

**Universities**



# Welcome to the West Midlands. The heart of the UK. The home of industry. The place to make your mark.

The West Midlands is undergoing a transformation. The birthplace of the industrial revolution is powering forward. Increased investment, strong growth and infrastructure improvements are driving the economy. And at the same time, our region is enjoying yet another cultural renaissance.

With a rich heritage of business and intellectual leadership, the West Midlands is home to three thriving cities: Birmingham, Coventry and Wolverhampton. Our region is flourishing as our economy expands, with a GVA growth rate of 20.2% over the last five years. The West Midlands' success is helping to drive forward the United Kingdom's growth.

The strength of the West Midlands is its diversity. It's home to the UK's youngest population and to leaders in the finance, life sciences, digital, automotive and aerospace sectors. No surprise, therefore, that international firms like HSBC, Deutsche Bank and PwC have also made their home in the West Midlands.





Our success story has an impact across the globe. Exports have increased by 16% over the last 12 months, and the West Midlands now has more Foreign Direct Investment Projects than Croatia, Norway or Greece. In fact, no other part of the UK outside London has created more jobs from international investment.

The next chapter in our story is just beginning.

Our population is predicted to grow by half a million over the next 20 years. To meet this new demand, major housing investment will deliver 215,000 new homes by 2031.

Our region has 2 million square feet of prime office space under development, and £3 billion in long-term infrastructure investment is transforming local and national transport connections. And when High Speed Rail arrives in 2026, travel times to London will be reduced to only 45 minutes.

Join us and make your mark.

-  15,000 life sciences companies and 7,400 medical graduates from our universities each year.
-  The heart of the UK's transport network, shaping the future of sustainable and intelligent travel.
-  World class university-led research in heating and cooling systems, fuel cell and battery technology.
-  12,200 tech companies supported by local universities at cutting-edge of AI and VR research.



# Universities in the West Midlands

**An internationally recognised academic community, world class research institutions, and boundless talent. The West Midlands universities are the source for discovery, innovation and technological development.**

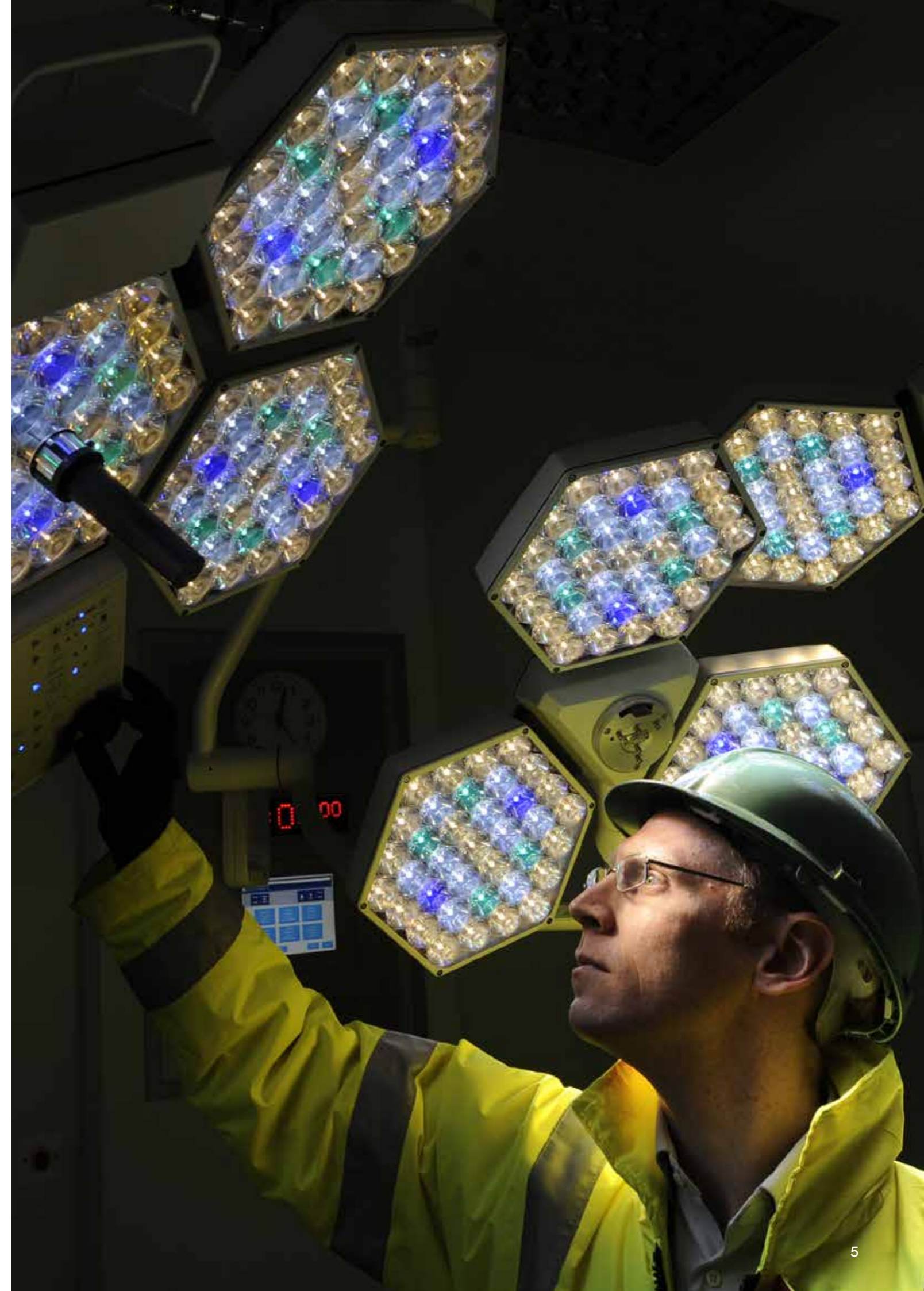
For centuries, the West Midlands has helped drive Britain forward and shape the world. It has always been an engine of growth and a catalyst for change, a magnet for inquisitive minds and commercial innovators. And as we move forward with ever increasing pace, our universities provide the acceleration.

