MIDLANDS ENGINE

MIDLANDS ENGINE MANUFACTURING OPPORTUNITIES

WHAT COULD BE MADE IN THE MIDLANDS IN FUTURE?

NOVEMBER 2021

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1. EXECUTIVE SUMMARY

As the UK's manufacturing engine, the Midlands is more than individual companies making products. Taken together these companies provide phenomenal capacity and capability; they are so much more than the sum of their parts. The interconnected supply chains across the Midlands form a network of companies all working together in collaborative and innovative ways to manufacture products for our everyday use. From spices and ceramics, to aeroplanes and medical devices, these products are then distributed and used not just in the Midlands and UK, but across the world.

The three themes of the report are low carbon, relating to the use and production of green goods, digital, relating to the manufacture and use of digital technologies in products and the manufacturing process, and new products and markets, some of which are used elsewhere but are new for the region.

The chosen sectors reflect the regional expertise identified in the 2017 Science and Innovation Audit as areas for growth.

THE IMPACT OF NEW MANUFACTURING OPPORTUNITIES COULD BE WORTH AN ESTIMATED...

+165,000
JOBS

+£13.7
BILLION
GVA

...TO THE MIDLANDS BY 2030

Midlands Engine manufacturing opportunities by theme

Low Carbon

- ***New materials, recycling or reusing processes*** can help make food packaging and medical equipment more sustainable
- Using waste from food and textile production through ***industrial symbiosis*** will decrease waste and lead to new products. ***Reprocessing*** will also be used for metals and lithium batteries
- ***Electric battery manufacturing and alternative fuel cell manufacturing***, including hydrogen, will become a significant opportunity for existing car manufacturers such as Toyota and Rolls-Royce and their supply chains
- ***Hydrogen*** presents an opportunity as a ***fuel for trains and cars***, but also as a ***heat source*** for homes
- ***Sustainable fuels, lightweighting and new electric flight systems*** will change aerospace development
- ***Lightweighting*** and developments in ***power trains*** will improve the ***efficiency of vehicles***
- Light and Very Light Rail can be deployed as ***cleaner and more efficient rail***
- ***The National Centre for Doctoral Training in Fuel Cells and their Fuels*** covers Birmingham, Nottingham, Loughborough, encouraging academic research and development
- The region can produce ***more green energy***, building on its existing capacity
- National Grid is investing money in the grid to ***improve efficiency.***
- There are significant opportunities in other energy generation methods, such as ***nuclear, wind and solar building on the region's current energy generation facilities***

Digital

- ***Automated production*** using drones and robotics will ***decrease waste*** and potentially make manufacturing across all sectors ***more efficient***
- ***Sensors*** can be used across ***food and health*** care to monitor patient health, increase food safety and reduce waste and improve crop yields
- Digital will change medicine, particularly ***monitoring and diagnostics***, through the use of ***wearable health devices and Big Data analysis***
- ***Digital control systems*** for the national grid and other systems like HS2 will be deployed across wind systems, among others, to ***understand usage and reduce waste***

New Products and Markets

- The food market could ***export its products*** further. This is coupled with new opportunities for ***'free-from' products*** as demand increases
- ***Connected and autonomous vehicles***, developed through the ***Future Mobility Zone***, will gain in popularity
- ***Defence and Trauma medicine*** has been an area identified for potential growth in the region
- ***New markets and manufacturers*** have become involved in the medical sector due to ***COVID-19*** will lead to ***greater diversity in supply chains***
- Improving ***drug pathway developments*** will develop new drugs and delivery mechanisms
- Lightweighting ***requires aluminium, high strength steels and carbon fibre*** which will continue to be developed. ***Composites and polymers*** will also be utilised in lightweighting
- ***Advanced ceramics*** will expand across multiple sectors such as space, medical and transport
- ***Textiles for wound care*** and other protective textiles has potential to expand, as well as an increased demand for ***reshoring fashion*** and textile re-use
- There are ***cross-cutting developments***, including injection moulding and ***digital technologies*** like robotics, 3D printing and machine learning

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Future Food and Drink

OPPORTUNITIES

- ***Automated production*** using autonomous vehicles, drones and automated production lines could reduce waste and improve efficiency
- Utilising ***sensors and satellites*** to track soil moisture, rainfall and soil health
- ***Food packaging will become more sustainable*** through the use of new materials or because it is able to be recyclable
- Sensors will be included in food packaging to tell consumers the ***safety of a food*** with greater accuracy than best before dates, ***reducing food waste***
- The region has a ***£22.9 billion share of the food exports market*** but this can grow as ***only one in five*** producers export
- Higher demand of ***'free-from'*** products to reflect dietary needs and choices e.g. gluten free, meat free
- Food and packaging ***waste will be reduced*** though creating new products from waste, such as textiles or biomass

POTENTIAL 2030 IMPACT

THE IMPACT OF FOOD AND DRINK OPPORTUNITIES COULD BE WORTH AN ESTIMATED...

+32,000 JOBS

+£2.1 BILLION GVA

...TO THE MIDLANDS BY 2030

- This reflects growth in food & drink and agri-tech technologies
- Improving on the ***53.2% CO2 emissions reduction*** from 1990 to 2018
- Improving yields and better managing the 70% of the UK's land area covered by farming
- Reducing food and packaging waste – ***improving on the 30% reduction in food waste per capita since 2011***

Next Generation Transport

OPPORTUNITIES

- ***Electric battery manufacturing*** could be worth up to £916m GVA in the Midlands, reflecting a £24bn electrification opportunity for the UK
- UK Battery Industrialisation Centre in Coventry, with more opportunities in the ***safe refuse and recycling of lithium batteries at the end of their life***
- The Midlands Engine has ***a significant hydrogen opportunity*** including hydrogen powered trains (HydroFLEX) and cars, as well as hydrogen fuel cell manufacturing
- Electric vehicles provide many opportunities including ***power electronics, and connected and autonomous vehicles***. This will utilise ***the Midlands Future Mobility Zone***
- ***Aerospace*** will see the development and deployment of sustainable fuels, lightweighting, and new propulsion systems
- ***Light and Very Light Rail*** and digital rail systems will be deployed as cleaner, efficient, and safe rail systems

POTENTIAL 2030 IMPACT

THE IMPACT OF NEXT GENERATION TRANSPORT OPPORTUNITIES COULD BE WORTH AN ESTIMATED...

+37,000 JOBS

+£3.3 BILLION GVA

...TO THE MIDLANDS BY 2030

- This includes almost £***2bn GVA in automotive opportunities, almost £500m in aerospace and £878m in rail***
- Taking ***connected and autonomous vehicles*** into commercial production will lead to higher regional income and more jobs
- Rail could lead on the ***electrification of the UK rail network***, and supporting the digitisation of UK rail

MIDLANDS ENGINE MANUFACTURING OPPORTUNITIES NOVEMBER 2021

Medical and Pharmaceuticals

OPPORTUNITIES

- Growth of ***digital health and wearable devices***, sensors to increase diagnostic capacity, and 3D printing and robotics
- ***Defence and Trauma medicine*** is currently supported only by ***18% of MedTech businesses*** and represents a significant area for potential growth
- ***New markets created by COVID-19*** have bought in new manufacturers to the sector. There is potential for ***more manufacturers to enter medical manufacturing***
- Improving ***drug pathway development*** though collaboration with universities and the NHS would improve patient care
- The region could become a hub of both new interventions and ***regulatory science*** which provides guidance on digital monitoring and new policy around healthcare
- ***Big Data*** from wearable devices and other new data sources could ***improve patient diagnosis and care***
- ***Reusable or recyclable*** medical devices

POTENTIAL 2030 IMPACT

THE IMPACT OF **MEDICAL AND PHARMACEUTICALS** COULD BE WORTH AN ESTIMATED...

+8,000 JOBS

+£1.5 BILLION GVA

...TO THE **MIDLANDS** BY 2030

- Over 5,000 jobs of could be in Med-tech and almost 3,000 in biopharma
- The current healthy life expectancy for the Midlands engine is ***1.9 and 0.9 years below the UK average*** for women and men respectively which exemplifies the need to improve the region's health

Low Carbon Goods

OPPORTUNITIES

- ***Control systems*** will be deployed across wind, smart grids, and HS2 to track energy and reduce usage
- ***Hydrogen*** is a significant opportunity with ***hydrogen heat pumps and boilers*** being developed by Bosch, as well as hydrogen vehicles and hydrogen generation taking place in the region
- ***The National Centre for Doctoral Training in Fuel Cells*** and their Fuels covers Birmingham, Nottingham, Loughborough, strengthening regional expertise
- ***Electric vehicles*** will become necessary and the major car manufacturers region (Toyota, JLR, Aston Martin, BMW, Tata Motors) adapting to these changes. The ***UK Battery Industrialisation Centre*** will aid this
- The country will need more ***green energy generation***, and the region can provide this through increasing the production of wind, solar, nuclear biomass, and anaerobic digestion power

POTENTIAL 2030 IMPACT

THE IMPACT OF **LOW CARBON GOODS** COULD BE WORTH AN ESTIMATED...

+39,000 JOBS

+£4.2 BILLION GVA

...TO THE **MIDLANDS** BY 2030

- This includes ***20,000 additional jobs in the wind sector*** and over 12,000 in solar
- £1.6bn GVA could be added by alternative fuels like ***hydrogen by 2030, creating 7,000 jobs***

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Advanced metals and materials

OPPORTUNITIES

- ***Lightweighting,*** the practice of making vehicles lighter and therefore more econmoical to run, requires aluminium, high strength steels, and carbon fibre
- ***Composites and polymers*** will increase in use in lightweighting in car bodies, chassis, and power trains
- ***Metal reprocessing and industrial symbiosis*** will be essential in reducing waste and improving reusability and recyclability of advanced manufacturing
- ***National Grid*** is investing significant money in the grid to improve the sustainability of the region
- ***Advanced ceramics*** will expand across multiple sectors such as space, medical and transport
- ***Textiles for wound care*** and other protective textiles has potential to expand
- There will be an increased demand for ***reshoring fashion*** and textile re-use
- There are ***cross-cutting developments***, including injection moulding and ***digital technologies***
- Driving sustainable construction by applying manufacturing processes, via Modern Methods of Construction technologies such as offsite

POTENTIAL 2030 IMPACT

THE IMPACT OF ADVANCED METALS AND MATERIALS COULD BE WORTH AN ESTIMATED...

+49,000 JOBS

+£2.6 BILLION GVA

...TO THE MIDLANDS BY 2030

- ***25,000 additional jobs could be created in the metals sector***, contributing £1.3bn GVA
- A further £900m GVA and 17,250 jobs could be added through ***advanced materials opportunities like ceramics and plastics***
- The potential of opportunities in textiles by 2030 is valued at ***£420m GVA and 7,250 new jobs***

2. BACKGROUND AND INTRODUCTION

This is the second part of a two-stage study into the manufacturing capabilities of the Midlands Engine region, undertaken by Midlands Engine Observatory.

The first part of the study analysed what is already being made in the Midlands, highlighting the region's manufacturing heritage and innovators like the steam pioneer Matthew Boulton, and the range of products made today including everything from Melton Mowbray pork pies and Stilton cheese to brake callipers for the Bugatti Veyron.

