The roundtable discussion raised the point that whilst not all corporates can be 'first' in achieving the necessary commercialisation, there can still be assurances that those around them will be allowed to subsequently benefit from the technology.

An example of efficient energy use and storage is in the recent installation of a 'Smart Grid' in the West Midlands as well as the London Borough of Islington²¹. The Smart Grid creates a two-way communication between residents use of electricity and the National Grid, allowing for more effective deployment of energy stored in the grid. The benefits of this tech are apparent and are outlined further below but in essence it ensures efficiency gains for consumers and the National Grid.

Powerful collaboration in research happens when there is co-investment between industry and the state and the incentive for all parties is clearly present. Indeed, for expedited progress towards commercial viability, it is a necessity. It is not enough to focus only on energy generation, there needs to be appreciation of how this energy is subsequently stored and utilised in a more effective manner. Investment in renewable energy must be matched by investment in storage methods which utilise energy efficiently. Therefore, there is growing potential for the Midlands to continue to lead in this area, including emerging work to develop large scale storage capacity, which could include re-purposing of brownfield and industrial land such as former coal power station sites within the region.

¹⁷ <https://www.gov.uk/government/speeches/eight-great-technologies>

¹⁸ <https://www.birmingham.ac.uk/research/energy/research/centre-energy-storage/index.aspx>

¹⁹ <https://www.energycapital.org.uk/west-midlands-at-the-forefront-of-battery-storage-testing/>

²⁰ <https://www.era.ac.uk/case-studies/battery-innovation>

²¹ <https://www.techsparx.co.uk/greensciences-smart-energy-grid-launches-in-west-midlands/>

Engagement

The use of 'Smart Grid' also raises consumer involvement, which is a key concern for a green recovery. The discussion at the roundtable highlighted that for corporate and government investment to yield results there needs to be engagement from the consumer.

Importantly, this is not simply a matter of ensuring products are commercially accessible for the consumer. It involves ensuring infrastructure is in place to enable consumer access (such as digital or mobile connectivity for smart meters) and encouraging consumer commitment to smarter energy use, housing retrofits and behavioural changes.

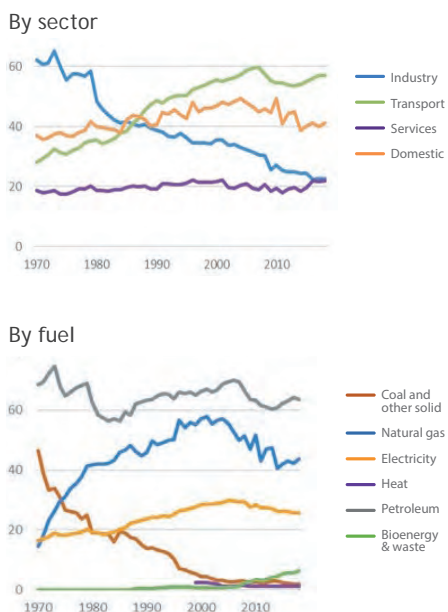
Smarter energy usage can be facilitated by 'Smart Grid' technology, which allows consumers to actively engage with their energy consumption²². Following installation, consumers are able to view on their phones via an app (or on their laptop) how energy has been used, as well as when it was used and see bills in real time. Following the pilot scheme in the West Midlands, investment could make this technology become a reality for the entire region, with energy efficiencies accruing. It would be further supported by 5G connectivity (discussed below). Consumers would be informed with timely updates about their costs and usage which would help instil a conscientious approach to energy consumption. This creates potential for consumer savings and reduces inefficient energy usage.

However, housing is still being constructed which is not net zero and the issue needs to be addressed at the source. "It cannot be correct that across the region we are building houses, powered by fossil fuels where this is cheapest to do so, and which will need to be insulated and retrofitted with low carbon heating within 10 years if the country is to meet its net zero target." Commented Carl Arntzen from Bosch Thermotechnology Ltd. Urgent action is needed to improve and tighten building regulations so that the houses being built today are energy efficient and built with low carbon heating solutions. This would be beneficial for the environment, the industry and for house buyers alike. This, unfortunately, is not a significant aspect of the recently released white paper planning for the future (although there is reference to 'a national framework of green infrastructure standards' and 'zero carbon ready homes', little detail is provided as to what this would entail)²⁵. However, the Government is due to publish its long awaited Energy White Paper, and a Heat Strategy and Buildings Strategy in autumn.

Technology developed in the Midlands, such as the new hydrogen boiler and heat pumps produced by Bosch Thermotechnology Ltd.²⁶, presents a step forward, particularly in retrofitting homes where electrification is much more difficult. However, this still lacks active consumer engagement in part due to high price points and in part the need to change behaviours, "the electrification of home heating requires changes in governmental policy and consumer behaviour, but behaviours can change as we have seen from the recent huge uptake of electric cars for example" commented Carl Arntzen from Bosch Thermotechnology Ltd. Incentives such as the solar panel Feed-In-Tariff scheme have proved successful in inspiring consumer uptake of such products, however, the purchase of hydrogen boilers or similar, at present, do not qualify for any such scheme. Similar incentives could accelerate consumer engagement.

Such incentives should not be limited only to households, and office space should also be given due regard. Whilst the pandemic has limited office use at present, there will eventually be some return to office use based on worker's preference (although the extent of this is not yet known). Related energy usage and emissions will then increase, and businesses should be encouraged to reduce their footprint by investing in a more sustainable office environment. These incentives would also be taken in the context of businesses working on greener transport arrangements or reskilling their workforce which are points covered in more detail below.

Figure 1: Change in energy consumption by sector and fuel 1970 to 2018



Further efficiency gains can be made by motivating consumers to undertake renewable energy housing retrofits. Electrical energy required is often a focus in the modern world, but it has been emphasised that energy required for space heating makes up a significant proportion of the UK's overall energy consumption²³. Largely, this consumption uses cheap carbon emitting gas rather than the more expensive electrical heating. To help combat this the Government has recently announced a £2 billion package for insulation and low carbon heating in homes²⁴, and this does provide a start in reducing household energy use and carbon emissions. However, in order to reach net zero by 2050, the majority of the country's housing stock will need to be retrofitted with low carbon heat technologies and co-ordinated approaches to secure investment in energy efficiencies which are currently available from the Government now need to be progressed at a pan-Midlands level, to secure greatest impact from effort and do so in a timely way whilst funding streams are live.

²² https://www.smartgrid.gov/the_smart_grid/smart_grid.html

²³ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820843/Energy_Consumption_in_the_UK_ECUK_MASTER_COPY.pdf

²⁴ <https://www.bbc.co.uk/news/business-53313640>

²⁵ <https://www.gov.uk/government/consultations/planning-for-the-future>

²⁶ <https://www.intelligentliving.co/worcester-bosch-reveals-unique-hybrid-hydrogen-boiler/>



A wider perspective

What is made apparent from the roundtable discussion and from this report is that there are a variety of different means to facilitate renewable energy generation as well as support it with efficient storage and energy saving. These means should not be viewed as independent solutions, but rather as different parts of an integrated solution for a green recovery. Investment in nuclear energy, for example, does not negate the use of hydrogen fuel cell technology. To achieve net zero there needs to be gains in all areas. To facilitate widespread economic stimulus there needs to be investment in as broad a range of sectors as possible. The roundtable discussion highlighted that there are a range of parties who all want to make a green recovery happen, but such progression cannot be a piecemeal process. Collaboration at scale is key.