West Midlands universities educate 150,000 students and produce more than 50,000 graduates each year. Working together, their individual research and innovation specialisms combine to secure our region's economic future.

Each university makes a vital contribution, offering leadership and game changing research in specialist fields. Whether it is Life Sciences, Tech & Digital, BPFs, Advanced Manufacturing or Food and Drink, our universities are researching, designing and building the technologies for the future. They provide the talent, innovation and passion that drive the West Midlands forward.

Rooted in the West Midlands, their impact and influence are global. The West Midlands universities are at the forefront of positive change: improving health, driving transport forward, storing energy, improving construction, advancing manufacturing, enabling entrepreneurs and making people's lives better.

**“The West Midlands’ universities are at the forefront of positive change.”**



# Think Beyond Data

Data is at the heart of every business. From medical technologies to logistics, construction to traffic management and from manufacturing to design, we can help you make better sense of your data.

Aston's experts are at the cutting edge of artificial intelligence thinking. From the relatively simple to the highly complex, a wide range of business problems can be represented in computing terms. Our algorithms can get to work finding solutions that meet your needs.

## Robotherapy

Robots are everywhere. But they've come a long way since the traditional production line model.

In the field of elderly care, Aston University is using machine learning to develop robots which can recognise a person's emotions based on their expressions and body language. Once the robot understands how they are feeling, it can adapt the way it interacts with them.

Human-robot interaction can also play a valuable role in child cognitive development and working with children with autism.

## Contact us

✉ [info@thinkbeyonddata.com](mailto:info@thinkbeyonddata.com)

🌐 [www.thinkbeyonddata.com](http://www.thinkbeyonddata.com)

## Mapping Behavioural Patterns

Being able to predict consumer behaviour is hugely important for any business.

Aston is looking at how machine learning can support tourism and outdoor events by predicting hotspots, mapping where more people will gather and which businesses are likely to benefit as a result.

**“In the field of elderly care, Aston University is using machine learning to develop robots which can recognise a person's emotions based on their expressions and body language.”**

## Key Facts



Aston University AI researchers are working with the NHS to predict how many ambulances they are going to need for specific days and in which locations.

Using human-centric sensors to measure people's heartbeat, blood pressure or temperature, patterns emerge that create early warning systems and predict if someone is going to have a heart attack in three days' time.

Aston is developing intelligent systems which are adaptable and flexible, able to perceive their environment, learn as they go along and make autonomous decisions.

# Healthcare Technologies Institute

The Healthcare Technologies Institute (HTI) is changing the landscape of healthcare. The Institute is striving to advance new technologies and treatments that encourage better tissue healing and rehabilitation tools.

The Institute brings together leading experts from a variety of disciplines across the University of Birmingham, including chemical engineering, biomedical science, computer science, applied mathematics, chemistry and physics.

This research supports the development of existing markets and stimulates new ones for small and medium sized Life Sciences businesses, enabling them to bring products to market quickly, at less cost with reduced risk.

From laboratory through to clinical trials, the interdisciplinary researchers are advancing bone structures and tissue regeneration, finding new methods of detecting brain injuries and cancers early, improving anti-scarring dressings and developing innovative, bespoke prosthetic devices.

Through this research, it will aid healing and make a difference to patients with debilitating conditions to ensure people are able to live longer, healthier and happier lives.

Research is conducted in collaboration with University Hospitals Birmingham NHS Foundation Trust (UHB), Medical Devices Testing and Evaluation Centre (MD-TEC) (funded by the European Regional Development Fund) and in partnership with Aston University, and other supporting partners.