The second part shows how the region's current specialities can be utilised to explore future opportunities. As the region moves towards Net Zero, adapts to post-Brexit Britain, and continues to innovate, manufacturing must respond to these new challenges, as well as the opportunities presented by developing technologies, particularly in digital. We have a rich heritage and extensive capabilities, but manufacturing needs to continue to adapt to economic and societal changes to maintain the regions capabilities and economic contributions. This will occur through developing new goods, responding to the climate crisis, and utilising digital technologies.

The region, as well as the rest of the UK, has significant potential to utilise reshoring which will both reduce carbon emissions and allow for greater exports across the world. Reducing the carbon impact of manufacturing is essential to global, national and regional success and wellbeing. The region has an important role to play in this, as it provides 18% of England's renewables capacity.

The region has significant strengths and challenges. The UK is the 9th largest manufacturer in the world, with £36 billion a year generated by Midlands manufacturers. The region has significant supply chains and expertise across numerous sectors, such as food and drink, MetTech, automotive, aerospace, green energy, additive manufacturing, plastics and textiles, to name just a few. Net Zero also creates significant opportunities for the region to become a leader in environmentally sustainable and responsible manufacturing, but this requires innovation and investment.

Our SIA framework for long-term productivity growth

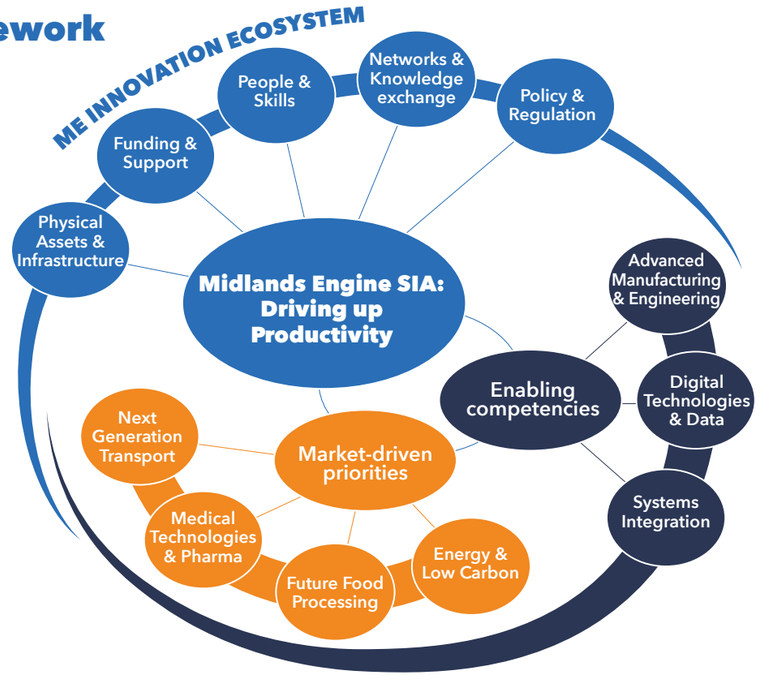

Figure 1, The Science and Innovation Audit framework for long-term productivity growth, setting out the region's key sectors.

However, the Midlands' 22% share of the UK's exports has been affected by the joint issues of Brexit and COVID. The issues related to the EU Exit such as new administrative rules on imports and exports create delays can now be classed as structural issues. A shortage of HGV drivers and increase in material prices is exacerbating the issue and shortages caused by COVID, resulting in severe supply and delivery problems across the region and the UK. This, partly caused by Brexit amongst other factors, is damaging all sectors particularly retail, food & drink, construction and agriculture, and has been played out in clear reality within the recent fuel crisis. COVID has also led to increased numbers of staff absences due to illness and self-isolation and difficulties finding staff with the right skills, further impacting output. It is estimated that labour supply issues could last for up to two years.[1] These are significant issues that need addressing.

As possibilities created by new digital technologies, reshoring and supply chain links proliferate, the Midlands needs to be poised to make the most of future opportunities. The Science and Innovation Audit of the Midlands Engine in 2017 (depicted in Figure 1) showed the ongoing need to respond to challenges, now accelerated by Covid and Brexit, but also the opportunities provided by maintaining and reshoring manufacturing in the Midlands.[2] This report is based upon previous work in this field.[3] Capabilities in this report refer to skills, infrastructure, or products that the region manufactures. These range from exporting capabilities to emerging technologies. Some capabilities, like drones, are not in wide use as of yet, but but their use has been initiated or developed by the region.

The following chapters analyse regional strengths, and how these may be adapted to meet future sectoral opportunities, with a particular focus on low carbon developments and the use of digital technologies. The Midlands has extensive digital and connectivity capabilities, including the UK's first multicity 5G testbed, and the world's first 5G connected forest, Sherwood Forest. The sectors are set out in Figure 2. The report links with the work of Warwick Manufacturing Group (WMG) who are considering how to improve the productivity of manufacturing in the region through distributed manufacturing, which also considers possible future developments. Both WMG and this report are a follow on to the supply chain resilience analysis,[4] and wider work such as the Midlands Manufacturing Resilience Commission.[5] Although we recognise that highly skilled people are necessary for the future success of manufacturing in the region, skills is outside the scope of this report due to the varied and complex nature of skills provision. Together, these reports suggest ways in which manufacturing in the Midlands can overcome the current challenges and utilise upcoming opportunities, particularly digital and low carbon developments, to continue producing world-leading manufacturing in the Midlands.

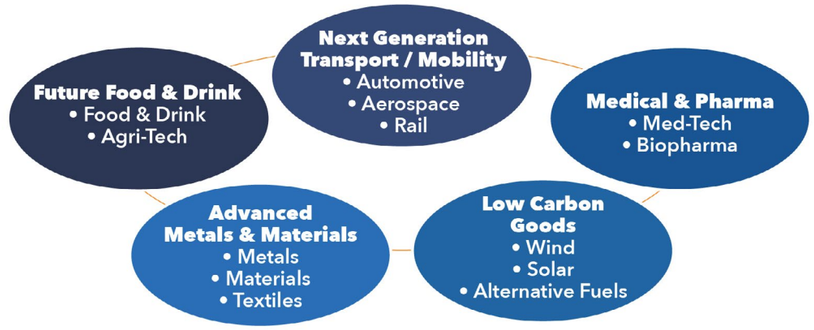

Figure 2, Sectors

[1]CBI, 2020 https://www.cbi.org.uk/media-centre/articles/labour-shortages-will-continue-in-face-of-government-inaction-delaying-uk-economic-recovery-director-general/

[2]Origin of the sector definitions: https://www.midlandsengine.org/wp-content/uploads/2017/04/Midlands-Engine-SIA-Volume-1-Report-01-Nov-1-2.pdf

[3]This report created the sector definitions that are used in this report and in other Midlands Engine work – Future Transport, MedTech and Pharmaceuticals, Future Food and Drink, Energy and Low Carbon. This has led to significant work across these sectors, including reports by Midlands Engine partners into the supply chain resilience across these sectors, (https://www.midlandsengine.org/our-programmes/observatory/sectors-and-supply-chains/) and extensive work by kMatrix Data Services into the current state of Low Carbon manufacturing and expertise (Midlands Low Carbon Sector Study | Sustainability West Midlands)

[4]Sectors and Supply Chains | Midlands Engine

[5] Chaired by Chief Executive of the Manufacturing Technology Centre (MTC), Dr. Clive Hickman, the Commission has gathered evidence from over 200 participants from industry, academia, and government, all united by a passion for the Midlands and for manufacturing; Available here.

3. OPPORTUNITIES BY SECTOR: WHAT COULD BE MADE IN THE MIDLANDS?

3.1 Future Food and Drink

Current Expertise

The region has long been home to **internationally recognised food and drink brands**, from Cadbury to Typhoo, and that legacy continues today with **arable, meat, seafood and vegetable** production thriving.[6] The Midlands Engine region **produced £1.82 billion of food and drink exports in 2019**, counting for **7.7% of the UK's food and drink exports**. This was worth **£5.56 billion** to the region and the sector **employs 90,250 people**.[7]

The region is utilising its manufacturing abilities to develop a niche in **food and drink machinery and production**.[8] This builds on the region's strength as a manufacturer, but also as a leader in food and drink development. The Midlands has expertise across a range of products. **The Humber Seafood Institute** supports seafood, agriculture and food logistics companies, enabling research in cutting edge frozen food technologies. But the region also includes water bottling facilities at Buxton, Derbyshire, and is home to the Melton Mowbray pie and Stilton cheese.[9] The East Midlands has a significant agriculture expertise, but that is now diversifying to include the future of food from the use and development of free-from food alternatives to drones and sensors in food packaging.

There are significant academic specialisms in agriculture and food within the Midlands Engine. There are **seven Food Enterprise Zones** alongside **world leading education and training** offers in agri-food. The Universities of Birmingham, Nottingham and Warwick are in the global top 100 universities and have significant strengths in teaching and research in the sector. These feed into the capacity of the region to take on future opportunities. The University of Lincoln hosts the **National Centre for Food Manufacturing and The Lincoln Institute for Agri-Food,** which includes the UK's first dedicated professor in **agri-robotics**. The region also hosts research centres in **brewing sciences and dairy innovation**, as well as **The Centre for Formulation Engineering** which looks at zero waste food processes.[10] There are numerous other centres and research facilities.

Opportunity Areas

There are numerous opportunities in the Midlands as food and drinks continues to **diversify and change** to meet consumer demand. As consumers moved away from Grab-And-Go food during the pandemic, producers responded and proved resilient, even in the face of supply chain disruption and consumer stockpiling.[11] Consumers are increasingly concerned about the contents of their food, ranging from meat-free alternatives to **free-from foods**, especially free-from gluten for coeliacs. Free-from ranges are expected to continue to grow, leading to new products being developed and launched.[12] It is possible to utilise **insights from other sectors** to develop the food and drink machinery that the region both produces and uses, and on how to improve the sector's supply chains.[13] Such a **responsive, dynamic sector** could quickly utilise new technologies, data sources, and consumer demands to sustain its place as a leader in the sector.

Creating a **Zero Waste food chain** is vital, as one third of all food produced is lost or wasted.[14] This can be achieved through the use and deployment of digital tools and new technologies. Creating a **circular economy** will be essential. This means that waste is reduced, and any waste or by-products are reused or repurposed. In the food and drink industry, this means redistributing or re-using by-products and services so that they do not go to waste, for example **additional food, fabrics for textiles or as sources of bioenergy**.[15] Digital technologies embedded in the earth and in space will also help reduce the carbon emissions and waste in the sector. By using **sensors within the soil** to inform when crops need watering, water wastage is reduced. Using **satellites to track and estimate rainfall** as well as growth and risks to the crops, such as nitrogen deficits.[16]

The region may also see growth in **urban horticulture**, as countries look to grow more food at home. The buildings and hydroponics for such an undertaking could be made in the Midlands, building on the **advanced manufacturing** and materials sector strength. Urban horticulture can also **utilise CO2** by releasing captured carbon dioxide into greenhouses to promote plant growth.[17]

Packaging is an area where there will be developments, as consumers and suppliers seek to reduce the amount of waste, particularly **plastic waste**, associated with food and drink. This may include novel food packaging materials such as bioplastics and packaging that can be reused or recycled, smart packaging whilst increasing convenience and reducing waste.[18] Such packaging may also help tackle **food security, authenticity and traceability**. Reducing waste and improving recyclability will also be essential to future developments.[19] However, it is not only in new materials or designs that there is innovation taking place in food packaging. **Smart sensors** have the potential to revolutionise the industry by further reducing waste and increasing convenience by tracking critical indicators. Sensors embedded in the manufacturing process allows AI elements to adapt and self-heal to reduce errors and down time, as well as provide back-ups in case of disasters. This is relevant across all sectors, and has the potential to transform manufacturing. These include pH levels, oxygen, microbes and temperature, which will help consumers and suppliers better understand the **safety and edibility** of a food, compared to **less accurate best before dates**. It is expected that more food companies will reshore some production in order to decrease their carbon impact, which will add to the industries efforts to reduce its carbon impact.