Energy Innovation Zones (EIZs) are important in facilitating this broader approach. EIZs focus on innovation in all areas of green technology and aim to both innovate and subsequently commercialise the products. EIZ's are currently located across the West Midlands in Tyseley Energy Park, the Black Country and more²⁷. There is already active commitment in the Midlands to tackle energy usage and innovate in all areas to achieve net zero, and there is potential for further expansion with additional EIZs across the region. Local Energy Partnerships and the universities across the Midlands also all have a responsibility to support the work coming out of these EIZs. Collective action would garner commitment and accelerate pace of innovation towards a green recovery. As stated by Laura Hughes in the roundtable discussion, "the power of business and communities coming together is so important".

Midlands policy approach

Roundtable attendees discussed the potential to instil real and substantive change through the influence of tailored policy across local government, rather than - or linked to - complementary national policies. Historically some of the best green initiatives have come from local implementations - for example, bus lanes and cycle lanes are small but have a noticeable impact. Local government can more easily identify the areas of carbon emissions and respond accordingly to implement change.

Primarily this policy-based approach could be inspired, coordinated and led by the Midlands Engine. By cementing, for example, a Midlands wide policy to achieve net-zero before any other region there would have to be widespread appreciation of the desired goal in all aspects of socio-economic behaviour. This would go beyond any government guidelines and place the Midlands as a region which exceeds the expectations placed on the rest of the country. Although this would need significant support to grow expertise and resource at a local level to help develop plans, the policy could be implemented early on in any Midlands based developments and would ensure any direction of growth is distinctly green.

²⁷ <https://www.energycapital.org.uk/eizs-across-the-west-midlands/>

Transport

Despite the recent headlines being dominated with Covid-19, one consistent opinion being voiced by government, public bodies, NGOs, members of the public and the private sector is that rebuilding after the Covid-19 pandemic needs to be green and sustainable. Although not everyone has the same views of what a 'green recovery' is going to look like, there is broad consensus that it should include cleaner transport and a reduction in the number of journeys in and out of cities.



Undoubtedly, transport, as one of the main culprits of greenhouse gas emissions and a main source of air pollution, has a key role to play in the green recovery and in achieving net zero greenhouse gas emissions by 2050.

The Midlands is the “heartbeat of the UK transport network”.²⁸ Not only does it boast two international airports and fast transport links to London and other regions, it is also home to global transport companies such as JLR, Aston Martin, Bombardier, Rolls-Royce, and London Electric Vehicle Company, making the Midlands region one of the best placed areas in the country to facilitate the transition from conventional modes of transport to zero emission vehicles.

80% of UK freight passes through the region and advancing plans to modernise and amplify rail capacity across the region to make the modal shift from road to rail for freight, such as Midlands Engine Rail, will see carbon reductions at scale.

In order to facilitate a green transport recovery, reduction of journeys and smart journey planning will remain in focus. Actions also need to be taken to make lower/zero emission means of travel more attractive to consumers and business in order to facilitate the behaviour change required to increase demand and attract investment needed. A full range of measures must be furthered in concert to maximise the green recovery and benefits to the Midlands Engine. Given the Midlands' credentials as a transport and logistics hub for the UK, the Midlands Engine is well placed to drive efforts to facilitate a more collaborative approach, in terms of connectivity and knowledge sharing.

²⁸ <https://www.midlandsengine.org/importance-globally-connected-midlands/>



Key observations

- Multiple alternative fuel sources need to be developed in tandem in order to reduce CO₂ emissions as quickly as possible and take full advantage of the range of technologies which offer potential in differing circumstances.
- In terms of charging infrastructure, the greatest potential rests with enabling smart charging at pace or enabling vehicles to recharge on the move. This makes EVs more attractive to consumers, particularly commercial consumers.
- Inter- and intra-regional transport links need to be improved with sustainable connectivity in focus, in order to increase access to jobs, encourage the use of public transport and move freight from road to rail, measurably reducing emissions.
- There should be a determined effort to keep manufacturing and assembly of zero emission vehicles in the UK. This will need investment in gigafactories to achieve scale and hydrogen generation plants near transport production centres, improving supply chains and revolutionising transport planning/investment drivers across the UK.
- A transport green recovery is not just about a move towards zero emission vehicles. Other green modes of travel should be accelerated including walking and cycling. A pan-regional approach to enable integrated planning and strong connections could present an accelerated opportunity.
- Covid-19 has perhaps permanently shifted commuter behaviours. The reduction in use of work related transport due to increased home based working presents an opportunity to re-think pre-pandemic transport planning which may no longer meet revised future demand.

Alternative fuel sources

Transport is responsible for **24%** of direct CO₂ emissions from fuel combustion globally

Road transport accounts for **75%** of all transport emissions



This figure has increased annually in the last decade²⁹ by



It is essential that a 'green recovery' accelerates the movement away from internal combustion engines (ICEs) alongside working to make ICEs more carbon neutral.

The proportion of renewable clean energy used by the transport sector in the UK is growing but remains small; there are around 35 million vehicles registered in the UK but currently only around 200,000 of these have some form of electrification in the powertrain.³⁰ Reasons for this include the cost disparity between cleaner engines and ICEs, the immediate lack of infrastructure to support a large scale roll out of zero emission vehicles and unsolved problems regarding the practicalities of using cleaner fuel sources, particularly the commercial vehicles sector.

The roundtable highlighted the importance of tackling the perception that "electrification is the silver bullet that slays all of our carbon demons"³¹ and acknowledging that "we do need a mixture of technologies"³² to support the future decarbonisation of the transport sector, especially for freight and logistics.

²⁹ <https://www.icis.com/explore/resources/news/2020/04/14/10495891/insight-synthetic-fuels-key-transitional-tool-for-decarbonising-europe-s-road-transport>

³⁰ <https://www.theengineer.co.uk/comment-could-synfuels-help-us-meet-our-2050-targets/>

³¹ Quotation from James Stephens: Aston Martin Lagonda.

³² Quotation from James Stephens: Aston Martin Lagonda.



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Synthetic fuels

The government has recently consulted on its intention to bring forward the date for the end of sale of new petrol, diesel and hybrid cars and vans from 2040 to 2035 or an earlier date if feasible.³³ These proposals solely relate to new cars and vans which creates the question what will happen to the existing fleet of vehicles on the roads and how can ICEs be made more carbon neutral in order to reduce CO₂ emissions as quickly as possible.

