



**MIDLANDS
ENGINE**

EXPLORING THE INVESTMENT POTENTIAL OF MIDLANDS CLUSTERS

OVERVIEW REPORT

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Acknowledgements

This report was developed over the last year in collaboration with our data and analysis partners, Beauhurst, The Data City, Wavteq and CBI Economics Unit. We would like to thank our partners across the region for their support and input into the project via the Midlands Trade and Investment Forum. We are particularly grateful to the West Midlands Combined Authority for their advice at the beginning of the project and for sharing the work that underpinned their cluster analysis as part of the West Midlands Growth Plan.

Other acknowledgements are due to colleagues in the Midlands Engine Observatory, in particular Charlie Hopkirk and Christopher Styche for their work on the scorecards and mapping; to Professor Andrew Leyshon for his review of the draft report and to Alex Favier for authoring this overview.



Sir John Peace – Chairman, Midlands Engine

FOREWORD

The Midlands has long been a powerhouse of industry and innovation. From our heritage as the birthplace of the Industrial Revolution to the diverse and dynamic region that's home to 11 million people – the largest regional economy outside London – the Midlands seizes the opportunities of each new age with ingenuity and enterprise.

Levelling up the Midlands Engine – for the good of our region and our country – is a priority of our partnership. Alongside concerted investment, long-term commitments and bold steps from government, Midlands businesses and public sector bodies are dedicated to tackling the hardships being experienced across many sectors.

As Midlands Engine partners continue this work, together, to accelerate growth in our region, there is increasing recognition that economic clusters are a key part of our collaborative efforts to build on

our exceptional sector strengths, boost productivity, and attract inward investment.

The Midlands Engine Partnership has worked with industry-leading partners The Data City, Beauhurst, Wavteq and CBI Economics, to develop a framework through which to examine existing clusters in our region and pinpoint the emerging and growing clusters with the high potential to attract domestic and international inward investment, in the short and long term.

The resulting insights, recommendations and forecasts – presented here and developed through direct engagement with the private sector – offer an invaluable resource both for partners seeking to drive inward investment and investors looking for a comprehensive picture of our region's huge investment potential, and are the beginning of a new conversation about clusters in our region and their potential to attract further investment. ▶

Executive summary

This report, *Exploring the Investment Potential of Midlands Clusters*, has been produced by the Midlands Engine Partnership to launch a new programme of analysis, engagement and policy development focused on supporting our regional partners, businesses, and the UK Government to better understand and develop clusters across the Midlands.

In this context, we hope the regional perspective on clusters provided by this report is both timely and appropriate.

It has been produced in collaboration with our partners, [The Data City](#), [Beauhurst](#), [Wavteq](#), [CBI Economics](#) and our own [Midlands Engine Observatory](#).

Our approach was to:

- **1.** Work with our partners to **identify a long list of over one hundred clusters** from across the region;
- **2.** Use data and analysis from The Data City and Beauhurst to then selected around thirty clusters which we were able to **aggregate up to the regional level** as the focus for our programme;
- **3.** Work with The Data City, Beauhurst, Wavteq partners and the Midlands Engine Observatory to develop a **bespoke analytical framework that includes twenty five metrics spread across four 'ecosystems'** through which to explore the 'investment potential' of the clusters;
- **4.** Undertake a series of **roundtable conversations with businesses and partners** within seven of the clusters to get their perspective and qualitative insight;
- **5.** Select **four clusters of different scale and maturity as case studies** for this initial overview report
- **6.** **Articulate our findings through a combination of metrics, narrative and visualisations** – including some initial recommendations for partners and policymakers. ▶

Identifying the number of clusters within any particular place is, hypothetically, a limitless exercise. This is due to the significant role that narrative and choice plays in defining the geography, sector and, therefore, name of a particular cluster.

Defining the 'investment potential' of any particular cluster is similarly open-end due to the different types of investor and the inherent subjectivism of what they might see as representing 'potential'.

Whilst acknowledging the complexity of both these issues, we have adopted the following pragmatic approach:

Identifying clusters across the Midlands

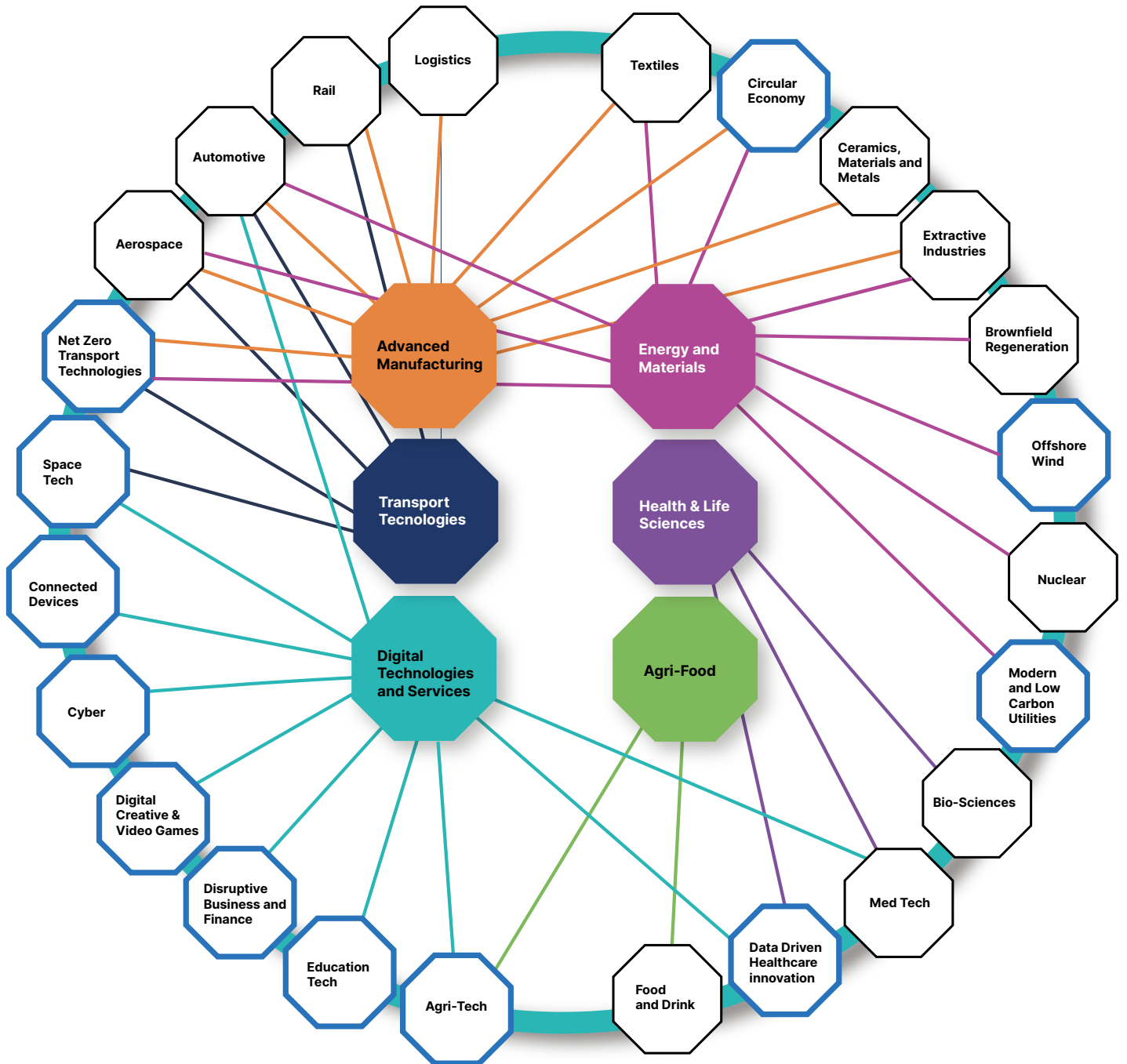
The Midlands Engine is a Pan-Regional Partnership funded by local partners and the UK Government to support economic growth and prosperity across the region. In keeping with our regional perspective, for this report we have looked to identify clusters that:

- 1) Our partners or the UK Government have already identified in economic strategies or policy analysis;
- 2) Can then be aggregated to the regional level where the data shows multiple locations of concentrated economic activity across the Midlands; and
- 3) Can be articulated using a simple hierarchy developed from a review of academic literature and recent policy analysis.

We have identified and selected:

- Six **Midlands 'Super-Clusters'**, which are our key sectors where we have world-leading economic strengths and innovation assets distributed across the region;
- At least ten **Midlands 'Established Clusters'**, which incorporate significant concentrations of economic activity in multiple locations, linked to sectors of long-established industrial strength within the region;
- At least fourteen **Midlands 'New Economy Clusters'**, which include multiple concentrations of economic activity identified and labelled by partners as aligned to emerging knowledge, technology and innovation-intensive sectors.¹

































¹At the frontier: The geography of the UK's new economy, Centre for Cities, <https://www.centreforcities.org/reader/at-the-frontier/> (December 2022).



KEY



UK Investment Atlas initiative linked to one or more Midlands clusters

	East Midlands Freeport UK Investment Atlas High Potential Opportunity Area		Humber Freeport UK Investment Atlas Freeport		
	Net zero transport in Coventry and Warwickshire UK Investment Atlas High Potential Opportunity Area		Circular economy in Telford UK Investment Atlas Net Zero FDI Opportunity		
	CAM modelling and simulation in Oxfordshire and the Midlands UK Investment Atlas Net-Zero Investment Opportunity		Offshore wind supply chain and ports in Teesside and the Humber UK Investment Atlas High Potential Opportunity Area		
	Space in Leicester and Leicestershire UK Investment Atlas High Potential Opportunity Area		Rehabilitation in Leicester and Leicestershire UK Investment Atlas High Potential Opportunity Area		
	5G technology in Worcestershire UK Investment Atlas High Potential Opportunity Area		Charnwood Campus Science, Innovation and Technology Park Life Science Opportunity Zone		
	Cyber security in Gloucestershire UK Investment Atlas High Potential Opportunity Area		Data-driven health innovation in Greater Birmingham and Solihull UK Investment Atlas High Potential Opportunity Area Life Science Opportunity Zone		
	Video games in Coventry and Warwickshire UK Investment Atlas High Potential Opportunity Area		Precision agriculture in Telford UK Investment Atlas High Potential Opportunity Area		
			Sustainable farming systems in Telford and Wrekin UK Investment Atlas High Potential Opportunity Area		
			Food processing automation in Greater Lincolnshire UK Investment Atlas High Potential Opportunity Area		

This is not intended as either an exhaustive or ranked list of clusters within our region. However, we hope it will provide as useful starting point for our programme of engagement with partners, policymakers and researchers over the coming months. Over the course of the Midlands Engine Partnership Clusters Programme, we will publish further cluster snapshots that combine the data we've collated as part of developing this report alongside insight and policy recommendations focused on individual clusters.

This report includes four of these clusters as case-studies:

- **Health and life sciences (Midlands Super-Cluster)**
- **Aerospace (Midlands Established Cluster)**
- **Agri-tech (Midlands New Economy Cluster)**
- **Space Technology (Midlands New Economy Cluster)**

Health and Life Sciences: a Midlands Super Cluster

At a glance...

- 17% of UK companies in this sector are located in the Midlands Cluster
- 12% of UK High Growth companies in this sector are based in the Midlands Cluster
- 23% of £100m + UK companies are in the Midlands Cluster
- 11,200 annual graduates in relevant fields from Midlands universities
- 143 of 254 (56%) of investments into UK Health and Life Sciences High Growth Companies were made into the Midlands Cluster
- Notable locations of concentrated economic activity include: Birmingham (Data-Driven Healthcare Innovation), Nottingham and the wider the East Midlands (Bio Sciences and Medical Technologies)
- The Midlands Cluster includes the highest number of Medical Technologies companies of any region in the UK (with a GVA of £1.6bn into the UK economy annually)
- 2 of the 3 largest UK NHS Trusts
- The 2nd largest Clinical Trials cluster in Europe
- 7 leading Medical Schools (producing over 20% of the UK's medical students).

Midlands
Super Cluster/
Key Sector



Aerospace: a Midlands Established Cluster

At a glance...

- The Midlands is home to the largest Aerospace cluster in the UK with 30% of aerospace businesses based in the Cluster
- The Midlands is home 7% per cent of Europe's and 3% of the world's aerospace industry
- 34% of £100m + UK companies in this sector are based in the Midlands Aerospace Cluster
- 26% of High Growth companies in this sector are based in the Midlands Aerospace Cluster
- 56,445 jobs linked to firms in the Cluster, 22% of all Aerospace jobs in the UK
- 81% of total Innovate UK funding since 2005 (£894m) to firms operating in the sector was to the Midlands Aerospace Cluster
- 43% of UK total Domestic Direct Investment and 51% of the job created related to UK Aerospace was into the Midlands Cluster
- Notable locations of concentrated economic activity include: Derby, which is home the heart of civil aerospace operations at Rolls-Royce, the world's second largest manufacturer of aircraft engines. Rolls-Royce accounts for one in four of the cluster's jobs. Radiating from this hub across the East Midlands are nodes where aero-engine parts are made and where electronic and mechanical systems that control how the engine operates are designed and built. Birmingham, Wolverhampton and Coventry has a concentration of firms supplying electro-mechanical systems to control aircraft moving parts. (Credit: Midlands Aerospace Alliance)
- The Midlands is home to some of the world's leading Aerospace research and innovation centres, such as the University of Nottingham Institute for Aerospace Technology, and Rolls Royce UTCs in Nottingham, Birmingham, Loughborough and Cranfield. The Manufacturing Technology Centre, High Value Manufacturing Catapult and Warwick Manufacturing Group are also internationally distinctive R&D hubs.

Midlands
Established
Cluster



Agri-tech: a Midlands New Economy Cluster

At a glance...

- 20% of UK companies in Agri-tech are located in the Midlands Cluster
- 9% of High Growth companies in the Agri-tech sector are based in the Midlands Cluster
- 3,808 or 10% of UK employees in companies in this sector are located in the Midlands Cluster
- 16 of 51 (31%) of investments into UK Agri-tech High Growth Companies were made into the Midlands Agri- Cluster
- 23% of UK total FDI and 25% of jobs created by inward investment related to this sector was into the Midlands Agri-tech Cluster
- 36% of UK total DDI and 34% of jobs created by inward investment related to this sector was into the Midlands Agri-tech Cluster
- Notable locations include: Greater Lincolnshire's Food Valley and significant clusters in Herefordshire and Shropshire, with further contributions across counties in the region in a wider agriculture sector with upwards of 90,000 jobs
- The University of Nottingham's Agri-sciences campus at Sutton Bonington, Harper Adams University, University of Birmingham, Cranfield University and University of Lincoln are all world-leading centres of research and innovation for Agri-tech and associated subjects.



Space Technologies: a Midlands New Economy Cluster

At a glance...

- 21% of UK companies in the Space Technology sector are located in the Midlands Cluster
- 25% of £100m + UK companies in the Space Technology sector are based in the Midlands Cluster
- 14% of High Growth companies in the Space Technology sector are based in the Midlands Cluster
- 43% (£167m) of total Innovate UK funding since 2005 to firms operating in the Space Technology sector was to companies within the Midlands Cluster
- 18,105 or 12% of UK employees in companies in the Space Technology sector are located in the Midlands Cluster
- 7 of 36 (19%) of investments into UK Space Technology High Growth Companies were made into the Midlands Cluster
- 50% of UK total DDI and 38% of jobs related to the Space Technology sector was into the Midlands Cluster
- The Midlands recently received £6m of funding to further develop the Midlands Space Cluster
- Notable locations include: Space City Leicester, linked to the University of Leicester which also provides the first approved customs site through the East Midlands Freeport. Concentrations of space technology manufacturing in the West Midlands, with high growth clusters also found elsewhere including in parts of Worcestershire, Herefordshire and Shropshire
- The University of Leicester hosts the East Midlands Centre of Excellence for the Satellite Applications Catapult, the University of Nottingham host the Geospatial Research and Applications Centre of Excellence and the Midlands Innovation Space Group forms one of the largest collections of space expertise in the world, combining 900 academic, research and technical staff within the Midlands.



Exploring investment potential

INVESTMENT POTENTIAL

Several recent reports have explored the wider 'growth potential' of clusters. This includes the West Midlands Growth Plan, which identifies eight primary and eight nascent clusters across the West Midlands Combined Authority (WMCA) geography. However, in-keeping with the remit of the Midlands Engine Partnership to extend the global reach of the region, we have focused on data and analysis likely to be relevant to partners seeking to attract investment into clusters.

Following an extensive review of academic literature and recent policy analysis, we have developed an analytical framework that incorporates a basket of twenty-five metrics spread across four interconnected ecosystems. The investment potential of each cluster is inferred through demonstration of growth, comparative advantage, or disproportionate market share of investment, across these metrics.

The ecosystems are:

1. Business ecosystem

Including metrics linked to each cluster such as the number of businesses, the number of high-growth companies and the number of major strategic companies (£100m + annual turnover) and identifying any existing cluster support organisations or networks.

2. Innovation ecosystem

Including metrics linked to each cluster such as the amount of Innovate UK funding received by businesses in the cluster, the number of businesses in receipt of Innovate UK funding, major sector-related university

R&D and innovation assets, high-growth company grants and accelerator engagement.

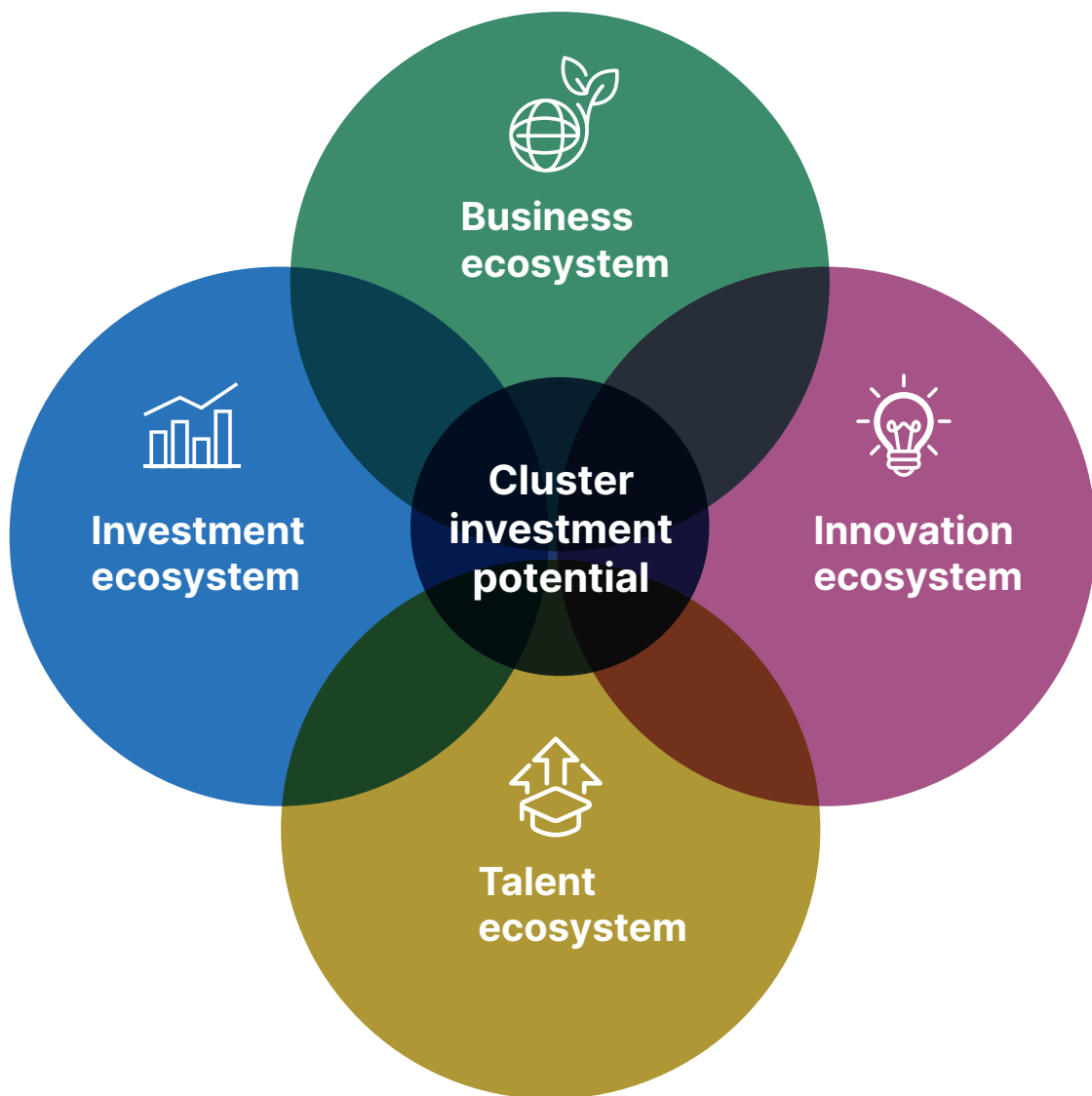
3. Talent ecosystem

Including metrics linked to each cluster such as the number of employees at businesses in the cluster and average salary levels, the number of annual Further Education leavers in related fields, the number of annual university graduates in related field and local graduate retention rates and high-ranked (UK Top 25) university departments in related fields.