**“From laboratory through to clinical trials, the interdisciplinary researchers are advancing bone structures and tissue regeneration.”**

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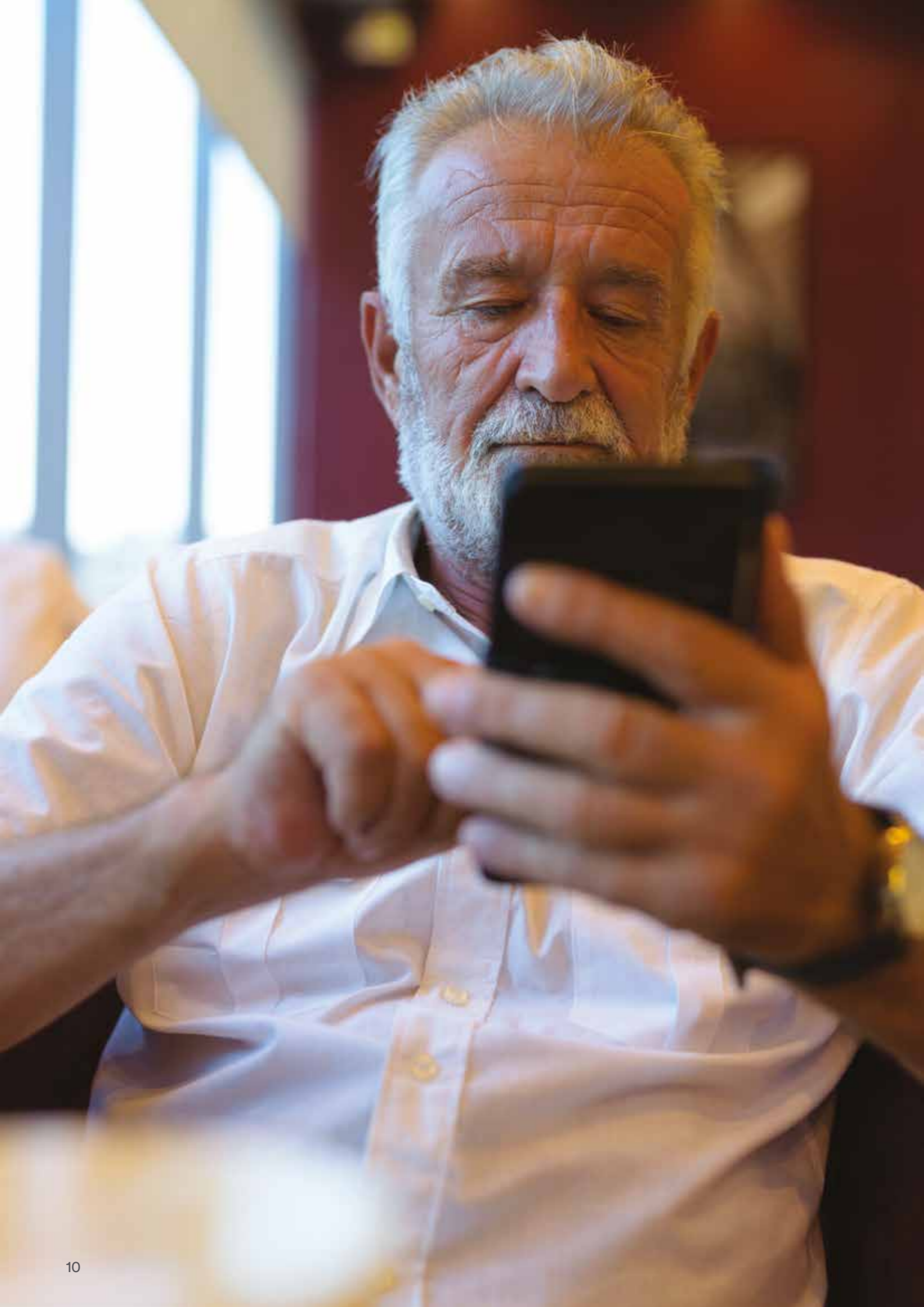
## Key Facts



University of Birmingham's research in to new models in bone structuring has potential application for future transplantation and bone defect replacement.

The project, funded by the National Centre for the Replacement & Reduction of Animals in Research (NC3Rs), also supports the reduction of the number of animals used for musculoskeletal research.

Recreating bone tissue in vitro (a process performed or taking place in a test tube, culture dish, or elsewhere outside a living organism), has been challenging to date because of its structural complexity and continuous remodelling. However, the new model simulates the construction of real bone for the first time by taking cells and putting them into a culture system that allows the cells to make, not only simple bones, but multi-layered constructions that are similar to tissues in the body.



# MATUROLIFE

## Intelligent Healthcare

The overall objective of the MATUROLIFE project is to put creative and artistic design at the heart of the innovation journey.