During the roundtable, James Stephens, representative from Aston Martin Lagonda Ltd, stated that a technology neutral approach to decarbonisation in transport was necessary to maximise the potential benefits. The use of “synthetic fuels should be an integral part of this approach as it is the only way in the short to medium term to decarbonise the existing transport”³⁴, whilst the technology in relation to other cleaner fuel sources is further developed. This is because synthetic fuels can be utilised without a need to modify existing engine or fuel supply infrastructure as they can be easily blended with or replace conventional petrol and diesel to help reduce the CO₂ emissions from ICE vehicles. Such reduction in CO₂ emissions could therefore be achieved immediately upon launch. Synthetic fuels are currently also a lot easier and cheaper to store and transport, compared to other alternative fuel sources, particularly hydrogen.

Despite these significant advantages, further investment and development is still required. Synthetic fuels have lower engine efficiency rates compared to other alternative fuel sources and the most common method of their production, Fischer Tropsch synthesis, still uses fossil carbon sources.³⁵ Further technological development should seek to ensure that non-fossil carbon dioxides are used in the production process of biofuels. Equally, further development of renewable energy sources, such as wind, nuclear or solar power, can assist in electro fuels production which is carbon-neutral.

³³ <https://www.gov.uk/government/consultations/consulting-on-ending-the-sale-of-new-petrol-diesel-and-hybrid-cars-and-vans>

³⁴ Quotation from James Stephens: Aston Martin Lagonda.

³⁵ <https://royalsociety.org/-/media/policy/projects/synthetic-fuels/synthetic-fuels-briefing.pdf>

Hydrogen

Whilst still a technology in the early stages of deployment, hydrogen produced using renewable energy sources ('green hydrogen') has been widely identified to play a key role in global decarbonisation efforts, most notably in its potential to replace petrol and diesel in the transport sector. In order for the UK to be at the forefront of this emerging technology, it is vital that green hydrogen be prioritised in the government's plans to 'build back better'. A point that was made by Prof Martin Freer during the roundtable was that “hydrogen will have a big role to play in the future transport economy”.³⁶ James Stephens agreed suggesting that the sectors in which green hydrogen could have the most impact is that of commercial vehicles, including heavy goods vehicles (HGVs), freight and public transport, and high performance sports cars. Compared to batteries, hydrogen is a more suitable alternative fuel for these sectors because it has a higher energy storage density than lithium-ion batteries and a lower overall environmental impact (whole of life disposal and mitigation of battery components, for example, is environmentally costly).

An example of this is the ground breaking HydroFLEX project, which has been set up in the Midlands to demonstrate how hydrogen could be used across the rail network as a greener alternative to current diesel trains.³⁷ Following on from the success of its demonstrator train in 2018, this project involves the fitting of hydrogen fuel cells into existing Class 319 trains. As a partnership between the Birmingham Centre for Railway Research and Porterbrook, a railway rolling stock company in Derby, this project is a great illustration of what can be achieved through collaboration of academic and private sector bodies. With the recent announcement of new funding, the HydroFLEX is moving ever closer to commercial operation.³⁸

Despite hydrogen powered vehicles producing zero exhaust emissions,³⁹ the cost of producing green hydrogen has always placed it out of competition with fossil fuels. The roundtable discussion supported this point, highlighting that the price disparity between a potential hydrogen vehicle and an ICE is still too much for mainstream consumers. Inevitably this presents an access barrier for lower income households to the new technology until this has been addressed. Affordability is likely to increase as a result of the scaling up of green hydrogen production and the declining cost of renewable energy. According to the International Energy Agency (IEA), the cost of producing green hydrogen could fall up to 30% by 2030.⁴⁰ Alongside the reduction in production costs as a result of economies of scale, support and investment into research and development is crucial to further lower costs and improve performance. Future uptake of hydrogen fuelled vehicles will depend on continuing reduction of costs and infrastructure availability, such as re-fuelling points and hydrogen plants.

³⁶ Quotation from Prof Martin Freer, University of Birmingham.

³⁷ <https://www.birmingham.ac.uk/research/spotlights/hydrogen-powered-train.aspx>

³⁸ <https://www.birmingham.ac.uk/news/latest/2020/06/hydroflex-secures-funding-for-hydrogen-powered-train-design.aspx>

³⁹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf

⁴⁰ <https://www.iea.org/reports/the-future-of-hydrogen>



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Battery Electric Vehicles (BEVs)

The electric revolution provides an opportunity for the transport sector to move away from its dependence on fossil fuels in order to achieve the zero emissions target by 2050. Similar to hydrogen powered vehicles, BEVs have zero exhaust emissions and are shown to be highly energy efficient.⁴¹ In the future it is predicted that the cost of ownership for BEVs will drop below that of an ICE vehicle. Additionally, Aston Martin, through development of their Rapide E model, has already demonstrated that owning a BEV does not have to mean that you are settling for substandard vehicle performance.⁴² As a result, consumer demand will likely increase dramatically, presenting an overt opportunity for the Midlands.

During the roundtable, Prof Martin Freer acknowledged that there was a great opportunity for the Midlands because transport firms in the region, such as JLR, are already pioneering in this field. Not only is JLR working to make electric car ownership more accessible and has opened a BEV manufacturing centre in Castle Bromwich, but they have also decreased their use of cobalt in lithium-ion batteries by over 60%, taking them closer to their goal of climate-neutral manufacturing.⁴³ More organisations should be striving to operate carbon-neutral manufacturing otherwise, as identified by Robert Mason during the roundtable, there is a risk of “squeezing the balloon”⁴⁴ to the point that the environmental impact of increased mining of precious metals may further be called into question.

In light of the global electric revolution, Prof. Tracy Bhamra made the point during the roundtable that “if we replaced all vehicles with electric vehicles there would not be enough resources to manufacture all the batteries required”,⁴⁵ despite the fact that a recycling market may emerge once electric vehicles become widespread. However, the region is developing the technology for recycling lithium-ion batteries as part of the Faraday Challenge⁴⁶ is not one single solution to reduce transport CO₂ emissions, and rather electrification is one of a number of greener fuel sources that can be used to achieve such a goal.

As James Stephens highlighted at the roundtable, “we shouldn’t pick a technology, it is a multitude of technologies”.⁴⁷ There are a number of groups set up to lobby central government in relation to each individual alternative fuel source. The Midlands Engine is well placed with its combination of academic capabilities and industry innovators to highlight how these alternative fuel sources can be used more effectively in conjunction with each other and provide a platform for a more collaborative approach.

⁴¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf

⁴² <https://www.astonmartin.com/en-gb/models/rapide-e>

⁴³ <https://www.jaguar.co.uk/electric-cars/index.html>

⁴⁴ Quotation from Robert Mason, Staffline.

⁴⁵ Quotation from Prof. Tracy Bhamra, Loughborough University.

⁴⁶ <https://www.era.ac.uk/The-Faraday-Institution>

⁴⁷ Quotation from James Stephens, Aston Martin Lagonda.

Infrastructure

In order to transition to zero emission vehicles, it is not enough for vehicles to be made affordable and available. The associated infrastructure network needs to be in place which is efficient and easy for consumers to use. Infrastructure also needs to be in place to manufacture and transport key component parts of zero emission vehicles.