Digitisation will have a significant impact on the future of food. In Shropshire, **Harper Adams University** has developed the first '**Hands-Free Hectare**', where crops were planted, tended, and harvested exclusively through **autonomous vehicles and drones**.[20] The sector looks to be moving towards **batch production** and **fully automated production lines**, allowing for quicker production, less waste, and greater precision. These systems are already being developed by Olympus Automation and The National Centre for Food Manufacturing.[21]

There is significant scope for food producers to **export** more of their products, despite international trading being complicated by Brexit and COVID. Despite the growing number of markets the UK food and drink sector is exporting to, only **one in five** manufacturers export.[22] **£13.9 billion** is exported to the EU per annum from the UK, and £9 billion to the rest of the world, with **growing markets in Asia and Oceania**. The Midlands exports £1.6bn of food and live animals and £121m of beverages and tobacco. Despite this, the UK imports approximately twice as much food and drink as it exports.[23]

[6]Midlands Engine Opportunities in Agri-Food, Midlands Engine Opportunities in Agri-food
[7]Food and Drink Federation Regional Map 2021, link here
[8]West Midlands Local Industrial Strategy Delivery Plan: Food and Drink Manufacturing, GBSLEP
[9]Midlands Engine Opportunities in Agri-food
[10]Midlands Engine Opportunities in Agri-food
[11]Midlands Engine Observatory, Midlands Engine Supply Research Report Food Supply Chains, link here
[12]Sector Bulletin, Food and Drink, Make UK 2017 available here
[13]Midlands Engine Supply Chain Research Report: Food Supply Chains
[14]Midlands Engine Opportunities in Agri-food
[15]WMCA Circular Economy Roadmap Draft
[16]Midlands Engine Opportunities in Agri-food
[17]https://www.intelligentliving.co/urban-horticulture-sustainable-future/
[18]Sector Bulletin, Food and Drink, Make UK 2017 available here
[19]Science and Innovation Audit, A Science & Innovation Audit for the West Midlands (wmca.org.uk)
[20]Midlands Engine Opportunities in Agri-food
[21]Sector Bulletin, Food and Drink, Make UK 2017 available here
[22]Sector Bulletin, Food and Drink, Make UK 2017 available here
[23]Sector Bulletin, Food and Drink 2020 Update, Make UK available here, ME data sources (Duedill)

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What Could be Made in the Midlands?[24]

This table shows the potential opportunities for the Midlands in the Food and Drink sector, setting out what areas look set to grow.

Area	Capability	Opportunity and Potential 2030 Impact
Digital	Autonomous Vehicles and Drones	- Increased efficiency and land covered - Reduced production costs and materials usage, leader in technology
	Automated production lines	- Quicker production, less waste, and greater precision - Greener food production – improving on the 53.2% reduced CO2 emissions from 1990 to 2018, reduced production cost
	Sensors and satellites	- Manage water and potential nutrient or disease - Improved yields, leader in technology, better manage the 70% of UK's land area covered by farming
Packaging	Green/recyclable	- Produce recyclable, reusable, and attractive packaging - Reduced food and packaging waste - improving on 30% reduced food waste per capita since 2011, higher sales
	Sensors	- Include sensors in packaging to inform longevity of the product - Reduce food waste, increase sales through higher consumer confidence
Food Products	Export	- Increase market share of food and drink exports globally - Increase £22.9billion share market in exports, increase profit and jobs
	Free From	- Higher demand for 'free-from' foods - Increase production to meet consumer demand – this is seen as an opportunity
Circular Economy	Products from waste e.g. textiles	- Reduce waste, create new product/sources - Better greener credentials – farmland already acts as a carbon sink with £514m a year, reduced costs

[24]Sources for the impact are: Food and Drink Federation, Industry at a Glance, here, Food and Drink Federation Business Confidence Survey Q1 2021, here, NFU Contributions of Agriculture Report here

3.2 Next Generation Transport / Mobility

Current Expertise

The Midlands is at the heart of transport manufacturing in the UK, with major capabilities across automotive, aerospace and rail. The **Midlands' transport and mobility cluster includes cutting edge research and development** and established original equipment manufacturers (OEMs). These are supported by globally competitive, **robust, and interconnected supply chain firms**.

The Midlands is an **internationally significant hub for automotive**, employing more than 293,000 people and home to seven volume car manufacturers, seven commercial vehicle manufactures and 16 of the world's top 20 automotive suppliers.[25] The combined value of the JLR and Toyota cars made in the Midlands is just over £14.6bn, or **44% of the of the value of UK vehicle production**.[26]

Aerospace has grown rapidly in recent years and the Midlands now has one of the largest regional networks internationally. The cluster's contribution to the economy is driven by expertise within **high-technology aero engines, complex aircraft systems and precision-engineered components** for aircraft manufacturing giants such as Airbus and Boeing.[27]

There is also leading expertise, capability and opportunity within **the rail sector**. **HS2 represents Europe's largest infrastructure project**, while companies and universities are at the cutting-edge of next generation rail. This includes Dudley's emerging Very Light Rail and Innovation Centre, and the development of **HydroFLEX** – the UK'S first hydrogen train – via the Birmingham Centre for Railway Research and Education (BCRRE) at University of Birmingham. **Hydrogen fuel cell development** is a regional strength, with multiple organisations within the Midlands Engine being members of the **UK Hydrogen and Fuel Cell Association**, including Rolls-Royce, University of Nottingham and the University of Birmingham's Fuel Cells Group.[28] The region could be the home of fuel cell technologies, building on this academic and industrial expertise. Hydrogen will be discussed in more detail on page 24.

Opportunity Areas

Automotive in the Midlands has the building blocks of a thriving electric vehicle specialism, reflected by distinct OEM, academic and supply chain excellence. Battery Electric Vehicles (BEVs) are being developed at pace by firms such as **JLR, Aston Martin and the London Electric Vehicle Company**, while universities are spearheading innovation through projects such as the **UK Battery Industrialisation Centre (UKBIC)**.[29]

The Advanced Propulsion Centre (APC) has identified a £24bn UK supply opportunity in the road to electrification,[30] a critical opportunity to drive the region's green industrial revolution. Electric vehicles will require a new breed of high-performance **power electronics** based on compound semiconductors, such as SiC (silicon carbide) and GaN (gallium nitride). APC estimate a £10bn supply opportunity in the UK, with specific opportunities in the Midlands for **inductors, capacitators and sensors**. This builds on existing expertise in **drivetrain and powertrain technologies**, via firms such as Changan, ZF Lemforder and Hofer Powertrain.[31] Valued at £2bn, another opportunity is in the electric machines market. This relates to the manufacturing of **magnets, electrical steel and the assembly of electric machines and motors**.

However, the largest opportunity within electrification lies in **battery manufacture**. Batteries represent around 40% of an electric vehicle's value, and half the opportunity value (£12bn) of BEVs according to APC. Key opportunities are in the manufacture of components used to **make a**

[25]Ten Point Plan for Green Growth | Midlands Engine
[26]BCU: Advanced manufacturing supply chains, here
[27]Midlands Aerospace Alliance, Rescuing and Recovering Aerospace Supply Chains at the Heart of UK Manufacturing, here
[28]Current Members – UK Hydrogen and Fuel Cell Association (ukhfca.co.uk)
[29]Ten Point Plan for Green Growth | Midlands Engine
[30]APC Passenger car electrification report v16.indd (apcuk.co.uk)
[31]West Midlands Growth Company Advanced Manufacturing Pitchbook

battery cell (cathode and anode manufacturing, electrolyte supply and final cell assembly) and the supply of components for **battery modules and packs (such as cases, covers, bracketry, supporting parts and cabling)**.[32]

Given the region's reliance on automotive, **securing a successful green transition in the sector is absolutely critical to the Midlands' future economy**. This represents a significant opportunity across the supply chain, led by OEMs but supported by the expertise and engineering quality of our SMEs. Success could be harnessed by exploiting the emerging re-setting of international supply chains and encouraging substantial **re-shoring**. Bringing the manufacture of batteries firmly to the UK, and specifically the Midlands, would also be advantageous in the context of UK-EU Rules of Origin from 2027.[33]

An integrated supply of BEVs (Battery Electric Vehicles), supported by a Gigafactory and local supply chain, would create the most value. Initiatives are already off the ground, for example **Coventry's Gigafactory's site and Britishvolt's facility at Mira Technology Park**,[34] but much work is still to be done to secure the Midlands' green automotive future.

The Midlands can lead the way in the manufacture of low carbon rail and aerospace systems too. In aerospace, Rolls-Royce is working on developing the world's largest **aero-engine (UltraFan) with the potential to increase fuel efficiency by 25% compared to older engines**.[35] The greening and lightweighting of aircraft will be an industry-wide endeavour, with innovation required throughout supply chains to maximise the use of **additive manufacturing, specialist composite materials and sustainable jet fuels**.[36] In addition, considerable opportunities within space have been identified, with the Midlands particularly well-placed to support the increasing global demand for **satellites and associated space vehicle technology**.[37]

With only 38% of UK railways currently electrified, decarbonisation is a major opportunity in rail, a key manufacturing cluster in both the East Midlands and West Midlands. The region is leading in developing **new propulsion technologies**, driven by universities through the UK Rail Research and Innovation Network (UKRRIN). UKRRIN, including BCRRE and the University of Nottingham, also leads the way on exploring and implementing the **UK's digital railway vision**. Opportunities in this space include **predictive maintenance and remote condition monitoring systems, signalling, connected robotic devices and drones and delivering autonomous rail systems**.

Next-generation autonomous transport modes are also being explored in aerospace and, more intensively, in automotive. The **Midlands Future Mobility Zone** providing a national testbed for trials and commercialisation of technologies, complementing the existence of **Connected and Autonomous Vehicle (CAV)** manufacturers such as RDM and Westfield Technologies, and scaling opportunities within **self-driving hardware and software**.[38]

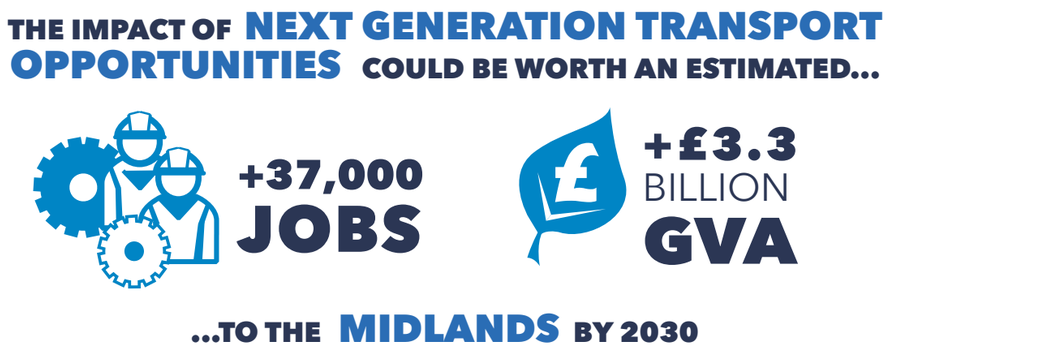
The Midlands' opportunity to lead the digital transformation of transport is underpinned by world-leading university assets. Industry-specific expertise, such as the **National Automotive Innovation Centre**, are present, as well as cross-cutting support for **digital manufacturing / Industry 4.0 (for example, the Manufacturing Technology Centre)**. The region is also supported by excellent digital infrastructure like **5G**.