4. Investment ecosystem

Including metrics linked to each cluster such as the number of Foreign Direct Investment (FDI) and Domestic Direct Investment (DDI) projects and as a proportion of the UK total into that sector (2017-21), total FDI and DDI jobs and as a proportion of the UK total into that sector (2017-21), the proportion of high-growth companies receiving FDI, the proportion of UK total FDI and DDI Capex (2017-21) into that sector, fundraising volumes across seed and venture investments, FDI Capex forecasts for the sector by 2025. ▲

Clusters overview

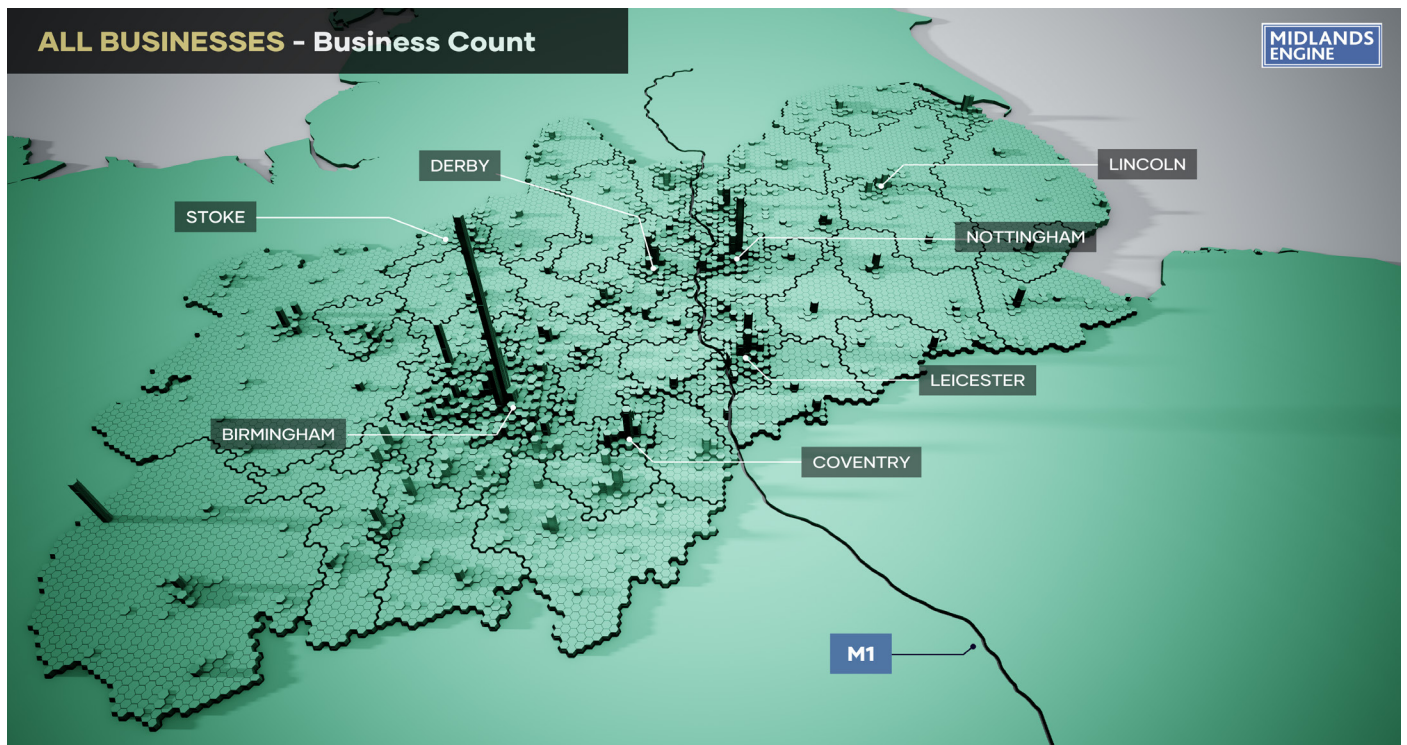


Articulating our analysis: visualising the clusters

Over the course of the Clusters programme we will publish a series of ‘Snapshots’ that will include the above data and analysis of investment potential but also the insight and recommendations drawn from the roundtables and engagement we will convene with businesses and partners across each cluster.

The four case-studies in this report provide an example of how we will present some of this information. We have also worked with The Data City to develop a suite of maps that help visualise key economic activity across the Midlands for each cluster. These are initially focused on core metrics such as business count, turnover and employee numbers as well as illustrating innovation activity and assets such as universities. ▶

Figure 1: Total business count (all sectors) across the Midlands Engine.



Recommendations for policymakers and partners

Our forthcoming programme of engagement with businesses, partners and policymakers focused on specific clusters will seek to develop a series of evidence-based recommendations for policy and practice to help that cluster secure greater investment and grow. However, there are a number of key recommendations related to the future development of clusters that have already emerged from the analysis, business and partner consultation already undertaken by the Midlands Engine Partnership.

These include:

- **Fund local partners to create Cluster Development Companies**

Clusters need dedicated, focused support to grow and thrive. The importance of a central cluster network was highlighted by businesses, partners and in the academic literature. These organisations were seen as vital to the creation of knowledge and innovation spillovers, providing a concierge service to help attract investment, convening within the clusters and advocating externally for funding and more favourable policies.

The Government should fund the creation of 'Cluster Development Companies', which would be devolved and run by coalitions of local government and economic growth partners, universities and industry associations. [The recent investment into the Midlands Space Cluster](#) should be seen as a pilot for this model of support.

- **Improve the quality and accessibility of the evidence-base for clusters in the UK. Establish a national programme of research, analysis and insight that includes the development of a toolkit and open-access data set for local organisations to aid better policymaking.**

The evidence-base upon which clusters in the UK can be readily understood, analysed and articulated by local, regional or national policymakers needs to be improved. Our report has drawn from multiple data-sources, several of which are provided by commercial organisations and are therefore not readily accessible by local partners without significant duplication of investment. The complexity of England's sub-national geographical units of analysis also complicates any assessment of clusters, which don't neatly fit into existing administrative boundaries. Our report is similarly limited by the Midlands Engine regional geography, but we know that many of our clusters overlap with neighbouring regions.

The scale and complexity of research required can only be met by a serious programme of national research and analysis. We welcome recent developments led by the Department for Science, Innovation and Technology (DSIT) to develop this programme and, the Government should seek to establish a UK-wide dataset and toolkit that is accessible for local and regional decision-makers.

- **Simplify the inward investment landscape whilst increasing support for 'product development' and 'concierge services' to attract investment into clusters.**

As we explore in the report, the inward investment landscape in the Midlands (and across the UK) is highly complex, with multiple agencies and organisations operating with overlapping remits and across geographies. This complexity is not desirable for investors looking for clarity and stability in decision-making. As a corollary to this, the Government should seek to increase long-term and consistent support to local partners for 'product development' and 'concierge services' aimed at attracting investment into Clusters. The Department for Business and Trade's High Potential Opportunities programme has been praised by local partners across the Midlands Engine Partnership as a valuable, long-term initiative that has helped them develop and launch propositions seeking to attract investment into clusters.

The Government is currently reviewing its approach to attracting foreign direct inward investment into the UK and we would recommend it considers how it integrates continue support for these value-added activities whilst simplifying the current landscape of organisations, initiatives and decision-making.

- **Work with universities to develop an integrated approach to foreign direct investment into R&D.**

Universities and Research and Development (R&D) are integral to any consideration of the future investment potential of clusters. Therefore, we strongly endorse the twelve recommendations for Government, universities and local economic growth partners made by the recent report, *The role of universities in driving overseas investment into UK Research and Development*, produced by the Higher Education Policy Institute in partnership with Universities UK International, the National Centre for Universities and Business and Midlands Innovation.

The economic future of clusters across the Midlands is dependent on harnessing the growth potential of new technologies and high-innovation sectors. This will require significant international investment across the Technology Readiness Levels (TRLs) and we welcome the Report's call for greater partnership working between all parties to target the world's Top 200 investors in R&D, develop bigger and bolder FDI into R&D propositions and unleash the levelling up potential of the UK's world-renowned universities. With support from the Midlands Engine Partnership, our region hosts the trailblazing Universities as drivers of trade and investment Pilot, which will share an evidence-base with our Clusters Programme over the next two years. ▲



EXPLORING THE INVESTMENT POTENTIAL OF MIDLANDS CLUSTERS

1.0 Introduction

INTRODUCTION

This report, *Exploring the Investment Potential of Midlands Clusters*, has been produced by the Midlands Engine Partnership to launch a new programme of analysis, engagement and policy development focused on supporting our regional partners, businesses and the UK Government to better understand and develop clusters across the Midlands. Over the next two years the *Midlands Engine Partnership Clusters Programme* will:

- 1) Continue to develop the evidence-base around clusters across our region;
- 2) Convene business, local partners and policymakers to understand from them what support their clusters need to grow; and
- 3) To then advocate for the policies and practice required to deliver this growth in the future.

The Midlands Engine Partnership supports Local Authorities, businesses, universities and third-sector organisations from across our region. Through a pan-regional perspective, we provide an evidence-base, act as a convenor and advocate for policies and practice that will help improve economic prosperity and the wellbeing of communities and people across the Midlands.

It has been produced in collaboration with our partners, [The Data City](#), [Beauhurst](#), [Wavteg](#), [CBI Economics](#) and our own [Midlands Engine Observatory](#).

We introduce this report with an explanation of our rationale for the focus on clusters, the decision to explore their investment potential as well as the underlying investment trends and landscape across the Midlands. ▶

Why clusters?

Clusters have been of interest to both governments and investors across the world for decades. They have recently returned to prominence in the UK, with an emphasis on the significance of clusters incorporating innovation and new technology in driving future economic growth outside of London and the South East.

One helpful definition of Clusters is that they are a geographical and sectoral concentration 'of firms and intermediary organisations involved in related activities... [where] the focus of inquiry is generally on understanding how the group benefits, and contributes to collective benefit, from collocation with each other¹.

The impact of the pandemic continues to change the way our economy functions, with hybrid-working enabling a greater geographical distribution of labour and talent around workplaces. The fundamental economic changes wrought by the pandemic are particularly significant for any attempt to understand how clusters will work in the future.

These impacts will likely vary according to both sector and location. For example, [the flight of tech company employees from San Francisco](#) over the last three years looks to have caused a cascade of economic issues for what was one of the world's foremost concentrations of hi-tech economic growth. However, the greater spread of workers and their spending power is also an opportunity for a broader distribution of economic benefits. It may also mean that clusters become less concentrated, but perhaps more interconnected with similar or adjacent

industries across a wider geography.

Across the Midlands, our partners have a strong and growing interest in Clusters. This includes the [West Midlands Growth Plan](#), which identifies eight primary and eight nascent clusters across the West Midlands Combined Authority (WMCA) geography. No fewer than 100 clusters were identified across the region from a review of partner economic strategies, plans and investment prospectuses. However, as we detail below, there was significant degree of overlap and interconnection between many of these clusters – suggesting an opportunity for aggregation or clearer articulation. In this context, the adoption of a pan-regional lens for this analysis of cluster seems both timely and appropriate.

Why the investment potential of clusters?

The relationship between clusters and investment is a complex one, as the literature has not typically focused on this relationship. Instead, researchers are more likely to have studied the behaviours of foreign-owned versus domestic-owned firms. Some research has been focused on the challenges of successfully attracting FDI to a cluster and what this might look like, which links to the concept of "sustainable FDI attraction".

These studies, in turn, link into discussions in the policy space around cluster management, promotion, and strategy.

Several authors have found evidence of spill over benefits from FDI for both regions and the firms within clusters. These benefits include both horizontal (i.e., between the same industry) and vertical (i.e., up and down the value chain) spill overs, which have been found to improve the productivity of domestic firms and the host country overallⁱⁱ. For example, one recent study found that foreign-owned firms helped increase the number of patent registrations in different regionsⁱⁱⁱ. However, UK researchers found that the total factor productivity benefits associated with FDI are limited to pre-existing clusters, with non-cluster areas seeing no spill over effects. This implies that efforts to attract foreign-owned firms and FDI should be focused on existing clusters, while domestic policy should seek to support domestic firms elsewhere to develop the foundations for future clusters^{vi, v}.

It's important that cluster management organisations and investment promotion agencies specifically focus on attracting foreign investment, in addition to the promotion and development of the cluster. There is some evidence that good management does help to reach foreign

target markets^{vi}, and that business network dynamics can be important in influencing firms' internationalisation behaviours^{vii}. There is also evidence supporting the activity of regional investment promotion agencies (compared to national investment promotion agencies), with a recent study finding that these had a statistically significant positive effect on FDI attraction in regions across the EU Single Market. This study also noted that for these agencies to be successful, they were required to select specific sectors to target: the creation of these agencies alone was insufficient to attract additional FDI. Finally, it was also found that these agencies are more successful at attracting FDI from 'occasional' investors (those who do not typically engage in multiple foreign investments), as 'serial' investors are more likely to be able to leverage existing intra-corporate networks they have previously developed^{viii}.

Why investment in the Midlands? Trends

The UK remains a top destination and source country for FDI globally and within Europe. However, the UK's total FDI inflows still remain below their 2016 peak, following the Brexit vote, despite beginning to recover in 2021. ▲

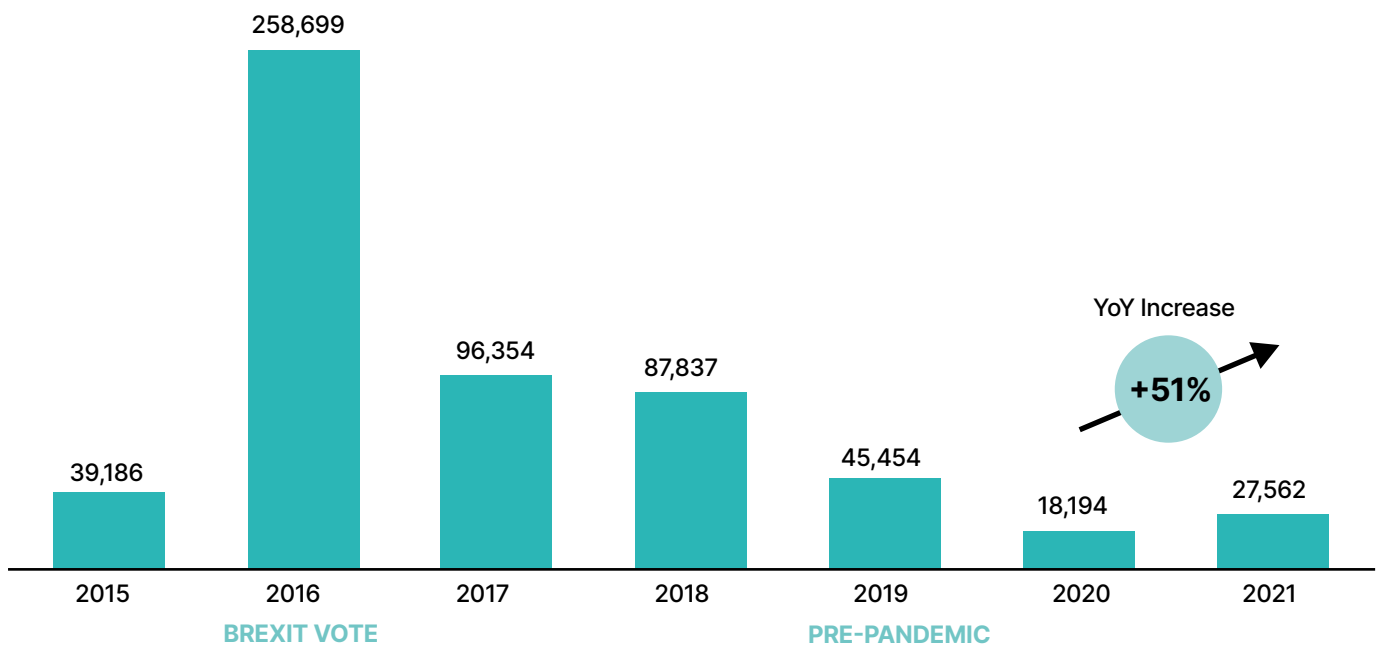
WHY CLUSTERS?

UK FDI TRENDS, FORECASTS & DDI Analysis

The UK's total FDI inflows decreased since their 2016 peak, following Brexit vote, and began to recover in 2021

United Kingdom FDI inflows

2015-2021, total USD millions



It should be noted that Wavteq sourced the values presented here from UNCTAD, which shows a lower value for 2020 FDI than shown by ONS data.

This is due to the fact that the Office for National Statistics (ONS) introduced new information from a commercial data source to inform FDI statistics and this has influenced FDI statistics to increase in 2020 compared with 2019. ONS recommends using caution when interpreting such 2020 ONS statistics.¹

Source: Wavteq based on UNCTAD World Investment Report 2022, ¹ ONS Statistical Bulletin 2020 [Link](#)

The future looks somewhat brighter for the UK. According to Wavteq's global FDI forecasting model², by 2025, the UK is forecasted to be the second largest destination country for FDI projects, the third largest destination country for Greenfield FDI capex, and the seventh largest destination country for FDI jobs. All such positions for the UK represent positive growth from 2016-2021 yearly averages compared to 2025 forecasts. Over the past six years, Western Europe has been the largest source region investing in

the UK, but the largest source country has been the US (which is responsible for 27% of the Greenfield capex inflows into the UK). Nearly half of all FDI capex into the UK during this time was concentrated in the renewable energy and real estate sectors. Wind electric power and industrial building construction were the largest subsectors for Greenfield FDI in the UK. Software and IT services and business services will remain the top sectors for FDI projects in the UK by 2025. ▲

The Midlands is still an attractive location for FDI and DDI. In the past five years:

- The East and West Midlands have collectively attracted around £34 billion (\$45 billion) in FDI and DDI capex.
- The Midlands received 10% of the FDI into the UK, with Birmingham as the leading destination city within the region.
- The Midlands also collectively received 18% of UK DDI, with Nottingham and Birmingham as the top destination cities within the region.
- The top source country for FDI into the Midlands was the US (27%), followed by Germany (14%) and France (6%).
- FDI projects in the Midlands were split between new projects (53%) and expansion projects (45%), with the remaining 2% being co-location projects.
- 73% of DDI into the Midlands came from firms based in the East or West Midlands.
- DDI projects in the Midlands were mainly expansion projects (63%), while the remaining 37% were new projects.

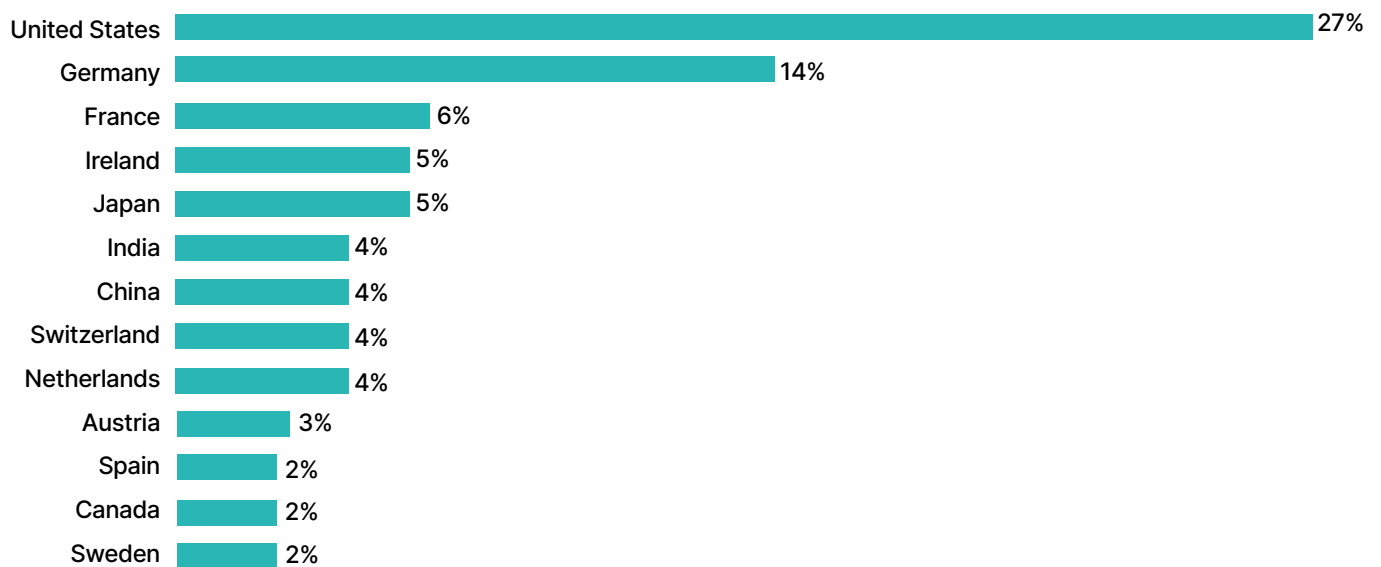
²Wavteq's forecasting model is specific to Greenfield FDI.

MIDLANDS COMPARATIVE FDI & DDI ANALYSIS

The US is the top source country for FDI into the Midlands followed by Germany

Top 10 Source Countries for FDI Projects

2017-2021, % of total



NOTE: FDI and DDI projects respectively have been considered for the analysis

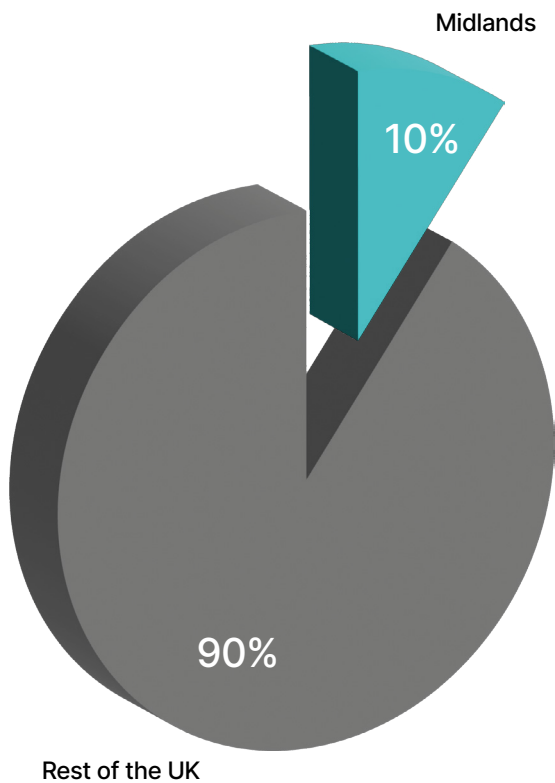
SOURCE: Wavteq based on fDi Markets by the Financial Times (dataset excludes retail projects) & UK Investment Flow

MIDLANDS COMPARATIVE FDI & DDI ANALYSIS

The Midlands received 10% of UK FDI from 2017-2021, Birmingham was the leading destination city in the Midlands

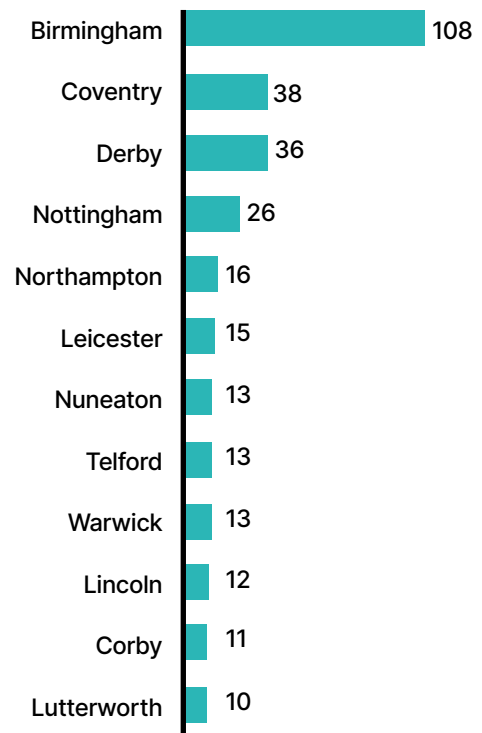
East & West Midlands Market Share of UK FDI

2017-2021, % of projects



Ranking of top destination cities in Midlands by number of FDI projects

2017-2021, Number of projects



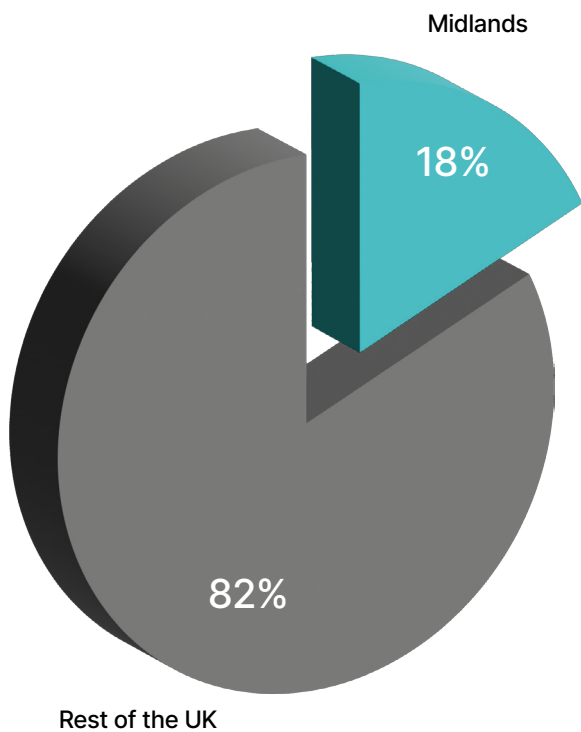
SOURCE: Wavteq based on fDi Markets by the Financial Times, Dataset excludes retail projects.