Design is coupled with innovative advanced materials to produce high added value, aesthetically pleasing and functional products for Assistive Technology (AT). The project's goal is to make urban living for older people easier and more independent. This ambitious project will bring together SMEs operating in the creative industries with scientists working on cutting-edge advances in Electrochemistry and Nanotechnology.

Through the involvement of SMEs in the materials supply chain, highly innovative, conductive, multifunctional smart textiles and fabrics will be developed to enable the production of novel AT prototypes.

The new emerging AT products will address current and future societal challenges to urban living for older people whilst assuring competitive and sustainable development of SMEs. This ambitious project brings together 20 partners: 11 SMEs from 9 EU countries, research technology development companies, non-government organisations and academics in a €6.0 million, 36 month project.

### Key Facts



Cutting-edge materials science: Electroless Plating, Nanotechnology and selective metallisation.

The MATUROLIFE project incorporates important elements of Emotional Design, Creative/Artistic Design and co-creation.

MATUROLIFE is delivering Clothing, Footwear and Furniture Prototypes.

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 [www.coventry.ac.uk/research](http://www.coventry.ac.uk/research)

# Bioenergy and Energy Systems Research

Bioenergy is a rapidly growing market with many benefits for business.

## Customers are looking for green suppliers

Today's consumers are more aware of the environment and the carbon footprint left by the purchasing choices they make. The use of bioenergy sends a powerful message to your customers.

## Bioenergy provides low-cost, green energy

The rising price of energy from traditional sources makes bioenergy a financially attractive proposition not only to major consumers such as factories, but also to other large businesses.

## Bioenergy can reduce your waste disposal costs

The bioenergy sector can offer businesses a profitable alternative to waste disposal costs by using commercial and industrial waste as feedstock for bioenergy plants.

## Bioenergy can be cost effective for businesses with high energy needs

If your business requires a lot of heat and electricity to power a large building then bioenergy could provide you with a cost-effective solution.

## Value from waste

Aston's European Bioenergy Research Institute (EBRI) brings together world-leading scientists and state-of-the-art facilities to offer industry partners the opportunity to develop the next generation of bioenergy and energy systems solutions.

Whether your business is a leading multinational or a micro-sized start-up, EBRI can provide you with a range of expertise and services.

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 @EBRI\_UK

 [www.aston.ac.uk/EBRI](http://www.aston.ac.uk/EBRI)

## Key Facts



The bioenergy sector is set to generate £12 billion of new market opportunities in the UK supply chain by 2020, combined with a £5 billion investment opportunity in energy recovery from waste after recycling.

The UK smart grid market is forecast to generate an estimated £13 billion of GVA, including £5 billion of potential exports to 2050 and 9,000 jobs by 2030.

Aston's Bioenergy Research Institute provides a wide range of business solutions including technology, business support, economic feasibility studies and a variety of tailor-made events for entrepreneurs and business leaders.




# National Centre for Brownfield Regeneration

The University of Wolverhampton will help tackle the housing shortage through its new dedicated Brownfield Research Centre.

The Brownfield Research and Innovation Centre (BRIC) will be located at the University of Wolverhampton Springfield Campus and will play an integral role in the process of developing former industrial sites in the Black Country so that home can be built on them.

The Centre will become a Black Country portal and centre of market intelligence for Brownfield regeneration, land remediation, providing expertise in building heritage, conservation and façade retention.

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 @wlv\_uni  
 [www.wlv.ac.uk/springfield](http://www.wlv.ac.uk/springfield)

### Key Facts



The Brownfield Research and Innovation Centre (BRIC) will provide innovative solutions, advice and guidance on how brownfield sites can be brought back into use.