[32]APC and BCU
[33]SMMT Blueprint for Electric Revolution, SMMT-Electrified-blueprint-FINAL.pdf
[34]West Midlands Growth Company Advanced Manufacturing Pitchbook
[35]West Midlands Growth Company Advanced Manufacturing Pitchbook
[36]Midlands Aerospace Alliance, here
[37]Midlands Manufacturing Resilience Commission, Manufacturing Confidence, here
[38]West Midlands Growth Company Advanced Manufacturing Pitchbook

What Could be Made in the Midlands?[39]

This table shows some of the opportunities for the region in future mobility and transport, and the potential impact of capitalising on that opportunity.

Area	Capability	Opportunity	Potential 2030 Impact
Automotive	Battery manufacturing	£12bn UK supply opportunity, critical to future of Midlands industry	£916m GVA and 8,000 jobs.[40] Retention of automotive market Reduction in greenhouse gas emissions by as much as 7MtCO2 per annum by 2040
	Power Electronics	£10bn UK supply opportunity	
	Electric Machines	£2bn UK supply opportunity	
	Connected & Autonomous vehicles & supply chain	Realisation of leading trials, infrastructure and manufacturers to mass market	£1bn GVA and 8,000 jobs
Aerospace	Sustainable Fuels	Drive decarbonisation via production and use of low carbon fuel for aircraft	£470m GVA and 6,500 jobs
	Lightweighting	Use of additive manufacturing & composite materials to reduce weight	
	Propulsion Systems / electric flight	Harnessing regional expertise on engine development; electric flight future	
Rail	Light and Very Light Rail	Lead on the electrification of the UK network, enhanced by regional expertise	£878m GVA and 15,000 jobs
	Digital Rail	Support the digitalisation of UK rail e.g. sensors, signalling	



[39]Midlands Aerospace Alliance, MAA_Five_Point_Plan.pdf (midlandsaerospace.org.uk)
[40]Ten Point Plan for Green Growth | Midlands Engine

3.3 Medical & Pharma

Current Expertise

The region has expertise in multiple key areas of medical and pharmaceutical manufacturing and makes significant contributions in several other areas. Our core regional specialisms are:

- Assistive technology
- Hospital hardware
- Singe use technologies
- Infection control
- Wound care and management

Midlands Engine has extensive **Digital Health capabilities** such as sensors and digital measuring devices that are made and deployed across other sectors as well as Digital Health.[41] The **5G testbed** in the region also allows for the development of new Digital Health technology, including **wearable health tech** and **predictive and diagnostics techniques** that utilise the data from these devices. **3D printing and robotics** are also transforming the field with the potential for use in surgery and care and are being developed and tested in the region.[42]

The region's universities house significant expertise across individual illnesses, such as Diabetes, but also for specific organs, such as the lungs. Numerous research centres provide research facilities such as the **NIHR funded Leicester Biomedical Research Centre** which is world-leading in its cardiovascular, respiratory and lifestyle-related metabolic disease research.[43] Academic expertise is also contributing to **drug pathway development**, which seeks to understand how drugs are handled by the body so that they can be delivered successfully and make care more effective.[44]

The manufacture of medical devices and goods also takes place within the Midlands Engine. This includes:

- Orthopaedic Devices (often single use)
- Fibres and fabrics e.g. for wound dressings
- Gas for anaesthetics and respiratory cases
- Accessible bathrooms for people with additional needs
- Pools and hydro aquatic therapy fittings[45]

However, it is not only in the development and delivery of health goods and pharmaceuticals that the region excels. The West Midlands has the **UK's only NHS academic centre for Regulatory Science and Innovation**, which provides expertise to guide the creation of new regulations.[46]

Opportunity Areas

The **COVID-19 pandemic** has shown that the medical and pharmaceutical sector can be dynamic, responsive, and innovative. Several regional businesses pivoted or increased production to provide PPE or respiratory equipment, such as Arrow Medical and Airguard Filters, as part of The West Midlands PPE Collective.[47] Although the pandemic will continue to decrease in intensity, and with it the need for PPE and respiratory equipment, these manufacturers could continue to supply a **new market**, diversifying their buyers.

This is indicative of the broader **cross-sector opportunities** in the medical and pharmaceutical sector. Whilst there are manufacturers who specialise in medical goods, they may to be able to supply other sectors at the same time as the medical supply chains.

'Other traditional and advanced manufacturers operating primarily in areas such as aerospace, automotive, textiles and electronics serve the market and are delivering the product innovation that is helping to transform the [medical] sector.' [48]

Whilst this may make the drugs more expensive than those manufactured in China or India, it would be a more sustainable supply and environmentally conscious.[49] The possibilities for **reshoring** within medicine and pharmaceuticals is notable and desirable.[50] **Shortages of key medicines** like paracetamol occurred during the pandemic since, like many other drugs, several of its components are made or manufactured in China or India. **Supply chain disruption** meant that the UK struggled to get hold of paracetamol and many more key medicines during the pandemic.[51] There are other reasons to reshore medicine production as well. The UK can produce medicines in an **environmentally sustainable way**, and the Midlands can utilise its drug development expertise to **create custom or small batch pharmaceuticals**. **Green chemistry**, the efforts of manufacturers to minimise or eliminate the use and production of hazardous substances and to develop safer, more resource-efficient molecules, materials, products and processes, would allow the sustainable development of drugs in the Midlands.[52]

One area of potential growth for the region is in **defence and trauma medicine**, which is under-explored within the Midlands Engine. This is a specialised branch of the medical field, which transfers military innovations into civilian medicine through military, academic and business partnerships. Defence medicine was supported by **only 18% of MedTech businesses**, suggesting significant room for growth.[53] The region also has rehabilitation and trauma facilities, such as **NIHR Trauma Management MedTech Co-operative** and the Loughborough-based Stanford Hall Rehabilitation Estate which hosts the **UK's Centre of Excellence for Rehabilitation and Defence Medicine** and centres for both defence and civilian care and rehabilitation.[54] This significant research and academic capability could be better utilised by manufacturers in the region to expand their market share of defence and trauma medicine and care.

As **5G connectivity and wearable tech** develops, there will be increasing opportunities for the Midlands Engine to capitalise on both its digital and medical sector strengths to lead in digital health. 5G is still being rolled out across the region, and apps utilising its improved connectivity are **still in development**, meaning that many of the possibilities of the technology have not yet been realised.

Single use medical equipment has become a greater concern during the pandemic, but single use items are common across the sector. Many orthopaedic devices are currently single use, for example, meaning there are opportunities to find sustainable and safe **reusable alternatives** to **reduce waste**.[55]

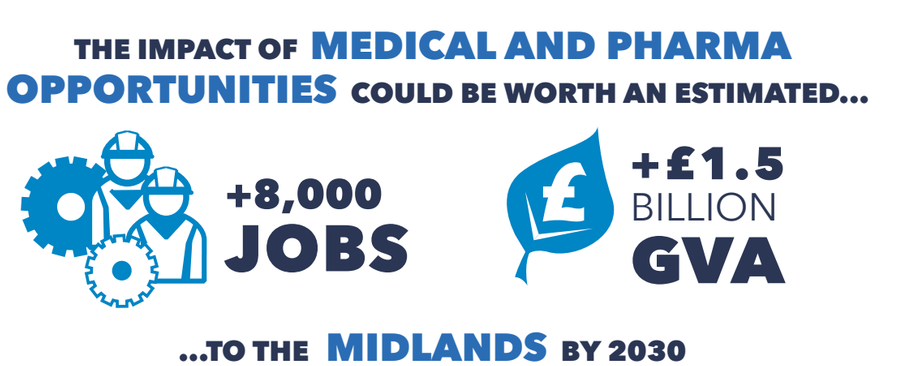
[41] Regeneris Report (midlandsinnovation.org.uk) Midlands MedTech Sector Analysis
[42] Pioneering robotic-arm assisted surgery at The Royal Orthopaedic Hospital (roh.nhs.uk); Tech and Creative Pitchbook, West Midlands Growth Company
[43] Regeneris Report (midlandsinnovation.org.uk) Midlands MedTech Sector Analysis
[44] Midlands Engine Health, Feb 2021
[45] Regeneris Report (midlandsinnovation.org.uk) Midlands MedTech Sector Analysis
[46] BHP Centre for Regulatory Science and Innovation – Birmingham Health Partners
[47] The West Midlands PPE Collective | AHSN Network Innovation Exchange (ahsninnovationexchange.co.uk)
[48] Regeneris Report (midlandsinnovation.org.uk) Midlands MedTech Sector Analysis
[49] https://www.theguardian.com/commentisfree/2020/mar/19/will-coronavirus-lead-to-drug-shortages-for-the-nhs
[50] https://www.theguardian.com/business/2020/may/10/bring-drug-manufacturing-to-uk-nhs-mps
[51] https://www.theguardian.com/commentisfree/2020/mar/19/will-coronavirus-lead-to-drug-shortages-for-the-nhs
[52] https://www.themanufacturer.com/articles/uk-chemical-manufacturing-the-element-of-success/
[53] Regeneris Report (midlandsinnovation.org.uk) Midlands MedTech Sector Analysis
[54] ME-Health-Focus_Trauma.pdf (midlandsengine.org)
[55] Regeneris Report (midlandsinnovation.org.uk) Midlands MedTech Sector Analysis

MIDLANDS ENGINE MANUFACTURING OPPORTUNITIES NOVEMBER 2021

What Could be Made in the Midlands?[56]

The table shows some of the developments that might take place within MedTech and Pharmaceuticals, and how these relate to possible opportunities and impacts.