MIDLANDS COMPARATIVE FDI & DDI ANALYSIS

The Midlands received 18% of UK DDI from 2017-2021, Nottingham and Birmingham were top destination cities

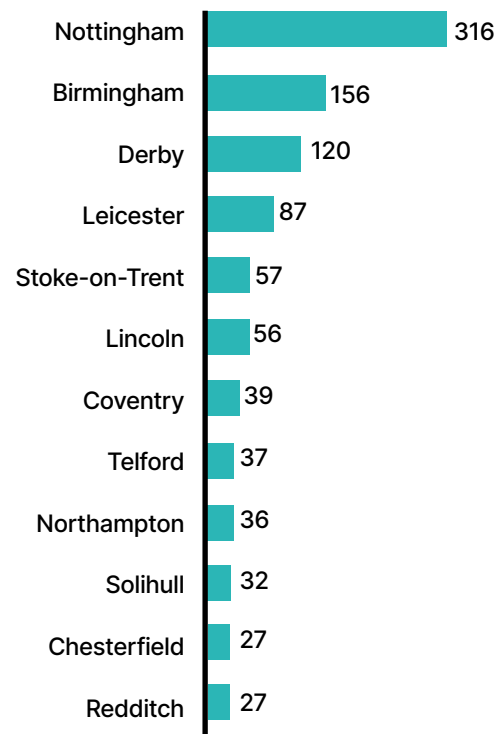
East & West Midlands Market Share of UK DDI

2017-2021, % of projects



Ranking of top destination cities in Midlands by number of DDI projects

2017-2021, Number of projects

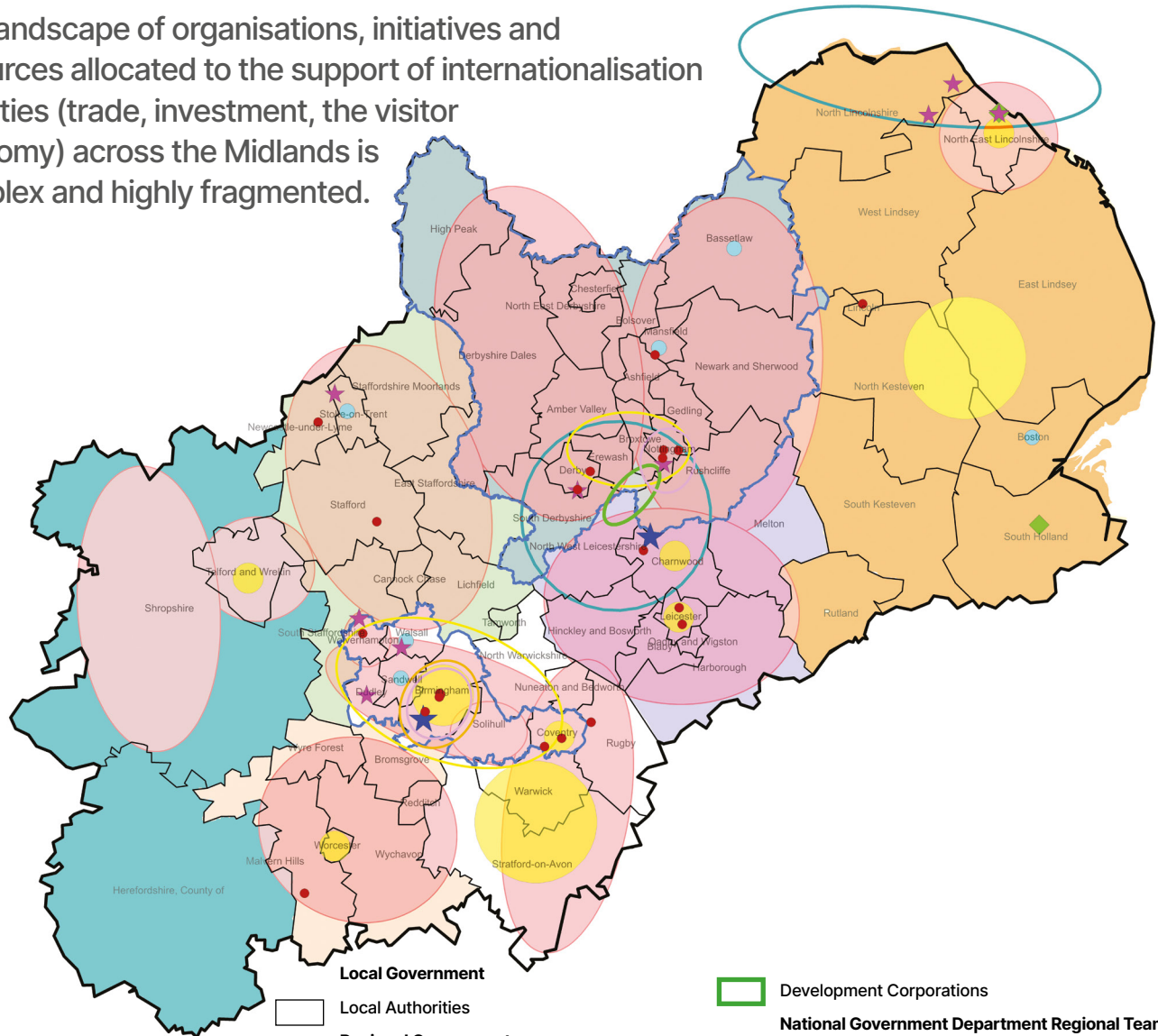


SOURCE: Wavteq based on UK Investment Flow, Dataset excludes retail projects



Why investment in the Midlands? Landscape

The landscape of organisations, initiatives and resources allocated to the support of internationalisation activities (trade, investment, the visitor economy) across the Midlands is complex and highly fragmented.



There are multiple agencies and bodies operating across overlapping geographies, with overlapping remits. This complexity is not desirable for investors looking for clarity and stability in decision-making. It is also difficult for partners to aggregate opportunities, resources and develop more ambitious inward investment programmes. The image below provides an illustration of this organisational complexity and it is to be hoped that the Government's recently announced review of inward investment support will acknowledge and address this.

- Local Government**
 - Local Authorities
- Regional Government**
 - Current and proposed Combined Authorities
 - Derby, Derbyshire, Nottingham and Nottinghamshire LEP
 - Greater Lincolnshire LEP
 - Leicester and Leicestershire LEP
 - Stoke on Trent and Staffordshire LEP
 - The Marches LEP
 - Worcestershire LEP
- Pan-regional partnerships**
 - Midlands Engine Partnership
- Local/regional government agencies**
 - Growth Companies/Investment Promotion Agencies/Destination Marketing Organisations
- Development Corporations**
- National Government Department Regional Teams**
 - DBT Midlands Engine Investment Hub
 - DBT East Midlands and DBT West Midlands
- National Government Inward Investment initiatives**
 - High Potential Opportunity
 - Freeports
 - Investment Zones
 - Life Science Opportunity Zones
 - Food Enterprise Zones
 - Science & Innovation Parks
 - Enterprise Zones
 - Levelling Up Partnerships

2.0 Approach

Clusters are inherently complex economic entities to define and research. This is because, in the real-world, businesses operate in more than one sector. The names and scale of sectors regularly overlap, intersect and the exact geographical boundaries of clusters are, therefore, often blurry.

There is a substantial body of academic literature and policy drawn from the UK and all over the world that seeks to provide a framework for the analysis of clusters. A common theme emerging from the literature is that there is almost always an element of narrative and 'marketing' at the heart of how clusters are described.

In short, any process seeking to identify clusters requires an element of subjective choice.

Step 1: Identifying clusters

This is why our first step for this report's identification of clusters across the Midlands was to undertake a process of review with our partners across the region. The clusters that they had already chosen to articulate in various strategies, plans, investment prospectuses or in direct consultation provided us with our initial longlist.

Cutting the cake: when does a cluster become cluster? Transport Technology in the Midlands

Our analysis shows that the Midlands is home to a world-leading 'Transport Technology Super Cluster' that spans our region. This incorporates notable economic activity across areas of long-established industrial strength for the region in the aerospace, automotive and rail sectors.

But these 'established clusters' are, in turn, comprised of multiple location-specific concentrations of economic and innovation activity that are spread right across the Midlands.

Finally, it is then possible to make an additional articulation or 'cut' when looking to describe a cluster of firms active in what has been called a 'new economy'. For example, we can identify a 'Net Zero Transport Technologies' cluster that is made up of businesses and locations distributed across all of the above industries, sectors and locations.

Step 2: Selecting clusters

We then worked with some of the UK's leading data-providers including The Data City, Beauhurst, WavTeq, the CBI Economics Unit and our own *Midlands Engine Observatory* to select thirty clusters, which we were able to aggregate up to the regional level as the focus for our programme.

Step 3: Analysing investment potential

We then developed an analytical framework to explore what we meant by 'investment potential'. This was based on testing, selecting synthesising metrics drawn from a number of available datasets, a comprehensive literature review of the

subject matter and a series of roundtable conversations with businesses based in several clusters across the region. We identified twenty-five metrics that together provide a 'scorecard' to aid our exploration of investment potential for each cluster.

Step 4: Visualising the clusters

Finally, we worked with The Data City to develop a suite of maps that help visualise key economic activity across the Midlands for each cluster. These are initially focused on core metrics such as business count, turnover and employee numbers as well as illustrating innovation activity and assets such as universities.

“ Ideally, cluster evaluation studies use a combination of methods – qualitative methodologies to zero in on firms and industrial structure complemented by quantitative methods to establish the significance of the cluster nationally and/or internationally. However, where comparative analysis is not required, qualitative approaches alone may be sufficient.^{ix} ”

INNOVATION CAUCUS, UNDERSTANDING CLUSTER GROWTH POTENTIAL, 2022

Proviso

At this point, we should issue a proviso. Comparing or evaluating clusters against each other is extremely difficult because of the subjectivism highlighted above. For example, ascribing a broader geographical or sectoral definition will lead to more impressive statistics. It is also worth highlighting that the sources of both public and proprietary data of relevance to clusters have a number of flaws. To that end, we would caution readers of this report to avoid drawing any firm conclusions about whether one cluster has more investment potential than another.

Our approach and the findings in this report are an attempt to discern a signal from the noise of multiple sources of imperfect data. Throughout the following methodology and case studies, we have tried to acknowledge the inevitable limitations of our analysis and highlight areas where we think more work needs to be done. All the underpinning data,

analysis and literature will be available to partners and Government via the Midlands Engine Observatory.

We hope that this open approach will make this report and the wider programme of work exploring clusters across our region more useful to all. We are also pleased that the UK Government, through the Department for Science, Innovation and Technology (DSIT) are undertaking a more comprehensive programme of cluster analysis across the UK and will continue to work with them to support these efforts.

This report and the *Midlands Engine Partnership Cluster Programme* that will accompany it should be seen as the start of a conversation with our regional partners, businesses and the UK Government to better understand, develop and support clusters across the Midlands. ▴

Step 1: Identifying clusters across the Midlands

Our first step was to work with our partners to identify a long list of over 100 clusters from across the region.

We reviewed local industrial and economic strategies, the *Levelling Up White Paper* and consulted with the West Midlands Combined Authority, Local Enterprise Partnerships, Local Authorities, Growth Companies, Investment Promotion Agencies and other partners in order to identify extant clusters in the Midlands Engine region. This included sophisticated analysis recently undertaken by the West Midlands Combined Authority as part of their [West Midlands Growth Plan](#), which identified eight primary and eight nascent clusters. However, the exercise demonstrated the variance in cluster definitions amongst our partners. For example, some declared clusters covered

an individual town or local authority, while others encompassed entire regions within the East or West Midlands. By first identifying the clusters already described by partners, the project was appropriately informed and thus framed by previous work to identify and promote key clusters across the Midlands Engine area.

Finally, we also looked at where the UK Government had already identified a cluster as being of likely interest to investors through schemes such as the High Potential Opportunities programme, Freeports or by showcasing them on the The UK Government's Investment Atlas. ▴



As of 2023, this includes the following twenty initiatives:

FDI and High Potential Opportunities on the UK Investment Atlas

[Data Driven Healthcare & Technologies in Birmingham & Solihull](#) (also a Life Science Opportunity Zone)

[Net Zero Transport in Coventry and Warwickshire](#)

[Video Games in Coventry and Warwickshire](#)

[CAM modelling and simulation in Oxfordshire and the Midlands](#)

[5G Technology in Worcestershire](#)

[Circular economy in Telford](#)

[Precision Agriculture in Telford](#)

[Sustainable farming systems in Telford and Wrekin](#)

[Food processing automation in Greater Lincolnshire](#)
(includes Food Valley which is a Food Enterprise Zone)

[Offshore wind supply chain and ports in Teesside and the Humber](#) (also part of the Humber Freeport)

[Space in Leicester and Leicestershire](#)

[Rehabilitation in Leicester & Leicestershire](#) (also linked to Charnwood Campus, which is a Life Science Opportunity Zone)

Freeports

[East Midlands Freeport](#)

[Humber Freeport](#) (also linked to the Offshore wind supply chain and ports in Teesside and the Humber High Potential Opportunity area)

Investment Zones

[East Midlands Combined Authority Investment Zone](#) (tbc)

[West Midlands Combined Authority Investment Zone](#) (tbc)

Life Science Opportunity Zones

[Birmingham Health Innovation Campus](#)

[Charnwood Campus Science, Innovation and Technology Park](#)

Food Enterprise Zones

[South Lincolnshire](#)

[Europarc III](#)

Step 2: Aggregating and selecting pan-regional clusters

In keeping with our remit as the pan-regional partnership for the Midlands, we wanted to focus our analysis on clusters that could reasonably be aggregated up to the regional level. There were also multiple examples of our partners nominating clusters in the same or similar sectors but located in different geographies across the region.

We asked Beauhurst and The Data City to use their respective databases of business activity to independently review the clusters nominated by our partners, providing our process of selection and aggregation with a more robust evidence-base. We also asked them to investigate whether the data revealed any further clusters that our discovery phase had missed. This initial review looked at a limited number metrics that were felt to be of fundamental importance to the selection of clusters for further analysis, including business count, employee count, turnover and high-growth companies. We also asked both partners to try and place the clusters in both regional and national context, using a Locational Quotient technique.

We selected these two partners for this exercise because they provided a complimentary analytical offer. The Data City's Real Time Industrial Classification (RTIC) system is able to identify a greater **breadth** of companies, with a particular focus on capturing activity in new and emerging subsectors (such as artificial

intelligence). RTIC methodology is a new approach to industrial classification based on web-crawling technology and supervised machine learning. Companies are classified according to common language patterns in their website text, making it possible to quantify the size and value of new economic sectors. Beauhurst's database of over 5 million UK companies and 50,000 high-growth businesses that they actively monitor provides a significant **depth** of comprehensive insight into company growth and associated behaviours (such as engaging with accelerators), across more traditional sectors. More information about the methodology used by The Data City and Beauhurst is available in Appendix II.

Following this process of data-driven review, both partners presented their findings – with a high degree of similarity in the Clusters they had identified. This provided a single, reconciled and data-validated list of clusters from which all partners could identify those that might more appropriately aggregated into the pan-regional clusters.

This led to the selection of thirty pan-regional clusters for a deeper exploration of their investment potential.

Because partners and public sources of data use different sector classifications, we developed a 'container' approach in order to create the aggregated pan-regional clusters. Each data partner agreed a 'best-fit' approach that linked activity in relevant sectors to the cluster. Where possible, we anchored data at Local Authority level, with the rest provided at a regional (West/East Midlands or whole Midlands) level.

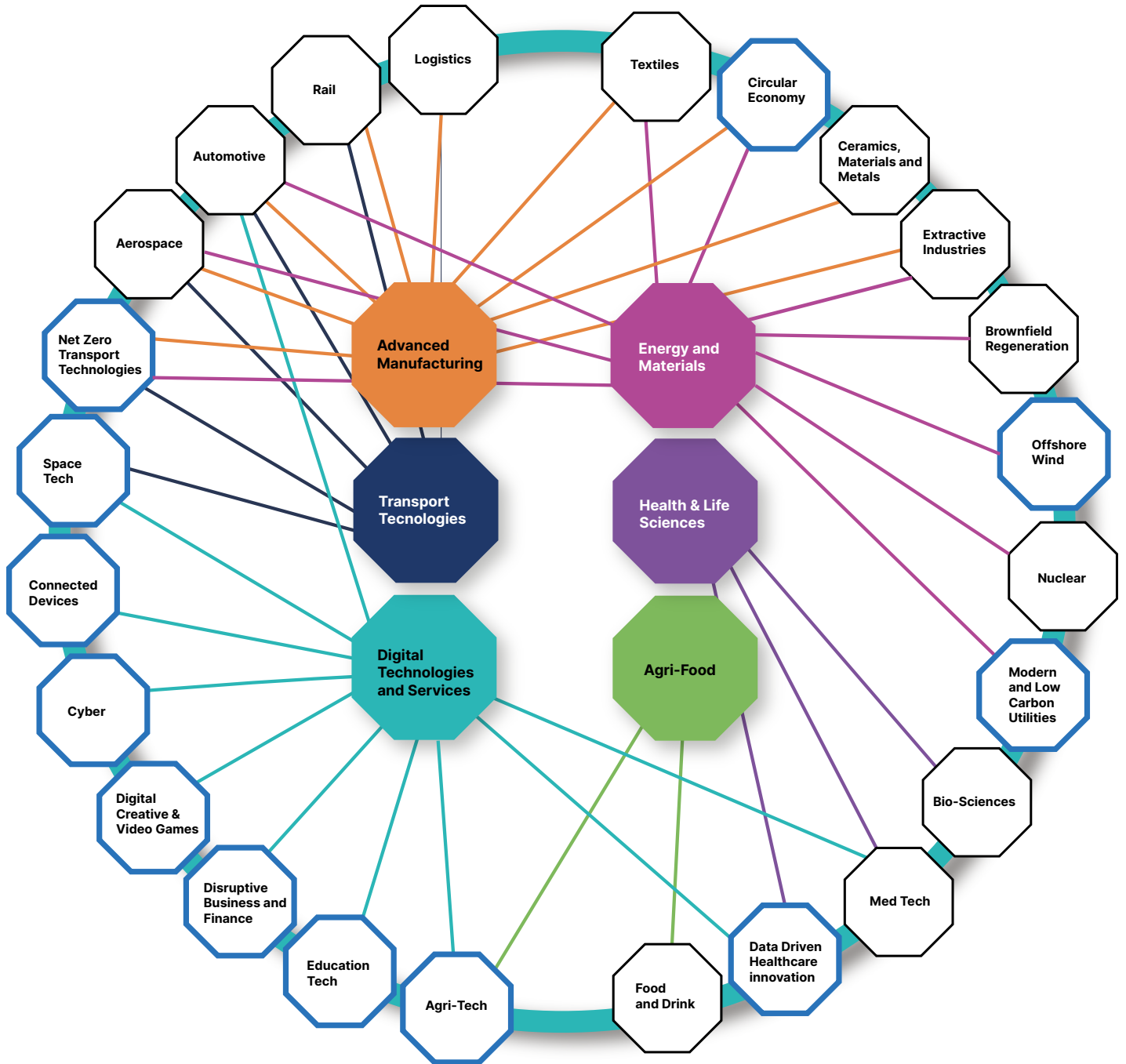
A taxonomy and hierarchy was then developed in order to provide a simplified structure to this process of aggregation.

This identified:

- Six **Midlands 'Super-Clusters'**, which are our key sectors where we have world-leading economic strengths and innovation assets distributed across the region;
- At least ten Midlands **'Established Clusters'**, which incorporate significant concentrations of economic activity in multiple locations, linked to sectors of long-established industrial strength within the region;
- At least fourteen Midlands **'New Economy Clusters'**, which include multiple concentrations of economic activity identified and labelled by partners as aligned to emerging knowledge, technology and innovation-intensive sectors³. ▲

It is worth reiterating that this process of selection was not intended to produce either an exhaustive list of clusters within our region, nor a ranking of those clusters with the greatest investment potential.

³At the frontier: The geography of the UK's new economy, Centre for Cities, <https://www.centreforcities.org/reader/at-the-frontier/> (December 2022).