We shouldn't pick a technology, it is a multitude of technologies.

James Stephens,
Aston Martin Lagonda

Production

The Chief Executive of JLR is of the opinion that, "If batteries go out of the UK, then automotive production will go out of the UK".⁴⁸ Whilst there is an existing gigafactory in Sunderland, James Stephens raised the issue during the roundtable that "this factory produces the same cell, module and pack" solely for Nissan, which will be insufficient if consumer demand for BEVs increases.⁴⁹ and noted that what is needed "isn't a gigafactory, it is *gigafactories*."⁵⁰

With increased capability for batteries being manufactured in the UK, assembly of BEVs would be more likely to happen - as companies may look to shorten supply chains and assemble batteries and vehicles in the same place. Not only would this make supply chains "greener", but it would also create jobs in the UK.

During the roundtable, Charlotte Horobin identified the possibility of "co-locating different businesses in order for them to share resources in a smarter way"⁵¹. Such co-location of transport companies has naturally occurred in the Midlands. However, this will only be effective if production infrastructure, such as gigafactories, is developed to cater for the needs of multiple businesses.

The Department for International Trade is considering potential locations to host gigafactories. One possible site is located near the Shropshire-Staffordshire border close to the M54. This site is about 8 miles from JLR's I54 production plant and is also close to supply chains across the Midlands. This green economic opportunity for the Midlands potentially brings forward producing multiple different types of batteries on a large scale in the future.

It is equally as important for consideration to be given to locations for hydrogen generation plants. Given the high cost of transporting hydrogen, it is necessary that any hydrogen generation plant is located near transport production plants, such as those in the Midlands.

⁴⁸ <https://www.wired.co.uk/article/gigafactory-uk-government>

⁴⁹ Quotation from James Stephens, Aston Martin Lagonda.

⁵⁰ Quotation from James Stephens, Aston Martin Lagonda.

⁵¹ Quotation from Charlotte Horobin, Make UK.



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Implementation

A big challenge facing the Midlands and the UK as a whole is the infrastructure required to support the roll out of zero emission vehicles on a large scale, with the most significant infrastructure required being a network of charging and refuelling points. Consumers, particularly commercial consumers but increasingly domestic consumers too, require fast recharging. Hydrogen fuel cell electric vehicles typically charge within 5 minutes, however there are currently only 12 hydrogen refuelling stations available for public use in the UK.⁵² To tackle the issues with BEV charging, to make it a more attractive option for consumers, investment needs to be made in technology that can be used to either speed up the charging process or allow vehicles to charge on the move.

In Nottingham, smart charging pads are being trialled outside the city's station to allow taxis to charge whilst waiting for a fare. Such developments are key to stimulating demands from consumers, giving them confidence to switch from an ICE to a zero emission vehicle. Smart technology will benefit consumers but it also has the potential to benefit supply/demand peaks in the grid - for example, charging BEVs can be done during off peak periods or where there is abundant renewable energy generation.

⁵² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf

Movement

With better connectivity across the Midlands, more business opportunities and jobs will be created. This will enhance the region's economy but also that of the nation. Businesses will benefit by having a wider resource pool; individuals will benefit by gaining wider access to jobs; and universities will benefit as better connectivity will improve graduate employability.

The key to unlocking these benefits is greater transport links both inter-regionally and intra-regionally. Transport links across the Midlands and other regions will inevitably be improved by the installation of the High-Speed Railway 2 (HS2). However, public transport will only become a preferable option compared to personal vehicles if it is affordable, reliable and fit for purpose.

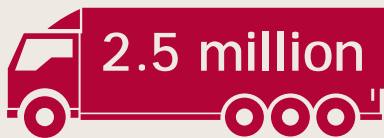
Positive steps have already been taken. For example, the 2020 Budget pledged a proportion of the Transforming Cities Fund to Derby, Nottingham and Leicester to support a range of schemes over the next few years which will include three new smart park-and-ride hubs and a demand responsive transport service which would link Derby city centre to key employment locations.⁵³ Midlands Engine Rail, and specifically the Rail Hub, brought forward by Midlands Connect has secured important development funding. This project is expected to increase the number of passenger commuter and inter-regional train services and open up more rail freight paths.

Not only will an integrated transport network across the region encourage consumers to choose public transport but it will also support the movement of freight from road to rail. This is key to decarbonising transport.

Transporting freight by rail rather than by road produces

76% less CO₂ emissions⁵⁴

HS2 is estimated to create capacity for **144 extra freight trains a day** which is equivalent to



lorries' worth of cargo each year.⁵⁵

A more efficient transport system would also make the UK and the Midlands attractive centres for supply chain links. Infrastructure projects, such as HS2, can act as a driver of innovation across supply chains and have the potential to draw more advanced manufacturing to the region, which would in turn create more high value jobs. The Midlands Engine welcomes the Government's commitment to levelling up the economy with a focus on a pan-Midlands approach to improving transport links and supply chains, including, as mentioned by Charlotte Horobin during the roundtable, improved "mapping and understanding of supply chains".⁵⁶ James Stephens agreed that the understanding of supply chains was crucial particularly for the BEV sector because "we do not have the commodities in this country"⁵⁷ to create the components for batteries, instead these need to be imported. However, as discussed above in relation to the Port of Immingham but also in respect of regional air freight centres in East Midlands and Birmingham airports, there are ways in which imported freight can be made more efficient and therefore greener.

Connectivity can be digital as well as physical. The Covid-19 pandemic has meant many people have adapted to working from home. It is unclear whether businesses will make such arrangements permanent or semi-permanent with increased flexi-working in terms of locations. With technological advances, working from home may be preferable for some employees and sought after by some employers. Whilst improvements are needed to make it sustainable and successful longer term, this will only be possible if IT infrastructure and digital connectivity is at a level which can sustain increased demand and peaks in consumption. Investment is needed and should target areas with the poorest connectivity. And if home-based working is to be possible for more people - such investment could in turn possibly reduce car journeys in and out of cities and this would further change patterns of travel, reducing the level of emissions.

⁵³ <https://www.business-live.co.uk/economic-development/budget-2020-east-midlands-road-17905866>

⁵⁴ <https://www.railpro.co.uk/railpro-magazine/july-2020/achieving-a-green-recovery>

⁵⁵ <https://www.railpro.co.uk/railpro-magazine/july-2020/achieving-a-green-recovery>

⁵⁶ Quotation from Charlotte Horobin, Make UK.

⁵⁷ Quotation from James Stephens, Aston Martin Lagonda.

Greening transport links in cities

Facilitating a shift towards greener transport, particularly public transport, is ongoing and requires further development to improve efficiency and reliability to make it the more attractive choice for consumers. However, decisions need to be made by local councils about what the transport mix will look like in cities in the future. Such decisions need to be driven by local councils and communicated as a consistent message, with appropriate measures in place so that consumers can access low carbon transport options.