Area	Capability	Opportunity and Potential 2030 Impact
Digital	Wearable health devices	- Utilising 5G and medicinal expertise - Becoming a leader in digital health care
	Sensors	- Cross sector supply chains and increased diagnostic capability - improving supply chains resilience and diversity
	3D printing and robotics	- Improving patient care - Healthier population – 2017-19 healthy life expectancy in ME 1.9 and 0.9 years below national average for women and men respectively
Defence and Trauma Medicine	Care and rehabilitation	- Utilising academic and research expertise - Becoming a leader in defence and trauma medicine
	Defence innovation products	- Bringing new products to market
Covid-19	PPE and respiratory equipment	- New markets and products for some firms - Improved supply chains resilience and diversity
Cross-sector	All medical equipment and devices	- Utilising manufacturing abilities of other sectors to serve medicine and pharmaceuticals
Sustainable Medicine	Sustainable/ reusable (orthopaedic) devices	- Developing new devices with international markets - Reducing waste and environmental impact, global leader
Pharmaceuticals	Drug pathway development	- Utilising existing skills and expertise to improve drug delivery
Auxiliary	Regulatory science	- Developing new drugs alongside digital monitoring and creation of new policy
	Big Data	- Utilising new data sources and improved connectivity to better diagnose and care for patients - Improved diagnosis and care, healthier population



[56]Data from Midlands Engine Observatory Health Sector Slides and Observatory Sources, Regeneris Report (midlandsinnovation.org.uk)

3.4 Low Carbon Goods

Current Expertise

The Midlands has a range of low carbon companies, ranging from SMEs to large businesses who have an interest in making or supporting low carbon goods. Low carbon supply chains encompass a variety of sectors, with extensive sub-sectors in **hydrogen, fuel cells and electric vehicles**. However, there are also significant sub-sectors in a variety of other energy generation methods, such as **nuclear, wind** and **solar**. There is substantial room for growth and export of low carbon technology produced in the Midlands.[57]

There is a significant hydrogen cluster, with the region producing **hydrogen fuel**, **hydrogen vehicles** and hardware needed to utilise **hydrogen as a fuel source**. **Bosch** makes hydrogen boilers and **ITM Power** works on products that generate hydrogen gas. There are significant opportunities for Midlands manufacturers to use diversify their cutting-edge developments into wider commercial uses, whilst still driving innovation. The Midlands Engine is currently developing a regional Hydrogen Strategy to ensure that the opportunities are not missed.

Across the region, there are a variety of **real-life test beds** for green and low carbon technology. These are essential if new technologies are to be commercialised. **Project SCENe** in Nottingham is a community energy scheme which enables residents to generate, store and use solar electricity.[58] **Tyseley Energy Park** provides access to multiple low and zero carbon fuels, allowing hydrogen and electric vehicles to run on the region's roads, and undertakes research and innovation into clean technology.[59]

The region has expertise in fuel cell technologies, particularly in lithium batteries for electric vehicles. **Toyota**, **JLR**, **Aston Martin**, **BMW and Tata Motors** all have a presence in the region, with the West Midlands having a particular heritage in the automotive sector. SMEs also provide a core part of the regions low carbon infrastructure with **Fenix Battery Recycling** in Willenhall leading the way in battery recycling and reprocessing.[60]

Opportunity Areas

The region's manufacturers can capitalise on the **region's universities**, **industrial expertise** and **clusters in hydrogen**, **electric vehicles**, **solar and wind**, and the current manufacture of **electrical components** to make the most of future opportunities. Whilst there is some regional variation in specialisation, with the West Midlands focusing on **electric vehicles** and the East Midlands on **tidal and wave power** due to its coastline, there are significant opportunities across the region. Opportunities reflect the government and the regions commitment to Net Zero. Since the region has expertise across a range of low carbon supply chains, it is well placed to capitalise on a variety of changes and opportunities, making the sector more resilient. The sector itself is **fast growing, exportable and scalable**.

SMEs have the opportunity to recover from the effects of the pandemic in a more **environmentally conscious** way. New reserach shows that the majority of SMEs **value the environment above profit**, reflecting a move in business and consumer sentiments towards more sustainable products and production. **Training and investing in new manufacturing processes** are essential to allowing SMEs to combat their environemental impact, and thrive as a business. **Research and innovation and government incentives** such as subsidies will also support the greening of all the region's SMEs.[61]

The Midlands is a **hydrogen hub**, with **extensive expertise and research** in this area across the region's industry and universities.[62] This builds on the region's **heat pump** manufacturing capability, as exemplified by **Vaillant**, which may be an opportunity as the government continues to roll out its **retrofitting** of fuel inefficient homes, increasing the demand for heat pumps and enacting green measures in new homes.[63] The Government's Ten Point Plan sets out a place for hydrogen in the UK's future, making the region's expertise critical.[64] This includes **hydrogen fuelled cars**, with the universities of Loughborough

[57]Midland Energy Hub Regional Report Low Carbon Environmental Goods and Services Market Snapshot, March 2021, kMatrix_LCEGS_MEH_Regional_Final_Report_March_2021.pdf (sustainabilitywestmidlands.org.uk)

[58]Ten Point Plan for Green Growth | Midlands Engine

[59]Midlands Low Carbon and Environmental Goods and Services (LCEGS) Sector Study Milestone 6: Recommendations Report Recommendations-Report-25.03.21.pdf (energyservices-ncc.co.uk)

[60]Ten Point Plan for Green Growth | Midlands Engine

[61] https://www.businessleader.co.uk/how-the-pursuit-of-sustainability-can-drive-growth-for-smes/130823/

[62]Midlands Low Carbon and Environmental Goods and Services (LCEGS) Sector Study Milestone 6: Recommendations Report, here

[63]Ten Point Plan for Green Growth | Midlands Engine

[64]The Ten Point Plan for a Green Industrial Revolution (HTML version) - GOV.UK (www.gov.uk) (accessed 23/06/2021)

and Birmingham undertaking some of the leading research into **hydrogen fuel cell manufacturing**. The region has potential to become a leader in the manufacturing of hydrogen fuel cells. The University of Birmingham has developed the **UK's first practical hydrogen powered locomotive** and hydrogen driven trains. Both innovations can remove damaging diesel and petrol transportation from the region. This research is aided by the **National Centre for Doctoral Training in Fuel Cells and their Fuels**, which is a project between the universities of Birmingham, Nottingham, Loughborough, Imperial College and University College of London.[65]

Nuclear power will be a growing opportunity for the region as the country continues to move away from fossil fuels. The region holds a significant proportion of the **nation's nuclear skills base**, particularly in Derby which is home to Rolls-Royce's SMR programme and a branch of the Nuclear Advanced Manufacturing Research Centre. Through both **modular nuclear plants and nuclear fusion**, alongside other significant developments in wind like the ABLE Marine Energy Park and Hornsea Two, the region has an increased roll to play in energy generation for the nation.[66] Nuclear power generation, power stations, and some other other manufacturing plants can be made safer through the use of digital systems, robotics and other remote technologies that allow humans to stay out of danger.

The Midlands Engine also can lead the way in utilising **digital technology** to better manage energy and energy usage. National Grid has invested **£7bn up to 2026 to get to carbon zero by 2025** and is facilitating innovation in **ultra-rapid electric vehicle charging** at motorway services. With the growth of digital technology, **HS2** will aim to reduce emissions by tracking and reducing delays. The region already makes a range of **sensors and electrical components**, reducing the cost of creating and using these systems within the region.[67] A highly efficient power and water grid managed by digital systems will reduce energy waste and improve efficiency.

The growth of **electric vehicles** is necessitated by the government's ban on the sale of new internal combustion engine vehicles by 2030.[68] The Midlands is well placed to supply the domestic market with electric and hybrid cars due to the presence of JLR and Rolls Royce, alongside the goods vehicle manufacturer JCB. The £130 million **UK Battery Industrialisation Centre (UKBIC)** near Coventry will focus on the large-scale manufacture of batteries, as part of the nationwide scale-up of UK battery manufacturing.[69] **Recycling and repurposing batteries** at the end of their life would help make the region a leader in **circular economy** practices and help overcome supply chain challenges in getting rare materials.[70] This will make the supply chains more **resilient** to international shocks.

The region has subsidiary manufacturing that would also benefit from the development of low carbon supply chains. The manufacturing of generic **electrical components and sensors** will contribute to the development of **smart, efficient power and water networks**, as well as integration and management of specific energy supplies such as wind and solar.[71] This means that these industries can keep the carbon in their supply chains down by using regional suppliers for some components.[72] The manufacture of **pumps and boilers**, both for heat and gas, also have multiple uses as they can be utilised for heat pumps and hydrogen.

Critically, relieving high intensive energy users of uncompetitive energy costs will be important for **providing capacity for investment** in low carbon manufacturing processes.

[65] Midlands Hydrogen: Research Capabilities and Commercial Activities (era.ac.uk)

[66] Ten Point Plan for Green Growth | Midlands Engine

[67] Opportunities for Our Greater Lincolnshire Supply Chains, March 2012, Microsoft Word - supply chains report June 2012.doc (greaterlincolnshirelep.co.uk)

[68] Government takes historic step towards net-zero with end of sale of new petrol and diesel cars by 2030 - GOV.UK (www.gov.uk) (accessed 23/06/2021)

[69] Ten Point Plan for Green Growth | Midlands Engine

[70] Towards net-zero: Exploring the current state of low carbon supply chains in the Midlands, here

[71] Opportunities for Our Greater Lincolnshire Supply Chains, March 2012

[72] Ten Point Plan for Green Growth | Midlands Engine

What Could be Made in the Midlands?[73]

The table shows the developments that might take place in the Midlands Engine to meet higher demands for low carbon goods, and the impact this has on the economy and the environment

Area	Capability	Opportunity and Potential 2030 Impact
Wind **Energy management** **Smart grids** **HS2 tracking**	Control systems development	- Higher demand for electrical components, sensors, and expertise - Better energy management and efficient use - Consumers could save >£1b a year by 2030 through smart energy management
Hydrogen	Hydrogen pumps, boilers Hydrogen vehicles – trains, buses, cars, excavators Hydrogen generation	- Development of the region as a national leader in hydrogen technology
Electric Vehicles and batteries	Batteries – production and recycling	- Leader in circular economy, supporting SMEs, Coventry Gigafactory - Diverse supply chain, more jobs, regional production, reduce greenhouse gas emissions
	Car and battery components	- Higher demand for generic components - Lower carbon emissions in supply chain, supporting region, up to an additional 11,500 jobs by 2050
Wind **Solar** **Nuclear** **Biomass and Anaerobic digestion**	Energy generation	- Increased demand in a diverse range of energy sources to meet future need

THE IMPACT OF LOW CARBON OPPORTUNITIES COULD BE WORTH AN ESTIMATED...

+39,000 JOBS

+£4.2 BILLION GVA

...TO THE MIDLANDS BY 2030

[73] Statistics from Ten Point Plan for Green Growth | Midlands Engine, kMatrix_LCEGS_MEH_Growth_Forecast_Final_Report_March_2021.pdf (sustainabilitywestmidlands.org.uk)

3.5 Advanced Metals and Materials

Current Expertise

With technical knowledge and practical know-how in designing, validating, producing, and servicing new products and industrial processes, the Midlands remains the **UK's leading region for 'making things'**.[74] This craftmanship is integrated across an increasingly diverse range of sectors and markets, refcting **flexible and robust supply chains** – particularly in the manufacture and supply of advanced metals and materials.

Advanced metals and materials provide critical inputs to sectors such as **automotive, aerospace, construction, nuclear, retail and healthcare**. They are often **hidden, niche or specialist components** but are hugely important to the everyday products we use and the infrastructure we enjoy. It is no accident that strong clusters of advanced manufacturing sectors exist in the region, given the excellent and historic supply chain base of metals and materials.