KEY



UK Investment Atlas initiative linked to one or more Midlands clusters



East Midlands Freeport
UK Investment Atlas
High Potential Opportunity Area



Net zero transport in Coventry and Warwickshire
UK Investment Atlas
High Potential Opportunity Area



CAM modelling and simulation in Oxfordshire and the Midlands
UK Investment Atlas
Net-Zero Investment Opportunity



Space in Leicester and Leicestershire
UK Investment Atlas
High Potential Opportunity Area



5G technology in Worcestershire
UK Investment Atlas
High Potential Opportunity Area



Cyber security in Gloucestershire
UK Investment Atlas
High Potential Opportunity Area



Video games in Coventry and Warwickshire
UK Investment Atlas
High Potential Opportunity Area



Humber Freeport
UK Investment Atlas
Freeport



Circular economy in Telford
UK Investment Atlas
Net Zero FDI Opportunity



Offshore wind supply chain and ports in Teesside and the Humber
UK Investment Atlas
High Potential Opportunity Area



Rehabilitation in Leicester and Leicestershire
UK Investment Atlas
High Potential Opportunity Area



Charnwood Campus Science, Innovation and Technology Park
Life Science Opportunity Zone



Data-driven health innovation in Greater Birmingham and Solihull
UK Investment Atlas
High Potential Opportunity Area
Life Science Opportunity Zone



Precision agriculture in Telford
UK Investment Atlas
High Potential Opportunity Area



Sustainable farming systems in Telford and Wrekin
UK Investment Atlas
High Potential Opportunity Area

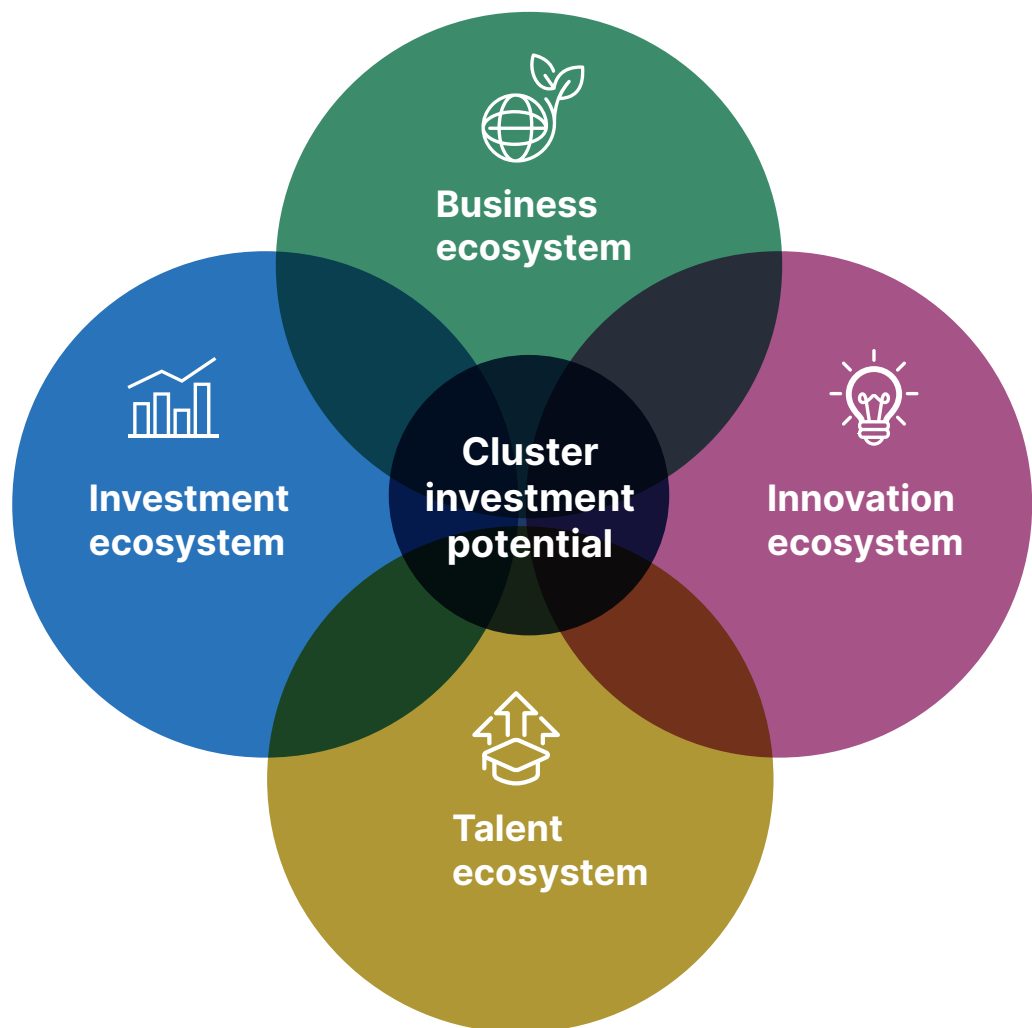


Food processing automation in Greater Lincolnshire
UK Investment Atlas
High Potential Opportunity Area



Step 3: Exploring investment potential – analytical framework and scorecards

Following an extensive review of academic literature and recent policy analysis, partners developed an analytical framework and investment potential scorecard. This incorporated a basket of twenty-five metrics selected to best represent 'investment potential' spread across four interconnected ecosystems.



Beauhurst, the Data City, Wavteq and the Midlands Engine Observatory then compiled data for each of these metrics from a variety of proprietary and public sources. These metrics were collected at Local Authority level, where possible, to allow deeper interrogation by Midlands Engine partners. The data were then aggregated into the pan-regional cluster ‘containers’ and supplemented with both ‘cluster contextualisation’, relevant commentary and mapping of key cluster locations across the Midlands Engine area. These scorecards present twenty-five characteristics of the pan-regional clusters that are factors in the attraction of inward

investment, such as talent pipeline or strength of relevant research in the region, and associated commentary to provide further context. **In short, the investment potential of each cluster is inferred through demonstration of growth, comparative advantage, or disproportionate market share of investment, across these metrics.**

A range of factors determined the selection of each metric for the snapshots. A more detailed account of the methodology deployed in the selection of these metrics is available in [Appendix II](#). ▶

The metrics selected were:

1. Business ecosystem



Including metrics linked to each cluster such as the number of businesses, the number of high-growth companies and the number of major strategic companies (£100m + annual turnover) and identifying any existing cluster support organisations or networks.

	Metric	Source	Cluster contextualisation
1.1	Total Cluster Business Count	<i>Data City, 2023</i>	<ul style="list-style-type: none"> • % of UK companies in this sector located in the Midlands; • Midlands significance compared to other UK regions • % growth of Midlands companies since 2013
1.2	£100m+ Turnover Companies	<i>Data City, 2023</i>	<ul style="list-style-type: none"> • % of £100m + UK companies in this sector based in the Midlands.
1.3	High Growth Companies	<i>Data City, 2023</i>	<ul style="list-style-type: none"> • % of High Growth companies in this sector based in the Midlands.
1.4	Incorporations 2017-22	<i>Data City, 2023</i>	<ul style="list-style-type: none"> • % of UK incorporations in this sector between 2017 and 2022 located in the Midlands.
1.5	Relevant Cluster Organisations	<i>Midlands Engine Observatory</i>	



2. Innovation ecosystem

Including metrics linked to each cluster such as the amount of Innovate UK funding received by businesses in the cluster, the number of businesses in receipt of Innovate UK funding, major sector-related university R&D and innovation assets, high-growth company grants and accelerator engagement.

	Metric	Source	Cluster contextualisation
2.1	Accelerator Engagement	<i>Beauhurst 2022: High growth companies utilised accelerators</i>	
2.2	Relevant Spinouts	<i>Beauhurst 2022</i>	
2.3	Relevant high performing HEI research	<i>Midlands Engine Observatory, REF 2021</i>	<ul style="list-style-type: none"> Midlands universities with a GPA >3.0 in a related research unit
2.4	Significant Innovation Hubs	<i>Midlands Engine Observatory,</i>	<ul style="list-style-type: none"> % of UK incorporations in this sector between 2017 and 2022 located in the Midlands
2.5	High Growth Company Grants	<i>Beauhurst, 2022</i>	
2.6	Innovate UK funding	<i>Data City, 2023</i>	<ul style="list-style-type: none"> % of total Innovate UK funding to firms operating in the sector with a Midlands location





3. Talent ecosystem

Including metrics linked to each cluster such as the number of employees at businesses in the cluster and average salary levels, the number of annual Further Education leavers in related fields, the number of annual university graduates in related field and local graduate retention rates and high-ranked (UK Top 25) university departments in related fields.

	Metric	Source	Cluster contextualisation
3.1	Estimated Employees	<i>Data City, 2023</i>	<ul style="list-style-type: none"> • % of UK employees companies in this sector located in the Midlands; • Midlands significance compared to other UK regions
3.2	Earnings	<i>ONS ASHE, 2021 - relevant sectors</i>	<ul style="list-style-type: none"> • Salary in the Midlands compared National average for this sector
3.3	Further Education Leavers	<i>DfE Unit for Future Skills: Further Education leavers 18/19 in relevant fields</i>	<ul style="list-style-type: none"> • Midlands significance compared to other UK regions
3.4	Relevant HEI High-Ranking Department	<i>QS World University Rankings (Subject Area Rankings) 2022</i>	<ul style="list-style-type: none"> • Midlands universities ranked within the Top 25 of UK universities for relevant subject areas
3.5	University Graduates	<i>Higher Education Statistics Agency Graduate Leavers (HESA) 2021</i>	<ul style="list-style-type: none"> • % of graduates from the Midlands who graduated with a degree in a relevant subject area to the sector
3.6	Graduate Retention: change over 3 years	<i>DfE Graduate Outcomes by Industry 2019</i>	<ul style="list-style-type: none"> • Midlands significance compared to other UK regions





4. Investment ecosystem

Including metrics linked to each cluster such as the number of FDI and DDI projects and as a proportion of the UK total into that sector (2017-21), total FDI and DDI jobs and as a proportion of the UK total into that sector (2017-21), the proportion of high-growth companies receiving FDI, the proportion of UK total FDI and DDI Capex (2017-21) into that sector, fundraising volumes across seed and venture investments, FDI Capex forecasts for the sector by 2025.

	Metric	Source	Cluster contextualisation
4.1	FDI into High Growth Companies	<i>Beauhurst, 2022</i>	<ul style="list-style-type: none"> Number and % of investments into this sector High Growth Companies made into this Cluster
4.2	FDI Capex 2017-21	<i>Wavteq, 2022</i>	<ul style="list-style-type: none"> Midlands Cluster received % of the UK total FDI into this sector
4.3	DDI Capex 2017-21	<i>Wavteq, 2022</i>	<ul style="list-style-type: none"> Midlands Cluster received % of the UK total DDI into this sector
4.4	Fundraising Volumes	<i>Beauhurst, 2022</i>	
4.5	FDI Jobs 2017-2021	<i>Wavteq, 2022</i>	<ul style="list-style-type: none"> Midlands Cluster received % of the UK total FDI jobs into this sector
4.6	DDI Jobs 2017-2021	<i>Wavteq, 2022</i>	<ul style="list-style-type: none"> Midlands Cluster received % of the UK total DDI jobs into this sector
4.7	FDI Projects 2017-2021	<i>Wavteq, 2022</i>	<ul style="list-style-type: none"> Midlands Cluster received % of the UK total FDI projects into this sector
4.8	DDI projects 2017-2021	<i>Wavteq, 2022</i>	<ul style="list-style-type: none"> Midlands Cluster received % of the UK total DDI projects into this sector
4.9	Foreign-owned enterprises	<i>Data City, 2023</i>	<ul style="list-style-type: none"> Proportion of foreign-owned enterprise compared to national average for this sector



Step 4: Articulating the clusters: visualisation and mapping

To bring our analysis to life, we worked with The Data City to develop a suite of maps that help visualise key economic activity across the Midlands for each selected cluster. We produced these for the four clusters that provide case-studies for this overview report. The maps are initially focused on core metrics such as business count, turnover and employee numbers as well as illustrating innovation activity and assets such as universities.

Unsurprisingly, there are several of provisos that accompany the visualisations. The most important is that the maps should be viewed collectively within each cluster, rather than as an individual or isolated visualisation. This is because no single metric can effectively illustrate a cluster. Our attempts to overlay multiple metrics on the same map only resulted in a cluttered aesthetic that did not represent an effective method of data visualisation.

Finally, it is also worth noting that the act of mapping the clusters brings into stark relief some of the issues facing data collection relating to firms and economic activity in the UK. For example, when seeking to visualise a cluster by *business count*, we have seen spikes emerge in particular locations where multiple registered businesses have been created by a parent company for whatever reason. Where we have identified these distortions in the four case studies below, we have provided an explanatory annotation.

Ultimately, these issues reinforce our view that the data can only take our exploration of the investment potential of Midlands clusters

so far. As the Innovation Caucus conclude in their recent publication *Understanding Cluster Growth Potential*, 'the most significant insights about cluster growth potential will come from interviews with leaders and principal actors within each cluster'^x.

This is why this why we see the analysis covered in this report as the start of a conversation with our regional partners, businesses and the UK Government to better understand and develop clusters across the Midlands.

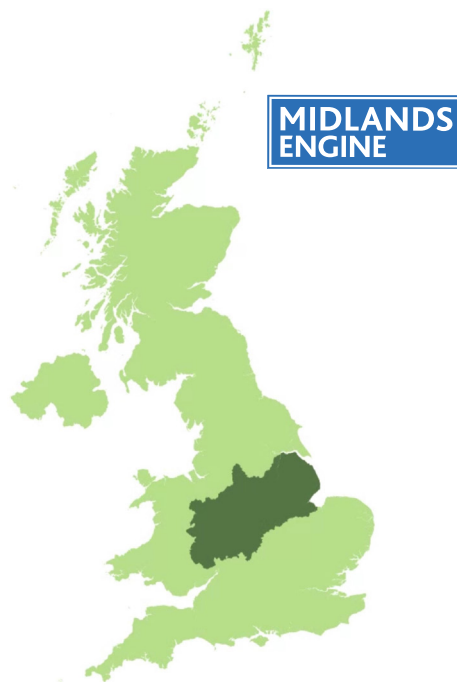
Over the next two years the Midlands Engine Partnership Clusters Programme will:

- 1) Continue to develop the evidence-base around clusters across our region;
- 2) Convene business, local partners and policymakers to understand from them what support their clusters need to grow; and
- 3) To then advocate for the policies and practice required to deliver this growth in the future. ▶

Mapping the Midlands – visualisation methodology

Working with The Data City, we explored a variety of different mapping and visualisation options for the clusters. Our aim was to combine an easily digestible aesthetic with a geographical unit that was aligned to the cluster data available to us via their platform. After several iterations, we decided on the following approach.

Step 1 – Define the Midlands Engine geography



The hex maps have been created using a universal standard 1km grid tile approach creating hexagon shapes spatially across a large geographical area of the Midlands Engine.

The purpose of this was to create a uniformly sized series of areas that meant that any mapping of firms that created 'spikes' by postcode areas would be equally representative. These areas were non-coterminous to administrative boundaries or geographies (as especially low-level boundaries such as Lower Layer Super Output Area (LSOA), Middle Layer Super Output Area

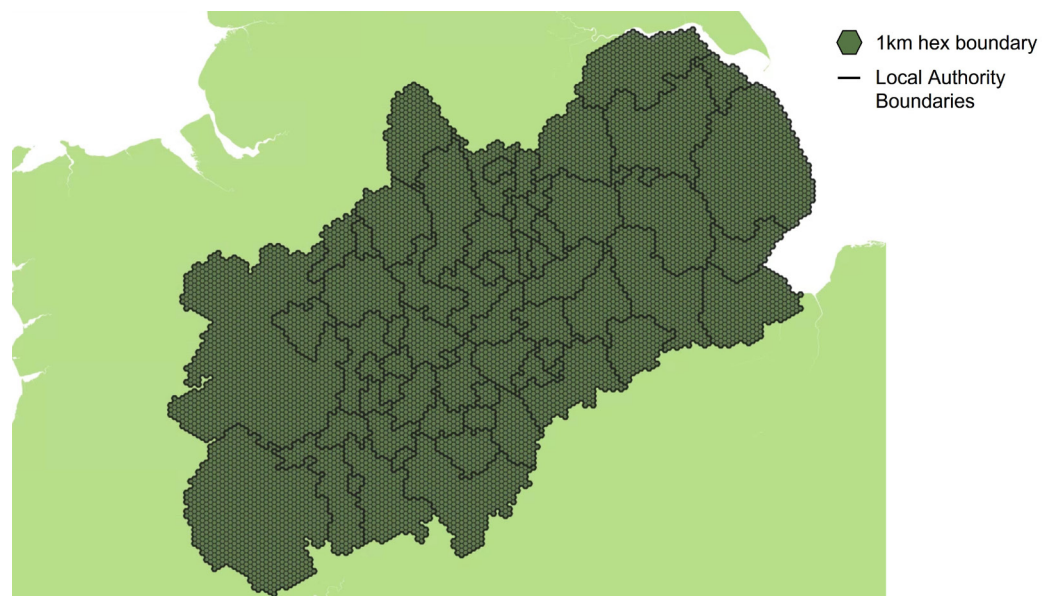
(MSOA) or postal district boundaries adhere by default to weighted thresholds of population or households).

In addition, it removes the visual weight of larger more rural areas in contrast to smaller sized urban areas creating a visual bias especially prominent when used with a choropleth style.

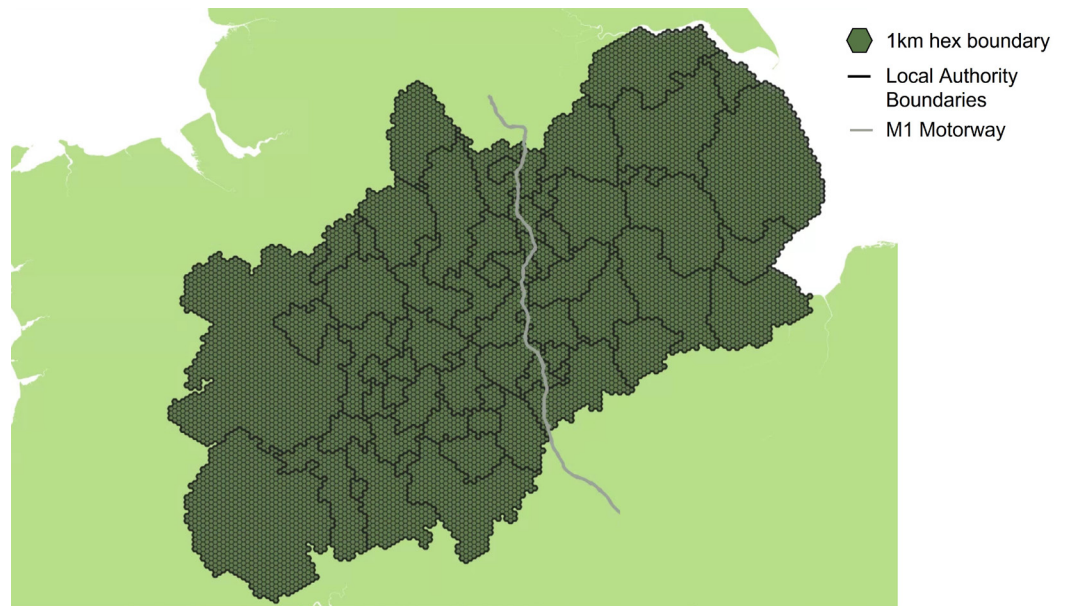
Step 2 – Dividing the Midlands into 1km level Hexes



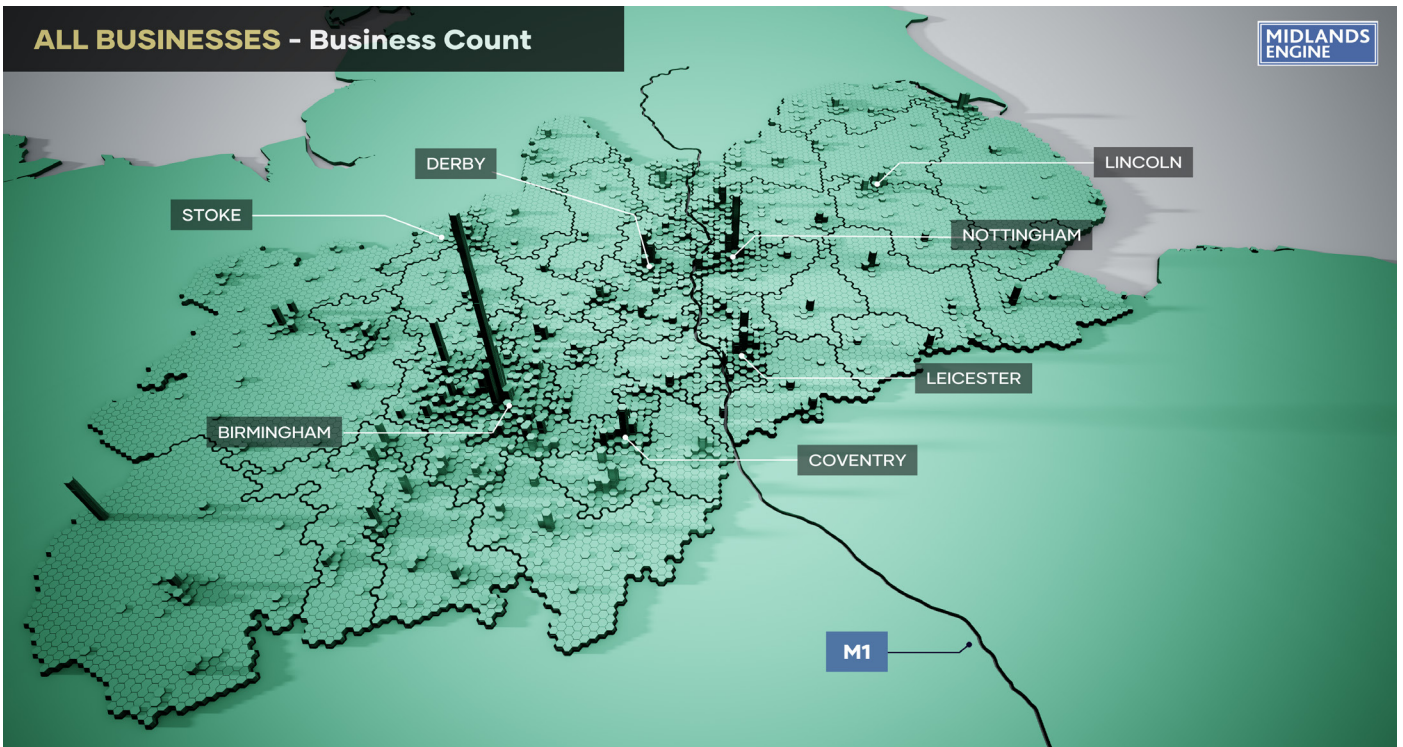
Step 3 – Adding Upping Tier Local Authority Boundaries