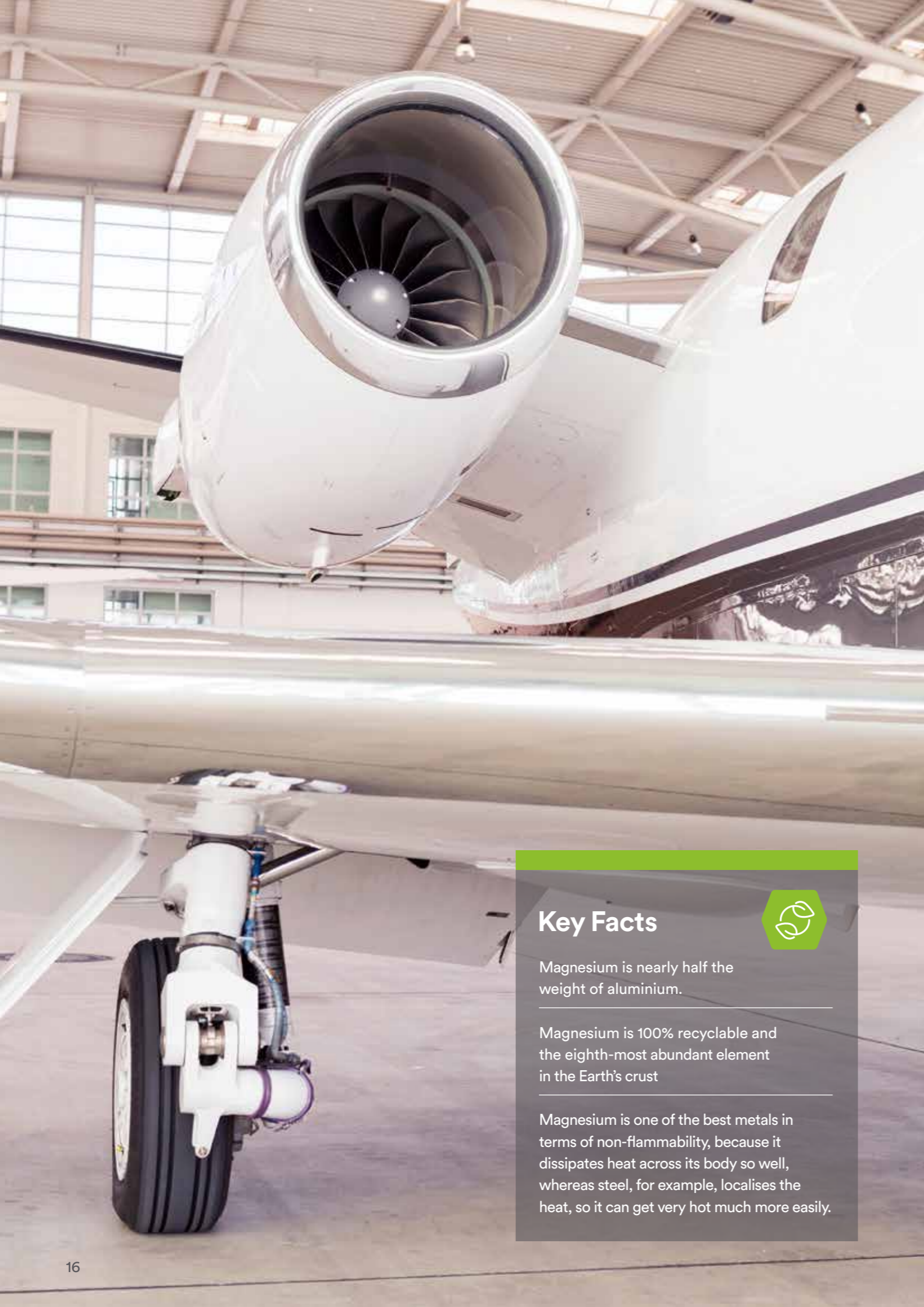
The Centre will be based on the University's Springfield Campus, itself a brownfield site which was formerly the Springfield Brewery.

The BRIC project is part-funded by the European Regional Development Fund (ERDF) to offer bespoke, free of charge services to Black Country SMEs.

**“BRIC brings academia together with key public and private sector stakeholders to develop cost effective and sustainable solutions.”**







# Birmingham City University Magnesium Innovation Group

It is nearly half the weight of aluminium, 100% recyclable and the eighth-most abundant element in the Earth's crust – so why don't we use magnesium more?

One of the reasons resides in the misconceptions of magnesium, which are rife not only among the general public but also within industry.

Hoping to explore this question in further depth and increase the material's industrial reach, Birmingham City University (BCU), has formed a strategic alliance with the world's largest producer of magnesium high pressure die cast components, Meridian Lightweight Technologies UK (MLTUK).

The partnership aims to overcome technical challenges relating to high-pressure die casting (HPDC), particularly in making the process more applicable to low-volume components (e.g. automotive) and developing a new SMART die technology, by removing barriers in manufacturing relatively small product runs using HPDC which stem from the up-front costs involved in equipment and tooling manufacture, complex tool and die setup involving multiple runners, and lengthy die changeovers.

Another exemplar of the partnership includes exploring the long-standing ban which has been lifted for the use of high-pressure magnesium die casting in aircraft seat construction and MLTUK in partnership with BCU, see this as an opportunity to work with the aerospace sector.

## Key Facts



Magnesium is nearly half the weight of aluminium.

Magnesium is 100% recyclable and the eighth-most abundant element in the Earth's crust

Magnesium is one of the best metals in terms of non-flammability, because it dissipates heat across its body so well, whereas steel, for example, localises the heat, so it can get very hot much more easily.

**“Innovation and opportunity for the automotive and aerospace sectors.”**

## Contact us

 @MyBCU

 [www.bcu.ac.uk/isf](http://www.bcu.ac.uk/isf)



# Birmingham Energy Institute/ Energy Capital

The Birmingham Energy Institute brings together more than 140 academics across the University of Birmingham engaged in energy and energy related research and development.