E-scooters

Cities across the UK are taking steps to further 'green' intra-city transport links. A big step forward in this regard is the e-scooter rental trials that are expected to take place in a number of West Midlands local authorities shortly. The Leader of Birmingham City Council has welcomed these trials as "public transport capacity will be reduced for some time after Covid-19".⁵⁸ In the wake of the pandemic, e-scooters could not only offer a "green" alternative to public transport but in the longer-term they could offer a sustainable and healthier alternative to personal vehicles for many journeys.

Although e-scooter trials are at an early stage, in order for significant progress to be made the evidence base gained from the trials should be shared as this would facilitate further trials in centres across the region. The Midlands Engine is well placed to facilitate this sharing of data in order to expedite any roll out of e-scooters and other forms of micro mobility in the future.

Clean Air Zones (CAZs)

In order to improve air quality in cities and as a result improve public health, a number of local authorities are introducing CAZs in which consumers will have to pay a charge if their vehicle exceeds emission standards. One of the first clean air zones will be launched in Birmingham early next year with more cities likely to follow shortly after. This initiative provides a strong incentive for people to reduce emissions or to choose other lower emission modes of mobility, such as public transport, walking or cycling. CAZs may also make cities more attractive places to live, work and spend leisure time, in turn boosting the local economy.

⁵⁸ <https://www.transport-network.co.uk/West-Midlands-to-roll-out-e-scooter-trial/16707>



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Walking and cycling

Modes of movement have come into sharp focus during the pandemic with unprecedented levels of people choosing to walk or cycle; in some areas, there has been a 70% rise in the number of cyclists. In order to encourage and support the public to continue to choose greener forms of travel, particularly as people begin to return to work, the government has announced a £2 billion investment package to create “a new era for cycling and walking”.⁵⁹ As part of this package, the government has pledged to fund and work with local authorities across the UK to help make it easier for the public to cycle as a method of travel.

An updated Cycling and Walking Investment Strategy⁶⁰ is also expected to be published this summer which will include further measures to transform walking and cycling. The measures include the creation of a national cycling and walking commissioner and inspectorate and the creation of a long-term budget for walking and cycling.

To make cycling, walking and public transport the most convenient modes of travel, local and regional input is required. *The Starley Network* is a new cycle hire scheme to serve the entire West Midlands Combined Authority area. The Starley Network will cover almost 500 miles of routes and has been implemented to create an easily understandable regional active travel infrastructure.⁶¹

There are a number of cities that have created their own walking and cycling strategies. However, there is no current regional approach and input into the Birmingham strategy is naturally localised⁶². Cities in the East Midlands are at an earlier stage in developing any such strategy and could benefit from pan-regional collaboration and an opportunity is present here for a shared endeavour by partners across the Midlands and facilitated by the Midlands Engine.



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Change in behaviour

Although numerous environmental benefits have arisen as a result of the Covid-19 pandemic, emissions are only predicted to decrease globally by about 8% this year.⁶³ Whilst significant, unless this is to be repeated annually, we cannot hope to reach the target of net zero emissions by 2050.⁶⁴

A green recovery needs a radical behaviour change in mass but not in the same way as we have experienced during lockdown as it is neither sustainable nor wholly effective.⁶⁵ Lockdown has been a catalyst for a change in behaviours and has provided an opportunity to make future changes in behaviour permanent. The way forward will be determined by actions outlined above by public and private sector bodies and effort will be needed to build on attitude changes and to make zero emission transport and other green means of mobility more attractive to the consumer and business. Increasing investment in research and development of zero emission technologies will likely stimulate further consumer demand and increase public/industry confidence.

⁵⁹ <https://www.gov.uk/government/news/2-billion-package-to-create-new-era-for-cycling-and-walking>

⁶⁰ <https://www.gov.uk/government/publications/cycling-and-walking-investment-strategy>

⁶¹ <https://www.transport-network.co.uk/West-Midlands-launches-260m-cycle-vision/16757>

⁶² https://www.birmingham.gov.uk/downloads/file/15860/walking_and_cycling_strategy_2020

⁶³ <https://www.nationalgeographic.co.uk/environment-and-conservation/2020/05/plunge-in-carbon-emissions-from-lockdowns-will-not-slow>

⁶⁴ <https://www.cbi.org.uk/articles/daily-coronavirus-webinar-preparing-for-a-green-recovery-02-06-2020/>

⁶⁵ <https://www.bbc.co.uk/news/science-environment-53681096>



Digital connectivity

The concept of 'connectivity' has traditionally been concerned with bringing people, businesses and markets closer together. As a result of a range of new digital technologies, such as 5G and the Internet of Things (IOT), connectivity means even more today. The connectivity of views, ideas, objects, appliances, tools and many other 'things' can be enabled virtually.

Enhanced connectivity supports business growth, boosts productivity and increases collaboration and knowledge sharing. The importance of connectivity, both to businesses and to any green recovery in the Midlands, was repeatedly stressed by delegates at the roundtable event. As Robert Mason, of Staffline, said: "one of our challenges is... how do we make sure we get the right people in the right places at the right time".

As the Covid-19 crisis, and the associated increase in remote working and virtual meetings, has made clear: connectivity can be both physical and digital. The physical aspects of connectivity are discussed elsewhere, and consideration here is with respect to digital connectivity.

The Covid-19 crisis has powerfully highlighted the environmental benefits of enhanced digital connectivity. Global lockdowns have led to increased home working and dramatically reduced levels of activity and travel, resulting in significant reductions in both fossil fuel usage and in pollution generally. The International Energy Agency has estimated that greenhouse gas emissions might fall by a record 8% in 2020⁶⁶. Digital connectivity also allows for greater levels of collaboration and knowledge-sharing amongst concerned stakeholders with the result that more concerted and coordinated action can be taken at both a regional and national level. The roundtable itself, having been convened remotely, is a key example of digitally enabled action.

Key observations

- Digital connectivity and associated technologies will underpin a green recovery - including broadband and 5G remote connectivity, 5G coverage, the IOT and smart cities.

- Broadband, full fibre and 5G remote connectivity will be an important part of greener working patterns, such as a remote working. Investment in comprehensive infrastructure to ensure connectivity (coverage and speed) will be vital, alongside investment into green transport.

- 5G and the IOT are revolutionising industry, with potential applications including smart heating and lighting of premises, more efficient manufacturing and smart traffic management. These applications allow a greater level of automation, greater efficiency and a consequent reduction in waste and emissions. Increasing pace of this tech-adoption will increase economic returns.

- 'Smart cities' deploy 5G and IOT technologies at scale. By connecting operations in the city with IOT-enabled sensors, the services in the city can become more efficient and sustainable. However numerous barriers have prevented this narrative from being properly realised to date and so action in this area will need to be able to overcome these.

⁶⁶ <https://www.iea.org/reports/global-energy-review-2020/global-energy-and-co2-emissions-in-2020>

Broadband and 5G remote connectivity ('personal connectivity')

The centrepiece of digital connectivity is individuals, businesses and organisations having high speed, reliable internet connections. This capability has generally been provided through broadband technology though this is generally regarded as insufficient for the needs of the best applications.