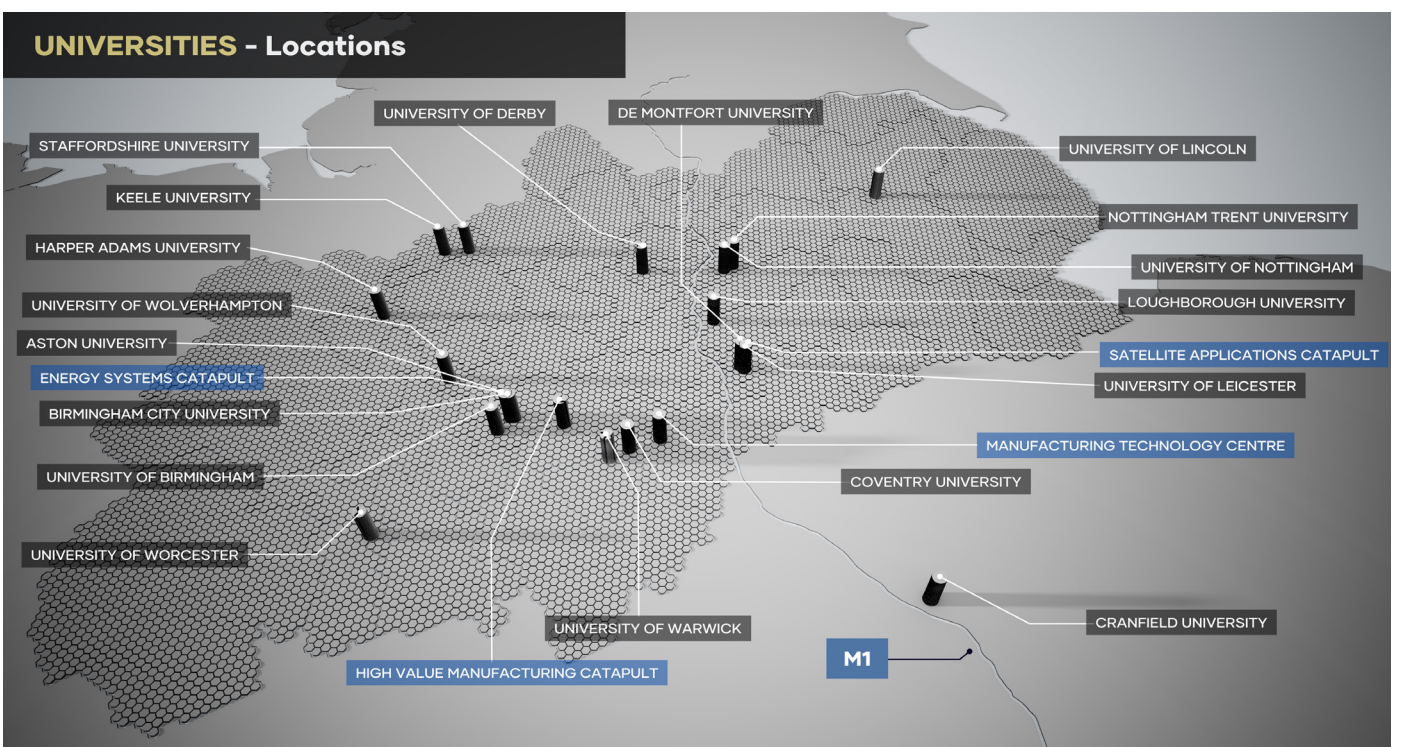
Step 4 – Adding illustrative elements to improve orientation



Step 5 – Introducing metrics via 3D visualisation



Step 6 – Locate and illustrate core innovation and R&D assets





3.0 Midlands cluster case studies

Whilst comparisons between Clusters are not an exact science, the below summary of key metrics helps place the four clusters selected as case studies for this report in the national context. As an approximate benchmark, overall the Midlands produces 15% of UK national economic output.

	Midlands proportion of UK total			
	Health & Life Sciences – Super Cluster	Aerospace – Established Cluster	Agri-tech – New Economy Cluster	Space Technology – New Economy Cluster
Businesses	17%	30%	20%	21%
Employees	7%	22%	10%	12%
High Growth Companies	12%	26%	9%	14%
£100m turnover companies	23%	34%	35%	25%
Innovate UK funding	10%	81%	11%	43%
Foreign Direct Investment capex (2017-21)	3%	7%	23%	8%
Domestic Direct Investment capex (2017-21)	15%	49%	36%	50%



3.1 Focus on: Health and life sciences – a Midlands super cluster

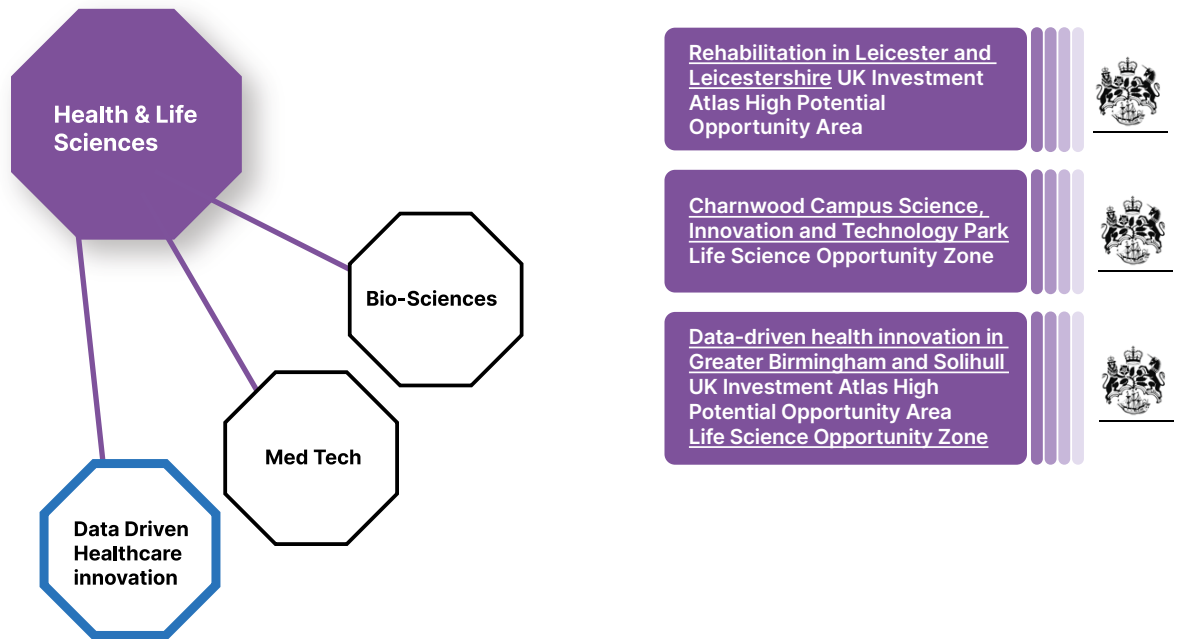
Midlands
Super Cluster/
Key Sector

Health and Life Sciences is a Midlands Super Cluster. The sector is estimated to contribute £20.5 billion to the regional GVA every year. It also increasingly operates as an integrated, networked cluster of firms, businesses and healthcare providers across the region – albeit with notable concentrations including the East Midlands Medical Technologies Cluster and Data Driven Healthcare Innovation in Birmingham.

Today, the Midlands has:

- **The highest number of Medical Technologies companies of any region in the UK (pumping £1.6bn into the UK economy annually)**
- **14%** of all UK Life Sciences employment (30,565 jobs)
- **2 of the 3** largest UK NHS Trusts
- **The 2nd largest** Clinical Trials cluster in Europe
- **7 leading Medical Schools** (producing over 20% of the UK's medical students)
- **A stable, ethnically diverse population of over 10 million citizens** (making it the ideal test bed for global health and multi-morbidity interventions).

Connection to other Midlands Clusters and UK Government investment support initiatives



KEY



UK Investment Atlas initiative linked to one or more Midlands clusters

Data Driven Healthcare Innovation is a New Economy Cluster for the Midlands, with a notable concentration in the West Midlands around the dedicated Life Science Opportunity Zone at the Birmingham Health Innovation Campus. The cluster focuses on population data in deriving new healthcare interventions, utilising the strong innovation infrastructure through Medilink and the Academic Health Science Networks. The UK Government have allocated ‘data-driven health innovation in Greater Birmingham and Solihull’ a High Potential Opportunity, with notable clusters of high growth businesses also found in Nottingham and Leicester - supplemented by academic and research excellence in these places.

**MIDLANDS
ENGINE
OBSERVATORY**

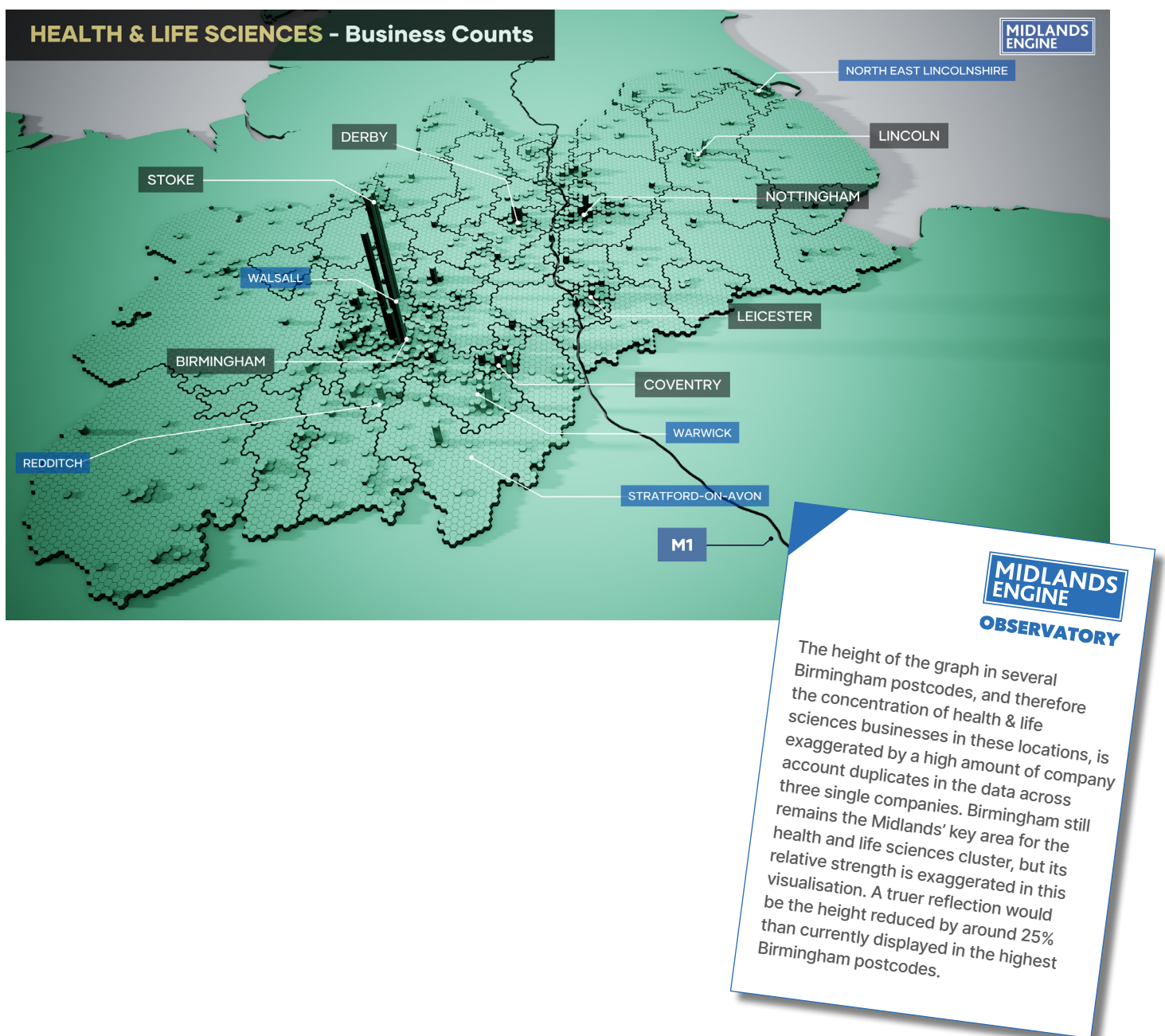
Health and life sciences is a difficult cluster to define and quantify, hence some discrepancies between the data - particularly the number of jobs - presented here and previous work; for example the Midlands MedTech sector analysis, which uses Office for Life Sciences (OLS) data, and previous Midlands Engine Observatory (MEO) publications related to health and life sciences, e.g. this factsheet. The latter takes a broader definition of health than this cluster project, incorporating public healthcare and social care service jobs, while the difference between the OLS data and the Data City estimates for the Midlands (32,000 jobs vs 18,000 jobs) is likely due to the method for allocating jobs per location in this project (an equal distribution across addresses). In this case the number of actual Midlands jobs in health and life sciences is likely to be underestimated by the Data City data (18,177) due to company account structures, specifically addresses. This is validated somewhat by the number of total employees in companies with a Midlands Engine address being as high as over 68,000. Therefore, as per the OLS company-level data, the number of employees in health and life sciences in the Midlands Engine are more likely to be in excess of 30,000 and beyond, while moving forward, MEO and wider Midlands Engine will continue to work with partners to best identify and track the cluster moving forward.

Medical Technologies is an Established Cluster for the Midlands, with the East Midlands is recognised as a centre of Medical Technologies (MedTech) activity. The Midlands has the highest number of Medical Technologies companies of any region in the UK (pumping £1.6bn into the UK economy pa). It is a driver of high productivity, with GVA per worker standing 40% higher than the Midlands average. There are close to 1,000 MedTech businesses operating in the Midlands – the largest number of MedTech companies in any region in the UK. Midlands MedTech employs 23,600 people – the second highest UK region for employment

The East Midlands MedTech Cluster was the focus of a recent Innovation Caucus report: *'The cluster covers a range of activities (e.g., product development, contract manufacturing, contract research). It builds on the region's heritage in pharmaceuticals, particularly a legacy of R&D activities formerly conducted in the region by Boots (Nottingham) and AstraZeneca (Loughborough). The East Midlands also has a long history in manufacturing and engineering industries that are a source of skills and capabilities related to the MedTech cluster. Respondents described the strength of the cluster relating to capabilities in being able to bring new product ideas to market rather than relating to a specialisation in any specific therapeutic area.'*

Business ecosystem

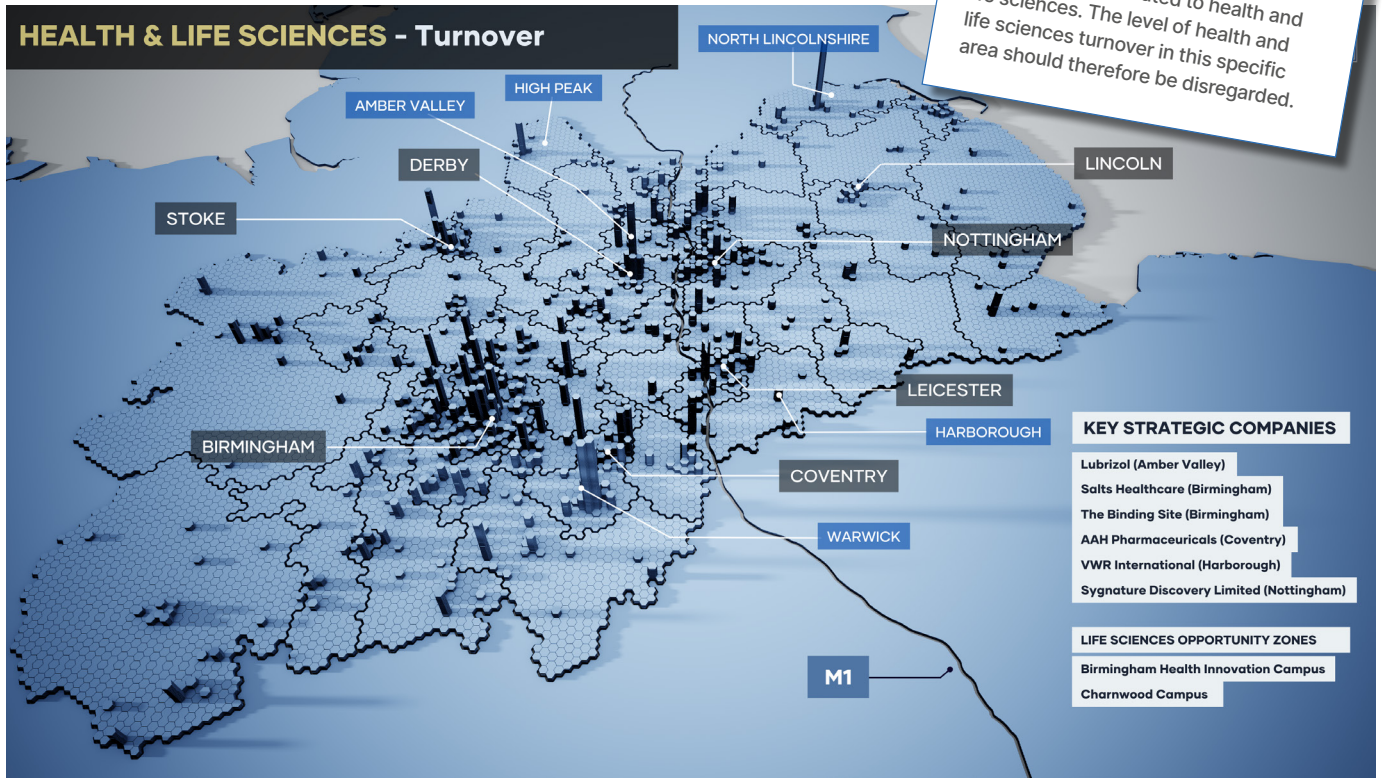
Health & Life Sciences is a growing Super Cluster within the Midlands (with a 93% company count growth 2013-22). With 420 businesses incorporated since 2017 and 34 spinouts currently being tracked, the growth looks set to continue. Prominent cluster locations based on business, growth and employee figures in particular are Birmingham and Nottingham. It has established organisations such as Medilink and Academic Health Science Networks, dedicated Life Science Opportunity Zones in Birmingham and Charnwood, as well as private incubator spaces such as BioCity in Nottingham—there is a robust cluster support infrastructure across the region.



MIDLANDS ENGINE OBSERVATORY

The height of the graph in a single North Lincolnshire postcode is likely to be exaggerated by a single large company, which is unlikely to generate the level of turnover accounted for just in this location, and indeed unlikely to all be related to health and life sciences. The level of health and life sciences turnover in this specific area should therefore be disregarded.