Nationally and internationally important clusters are present in the Midlands. For example, the **ceramics industry in Stoke-on-Trent / Staffordshire**, including cutting-edge R&D from Lucideon, a materials technology company that has developed the application of ceramics across industries – such as barrier coatings for aircraft engines and ceramic electrodes as an alternative to Lithium batteries.[75] Additionally, there is a concentration of **metals manufacture and treatment in Birmingham and the Black Country** and a major **textiles cluster in Leicester** – particularly associated with knitting and jersey production technologies.[76] Leicester and Leicestershire is the UK's fourth largest textile and fashion cluster outside London, with job creation and GVA growth occuring at a faster rate than anywhere outside the capital.

The Midlands' significant industrial and research capacity supports the regional response to major shifts in manufacturing towards **digital integration ('Industry 4.0') and the circular economy**. The High Value Manufacturing Catapult is based in the region, as are two of its Centres at **Warwick Manufacturing Group (WMG) and the Manufacturing Technology Centre (MTC).** These are complemented by universities with globally significant manufacturing and engineering competence, including **Nottingham's Precision Manufacturing Centre** and the **Centre for Circular Economy and Advanced Sustainability at Aston University**.[77]

Opportunity Areas

The **circular economy – recycling, remanufacturing and reuse** – is now critically important in manufacturing and creates new opportunities for value generation. Given its industrial concentration, this represents a challenge and an opportunity for the Midlands to drive **industrial decarbonisation**. The most carbon-intense metals and materials activities, the manufacture of basic iron, steel and ferro-alloys, rubber and plastic products and aluminium, should be seen as key targets for driving decarbonisation rather than industries that are opposed to it. This is at the heart of the **Repowering the Black Country project**.[78]

Industrial symbiosis, the process by which waste or by-products of an industry or industrial process become the raw materials for another, can be maximised with co-location of industries and creation of sharing platforms. The West Midlands was already home to one of the first pilot projects under the **National Industrial Symbiosis Programme (NISP)**, reflecting the opportunity. Additionally, **industrial sheds and warehouses can be transformed into sustainable powerhouses**; potentially trialled at premises like Tyseley Energy Park in Birmingham.[79]

[74]Midlands Engine Science and Innovation Audit, here
[75]MICG Advanced-Ceramics-Sector-Profile.pdf (micg.org.uk)
[76]The-Final-Alliance-Project-Report-Oct-2012-to-May-2017.pdf (ltma.co.uk)
[77]Midlands Engine SIA / WMCA Circular Economy Roadmap
[78]Repowering the Black Country (blackcountrylep.co.uk)
[79]WMCA Circular Economy Roadmap

Investment by **National Grid**, a Midlands-based organisation, presents a nationally significant supply chain opportunity. Its Electricity Transmission Business Plan outlines billions of pounds worth of investment that Midlands advanced metals and materials suppliers can capitalise on. For example, **£905m worth of investment in overhead lines (e.g. conductors, fittings, towers), £862m in underground cables & tunnels and £328m in transformers and reactors**.[80]

This provides evidence of one market in which metals and materials provide a range of precision components for larger products and industries. A major market for Midlands suppliers in this regard is **transport technologies**. Driven by the 'greening' transport agenda, the **use of lightweight materials – high-strength steels, aluminium**[81] **and carbon fibre** – is increasing significantly in all transport industries and will continue to do so.[82] Given the rise of electric cars, automotive is a particular opportunity for these advanced metals and materials in addition **to composites and polymers for such aspects of car manufacturing as the body, chassis and powertrain**.[83] Reshoring will be essential to the future of the textiles industry and the green credentials of the industry. While the UK may not be able to make all the fabrics and fastenings it needs, the country and the region can manufacture sustainable fashion in future. Tax incentives for responsible companies such as B Corps and those who have a stringent observation of human rights would further support the sector.[84]

Reprocessing of metals, such as secondary lead into new lead, zinc and tin will grow globally, with opportunities to combine this with battery development. For example, **RECOVAS is a key WMG project in partnership with Oldbury-based EMR (European Metal Recycling), Bentley Motors, BMW and JLR** amongst others. The project **repurposes electric car batteries to develop the UK's first commercial scale recycling facility for automotive battery packs**. It aims to provide a standardised and reliable route for recycling and **repurposing lithium-ion car batteries** at a scale that can cope with the expected sales of EVs in the UK.[85] There is distinct opportunity to **re-shore manufacturing processes** for emerging markets, and organisations like the Centre of Excellence for Low Carbon and Fuel Cell Technologies (CENEX), based in Loughborough, will help Midlands firms **across the supply chain** bring these manufacturing innovations to reality.

Advanced ceramics are also applied to next generation transport solutions, such as the electric London Taxis made in Coventry – which are dependent on **improved battery technology that relies on advanced ceramics**. This is one of many ceramics applications identified by the Midlands Industrial Ceramics group. Others include ceramics as a **lightweight replacement for alloys in turbine engines, rocket parts in the space sector and artificial hips and teeth for healthcare**. The Midlands makes a substantial contribution to the nation's space programme beyond ceramics. In November 2020, the West Midlands was named as a space hub, ensuring that it recieves appropriate backing for investement in space companies. Initial mapping of the space sector in the Midlands is underway.[86] This includes an intial report by City-REDI on the current state of the space sector in the West Midlands.[87] Space developments will have technology benefits across all sectors through the development of improved sensors and satellite data. [88] Healthcare is also a sector for textiles firms to capitalise on, for example the development of **fabrics for wound and health care as well as medical and protective textiles**.[89]

[80]West Midlands Growth Company Low Carbon Pitchbook
[81]Regional factors enabling manufacturing reshoring strategies: A case study perspective (springer.com)
[82]Midlands Engine Science and Innovation Audit, here
[83]https://www.apcuk.co.uk/app/uploads/2020/11/Technology-Roadmap-Lightweight-Vehicle-and-Powertrain-Structures.pdf
[84] Cleaning Up Fashion Report, July 2021
[85]West Midlands Growth Company Advanced manufacturing pitchbook
[86] https://www.birmingham.ac.uk/news/thebirminghambrief/items/2020/11/the-west-midlands-and-outer-space.aspx
[87] https://www.birmingham.ac.uk/documents/college-social-sciences/business/research/city-redi/space-cluster/wm-space-cluster-strengths-assets-market-opportunities.pdf
[88] https://www.birmingham.ac.uk/documents/college-social-sciences/business/research/city-redi/space-cluster/wm-space-cluster-report.pdf
[89]Regeneris Report (midlandsinnovation.org.uk) Midlands MedTech Sector Analysis

Aggregate minerals, such as limestone, sandstone, sand and gravel are particularly concentrated in the East Midlands. According to the latest report, the East Midlands is the largest producing region of land-won aggregates.[90] This is a key resource for the **construction industry**, supporting the manufacture of concrete, housebuilding and infrastructure development. Investment in major projects such as HS2 and accelerated housebuilding can drive **growth in the minerals sector**, benefiting sustainable construction techniques.[91]

A major driver for sustainable, more efficient construction, is the use of **Modern Methods of Construction (MMC)**. For example, applying a broad range of **pre-manufacturing techniques** to the construction process, including in remote factories, near site or on-site "pop-up" factories. By improving quality, programme efficiency and reducing waste, these offsite techniques provide a tangible alternative to traditional construction – **conducive to zero carbon, safe and affordable housing**.

The West Midlands Combined Authority (WMCA) has outlined the emerging cluster opportunity of MMC, highlighting that manufacture and application of offsite homes is already occurring. The region, for example, is home to **Totally Modular**, manufacturers of the UK's first hydrogen homes. In the East Midlands, **Laing O'Rourke's Explore Manufacturing Centre in Worksop** is a pioneering 215 acre facility that is at the forefront of MMC, and the most modern concrete facility in Europe. Innovation in both **digital and greening technologies** is at the heart of this manufacturing application to construction, an opportunity area that will only grow in future – alongside other construction demands such as retrofitting.[92]

Across advanced metals and materials, a major underpinning opportunity is the **integration of digital technologies into manufacturing processes**. Transformational change within manufacturing will involve the integration of **intelligent machines, advanced analytics and highly skilled people's capabilities** to create highly productive and knowledge-based manufacturing systems.[93] **Machine learning** will allow companies to do more with their data, optimising everything from materials sourcing to process adjustments and predictive maintenance. While **robotics, automation and additive manufacturing (3D printing)** will support the continuation of efficient, quality supply to major industries. Increased digitisation of supply chains is likely to lead to changes in freight and logistics as tracking and autonomous vehicles change the goods move. Four of the UKs fice primary rail freight routes run through the Midlands, and 80% of all freight, making the region well-placed to be part of the digital freight revolution.

This will go alongside, rather than against, **process and capability innovation** in Midlands firms; for example, boosting **injection moulding proficiency** and thus widening the pool of potential markets to supply. While traditional or foundational industries such as metals and materials are often reported to have poor levels of innovation,[94] the Midlands' **innovation support ecosystem is very strong**; providing firms of all sizes the opportunity to **boost their capabilities and become digitally-enabled within the fourth industrial revolution**.

[90] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1008931/AM2019_National_Collation.pdf

[91] Derbyshire County Council, Derby City Council and the Peak District National Park Authority (2020): Local Aggregate Assessment 2020; Available here

[92] WMCA: Roadmap for Advanced Manufacture in Construction; Available here | https://totallymodular.co.uk/2021/03/02/totally-modular-building-britains-first-hydrogen-homes/ | https://constructingexcellence.org.uk/explore-manufacturing-excellent-example-of-manufacturing-in-construction/

[93] Midlands Manufacturing Resilience Commission, Manufacturing Confidence, here

[94] https://www.ukri.org/news/research-shows-potential-for-innovation-in-the-uks-foundation-industries/

What Could be Made in the Midlands?[95]

The table below shows some of the existing opportunities and how regional capabilities could support the regions' ability to maximise these opportunities.

Area	Capability	Opportunity	Potential 2030 Impact
Metals	Lightweighting – aluminium, high strength steels, carbon fibre	Increased demand for aluminium, high strength steels, carbon fibre	£1.3bn GVA and 25,000 jobs
	Metal's reprocessing	Increased demand, e.g. secondary lead into new lead, zinc and tin	
	Energy grid infrastructure	National Grid global chain spend totals £5bn per year, including conductors, fittings, towers, transformers	
Advanced Materials (Ceramics, Plastics etc)	Industrial Symbiosis	Building on national pilot location & exploring sustainable powerhouses	£900m GVA and 17,250 jobs
	Advanced ceramics	Multiple applications of ceramics as a lightweight material: space, medical, transport	
	Composites and polymers	Lightweighting across industries, including car body, chassis & powertrain	
	Modern Methods of Construction	Applying manufacturing techniques into construction, harnessing offsite technologies.	
Textiles	Fabrics for wound and health care	Application to wound / health care, and protective textiles	£420m GVA and 7,250 jobs
	Sustainable fashion & circular economy	Reshoring of ethical manufacturing & re-use	
Cross-Cutting	Injection moulding	Raising capabilities for application across different metals and materials	
	Digital technologies: robotics, 3D printing machine learning etc.	Using digital to drive more efficient, quality processes & product delivery	

[95] Layout 1 (ukmetalscouncil.org), The-Final-Alliance-Project-Report-Oct-2012-to-May-2017.pdf (ltma.co.uk)

4. SUMMARY AND CONCLUSIONS

There are numerous opportunities for the Midlands to diversify and adapt the products and sectors that are already thriving to meet new challenges and capitalise on new technologies. Drawing on the academic expertise across our region's universities and the capabilities of our manufacturers, the region can remain the workshop for the world. Green practices, digital integration, and the ability to capitalise on the expertise in the region's universities and innovation are significant areas of growth.