The Birmingham Energy Institute is a focal point for the University of Birmingham and its national and international partners to create change in the way we deliver, consume and think about energy. The Institute harnesses expertise from the fundamental sciences and engineering through to business and economics to deliver co-ordinated research, education and the development of global partnerships.

Energy Capital aims to establish Greater Birmingham as the global capital for energy systems innovation and market development, associated with its energy, waste, and transport infrastructure.

Tyseley Energy Park innovation zone is part of Energy Capital.

## Contact us

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 [www.birmingham.ac.uk/partners](http://www.birmingham.ac.uk/partners)

## Key Facts



The West Midlands region is home to some of the leading energy research and innovation institutions in the UK including the Birmingham Energy Institute and its Thermal Energy Research Accelerator project at the University of Birmingham.

Energy Capital creates a virtuous circle of economic opportunity for regional businesses: opportunities for innovators to access the growing \$3 trillion global market for smart energy solutions.

Energy Capital aims to make the West Midlands one of the most attractive locations to develop and build innovative clean energy technology companies in the world.



# Clean Air in London

The Clean Air in London project is a partnership between the University of Warwick, Greater London Authority, The Alan Turing Institute. The project is funded by the Lloyds Register Foundation programme on Data Centric Engineering.

The University of Warwick is developing state of the art machine learning algorithms, statistical methodology and data science platforms to better estimate and forecast hyper-localised air pollution levels across London.

The project involves integrating evidence from multiple air quality sensor networks and additional data sources describing live traffic and emissions in the city, in addition to environmental and mobility patterns.

**The project's goals are:**

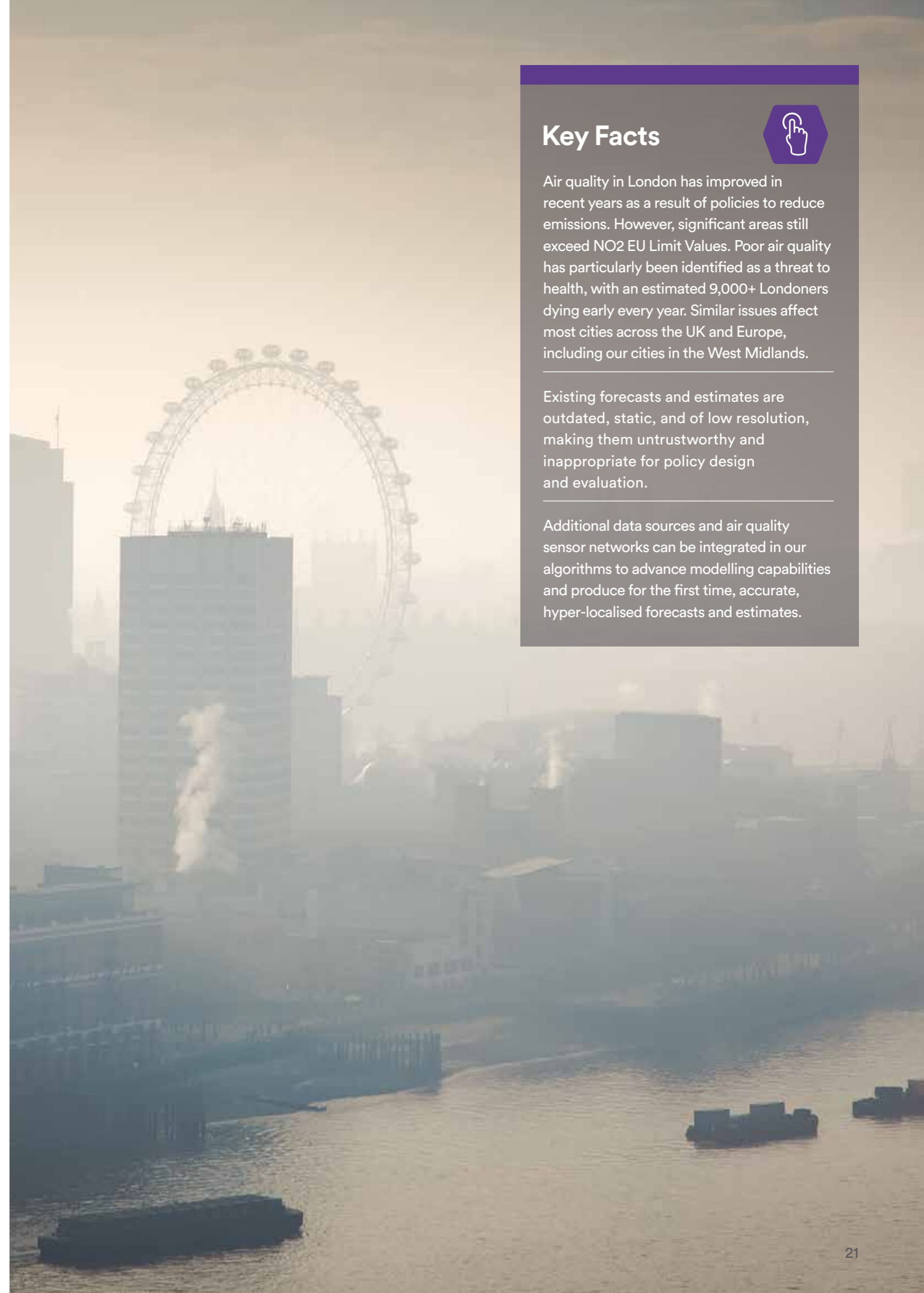
1. To ensure that data from a wide range of networks can be brought together to a single place for analysis,
2. To bring data into air quality models from a range of quality of sensors,
3. To monitor the effectiveness of the different interventions planned across London,
4. To present the best estimates and forecasts in a way that app and web developers can then use to inform residents.