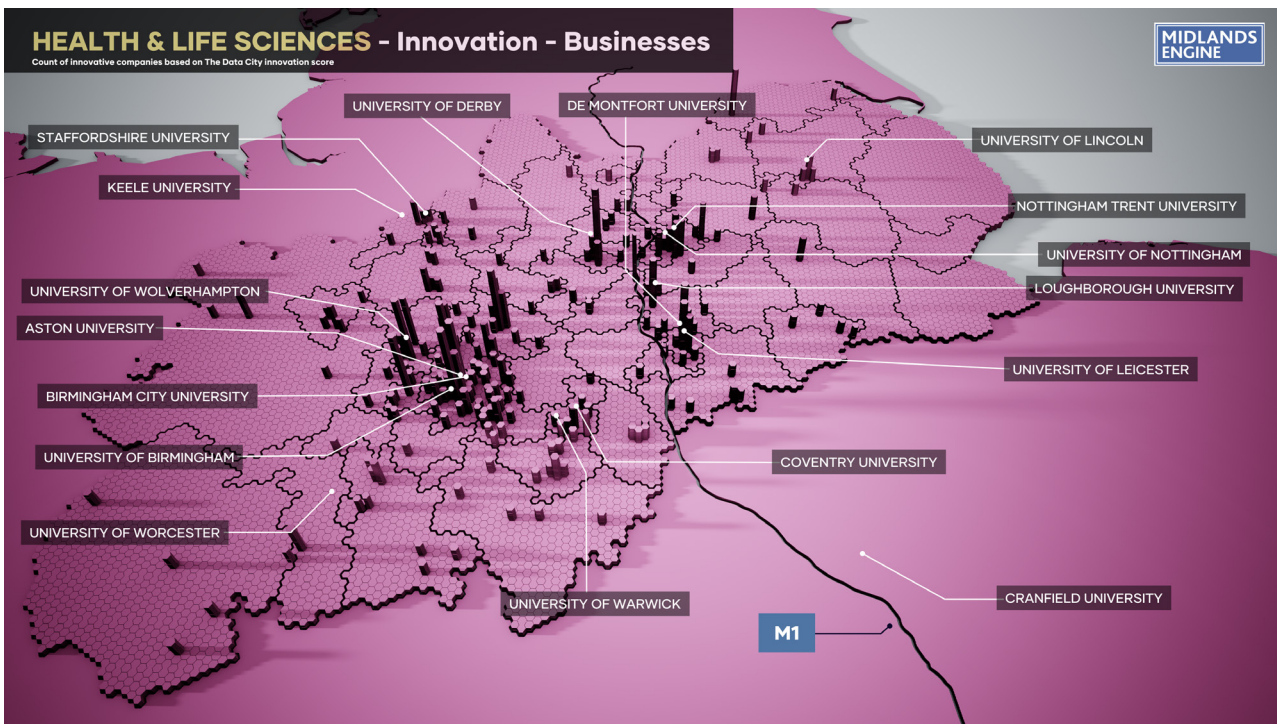
HEALTH & LIFE SCIENCES - Turnover



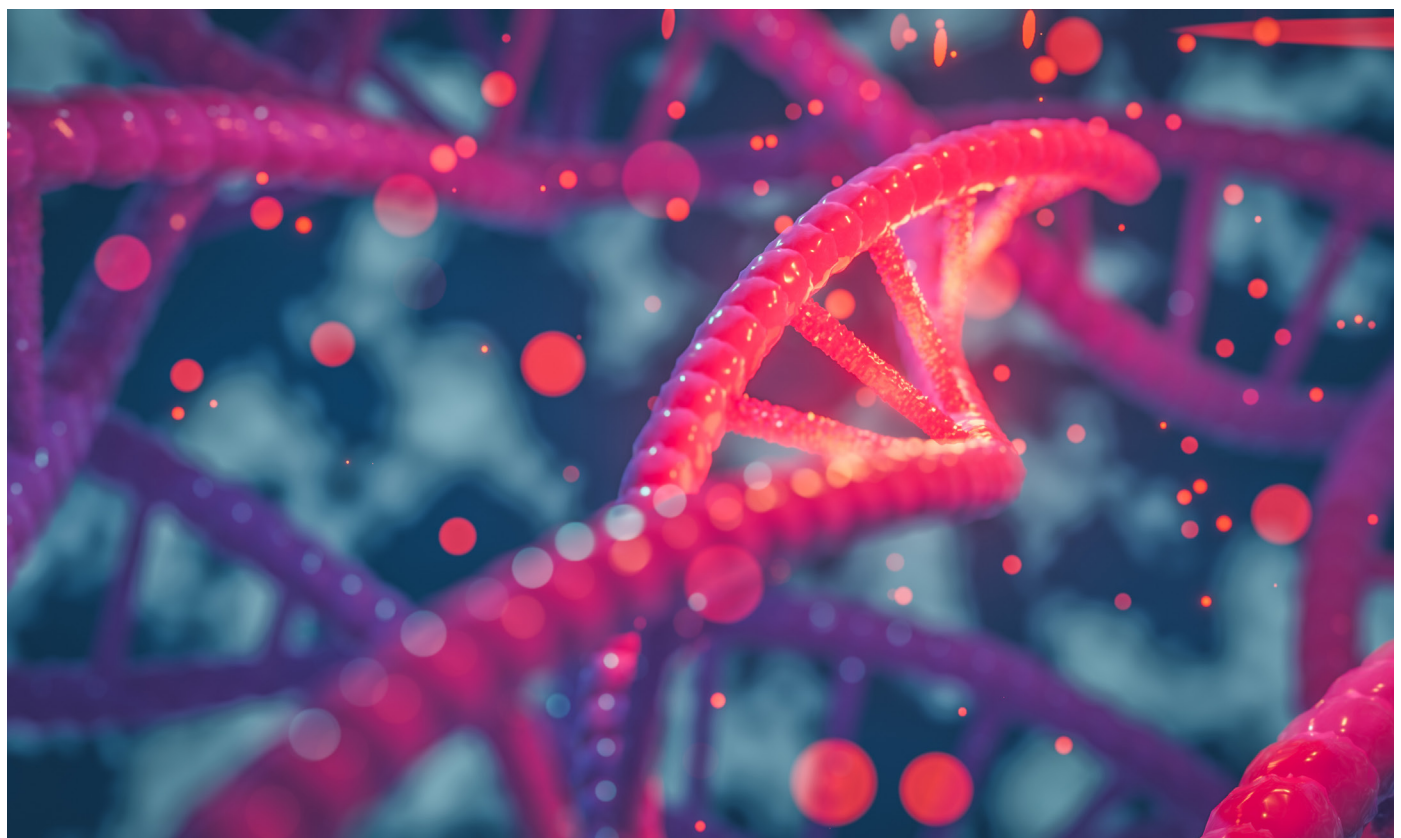
	Cluster metric	Source	Score	Cluster in context
1.1	Total Cluster Business Count	Data City, 2023	1,294	<ul style="list-style-type: none"> 17% of UK companies in this sector are located in the Midlands Cluster; 93% growth in Midlands companies in the Cluster since 2013
1.2	£100m+ Turnover Companies	Data City, 2023	17	<ul style="list-style-type: none"> 23% of £100m + UK companies in this sector are based in the Midlands Cluster
1.3	High Growth Companies	Data City, 2023	78	<ul style="list-style-type: none"> 12% of High Growth companies in this sector based in the Midlands Cluster
1.4	Incorporations 2017-22	Data City, 2023	420	<ul style="list-style-type: none"> 15% of UK incorporations in this sector between 2017 and 2022 are located in the Midlands Cluster
1.5	Relevant Cluster Organisations	Midlands Engine Observatory		Medilink; East & West Midlands Academic Health Science Networks; Birmingham Health Innovation Campus; Charnwood Campus; Innovation Alliance for the West Midlands; DIAGCOMM – The West Midlands Diagnostics Innovation Community; West Midlands Health Technologies Cluster

Innovation ecosystem

Our analysis shows the Midlands Health and Life Science Super Cluster is built on a strong research and innovation base, including 11 of the region's universities performing highly in relevant research.

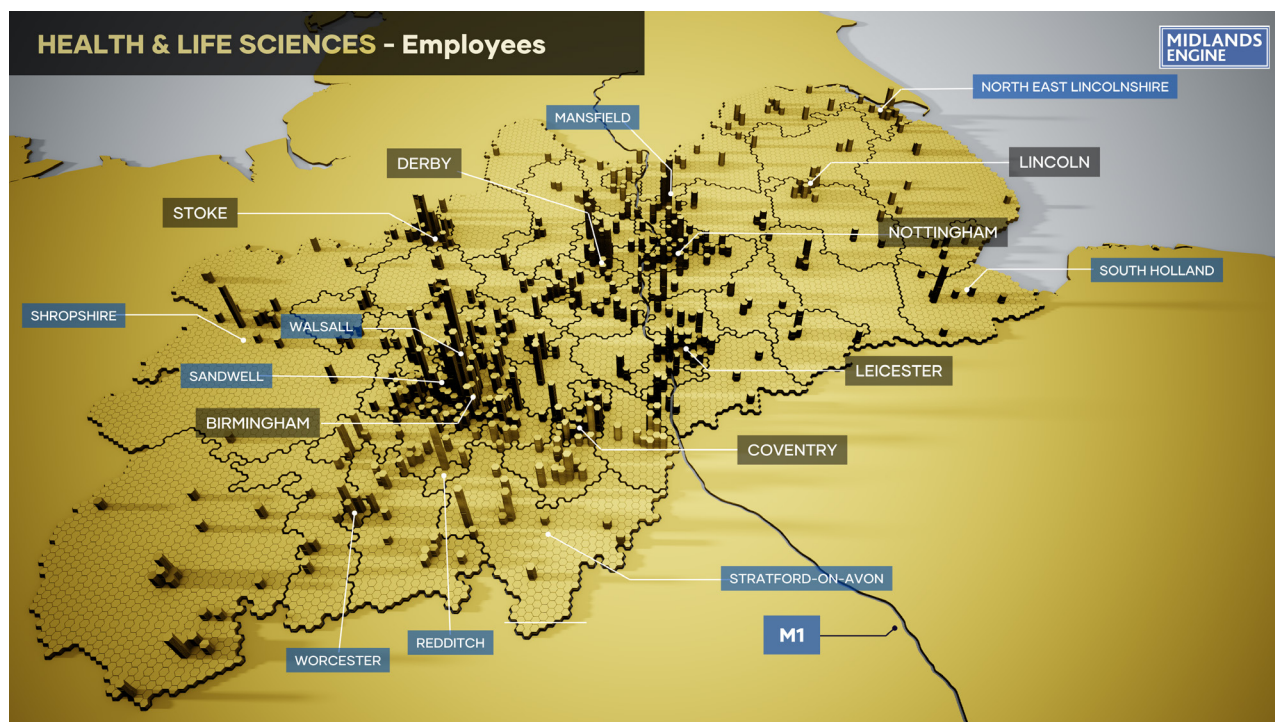


	Cluster metric	Source	Score	Cluster in context
2.1	Accelerator Engagement	<i>Beauhurst 2022: High growth companies utilised accelerators</i>	75 companies in 2022	
2.2	Relevant Spinouts	<i>Beauhurst 2022</i>	34 companies formed in 2022	
2.3	Relevant high performing HEI research	<i>Midlands Engine Observatory, REF 2021</i>	Universities of Aston; Birmingham; Coventry; De Montfort; Keele; Leicester; Lincoln; Loughborough; Nottingham; Nottingham Trent; Warwick	<ul style="list-style-type: none"> • 11 Midlands universities have a GPA >3.0 in a related research unit
2.4	Significant Innovation Hubs	<i>Midlands Engine Observatory,</i>	Birmingham Health Innovation Campus; Charnwood Campus; Biocity;	
2.5	High Growth Company Grants	<i>Beauhurst, 2022</i>	54 grants in 2022	
2.6	Innovate UK funding	<i>Data City, 2023</i>	£18m since 2005	<ul style="list-style-type: none"> • 10% of total Innovate UK funding to firms operating in the sector was to companies within the Midlands Cluster



Talent ecosystem

There are almost 45,000 Further Education leavers each year in health & life sciences, supplemented by over 10,000 Higher Education graduates.



	Cluster metric	Source	Score	Cluster in context
3.1	Estimated Employees	<i>Data City, 2023</i>	18,177	<ul style="list-style-type: none"> • 7% of UK employees in companies in this sector are located in the Midlands Cluster; • Midlands significance compared to other UK regions
3.2	Earnings	<i>ONS ASHE, 2021 - relevant sectors</i>	£30,755	<ul style="list-style-type: none"> • Salary is 17% lower in the Midlands Cluster than the national average for this sector
3.3	Further Education Leavers	<i>DfE Unit for Future Skills: Further Education leavers 18/19 in relevant fields</i>	43,940	<ul style="list-style-type: none"> • More FE leavers (including higher level) in relevant subjects than all other UK regions
3.4	Relevant HEI High-Ranking Department	<i>QS World University Rankings (Subject Area Rankings) 2022</i>	Universities of Nottingham; Birmingham; Warwick; Leicester	<ul style="list-style-type: none"> • 4 Midlands universities ranked within the Top 25 of UK universities for relevant subject areas
3.5	University Graduates	<i>Higher Education Statistics Agency Graduate Leavers (HESA) 2021</i>	11,200	<ul style="list-style-type: none"> • 8% of graduates from the Midlands who graduated with a degree in a relevant subject area to health and life sciences
3.6	Graduate Retention: change over 3 years	<i>DfE Graduate Outcomes by Industry 2019</i>	91.7%	<ul style="list-style-type: none"> • Negative balance for graduate retentions for both East Midlands and West Midlands

Investment ecosystem

The top countries for foreign ownership of businesses in this cluster are the USA, Germany, Australia, France, Sweden.

	Cluster metric	Source	Score	Cluster in context
4.1	FDI into High Growth Companies	<i>Beauhurst, 2022</i>	56%	<ul style="list-style-type: none"> • 7% of UK employees in companies in this sector are located in the Midlands Cluster; • Midlands significance compared to other UK regions
4.2	FDI Capex 2017-21	<i>Wavteq, 2022</i>	\$266.30mn	<ul style="list-style-type: none"> • Salary is 17% lower in the Midlands Cluster than the national average for this sector
4.3	DDI Capex 2017-21	<i>Wavteq, 2022</i>	\$544.21mn	<ul style="list-style-type: none"> • More FE leavers (including higher level) in relevant subjects than all other UK regions
4.4	Fundraising Volumes	<i>Beauhurst, 2022</i>	<ul style="list-style-type: none"> • Mean av. £688k fundraising investment • £68.2m in 99 investments (inc. £25.1m across 43 seed investments • £19.4m across 33 venture investments) 	<ul style="list-style-type: none"> • 4 Midlands universities ranked within the Top 25 of UK universities for relevant subject areas
4.5	FDI Jobs 2017-2021	<i>Wavteq, 2022</i>	889 jobs	<ul style="list-style-type: none"> • 5% of UK total FDI jobs related to this sector were into the Midlands Cluster
4.6	DDI Jobs 2017-2021	<i>Wavteq, 2022</i>	3,321 jobs	<ul style="list-style-type: none"> • 17% of UK total DDI jobs related to this sector were into the Midlands Cluster
4.7	FDI Projects 2017-2021	<i>Wavteq, 2022</i>	27 projects	<ul style="list-style-type: none"> • 7% of UK total FDI projects related to this sector were into the Midlands Cluster
4.8	DDI projects 2017-2021	<i>Wavteq, 2022</i>	47 projects	<ul style="list-style-type: none"> • 25% of UK total DDI projects related to this sector were into the Midlands Cluster
4.9	Foreign-owned enterprises	<i>Data City, 2023</i>	10% (131 companies)	<ul style="list-style-type: none"> • 3% greater proportion of foreign-owned enterprise compared to national average for this sector



3.2 Focus on: Aerospace – a Midlands established cluster

Midlands
Established
Cluster

The Midlands is home to the largest Aerospace cluster in the UK with 30% of aerospace businesses based here and more than half of domestic investment going to aerospace companies in the Midlands. This means the Midlands is also home to 7% per cent of Europe's and 3% of the world's aerospace industry.

Consisting of defence and civil elements, the region's aerospace enterprises are 87% domestically owned. Despite this, new and high growth companies benefit from high levels of foreign investment, with 42% of fundraising at seed and venture stages from international sources.

As the Midlands Aerospace Alliance sets out in their report on the [Midlands Aerospace Cluster](#), the principal hub of the cluster is the heart of civil aerospace operations at Rolls-Royce, the world's second largest manufacturer of aircraft engines, in Derby. Rolls-Royce accounts for one in four of the cluster's jobs. Radiating from this hub across the East and West Midlands are the supply chains that define the cluster's nerve system, linking the local nodes where aero-engine parts are made and where electronic and mechanical systems that control how the engine operates are designed and built.

A second cluster hub is organised around the companies Collins Aerospace, Rolls-Royce Control Systems, Meggitt and Moog, in Birmingham, Wolverhampton and Coventry, which supply electro-mechanical systems to control aircraft moving parts — wing flaps and slats, landing gear, wheels and brakes — to aircraft makers like Airbus, BAE Systems

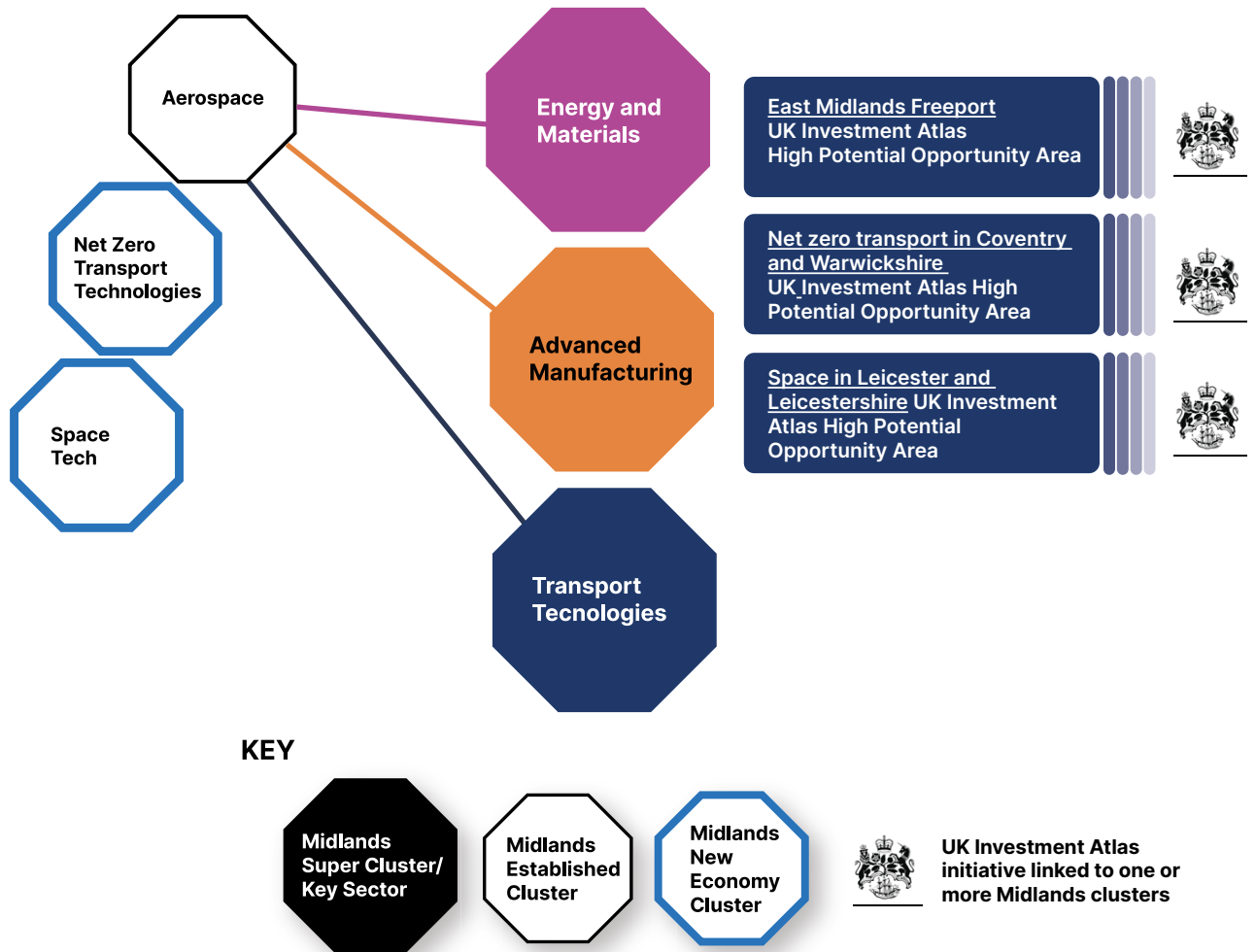
and Boeing, and (as above) similar control systems to Rolls-Royce and engine makers across the globe.

At the base of the supply chain, the Midlands hosts the UK's specialist aerospace materials producers including Alcoa (aluminium) and Timet (titanium) in Birmingham, Special Metals Wiggin (specialised alloys) in Hereford as well as Cytec (carbon fibre materials) in Derbyshire.

Major strategic companies such as Rolls-Royce in Derbyshire form part of a thriving innovation network (building on internationally significant research strengths in Warwick, Nottingham, Birmingham, Loughborough, Leicester, and Keele) supported by a pipeline of some 24,000 FE and HE graduates annually. Connectivity within the cluster is facilitated through key organisations such as the Midlands Aerospace Alliance and MakeUK.

With more than half of domestic investment going into Midlands Engine aerospace companies, this pan-regional cluster is nationally significant. The Midlands aerospace cluster overall also has a higher average annual wage than the national average. ▲

Connection to other Midlands Clusters and UK Government investment support initiatives



The aerospace cluster data and mapping presented provides broad estimates based on compiled company-level data using Data City's methodology. This provides a strong baseline and visual understanding of the cluster across the Midlands. Together with the Midlands Aerospace Alliance (MAA), Midlands Engine Observatory (MEO) is currently also working on an even deeper research project related specifically to the size and scale of the Midlands aerospace cluster and looking into the level of innovation funding received across the industry. This will be published in late Summer 2023, providing additional detailed insight to what has been presented in this illustrative, "first cut" analysis. For example, the number of businesses and employees is likely to be slightly overestimated in the Data City data due to company address discrepancies and company duplicates. Initial estimates from the MEO / MAA project suggest around 50,000 jobs and almost 700 business units being active in Midlands aerospace, while innovation / R&D funding is found to be highly concentrated in a small number of large or academic organisations. The broad results and visualisations of the research projects are similar, and the projects complement each other.