Low Carbon practices, such as reshoring, circular economy, and recyclability will become increasingly important as the nation moves towards a greener future. Reshoring is an essential development across textiles, medicine, and electric battery manufacturing, which will also help increase supply chain resilience, counterbalancing ongoing freight disruption. Greener materials and increased recyclability, reprocessing, and reusability will be necessary across both food and medical sectors. We also need to utilise the resources available in the region, from roof tops for growing food to aggregates in Derbyshire. Lightweighting and low carbon transport will be areas of significant growth.

Low carbon energy production will be a sector of growth for the region. Building on our current regional manufacture of hydrogen and hydrogen-powered devices from heating systems to trains, nuclear, wind, biomass and fuel cells for alternatives to internal combustion engines, the region will continue to develop new technologies. This may include hydrogen pumps, hydrogen generation, hydrogen vehicles, and hydrogen fuel cells.

Digital technologies have the potential to change the way manufacturing occurs takes place through sensors and automation. From satellites in farming to automated production, digital will create greater efficiencies, monitoring and reducing energy use. The use of digital will connect companies, increasing supply chain resilience. Wearable medical trackers for health indicators and sensors in food packaging to alert consumers to the safety of a food would allow for better healthcare and reduced food waste respectively.

The region's manufacturing sector will continue to draw on the Midlands abundant academic expertise. This includes training centres ranging from Fuel Cells to farming, and research in areas as diverse as rail technology to rehabilitation and defence medicine. The Midlands Engine hosts many manufacturers that are leaders in their field, which potentially allows them to undertake cross-sectoral manufacturing. Be it digital, fibre lasers, or ceramics for space, the region can utilise the range of expertise and the geographic cluster to find potential opportunities.

The Midlands Engine has a lot to gain from capitalising on each of the opportunities laid out above. In total, it could be worth 165,000 jobs and £13.7 billion GVA by 2030. The biggest economic growth could lie in Low Carbon Goods, which could bring in £4.2 billion GVA by 2030. Advanced Metals and Materials has the potential to add the highest number of jobs, standing at 49,000 by 2030. Up to 25,000 of these could be within metals alone. However, to capitalise on this, the region needs to ensure that its residents have the right skills and training to undertake these new jobs. The Midlands also needs to ensure that these jobs withstand growing automation and reflect the changes that will likely take place in society as a result. This includes addressing the structural issues around the EU Exit, as well as the disruption caused by COVID on global, regional, and national supply chains. However, the region has considerable potential for growth.

The future of Midlands manufacturing looks bright indeed.

APPENDIX 1

ASSETS MAPPING

Name	Description	Sector	Location
5PRING	Innovation using new 5G technologies	Digital	West Midlands
ABLE Marine Energy Park	Bespoke port facility for offshore wind	Low Carbon Goods	River Humber
Academic Health Science Networks	Helps accelrate the adoption of innovation in medicine and healthcare	Medical and Pharmaceuticals	East and West Midlands
Adelan	Global leader of solid oxide fuel cells for portable systems	Low Carbon Goods	Birmingham
Advanced Manufacturing Building (AMB)	Using AI, collaborative robotics and material science to secure future regional maufacturing	Advanced Metals & Materials	Nottingham
Advanced Manufacturing Park - Nuclear AMRC	Helping UK Manufacturers win nuclear sector work, combining academia with industry	Low Carbon Goods	Derby
Advanced Propulsion Centre	Making the Uk a centre of excellence for low carbon propulsion technology, strong industry links	Next Generation Transport	University of Warwick/ Coventry
Agrocology, Water, and Resilience	Develops and intergrates new knowledge in social, agroecological, hyrological and environmental processes	Future Food and Drink	Coventry University
Aston Brain Centre	Develop translational applciation of neurophysiological research for clinical services	Medical and Pharmaceuticals	Aston University
BioCity Nottingham	Health care business incubator facilities	Medical and Pharmaceuticals	Nottingham
Birmingham Centre for Railway Research and Education	From training engineers to develping world-leading technologies , utilising industry and academia	Next Generation Transport	Birmingham
Birmingham Life Science Park	Due to open 2023, utilsing academic and clinical strengths, encouraging investement, accelerate life science research and application	Medical and Pharmaceuticals	Univeristy of Birmingham
Caterpillar Innovation and Research Centre	Partnership of academia and industry to discover and develop new processes and components	Low Carbon Goods	Loughborough University
Centre for Advanced Low Carbon Propulsion Systems	Working with populsion system supply chain, most advanced test facility of its kind in the UK	Low Carbon Goods / Next Generation Transport	Coventry University
Centre for Circular Economy and Advanced Sustainability	Addresses global challenges imposed by climate change through research that provides practical answers to sustainability problems	Advanced Metals and Materials, Low Carbon Goods	Aston University

Name	Description	Sector	Location
Centre for Healthy Ageing (ARCA)	Understanding, predicting and preventing age-related degeneration	Medical and Pharmaceuticals	Aston University
Centre for Postdoctoral Development in Infrastructure, Cities, and Energy	Building and advancing skills necessary to support infrastucture and energy sectors to progress towards net-zero by 2050	Low Carbon Goods	Univeristies: Aston, Birmingham, Keele, Leicester, Leeds, Loughborough, Warwick. Also: The Alan Turing Institute, MTC
Centre for Regulatory Science and Innovation	Neutral body to support the development and delivery of novel theraputics and medical devices through advanced regulatory standards and tools	Medical and Pharmaceuticals	Birmingham
Centre for Supply Chain Innovation in Transport Engineering	Focused on technology innovation, system improvement, and proces re-engineering	Advanced Manufacturing and Materials	Derby
Centre of Excellence for Low Carbon and Fuel Cell Technologies (CENEX)	A non-profit through which UK capabilities can be showcased and can engage with emerging technologies and industy issues	Low Carbon Goods	Loughborough Univeristy
Centre of Excellence for Modern Construction (CEMC)	Lain O'Rourke offsite factory producing modular apartments, the most automated concrete facility in Europe	Advanced Metals & Materials	Nottinghamshire
Ceramic Valley Enterprise Zone	Driving economic growth and securing the region's reputation as a major centre of manufacturing expertise	Advanced Metals and Materials	Stoke-on-Trent and Staffordshire
Clinical Simulation Centre	A unique facility that trains clincial staff	Medical and Pharmaceuticals	Coventry University
DIME Project	Identifying digital innovations and technological developments to enable the region to change, connect, and identify gaps	Digital	Loughborough University
Drug Discovery, Delivery and Design	Pre-clinical drug discovery and development, identifying novel drug targets, and new methods of delivery	Medical and Pharmaceuticals	Univeristy of Lincoln
East Midlands Centre of Excellence in Satellite Applications	Links business and academia with development capacities, creating partnerships, boosting eonomic growth	Advanced Manufacturing and Materials	University of Leicester
Energy Innovation Zones	Foster clustering around new energy system appraoch, decarbonsising, attracting investement	Low Carbon Goods	Black Country; Tyseley and Birmingham; UK Central; Coventry & Warwickshire

Name	Description	Sector	Location
Energy Research Accelerator	Funded by Innovate UK to invest in new energy technologies	Low Carbon Goods	Midlands
Energy Systems Catapult	Accelrating the transformation of the UK's energy system and ensure businesses and consumers capture the opportunities of green growth	Low Carbon Goods	Birmingham, Derby
Environmental Sustainability Research Centre	Provides academics, government, industry and business the ability to contribute to urgent global channges in climate change and sustainable development	Low Carbon Goods	Derby
European Metal Recovery	Cutting edge leader in recycling including industry waste, vehicles, boats, and trains	Advanced Metals and Materials	Oldbury
Food Enterprise Zones	Allows farming and communities to more easily access investement whilst protecting the countryside	Future Food and Drink	Europarc, Central Lincolnshire and Holbeach in Lincolnshire; Melton Mowbray in Leicester and Leicestershire; the Vale of Evesham in Worcestershire; and Ivel Valley Stratton Business Park in South East Midlands
Fuel Cells Group	Focused on the development, application, and demonstartions of fuel cell and hydrogen systems and technologies	Next Generation Transport	University of Birmingham
Future Mobility Zone	A way of testing new transport technology in a real-world environment	Next Generation Transport	West Midlands
Gas Turbine and Transmissions Research Centre	Develop new technologies, analysis methods, and understanding existing and new turbines	Low Carbon Goods / Next Generation Transport	Nottingham University
Harper Adams University - The Agricultural Engineering Precision Innovation Centre	Home to the National Centre for Precision Farming, it provides a hydraulics lab, research labs for tractors and machines, and a mechatronics lab	Future Food and Drink	Shropshire
Hereford Centre for Cyber Security (HCCS)	A testing facility for internet and global information grid research, facilitating the scientific use of cyber testing methods	Digital	Hereford
High Temperature Research Centre	Collaboration with Rolls-Royce to enable production-scale research and experimentation in advanced manufacturing	Advanced Manufacturing and Materials	University of Birmingham
High Value Manufacturing Catapult	The catalyst for the growth and success of advanced manufacturing, with 7 Centres	Advanced Metals and Materials	Warwick
Horiba Mira: Mira Technology Park, MIRA Technology Institute	Global Centre of Excellence pioneering engineering, research, and testing for automotive, defence, aerospace, and rail	Low Carbon Goods / Next Generation Transport	Nuneaton
Hornsea Two	A 1.4GW windfarm in the North Sea and will be the biggest offshore windfarm when complete	Low Carbon Goods	River Humber
Humber Seafood Institue	State of the art research facility with specialist manufacturing and processing facilities	Future Food and Drink	Grimsby
HyDeploy	Pioneering energy demonstration for blending hydrogen into the gas supply	Low Carbon Goods	Keele University
Hyperbat	Largest inependent vehicle battery system producers in the UK	Low Carbon Goods / Next Generation Transport	Coventry
Innovation Birmingham	Working with businesses across tech, creative, and manufacturing to stimulate collaborative cross-sector innovation	Low Carbon Goods / Next Generation Transport	Birmingham
Insitiute for Future Transport and Cities	Coordinates expertise across manufacturing, design, intelligence systems, and business across automotive, aerospace, maritime and rail	Next Generation Transport	Coventry University
Institute for Advanced Manufacturing and Engineering	Working on powertrain-related technologies	Advanced Materials and Manufacturing	Coventry University
Institute for Aerospace Technology	Bringing together global aerospace companies and aviation leaders with researchers to consider electrification, propulsion, and manufacturing	Next Generation Transport	Nottingham
Institute for Translational Medicine	Accelerating innovation, a central hub for trials , improving patient and healthcare system applications	Medical and Pharmaceuticals	Birmingham
Institute of Digital Health	Improving health and well being using innovatibe digital technologies	Medical and Pharmaceuticals	Univeristy of Warwick
Institute of Energy and Sustainable Development	Interdisciplinary research to support sustainable living through low carbon energy and infrastructuure	Low Carbon Goods	University of Birmingham