The project can have huge benefits for citizens and policy-makers who can react faster to changing air pollution levels while better understanding the dynamic and spatial aspects of the process as well. The project is led by Dr. Theo Damoulas (Warwick CS & Statistics) and comprises a team of computer scientists and statisticians at both Warwick and Turing.

## Contact us

✉ [communications@turing.ac.uk](mailto:communications@turing.ac.uk)

**“State of the art statistical and machine learning algorithms extracting knowledge to inform policy.”**



## Key Facts



Air quality in London has improved in recent years as a result of policies to reduce emissions. However, significant areas still exceed NO2 EU Limit Values. Poor air quality has particularly been identified as a threat to health, with an estimated 9,000+ Londoners dying early every year. Similar issues affect most cities across the UK and Europe, including our cities in the West Midlands.

Existing forecasts and estimates are outdated, static, and of low resolution, making them untrustworthy and inappropriate for policy design and evaluation.

Additional data sources and air quality sensor networks can be integrated in our algorithms to advance modelling capabilities and produce for the first time, accurate, hyper-localised forecasts and estimates.



# Wolverhampton Cyber Research Institute

The Wolverhampton Cyber Research Institute (WCRI) is a team of over twenty academic staff based in the School of Mathematics and Computer Science at the University of Wolverhampton.

WCRI aims to become a world leading research institute by fostering a research environment, which is inclusive, interdisciplinary and encourages innovation and creativity to increase originality, significance and rigour in cyber research.

WCRI builds on the established strength of its members in the area of Network and Communication Security, Artificial Intelligence, Big Data and Cyber Physical Systems. WCRI works in collaboration with academic, industrial and governmental organisations to all aspects of security and privacy.

WCRI is based at the University of Wolverhampton city campus and the Hereford Centre for Cyber Security (HCCS) on the Skylon Park Enterprise Zone at Hereford.

WCRI aspires to be at the forefront of developing and leading an International Cyber Knowledge Hub to tackle threats in the cyberspace.

## Contact us

 @wlv\_uni

 [www.wlv.ac.uk/wcri](http://www.wlv.ac.uk/wcri)

## Key Facts



The Wolverhampton Cyber Research Institute (WCRI) brings most of the research in the School of Mathematics and Computer Science under a single umbrella institute.

WCRI currently consists of 24 academics carrying out research within: Cyber Security, Data Science & Mathematical Modelling and Cyber-Physical Systems.

The University has embarked in a joint venture with Herefordshire Council to develop a new Centre for Cyber Security, which will offer a range of specialist facilities for the cyber sector including server space and high speed broadband as well as research and development laboratory space.

# Stepping up Human Computer Interaction: The Benefits of Freehand Interaction in Augmented Reality

Augmented Reality (AR) for Enterprise is a trend driven by Industry 4.0 approaches to digitise manufacturing, logistics and servicing.

Use cases include warehousing, material handling and equipment maintenance, with clear expectations that AR will drive efficiencies and improve production. Examples include workers using smart glasses to receive remote expert guidance during unplanned downtimes, or training programmes that prepare workers for a tooling change in production.

In this field, Birmingham City University's (BCU) research focuses on natural free-hand interaction where users interact with an augmented physical world, enhancing the environment with virtual information and tools. Currently, users need to learn cumbersome gestures to interact with virtual objects, which don't reflect a real-world experience.

Free-hand grasping enables users to move an object in the virtual environment by making a realistic movement, such as picking up a book or mimicking the use of real tools or machinery. Free-hand interaction opens up a whole range of new applications in education, training, simulation and product promotion.

These new approaches will enhance training in a variety of fields: From enabling medical students to use virtualized tools in a safe and realistic augmented environment to help manufacturers to create and design new products in immersive environments.