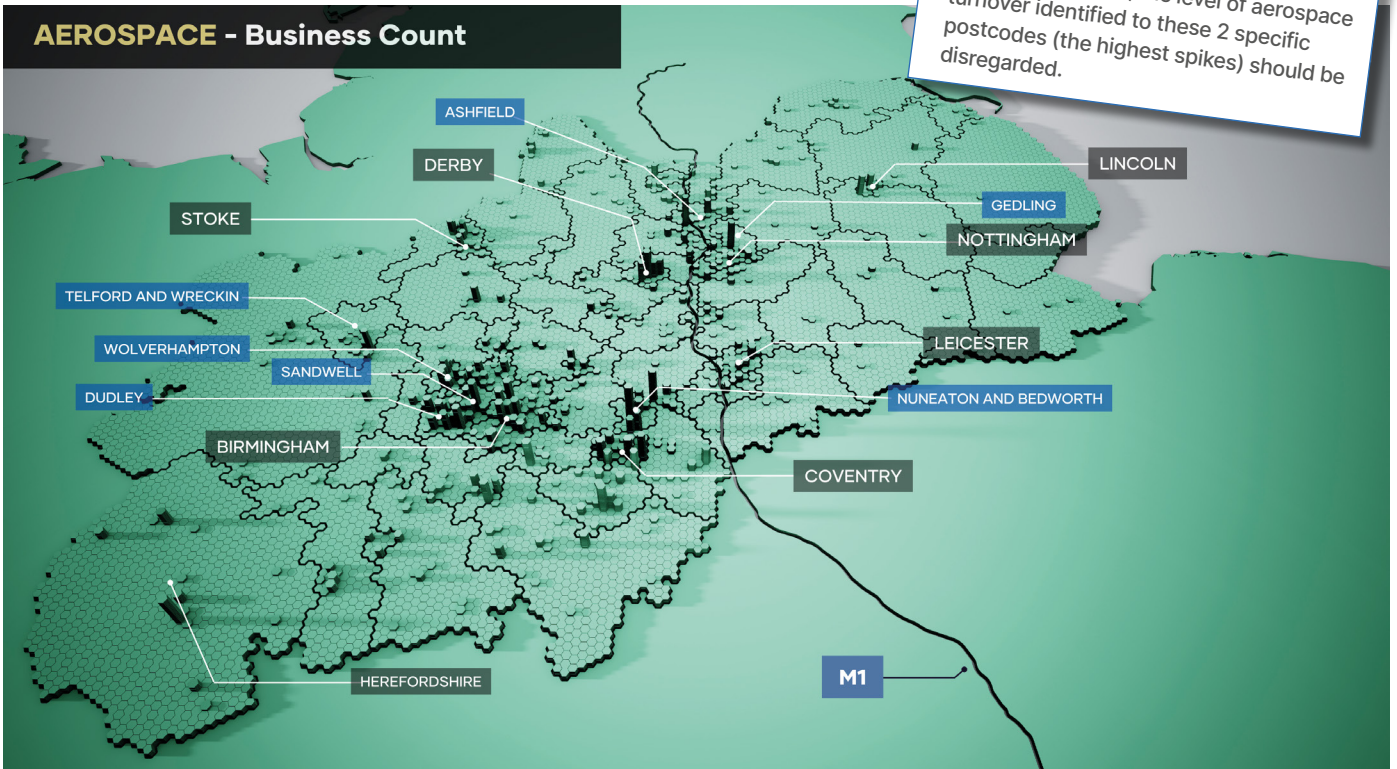


MIDLANDS ENGINE OBSERVATORY

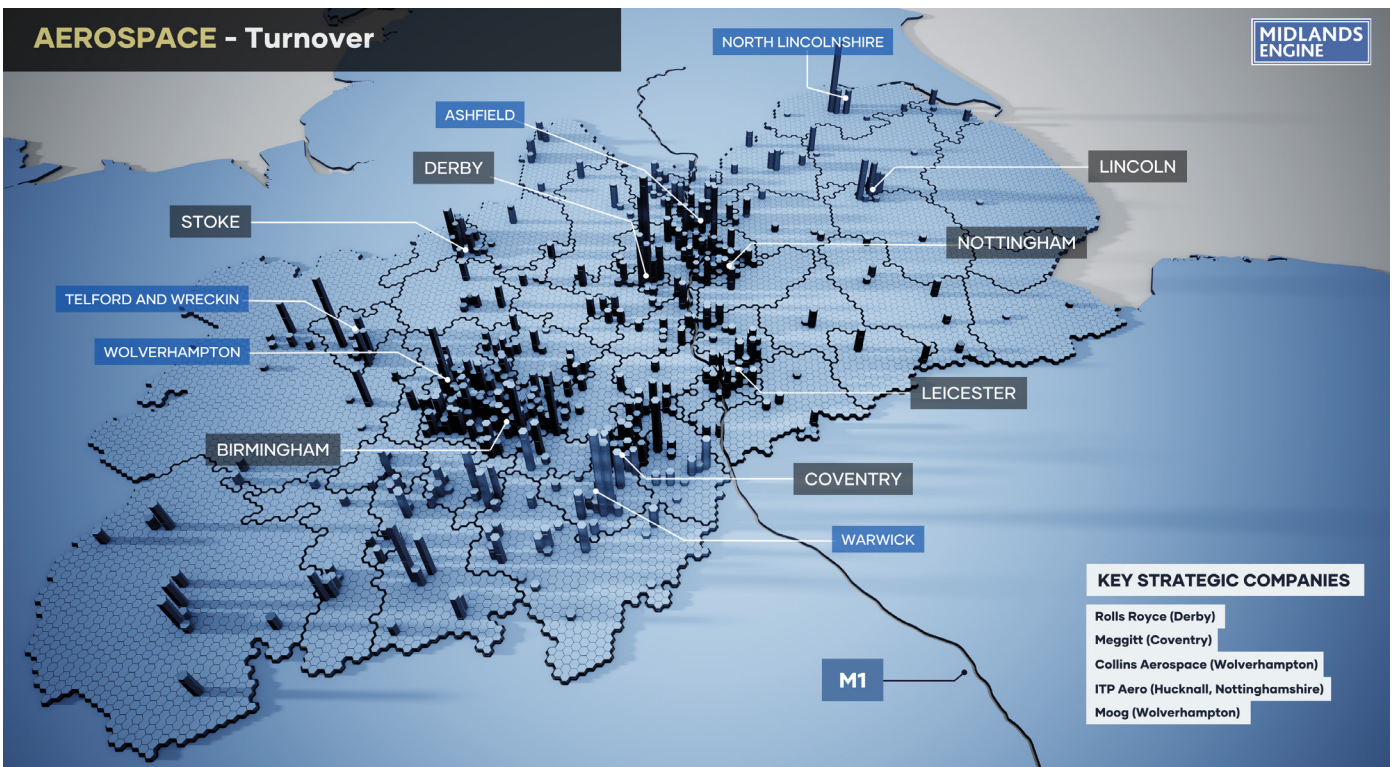
The height of the graph in a single postcode within both North Lincolnshire and Telford & Wrekin is likely to be exaggerated by a single large company, which is unlikely to generate the level of turnover accounted for just in this location, and indeed unlikely to all be related to aerospace. So, while North Lincolnshire and Telford and Wrekin retain a notable, "real" level of aerospace activity, the level of aerospace turnover identified to these 2 specific postcodes (the highest spikes) should be disregarded.

Business ecosystem

AEROSPACE - Business Count



AEROSPACE - Turnover

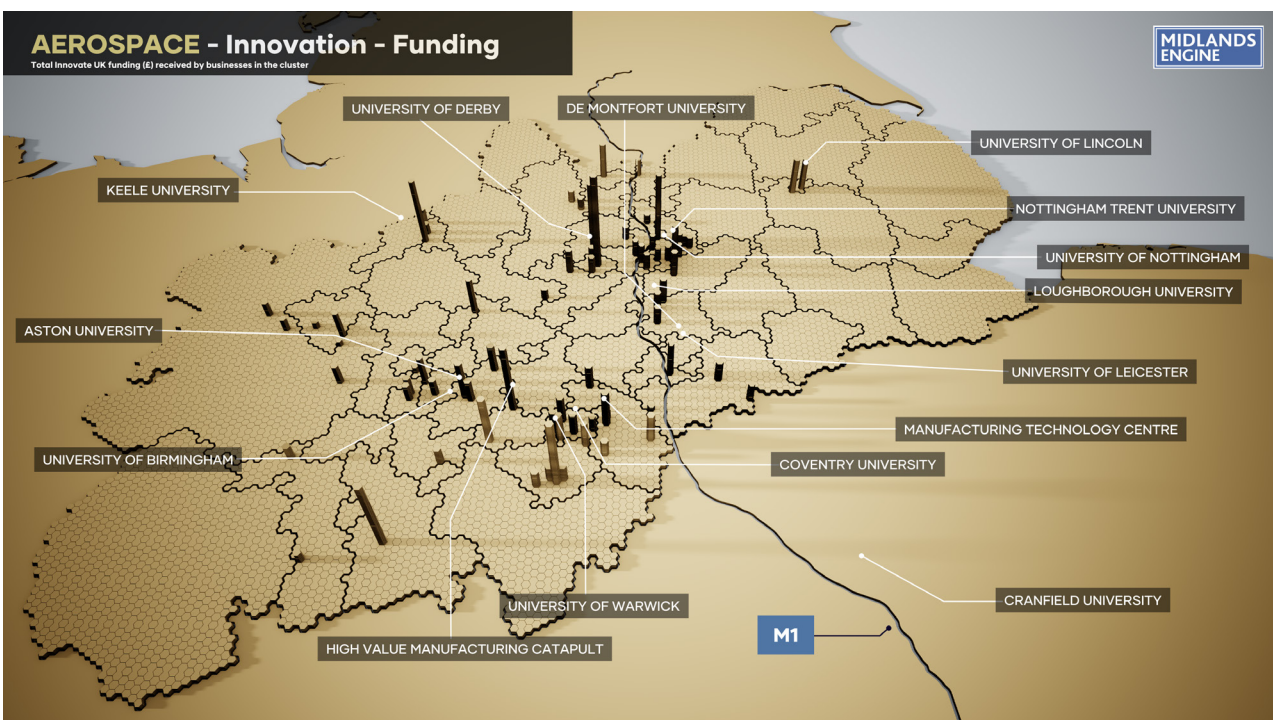
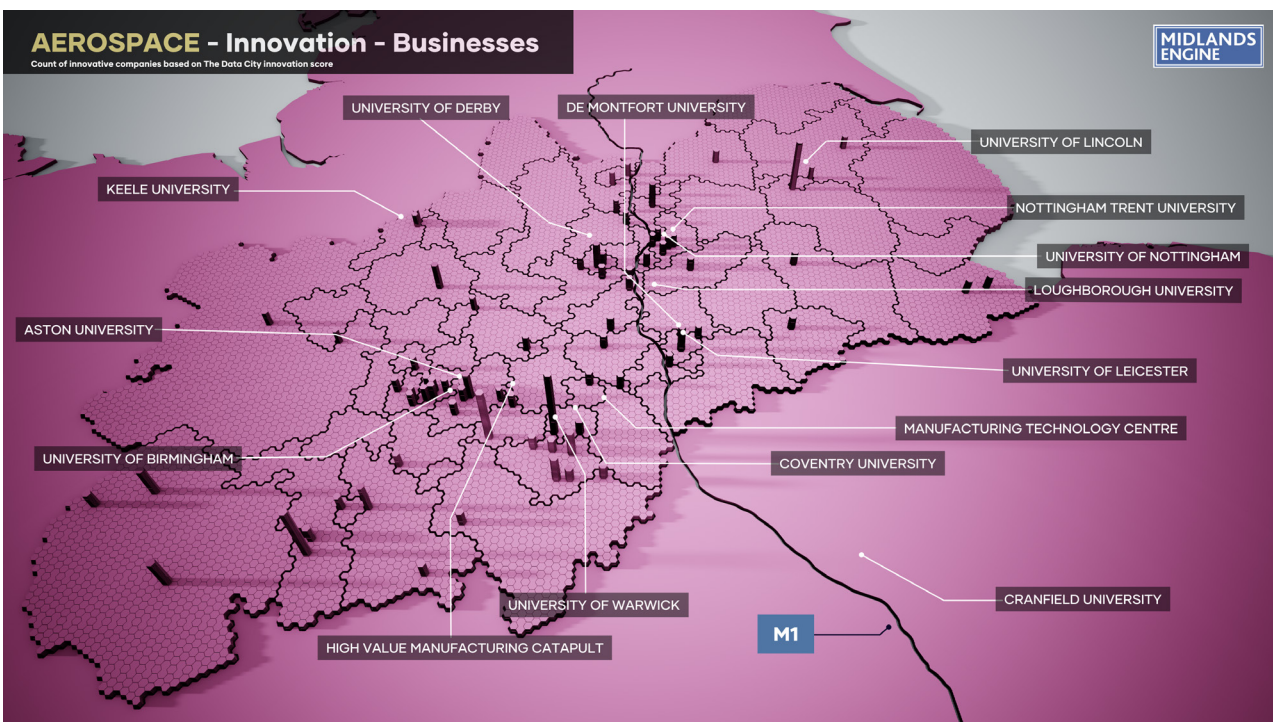


	Cluster metric	Source	Score	Cluster in context
1.1	Total Cluster Business Count	<i>Data City, 2023</i>	1,524	<ul style="list-style-type: none"> • 30% of UK companies in this sector are located in the Midlands Cluster; • 48% growth in Midlands companies in the Cluster since 2013
1.2	£100m+ Turnover Companies	<i>Data City, 2023</i>	22	<ul style="list-style-type: none"> • 34% of £100m + UK companies in this sector are based in the Midlands Cluster.
1.3	High Growth Companies	<i>Data City, 2023</i>	74	<ul style="list-style-type: none"> • 26% of High Growth companies in this sector based in the Midlands Cluster.
1.4	Incorporations 2017-22	<i>Data City, 2023</i>	285	<ul style="list-style-type: none"> • 27% of UK incorporations in this sector between 2017 and 2022 are located in the Midlands Cluster.
1.5	Relevant Cluster Organisations	<i>Midlands Engine Observatory</i>	<ul style="list-style-type: none"> • Midlands Aerospace Alliance; MakeUK; Innovation Alliance for the West Midlands; ADS. 	



Innovation ecosystem

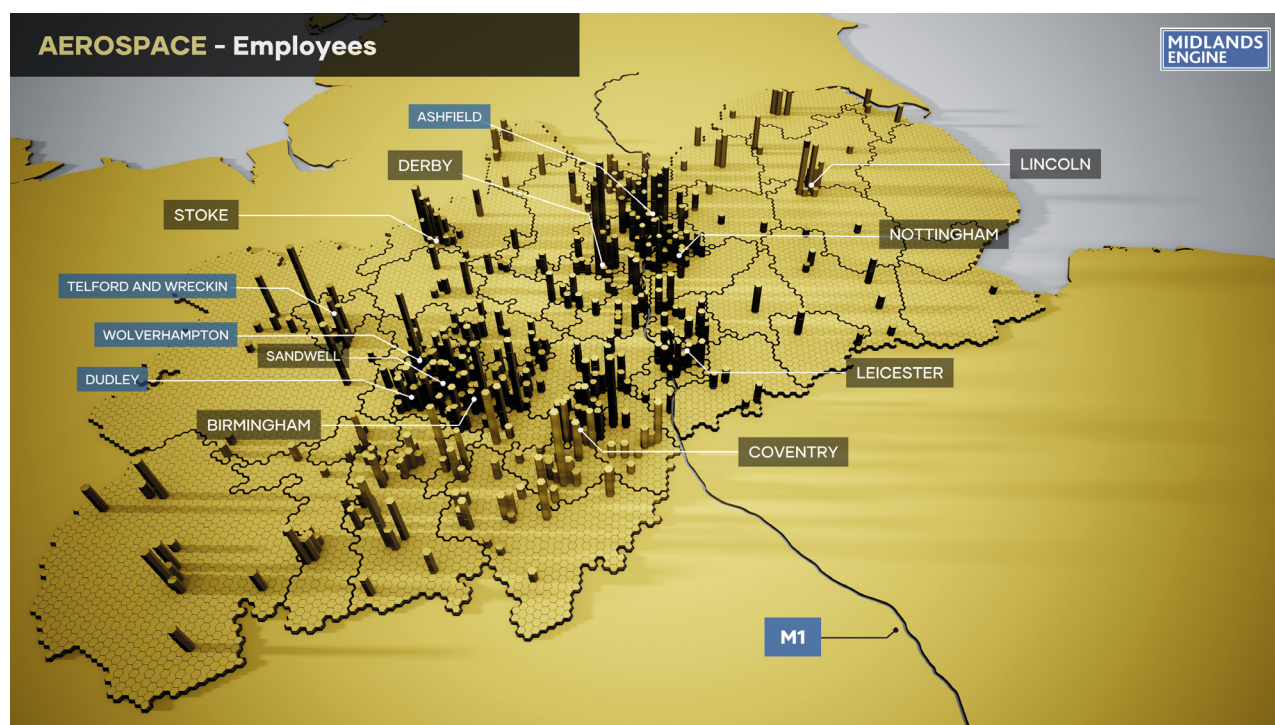
Our analysis shows the Midlands Health and Life Science Super Cluster is built on a strong research and innovation base, including 11 of the region's universities performing highly in relevant research.



	Cluster metric	Source	Score	Cluster in context
2.1	Accelerator Engagement	<i>Beauhurst 2022: High growth companies utilised accelerators</i>	2	
2.2	Relevant Spinouts	<i>Beauhurst 2022</i>		
2.3	Relevant high performing HEI research	<i>Midlands Engine Observatory, REF 2021</i>	Universities of Keele; Loughborough; Nottingham Trent; Birmingham; Leicester; Nottingham; Warwick	<ul style="list-style-type: none"> • 7 Midlands universities have a GPA >3.0 in a related research unit (Physics, Engineering)
2.4	Significant Innovation Hubs	<i>Midlands Engine Observatory,</i>	Manufacturing Technology Centre; Infinity Park Derby; Space Park; Warwick Manufacturing Group	
2.5	High Growth Company Grants	<i>Beauhurst, 2022</i>	23	
2.6	Innovate UK funding	<i>Data City, 2023</i>	£894m since 2005	<ul style="list-style-type: none"> • 81% of total Innovate UK funding to firms operating in the sector was to companies within the Midlands Cluster



Talent ecosystem



	Cluster metric	Source	Score	Cluster in context
3.1	Estimated Employees	<i>Data City, 2023</i>	56,445	<ul style="list-style-type: none"> • 22% of UK employees in companies in this sector are located in the Midlands Cluster; • Largest region outside of London & SE
3.2	Earnings	<i>ONS ASHE, 2021 - relevant sectors</i>	£44,617 average salary	<ul style="list-style-type: none"> • Salary is 2% higher in the Midlands Cluster than the national average for this sector
3.3	Further Education Leavers	<i>DfE Unit for Future Skills: Further Education leavers 18/19 in relevant fields</i>	15,230	<ul style="list-style-type: none"> • More FE leavers (including higher level) in relevant subjects than all other UK regions
3.4	Relevant HEI High-Ranking Department	<i>QS World University Rankings (Subject Area Rankings) 2022</i>	University of Nottingham; University of Birmingham; University of Warwick; Loughborough University	<ul style="list-style-type: none"> • 4 Midlands universities ranked within the Top 25 of UK universities for relevant subject areas
3.5	University Graduates	<i>Higher Education Statistics Agency Graduate Leavers (HESA) 2021</i>	8,560	<ul style="list-style-type: none"> • 6% of graduates from the Midlands who graduated with a degree in a relevant subject area to Aerospace
3.6	Graduate Retention: change over 3 years	<i>DfE Graduate Outcomes by Industry 2019</i>	97.3%	<ul style="list-style-type: none"> • West Midlands has the strongest manufacturing retention outside of London and the East regions. • 2,015/2,070 graduates trained in region remain in 'Manufacturing' 3 years of graduating in 2019. First degree only. (DfE Graduate Outcomes by Industry)

Investment ecosystem

- Midlands-based businesses in the manufacturing and engineering sector received just 7.44% of equity investment raised in the UK from 2017 to 2021, despite making up 18.7% of the high-growth companies in this sector.
- However, Midlands-based companies received 22.9% of all grant money received by high-growth companies in manufacturing and engineering, suggesting that the Midlands companies in the sector are being recognised for their innovation. This may reflect the Midlands' historical strengths in manufacturing and engineering.
- The Midlands DDI market share of Capex in this sector in the UK was 99% in 2017, this is however only based on 3 projects. In 2021 the Midlands market share was 31%, this was based on 9 total projects in the UK during that year.
- Top countries for foreign ownership of businesses are the USA, Germany, and China
- Wavteq forecast £414mn FDI capex in the Aerospace sector in the UK in 2025 – the Midlands has an opportunity to secure more than the 7% share of the 2017-21 FDI capex in Aerospace.

	Cluster metric	Source	Score	Cluster in context
4.1	FDI into High Growth Companies	<i>Beauhurst, 2022</i>	42%	<ul style="list-style-type: none"> • 15 of 36 (42%) of investments into UK Aerospace High Growth Companies were made into the Midlands Cluster
4.2	FDI Capex 2017-21	<i>Wavteq, 2022</i>	\$99.30m	<ul style="list-style-type: none"> • 7% of UK total FDI related to this sector was into the Midlands Cluster
4.3	DDI Capex 2017-21	<i>Wavteq, 2022</i>	\$217.09m	<ul style="list-style-type: none"> • 43% of UK total DDI related to this sector was into the Midlands Cluster
4.4	Fundraising Volumes	<i>Beauhurst, 2022</i>	<ul style="list-style-type: none"> • Mean ave. £630,933 fundraising investment • £22.7m in 36 investments (inc. £50k across 15 seed investments) • £360k across 7 venture investments) 	
4.5	FDI Jobs 2017-2021	<i>Wavteq, 2022</i>	218 jobs	<ul style="list-style-type: none"> • 6% of UK total FDI jobs related to this sector were into the Midlands Cluster
4.6	DDI Jobs 2017-2021	<i>Wavteq, 2022</i>	1,237 jobs	<ul style="list-style-type: none"> • 51% of UK total DDI jobs related to this sector were into the Midlands Cluster
4.7	FDI Projects 2017-2021	<i>Wavteq, 2022</i>	6 projects	<ul style="list-style-type: none"> • 11% of UK total FDI projects related to this sector were into the Midlands Cluster
4.8	DDI projects 2017-2021	<i>Wavteq, 2022</i>	9 Projects	<ul style="list-style-type: none"> • 22% of UK total DDI projects related to this sector were into the Midlands Cluster
4.9	Foreign-owned enterprises	<i>Data City, 2023</i>	13% (199 companies)	<ul style="list-style-type: none"> • 1% greater proportion of foreign-owned enterprise compared to national average for this sector

Aerospace – Cluster roundtable comments



Access to the EU export market has been a challenge for the Midlands' aerospace sector post-Brexit. Businesses pointed to aerospace as a slow-moving sector, with the returns on investment often being long-term. As such, one of the key asks from businesses was more coordinated efforts across the region, including proactive support by mayors, to retain and attract investment from Airbus, Rolls Royce, and other North American investors.

Nationally, businesses point to a need for specialist aerospace expertise in the Department for International Trade, and greater support for trade through more events and investor visits. SME support for innovation is a key gap as R&D funding from the Aerospace Tech Institute is focused on large businesses.





3.3 Focus on: Agri-tech – a Midlands new economy cluster

Midlands
New
Economy
Cluster

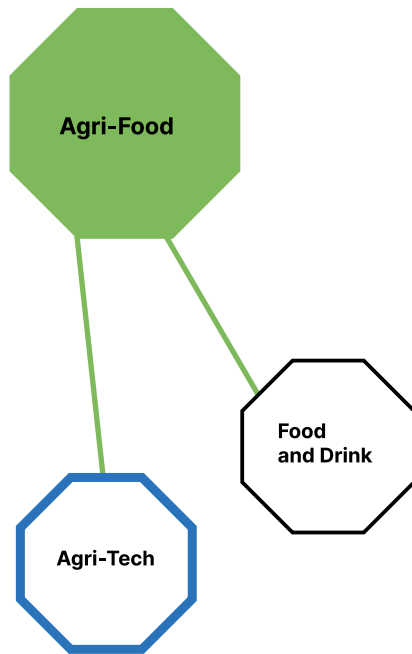
With 20% of the country's Agri-tech businesses based in the Midlands, the region is home to some of the UK's most significant concentrations of economic activity in this sector.

For example, Greater Lincolnshire's Food Valley and significant clusters in Herefordshire and Shropshire, with further contributions across counties in the region in a wider agriculture sector with upwards of 90,000 jobs. This is evidenced by the Midlands attracting a disproportionately high 36% of all domestic and 23% of foreign investment in agri-tech in the UK since 2017. The strength of this cluster in Greater Lincolnshire in particular is evidenced through the high proportion of agri-tech businesses based there relative to the rest of the UK.