Ofcom noted in its 2019 Connected Nations report⁶⁷ that at a national level there are still some premises which are unable to receive a 'decent' fixed line broadband connection, while other premises still lack access to superfast broadband. In the Midlands, full fibre to the premises falls short, with only 4.3% of premises connected against an England Average of 7.8%. Earlier full fibre targets have been diminished with broader based connection targets, but the Midlands still lags behind England averages. Issues with the speed and reliability of broadband connections is routinely cited by firms as a barrier to growth and significantly restricts the ability of individuals and organisations to deploy digital solutions, and (even more relevant now) it hinders the ability to work remotely. These factors, in turn, lead to greater amounts of avoidable physical travel being required, with potentially negative impacts on congestion and emissions. Investment into adequate digital infrastructure to ensure connectivity will need to be a vital plank of any green recovery.

In the Midlands Engine Independent Economic Review ('IER'), digital connectivity was highlighted as being a key barrier for the economic productivity of the region⁶⁸. In particular, the IER identified that "Digital connectivity is highly variable and in places (both urban and rural) wholly inadequate. This limits the ability of staff to work from home and the productivity of home-based businesses, and hinders modern communications with clients/suppliers overseas"⁶⁹. In recognition of this position, the Midlands Engine has pushed connectivity to the forefront of its agenda, with a particular focus on enhancing digital infrastructure, improving East to West Midlands connectivity and delivering "total digital connectivity"⁷⁰. This regional focus on delivering and investing in improved digital infrastructure puts the Midlands Engine at the forefront of the green recovery in this respect.

Beyond broadband, the key development in terms of internet connectivity is the emergence of 5G networks. 5G's much enhanced speed, lower latency, greater capacity to manage multiple connected devices and enhanced reliability give it the ability to drive 'on the go' connectivity forward exponentially. This could have a positive impact in the context of the green recovery by enabling remote working to an even greater degree, and by increasing the level of connectedness between various key stakeholders such as local authorities, companies and other organisations.

5G's unique characteristics also mean that it can act as a genuine alternative to broadband connections, through the deployment of 5G Fixed Wireless Access (FWA) technology. FWA is an established method of providing internet connections to homes using wireless mobile network technology rather than fixed lines. But, while FWA has traditionally been easy to set up, it has generally struggled to deliver speeds and reliability akin to broadband. By utilising 5G technology, 5G FWA will be able to deliver performance similar to fibre-based broadband networks. As with improving broadband coverage, realising this potential will require additional infrastructure investment but in return it would enable greater home working, assist SMEs based in areas lacking coverage, and enable innovative green business growth.

The Midlands, and the Midlands Engine partnership, are well placed to take the lead in this area. As was noted above, digital connectivity is already a central ambition for the Midlands Engine. Moreover, the Midlands has already begun demonstrating leadership in this regard. Local Nottingham partners recently entered into the nation's very first Civic Agreement, with one of the key priority areas under that agreement being the continued investment in both physical and digital low and zero-carbon infrastructure⁷¹. Beyond this, the West Midlands has begun to develop a deep expertise in 5G technologies, with the region becoming the site of the country's very first multi-city 5G testbed (WM5G), as well as also playing host to the considerable expertise of the 'Worcestershire 5G' testbed (W5G).

⁶⁷ https://www.ofcom.org.uk/__data/assets/pdf_file/0023/186413/Connected-Nations-2019-UK-final.pdf

⁶⁸ <https://www.midlandengine.org/wp-content/uploads/Midlands-Engine-IER-Full-Report.pdf>

⁶⁹ <https://www.midlandengine.org/wp-content/uploads/Midlands-Engine-IER-Full-Report.pdf>

⁷⁰ <https://www.midlandengine.org/our-ambitions/powering-an-ultra-connected-region/>

⁷¹ https://www.universitiesfornottingham.ac.uk/assets/downloads/Universities_for_Nottingham_Civic_Agreement_2020.pdf

5G and the Internet of Things (‘inter-application connectivity’)

The application of 5G technology extends beyond personal remote connectivity. One additional application in the context of the green recovery is its use alongside the IOT. Under the IOT, not only people, but processes, tools and other such ‘things’ will become hyper-connected.

The use of highly calibrated sensors in combination with effective Artificial intelligence (AI) will allow functions to become more automated, more efficient and more effective (i.e. ‘smart’), responding in real time to various triggers identified by sensors. The IOT was already poised to fundamentally change the way in which we lived our lives, but there was scepticism surrounding whether mobile networks such as 4G would be able to deliver the speed, reliability and capacity required for this kind of hyper-connected functionality. 5G solves these issues, providing a mobile network capable of supporting the IOT and offering a huge step forward in terms of inter-application connectivity.

Potential uses for this combination of technologies are still being explored, but it is already clear that they will enable a range of important possibilities in the context of a green recovery. For example, conventional farming can be enhanced through the deployment of autonomous robots, controlled by AI oversight, which use smart sensors to identify weeds amongst crops and to destroy them in a more targeted, non-chemical (and therefore more environmentally friendly) manner⁷². Alternative applications include the use of sensors in combination with smart lighting and heating solutions, so that these uses of energy can become more efficient. As this paper set out above, more efficient energy usage delivers savings for the consumer whilst also reducing unnecessary emissions. The importance of ensuring efficient energy usage was a point regularly stressed by the roundtable delegates, particularly in the context of thermal energy, and 5G and the IOT can clearly play a key role in delivering this necessary efficiency.

⁷² See <https://greenallianceblog.org.uk/2020/06/05/we-need-fresh-thinking-about-the-role-of-digital-technologies-in-our-food-system/>





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Whilst the possibilities from deploying these technologies are still being discovered and realised, the Midlands, and the Midlands Engine, have been at the forefront of exploring the possibilities offered by automation for some time, and have continued this legacy by leading the UK exploration of this latest growing area of technology.

For example, the work that the Midlands has done around the possibility of smart roads is market leading. In 2006 the Midlands was the site of Highways England's first Active Traffic Management pilot, which trialled the use of real time monitoring technology to more actively manage, direct and control the flow of traffic on the M42⁷³. This solution reduced journey times by 25%, pollution by 10% and fuel consumption by 4%⁷⁴. Building on this, Keele University recently began a 'Live Lab' project to explore, develop and test how this kind of smart automated road network can be designed, maintained and extended to local roads. The project involves innovative SMEs, University students and a range of local stakeholders in developing and testing new technology to reduce congestion and road incidents, improve road user experience and improve both sustainable transport and air quality. Looking to the future, WM5G recently began a procurement process for a partner to "design, build and install a sensor network for the West Midlands Key Route Network..." with the aim being "to improve our modelling and real time management capability" through the use of 5G and IOT technology⁷⁵. From a green recovery standpoint, these projects could have huge implications in terms of reducing congestion, emissions and fuel consumption.