## Key Facts



Virtual Reality (VR): The experience of interacting and experiencing a fully artificial environment that makes it feel virtually real.

Ref: Gigante, Michael A. "Virtual reality: definitions, history and applications." *Virtual reality systems*. 1993. 3-14.

Augmented Reality: Augmenting a real environment (or elements of it) using virtual objects that coexist in the same space as the environment.

Ref: Van Krevelen, D. W. F., and Ronald Poelman. "A survey of augmented reality technologies, applications and limitations." *International journal of virtual reality* 9.2 (2010): 1.

## Contact us

 @MyBCU

 [www.bcu.ac.uk/isf](http://www.bcu.ac.uk/isf)



## Key Facts



The Sparrowhawk project aims to encourage more low volume car production across Coventry and beyond.

This project sets out to prove that it is still possible to create unique, interesting and desirable cars in low volume, whilst meeting the expectations of customers in terms of safety, environmental friendliness and practicality.

The Sparrowhawk is actively contributing towards revolutionary highly efficient designs. The car is zero emission pure electric drive and features class-leading aerodynamics and light-weighting technologies to create a highly efficient vehicle.

A unique feature is that it can be aesthetically redesigned, enabling the creation of unique, one-off designs. This is made possible by having a fully self-supporting chassis and drivetrain system and lightweight cosmetic body panels.



## Future of Mobility



# Sparrowhawk

Coventry University has long been associated with the transport sector through our teaching, research and consultancy.

Coventry University's Institute for Future Transport and Cities brings together world-class expertise in disciplines across art and design, human factors, engineering, manufacturing, computer systems and business studies to deliver its vision of safe and sustainable transport solutions fit for the cities of the future.

The Faculty of Engineering, Environment & Computing at Coventry University has, to date, run over 250 student projects to design and create the commercially viable Sparrowhawk two-seater sports car.

Part-funded by the University's Higher Education Innovation Fund (HEIF), students have been tasked with creating a road-worthy vehicle which meets performance and legal requirements. Sparrowhawk must also meet a host of other customer expectations while featuring the latest technology.

Undergraduate and postgraduate students studying Automotive, Mechanical or Motorsport Engineering and Transport Design have worked on this project. Also, Business School students are currently developing a detailed business plan to ensure financial viability.

The drive train, chassis and suspension systems use unique and bought-in components. Student projects across the university's different faculties went into creating the vehicle, which is a flagship for the university's newly opened National Transport Design Centre.

**“The Sparrowhawk car forms a basis for work in advanced autonomous driving and powertrain technologies.”**

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 [www.coventry.ac.uk/research](http://www.coventry.ac.uk/research)

# Vehicle Electrification at WMG

There has been a surge in demand for electric vehicles (EVs) in the UK over recent years – new registrations of plug-in cars increased from 3,500 in 2013 to more than 166,000 by August 2018.



This will lead to increasing opportunities for the UK supply chain, particularly within EV battery manufacture, power electronics and electric machines and drives.

WMG's vision is to develop and enhance the UK's automotive manufacturing capabilities to enable the development of cleaner, safer and smarter vehicles – WMG has coined the phrase 'Low Emissions Mobility' to explain the concept, aligning with the Government's recently announced 'Road to Zero' strategy which aims to make road transport emission-free by 2050.

WMG delivers this vision by helping UK businesses seize the significant opportunities presented by electrification – estimated to be worth over £6 billion by 2025. WMG's insight and expertise is helping to address the challenges of vehicle electrification, including EV performance, range, battery life, safety and rapid charging.

Over the next five years, WMG will develop the manufacturing systems for cell and battery pack assembly and supply chain solutions, via its UK Battery Industrialisation Centre (UKBIC) funded as part of the Government's Faraday Challenge competition.

## Contact us

 [www.wmg.warwick.ac.uk](http://www.wmg.warwick.ac.uk)  
 [wmgbusiness@warwick.ac.uk](mailto:wmgbusiness@warwick.ac.uk)

**“WMG's vision is to develop and enhance the UK's automotive manufacturing capabilities.”**

## Key Facts



The Energy Innovation Centre (EIC) is a leading UK facility for battery innovation

EIC's extensive capabilities cover discovery, development, characterisation and verification

EIC's unique facilities encompass fundamental research through to industrialisation, accelerating the development of new technologies, products and associated manufacturing processes across multiple sectors.





# Contacts & Further Information

## West Midlands Growth Company

 @wmgrowth  
 [www.wmgrowth.com](http://www.wmgrowth.com)

**Natalie King**  
Account Manager

 [natalie.king@wmgrowth.com](mailto:natalie.king@wmgrowth.com)

Learn more about West  
Midlands universities by  
visiting their websites:

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[www.aston.ac.uk](http://www.aston.ac.uk)

[Birmingham City University](http://www.bcu.ac.uk)  
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