Name	Description	Sector	Location
Institute of the Motor Industry	The professional association automotive retail information, standards, and qualification	Next Generation Transport	Birmingham
Intelligent Energy	World leading fuel cell engineering company for automotive, stationary and unmanned aerial vehicles	Low Carbon Goods	Loughborough University
Keadby 2 Power Station	One of a kind, high efficiency gas-fired technology, expected to be the cleanest and most efficient gas-fire power station in Europe	Low Carbon Goods	Keadby
Laing O'Rourke	International engineering company in modern methods of construction	Low Carbon Goods	Darfoulds
Leicester Biomedical Research Centre	Links with industry, aims to translate scientific breakthroughs into diagnostics, preventions, and treatments	Medical and Pharmaceuticals	Leicester
Leicester Food Park	Provides space for manufacturing	Future Food and Drink	Leicester
Life Sciences Opportunity Zone, Charnwood Campus	Inspire discovery, encourage collaboration, and acclerate growth for MedTech and Biopharma	Medical and Pharmaceuticals	Loughborough University
Manufacturing Research Centre (MRC)	Providing a home for Nuclear AMRC Midlands, developing controls and instrumentation	Advanced Metals & Materials	Derby
Manufacturing Technology Centre - National Centre for Additive Manufacturing	Accelerate the uptake of additive manufacturing by developing the technology and systems required	Advanced Metals and Materials	Univeristies of Birmingham, Nottingham, Loughborough
Medical Devices Testing and Evaluation Centre (MD-TEC)	Supports business access to simulation and facilities	Medical and Pharmaceuticals	Birmingham
Midlands Cyber	Specialising in increasing security by design market, promoting sector growth and collaboration	Digital	Malvern, Worcestershire
Mondelez (Cadbury): Global Centre of Excellence for Chocolate Research and Development	Driving new prodcut development, new technologies, and bet practice	Future Food and Drink	Birmingham
National Automotive Innovation Centre	Bringing together the best of industry and academia to develop future vehicles and mobility solutions	Next Generation Transport	Warwick

Name	Description	Sector	Location
National Centre for Construction Excellence	Incorporations existing sites to make the Black Country a leader in construction, using drones and robotics	Advanced Metals & Materials	University of Wolverhampton
National Centre for Food Manufacturing	Offers part time and distance learning for food industry employees and innovation for businesses	Future Food and Drink	Holbeach
National Centre for Sports and Exercise Medicine	Translates research in sport, exercise, and physical activity into health outcomes	Medical and Pharmaceuticals	Loughborough University
National Centre for the Decarbonisation of Heat	Enable the rapid scaling up of manufacturing, skills, and deployment of heat solutions	Low Carbon Goods	University of Birmingham
National College for Advanced Transport and Infrastructure	High level training for rail projects including HS2 and Northern Powerhouse Rail	Low Carbon Goods	Birmingham
National District Heat Skills Academy	Training for students in collaboration with Swedish organisations in heat networks development	Low Carbon Goods	Stoke on Trent College
National Fluid Power Centre	UK's No. 1 training provider for Intergrated System Engineering, high level training facilities	Low Carbon Goods	Worksop
National Industrial Symbiosis Programme	The world's first national industrial symbiosis programme, running in 20 countries, practical applciation of industral symbiosis methodology, tools, and industrial delivery	Advanced Metals and Materials	Birmingham
National Transport Design Centre	Precision manuafacturing and 3D printing technologies	Low Carbon Goods / Next Generation Transport	Coventry University
NIHR Trauma Management MedTech Co-operative	Building expertise and capacity in the NHS to support the development of new medical technologies to care for trauma patients	Medical and Pharmaceuticals	Birmingham
Nottingham Biomedical Research Centre	Improving the health of those with common diseased like asthma and arthiritis through utilising medical innovations	Medical and Pharmaceuticals	Nottingham
Nottingham Clinical Research Facility	Delivering world class research in experimental medicine for adults and children	Medical and Pharmaceuticals	Nottingham

Name	Description	Sector	Location
Operations and Manitenance Centre of Excellence	National hub for offshore wind performance, catalysing innovation, technology, cross-sector collaboration and best practice	Low Carbon Goods	Grimsby
PathLAKE	Bringing together research and hospitals to create a national Centre of Excellence in AI pathology	Medical and Pharmaceuticals	Coventry and Warwickshire
Porterbrook	Partnered with Univeristy of Birmingham to produce UK's first hydrogen powered train	Next Generation Transport	Derby
Precision Manufacturing Centre	Helps companies create, develop and produce high value products through ultra precision equipment and expertise	Advanced Metals and Materials	Univeristy of Nottingham
Project SCENe (Sustainable Community Energy Networks)	Acclerate the adoption of community energy systems that provides locally generated heat and electricity	Low Carbon Goods	Nottingham
RDM Group	Working across autonomous vehicles, automotive, and aviation, including autoomous vehicles in airports	Next Generation Transport	Coventry
Real Time Adaptive and Predictive Indicator of Detioration (RAPID)	Using patient monitoring technology to allow early detection and response to clinical deterioration	Medical and Pharmaceuticals	Birmingham
Repowering the Black Country	Supported by UKRI to move the regions industrial areas towards zero carbon	Advanced Metals and Materials	Black Country
Research Strand - Drug Discovery and Design	Building on an existing strength to enhance the drug delivery process	Medical and Pharmaceuticals	University of Leicester
Severn Trent Water	State-owned water authority based in the Midlands and responsible for water supply management, waste water, and disposal	Low Carbon Goods	Midlands
Smart Energy Network Demonstrator	A European first, at scale environment for the generation, distribution, storage, forecasting and energy balancing across Keele University	Digital / Low Carbon Goods	Keele University
Southglade Food Park	Hosts start up and growing food companies	Future Food and Drink	Nottingham
Space Park	A cluster of collaborative community of industry, academics, and students, including research space	Advanced Manufacturing and Materials	University of Leicester
Stanford Hall Rehabilitation Estate - UK's Centre of Excellence for Rehabilitation and Defence Medicine	Combining regional resources for research, development, and innovation in rehabilitation treatment, teaching, and education	Medical and Pharmaceuticals	Loughborough University
Textile, Engineering and Materials Research Group (TEAM)	Multi-disciplinary research into improving material performance and processing	Advanced Manufacturing and Materials	De Montfort University
The Binding Site	Improves diagnosis and management of patients across cancers and immune system disorders	Medical and Pharmaceuticals	Birmingham
The Centre for Custom Medical Devices	Explores the full potential of additive manufacturing in medical devices sector	Medical and Pharmaceuticals	University of Birmingham
The Centre for Formulation Engineering	Finding economical and environmental solutions for the food, pharmaceutical, biotechnological, and consumer products and speciality products sectors	Future Food and Drink	Univeristy of Birmingham
The Energy and Bioproducts Research Institute	Overcoming the engineering and logistical challenges of a net-zero future	Low Carbon Goods / Next Generation Transport	Aston University
The EPSRC Centre for Innovative Manufacturing in Food	Maximising the imapct of innovative research, seeking a resource efficient and food secure future	Future Food and Drink	Univeristies of Nottingham, Birmingham, and Loughborough
The Food Refrigeration and Process Engineering Research Centre	Research areas include: refrigeration, decontamination, cooking, microwaves, and Computational fluid dynamics	Future Food and Drink	Grimsby
The Health Data Research Hub for Acute Care	Allowing innovative healthcare companies to develop, test, and deliver advances in clinical care in acute cases	Medical and Pharmaceuticals	University of Birmingham, PIONEER
The Health Data Research hub for Eye Health	Focus on eye health and wider health issues conencted to the eye	Medical and Pharmaceuticals	Birmingham
The Interdisciplinary Centre for Circular Chemical Economy	Creating new pathways to recover and reuse chemicals from end-of-life products	Low Carbon Goods / Advanced Metals and Manufacturing	Loughborough Univeristy

Name	Description	Sector	Location
The Lincoln Institute for Agri-Food	Home to a working farm with specialist research facilities including the use of AI, food manufacturing, and sustainability	Future Food and Drink	Lincoln
The Magnetic Materials Group	UK's only research group focussed on processing and recycling rare earth magentic metals	Low Carbon Goods / Next Generation Transport	University of Birmingham
The Medical Technologies Innovation Facility	Improving the quality of patient care by accelerating the development and commercialisation of innovative medical technologies	Medical and Pharmaceuticals	Nottingham
The National Centre for Doctoral Training in Fuel Cells and their Fuels	Creating a new generation of scientists and engineers in everything from chemistry to social science	Hydrogen, Low Carbon	Universities of Birmingham, Nottingham, Loughborough
The National Centre for Nuclear Robotics	State-of-the-art robotics, sensing, and AI technologies for hazardous environments	Low Carbon Goods	Univeristy of Birmingham
The Quinton Rail Technology Centre	UK's only privately owned rail testing site	Next Generation Transport	Stratford-upon-Avon
The Vehicle Technology Research Centre	Reseraching combustion engines and low carbon vehicle technology	Low Carbon Goods / Next Generation Transport	Univeristy of Birmingham
Tyseley Energy Park	Private and public site set to become the energy and waste nexus for Birmingham	Low Carbon Goods	Birmingham
UK Battery Industrialisation Centre	Provides the link between prototypes and large scale manufacturing of electric vehicle batteries	Next Generation Transport / Low Carbon Goods	Coventry
UK Central Hub	Economic area with significant infrastructure, also an Energy Innovation Zone	Low Carbon Goods	Birmingham
UK Centric Supply Chains project	Assisting companies from automotive to food to map, asses, and improve their supply chains and maximise UK content.	Sectors and Supply Chains	Aston Univeristy
UK Hydrogen and Fuel Cell Association	The oldest and largest pan UK assocaition dedicated to supporting stakeholders across the hydrogen sector and the fuel cell industry	Next Generation Transport	Various
UK Rail Research and Innovation Network	Creating a collaboration between academia and industry, encouraging innovation and accelerating new technologies	Next Generation Transport	Universities of Birmingham, Nottingham
Uniper Engineering Academy	Training provider across engineering, manufacturing and energy	Low Carbon Goods	Ratcliffe-on-Soar
Very Light Rail	Research and Development project using expertise to deliver innovative and affordable light rail	Next Generation Transport	Coventry
Very Light Rail Innovation Centre	Support the development and growth of the Very Light Rail industry	Next Generation Transport	Dudley
Warwick Crop Centre	Training and industry links in translational research in sustainable agricutlture, horticulture, and food security	Future Food and Drink	University of Warwick
Warwick Manufacturing Group	Part of the High Value Maufacturing Catapult, within University of Warwick, research includes energy, intelligent vehicles	Advanced Metals and Materials	Warwick
West Midlands Genomic Medicine Centre	Largest genomics lab hub in the country	Medical and Pharmaceuticals	Birmingham, Women and Children's Hospital
West Midlands PPE Collective	Collaborative project to respond to the shortage of PPE in the West Midlands	Medical and Pharmaceuticals	West Midlands
West Midlands Regional Energy Systems Operator	Exploring advantages of a new kind of energy systems at a city level	Digital / Low Carbon Goods	Coventry
Wolverhampton Cyber Research Institute	Covering security, AI, big data it works in collabortion with academic, industiral, and government bodies	Digital	Wolverhampton
Worcester Bosch	Manufacturer of boilers and developing hydrogen boilers	Low Carbon Goods	Worcester

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MIDLANDS ENGINE Observatory

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