The Midlands has also demonstrated market leadership in 5G and the IOT in the manufacturing sphere. In terms of manufacturing, 5G's increased capacity provides the ability to support thousands of devices on a factory floor at once, while its speed and low latency mean it can support real-time response and operations. 5G and the IOT allow manufacturers to transform their productivity, for instance through predictive maintenance. W5G, in partnership with Bosch Thermotechnology Ltd., recently explored the industry application of 5G and the IOT in predictive maintenance. W5G found that this delivered a demonstrable increase in plant efficiency⁷⁶. By applying these technologies in the manufacturing sector, businesses become more efficient, produce less waste and less emissions. BMW, who have begun to deploy similar technologies, estimate that it could "halve production time, while using half the power and 70 per cent less water per car"⁷⁷.

Given its heritage in automation, and its market-leading expertise in the application of 5G technology alongside the IOT, the Midlands is in a prime position to lead the development of these technologies within the UK, whilst at the same time delivering on the goal of a green recovery.

⁷³ https://www.green-alliance.org.uk/resources/smarter_transport.pdf

⁷⁴ https://www.green-alliance.org.uk/resources/smarter_transport.pdf

⁷⁵ <https://www.wm5g.org.uk/news/5g-enabled-road-sensing-project-tender/>

⁷⁶ <https://www.wm5g.org.uk/news/how-the-industry-is-manufacturing-a-5g-future/>

⁷⁷ https://www.green-alliance.org.uk/resources/smarter_transport.pdf

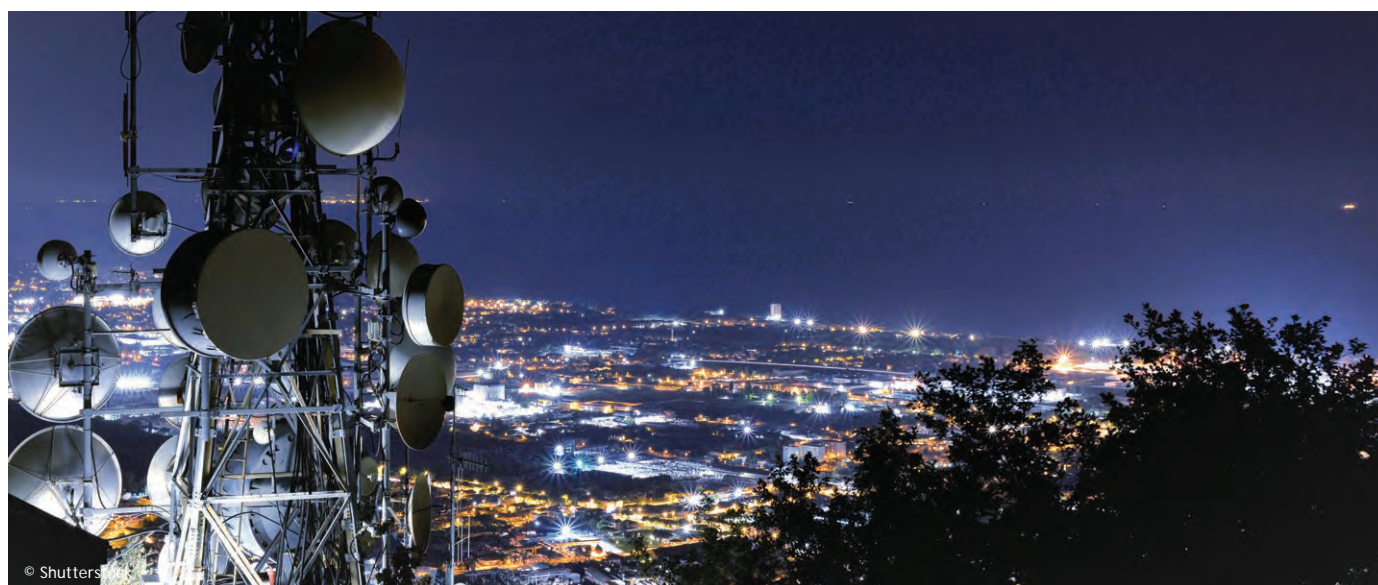
Smart cities ('intra-city connectivity')

Delegates at the roundtable were particularly interested in the possibility of driving the digital connectivity and green recovery agendas forward through 'smart cities', with Sir John Peace noting "the importance they play in future economic growth".

Whilst there is currently no universally agreed definition of what constitutes a 'smart city', the consensus is that a smart city is an urban area which uses a range of aligned technologies to deliver more efficient services within the city and to improve the lives of communities in a sustainable and more environmentally sound manner. A truly smart city will therefore be fully 'connected' through the use of the IOT, supported by 5G technology, which will provide real-time and detailed data regarding the city and its inhabitants. Data can then be used to generate insights which in turn can shape processes, services and resources in a more effective and efficient way. By using the IOT, operations within the city can become 'smarter' and much more responsive to real-time events.

By deploying the above technologies on a city-wide scale, a 'smart city' will deliver a range of opportunities and benefits. One possible application is increasing the energy efficiency of city lighting, e.g. by converting street lighting from conventional timers to smart through automated operations controlled by sensors which can detect the light levels which are actually required⁷⁸. In a similar way, the installation of smart water and solid waste tracking at premises throughout the city has been shown to be capable of reducing unnecessary waste⁷⁹.

A further possibility is that the use of real time data to optimise transport services in the city would cut journey times and reduce emissions. The Midlands as a region, through WM5G, is already at the forefront of exploring these applications. WM5G recently conducted, alongside parking technology provider AppyWay, the UK's first trial of 5G-enabled identification of live kerbside parking availability⁸⁰. The study found that, by using a live HD street scan processed via 5G networks and the use of AI, parking availability could be confirmed in the AppyParking app in real time. Given that "typically a third of all vehicles in West Midlands city centres were searching for available parking at once"⁸¹, this kerbside parking functionality could reduce congestion and cut emissions, as well as improve the lives of citizens, businesses and visitors to the region. As referenced above, WM5G is also currently beginning work on a sensor network trial on the region's road network in an effort to investigate whether 5G and IOT technologies can make traffic management more efficient. The deployment of this kind of technology within cities could deliver similar results to those seen in the US, where an intelligent traffic signal control system has demonstrated the ability to lower emissions by 20% by responding to changing traffic conditions in real time⁸². The projects currently being undertaken by WM5G demonstrate a real commitment in the Midlands to the possibility of making a smart city a reality.



⁷⁹ <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/smart-cities-digital-solutions-for-a-more-livable-future#>

⁸⁰ <https://www.wm5g.org.uk/news/appyway-use-case-video/>

⁸¹ <https://www.wm5g.org.uk/news/revolutionising-transport-amid-a-pandemic/>

⁸² <https://www.forbes.com/sites/tmobile/2019/10/21/how-the-5g-era-could-help-build-a-more-sustainable-future/#51a4611e664f>



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However, for all the promise offered by smart city technologies, the roundtable delegates identified that we are some way away from fully realising the potential of these technologies. In particular Laurence Marzell, of Serco, commented that “we haven’t yet grasped what it means economically and operationally...” but also commented that “we are not alone in the UK and in the Midlands in having it just as a narrative”, with the smart city initiatives in Europe also being “very fragmented”. Nevertheless the key view of the delegates at the roundtable was that now is the time to seize on the potential of smart cities, and that the regional aspects of smart cities meant that this was a key opportunity for the Midlands, as a distinct region, to understand the narratives and to bring the various components together in pursuit of a green recovery.

In order for the Midlands Engine to deliver on this regional desire for action, and for it to realise the opportunities for truly smart cities, it would have to overcome a series of barriers which have previously hampered smart city initiatives. Whilst barriers will vary from region to region, research in the UK has consistently highlighted challenges around funding, lack of consumer or stakeholder engagement and lack of proper collaboration leading to fragmented action⁸³. What these challenges highlight is that smart city initiatives will need to bring together both technological expertise and regional co-ordination, along with appropriate funding.

The Midlands Engine is ideally placed to lead in tackling these barriers, and on smart city technology more widely, precisely because this kind of endeavour requires buy-in at all levels across multiple organisations. The combination of businesses, universities, Local Enterprise Partnerships and local government which come together within the Midlands Engine partnership offers the opportunity to build consensus and deliver much more thoroughly on the smart city concept at a local level. Furthermore, the Midlands Engine’s focus on working alongside central government would allow it to coordinate that local effort in the most effective manner. Moreover, allowing the Midlands to lead in this area would recognise not only the industrial and manufacturing heritage of the region, but also the cutting-edge and market-leading pedigree which the Midlands is already displaying in these technologies.

⁸³ <https://www.openaccessgovernment.org/smart-cities-uk-barriers-to-adoption/58480/> and <https://www.smartcityuk.com/resources>



Skills transition: fossil fuels to clean energy

It is no surprise that the pandemic has had a great impact on the economy. With many businesses forced to temporarily close and consumer habits / corporate operation still not returning to pre-covid norms, there has been an increase in the unemployment rate. This is likely to increase further as the furlough scheme draws to a close. Therefore, not only is it essential to enable firms to survive but also, to plan for the fallout of when businesses fail, there needs to be a focus on how to provide employment opportunities for those who lose their jobs.

For there to be a successful green recovery there needs to be an increase in the capacity and skills of the low-carbon workforce.

Part of the solution will be reskilling those who become unemployed - and ensuring access to re-training as many firms pivot in their operations. Skills gaps are recognised across a number of sectors, such as renovation of buildings, construction, renewable energy, energy and resource efficiency, clean tech, environmental services and manufacturing. The two skill shortages are, firstly, when the number of skilled workers is insufficient (“quantitative skills shortage”) and secondly, where the number of people is adequate but there is a skill deficit (“qualitative skills shortage”). Both of these will need to be addressed.

Key observations

- Retraining and upskilling/ re-skilling the labour market to meet a new green economy’s skills needs will benefit the economy and workers alike.
- There is a wide variety of potential training routes that could be developed and therefore, green schemes could be adapted across all academic institutions in the Midlands.
- The Midlands is well placed to enable the training required and has demonstrated in the past its ability to reskill workers (for example, from the move from manufacturing and heavy industry to a service-based economy).

Education providers

World-leading universities are situated within the Midlands and collaboration between them should be celebrated. For example, Nottingham University and Nottingham Trent University have joined together to create the Universities for Nottingham Civic Agreement⁸⁵, which aims to establish a programme of projects between the universities and partners to ensure economic prosperity in the region; educational opportunity; health wellbeing and culture; unlocking the universities; and, most relevant, environmental sustainability. Furthermore, Midlands Innovation, a collaboration between eight universities in the Midlands, helps to drive cutting-edge research, innovation and skills development in the region. These types of agreements that link universities can be adapted at a larger scale in order to help to improve the approach to reskilling and skill creation needed by a Midlands based green economic recovery.

The roundtable debated the concept of a ‘green college’ which could be the centre of excellence for green skills, or whether it would be better to allow for ‘green schemes’ to be taught from academic institutions across the Midlands. Although the National College for High Speed Rail is a fantastic example of the former, it may be easier and more scalable for green schemes to be taught by academic providers across the Midlands in order for it to be accessible for many workers and businesses. However, as noted above, the need to collaborate to deliver a cohesive joined up and responsive solution is critical. The Midlands Engine’s goal would be for the Midlands to be the centre of excellence for linked skills to boost the green recovery amongst the public and to promote the reskilling and upskilling of the workforce in a unified approach.

Considerable work is ongoing across the Midlands Engine to encourage education providers to create bespoke and tailored offerings which meet the local business requirements. As discussed at the roundtable, there are a panoply of skills which are required with a wide range of pathways and entry points, and so collaboration and coordination is incredibly important between businesses and educational providers. Comprehensive maps on how to acquire those skills will be necessary in order to encourage workers to gain the skills that local business need in order to drive a green recovery.

⁸⁵ <https://exchange.nottingham.ac.uk/blog/universities-for-nottingham-major-new-civic-collaboration-with-nottingham-trent-university/>

Businesses

Businesses also play an important part in enabling the reskilling of the workforce. The discussion at the roundtable emphasised how important apprenticeships can be in bringing young people and those who have experience in different sectors into industry and ensuring they have the right skills. However, the current approach to apprenticeships was cited at the roundtable as not delivering. As with other initiatives, it will need concerted effort to refocus design to provide support for the green agenda and recovery. Apprenticeships can provide clear career pathways, but they need to lead to jobs and this can only be achieved if the apprenticeships are offered in stable or growth areas.

The roundtable discussed the benefit of in-work training. Improving the workforce, at work, has the obvious advantages of employee retention, improved skill base and continued income stream. However, for this to be successful, flexibility is crucial between employers and training providers in order for workers not to be overburdened. The support provided by the training providers again needs to be coordinated with businesses to reflect the needs of the employers and of the economy.

Funding

The real challenge for skills is that training schemes do not immediately generate revenue, which is a real issue now, when many businesses are already under significant financial pressure. Yet the value in having a skilled work force is obvious for business and the wider economy. Therefore, it is likely that training schemes will require private and public funding.

Chancellor Rishi Sunak has outlined that £2 billion will be spent as a kickstart scheme to fully subsidise jobs for young people as they are particularly vulnerable in the recession due to their lack of work experience. This plan involves support to find jobs, enabling young people to get the skills required for jobs and provide targeted help to get young people into work. This could be incorporated into the green recovery to allow for young people in particular to be incentivised into working in the green sectors.

The roundtable discussed that funding should be brought down in a coordinated fashion. It is often the case that funding is split between different schemes which all have slightly different requirements and therefore it is complicated for businesses and training providers to access the requisite funding. The funding requirements are often different for each region despite national aims and therefore, a regional approach would be a huge advantage to allow for a unified fund across the Midlands.

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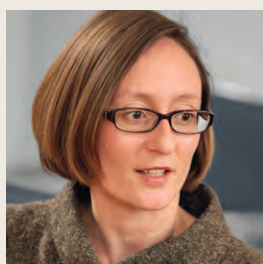
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