The Midlands has the highest farmed area and the highest crop and livestock output of all English regions. Along with swathes of arable land, agri-tech clusters in the Midlands benefit from dedicated cluster support environments and connectivity with leading research and innovation spaces. This includes food enterprise zones (in Lincolnshire), dedicated innovation parks such as Ni.Park, and expertise at universities such as Harper Adams, Nottingham, Lincoln and more. There are currently significant opportunities for greenfield investment across the food enterprise zones and beyond, including two High Potential Opportunities in Telford & Wrekin and one in Greater Lincolnshire. ▲



Connection to other Midlands Clusters and UK Government investment support initiatives



KEY



UK Investment Atlas initiative linked to one or more Midlands clusters

Precision agriculture in Telford
UK Investment Atlas
High Potential Opportunity Area



Sustainable farming systems in Telford and Wrekin
UK Investment Atlas
High Potential Opportunity Area



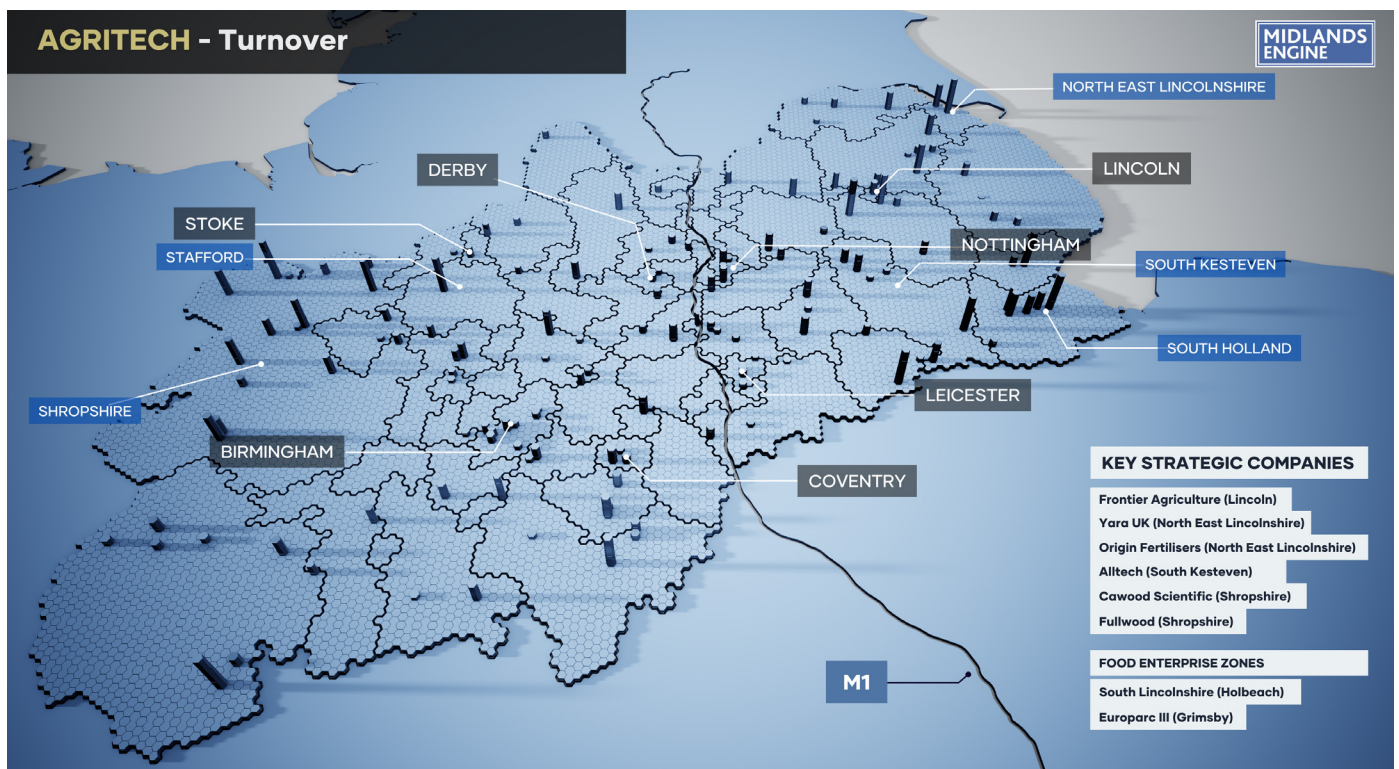
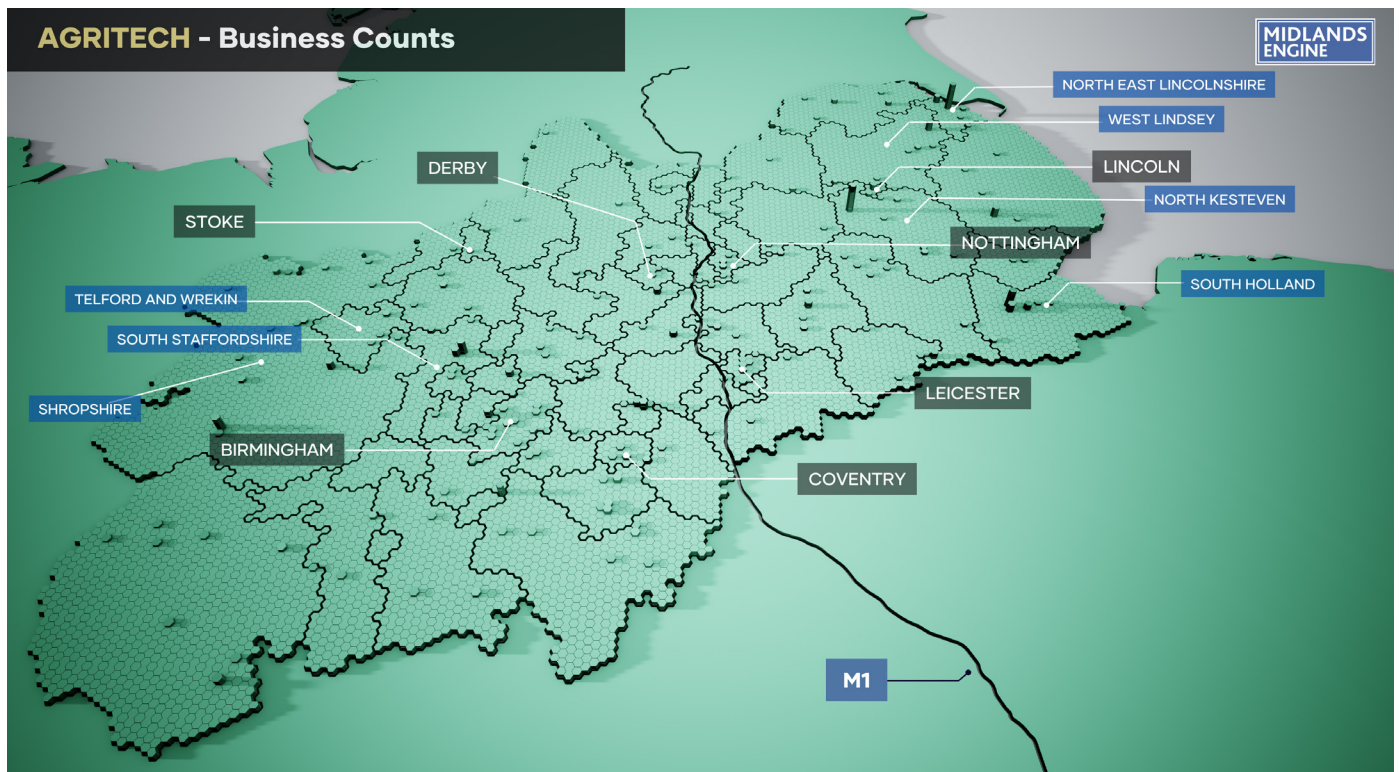
Food processing automation in Greater Lincolnshire
UK Investment Atlas
High Potential Opportunity Area





Agri-tech is an emerging cluster of strength within an established food and agriculture sector in the Midlands. The data presented for this cluster in this report should therefore be seen as a subset of the much larger food and agriculture sector, identified in 2022 work by Midlands Engine Observatory in partnership with industry (see this report and executive summary version) – suggesting that over 850,000 jobs contribute to the overall Midlands Engine food chain, and upwards of 90,000 in agriculture specifically. Midlands Engine continues to work with the agri / food industry to support policy, intelligence and campaigning, with this report highlighting agri-tech as one specific market opportunity within this.

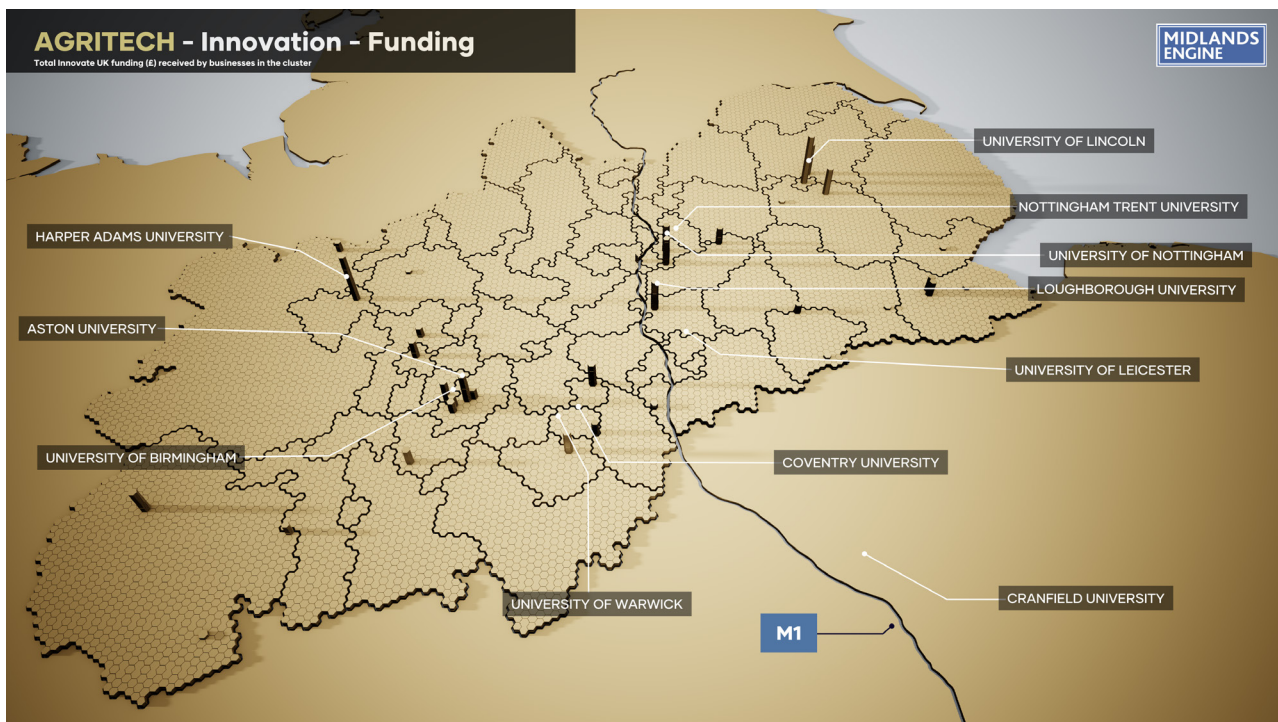
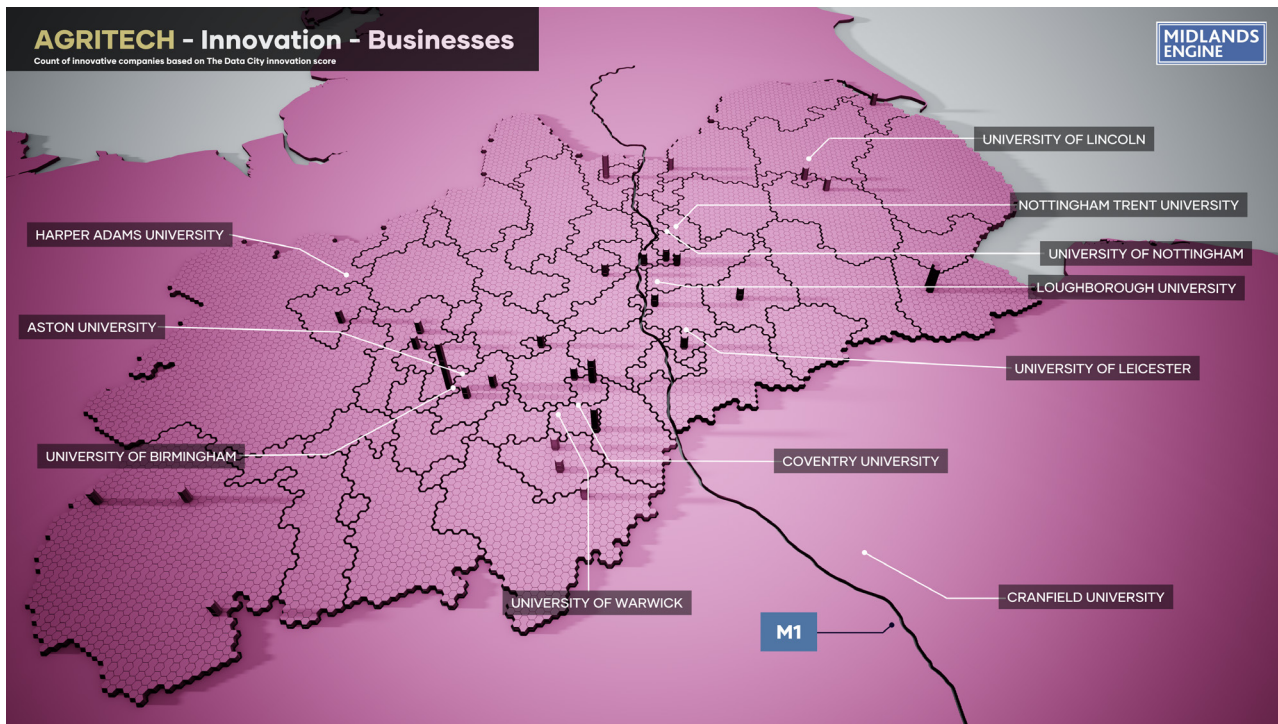
Business ecosystem



	Cluster metric	Source	Score	Cluster in context
1.1	Total Cluster Business Count	<i>Data City, 2023</i>	284	<ul style="list-style-type: none"> • 20% of UK companies in this sector are located in the Midlands Cluster; • 73% growth in Midlands companies in the Cluster since 2013
1.2	£100m+ Turnover Companies	<i>Data City, 2023</i>	9	<ul style="list-style-type: none"> • 35% of £100m + UK companies in this sector are based in the Midlands Cluster.
1.3	High Growth Companies	<i>Data City, 2023</i>	24	<ul style="list-style-type: none"> • 9% of High Growth companies in this sector based in the Midlands Cluster.
1.4	Incorporations 2017-22	<i>Data City, 2023</i>	79	<ul style="list-style-type: none"> • 16% of UK incorporations in this sector between 2017 and 2022 are located in the Midlands Cluster.
1.5	Relevant Cluster Organisations	<i>Midlands Engine Observatory</i>	<ul style="list-style-type: none"> • National Farmers Union (NFU); Country Land and Business Association; Food Valley; Food Enterprise Zones; Midlands Future Food Alliance 	



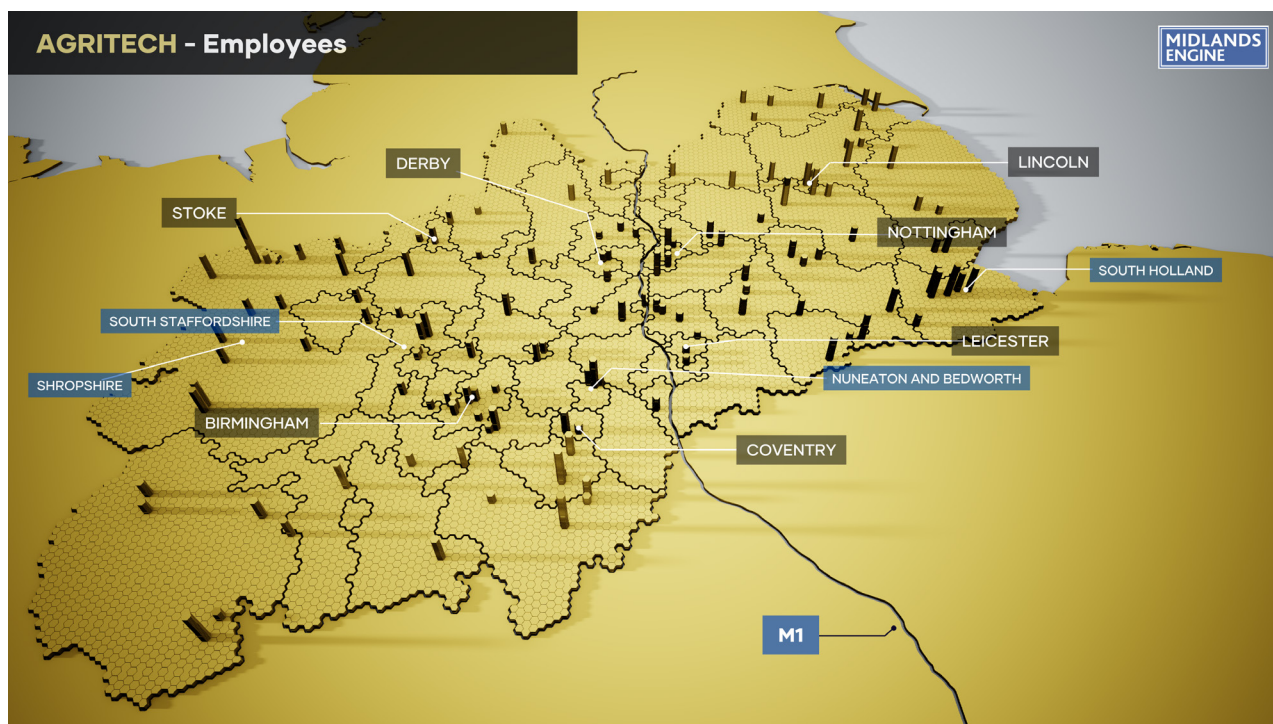
Innovation ecosystem



	Cluster metric	Source	Score	Cluster in context
2.1	Accelerator Engagement	<i>Beauhurst 2022: High growth companies utilised accelerators</i>	10	
2.2	Relevant Spinouts	<i>Beauhurst 2022</i>	2	
2.3	Relevant high performing HEI research	<i>Midlands Engine Observatory, REF 2021</i>	Universities of Nottingham; Keele; Birmingham; Lincoln; Leicester; Warwick	<ul style="list-style-type: none"> • 6 Midlands universities have a GPA >3.0 in a related research unit (Agriculture, food and veterinary science; Biological Sciences)
2.4	Significant Innovation Hubs	<i>Midlands Engine Observatory,</i>	Food Valley; Lincolnshire & Worcestershire Food Enterprise Zones; Ni.Park; National Centre for Precision Farming (Harper Adams); Lincoln Institute for Agri-Food Technology; Warwick Crop Centre	
2.5	High Growth Company Grants	<i>Beauhurst, 2022</i>	23	
2.6	Innovate UK funding	<i>Data City, 2023</i>	£54m since 2005	<ul style="list-style-type: none"> • 11% of total Innovate UK funding to firms operating in the sector was to companies within the Midlands Cluster



Talent ecosystem



	Cluster metric	Source	Score	
3.1	Estimated Employees	<i>Data City, 2023</i>	3,808	<ul style="list-style-type: none"> • 10% of UK employees in companies in this sector are located in the Midlands Cluster;
3.2	Earnings	<i>ONS ASHE, 2021 - relevant sectors</i>	£30,515	<ul style="list-style-type: none"> • Salary is 5% lower in the Midlands Cluster than the national average for this sector
3.3	Further Education Leavers	<i>DfE Unit for Future Skills: Further Education leavers 18/19 in relevant fields</i>	2,440	<ul style="list-style-type: none"> • Second highest of all regions for FE leavers (and most for higher level FE) in relevant subjects
3.4	Relevant HEI High-Ranking Department	<i>QS World University Rankings (Subject Area Rankings) 2022</i>	Universities of Nottingham; Harper Adams; Lincoln	<ul style="list-style-type: none"> • 3 Midlands universities ranked within the Top 25 of UK universities for relevant subject areas
3.5	University Graduates	<i>Higher Education Statistics Agency Graduate Leavers (HESA) 2021</i>	3,175	<ul style="list-style-type: none"> • 2% of graduates from the Midlands who graduated with a degree in a relevant subject area to Agri-Tech
3.6	Graduate Retention: change over 3 years	<i>DfE Graduate Outcomes by Industry 2019</i>	73%	<ul style="list-style-type: none"> • West Midlands has a high number of agriculture graduates trained in the region, but a third have left the region for work. East Midlands also in negative balance in contrast to the East, North West and Yorkshire. • 80/110 first degree graduates trained in region remain in 'Agriculture, Forestry & Fishing' in 3 years of graduating in 2019. (DfE Graduate Outcomes by Industry)

Investment ecosystem

- Midlands-based businesses in the food and drink processors (including quality control) and the precision agriculture sectors raised just 2.83% of the total equity received in the UK from 2017 to 2021 by high-growth companies in this sector, despite making up 10.5% of the sector's population. They also received 7.30% of the total grant money received by the sector.
- The top countries for foreign ownership counts are Norway, USA and France

	Cluster metric	Source	Score	Cluster in context
4.1	FDI into High Growth Companies	<i>Beauhurst, 2022</i>	31%	<ul style="list-style-type: none"> • 16 of 51 (31%) of investments into UK Agri-Tech High Growth Companies were made into the Midlands Cluster
4.2	FDI Capex 2017-21	<i>Wavteq, 2022</i>	\$1.82bn	<ul style="list-style-type: none"> • 23% of UK total FDI related to this sector was into the Midlands Cluster
4.3	DDI Capex 2017-21	<i>Wavteq, 2022</i>	\$2.41bn	<ul style="list-style-type: none"> • 36% of UK total DDI related to this sector was into the Midlands Cluster
4.4	Fundraising Volumes	<i>Beauhurst, 2022</i>	<ul style="list-style-type: none"> • Mean ave. £1.1m fundraising investment • £59.8m in 51 investments (inc. £51.6m across 33 seed investments; • £8.2m across 12 venture investments) 	
4.5	FDI Jobs 2017-2021	<i>Wavteq, 2022</i>	5,476 jobs	<ul style="list-style-type: none"> • 25% of UK total FDI jobs related to this sector were into the Midlands Cluster
4.6	DDI Jobs 2017-2021	<i>Wavteq, 2022</i>	11,218 jobs	<ul style="list-style-type: none"> • 34% of UK total DDI jobs related to this sector were into the Midlands Cluster
4.7	FDI Projects 2017-2021	<i>Wavteq, 2022</i>	80 projects	<ul style="list-style-type: none"> • 24% of UK total FDI projects related to this sector were into the Midlands Cluster
4.8	DDI projects 2017-2021	<i>Wavteq, 2022</i>	92 projects	<ul style="list-style-type: none"> • 13% of UK total DDI projects related to this sector were into the Midlands Cluster
4.9	Foreign-owned enterprises	<i>Data City, 2023</i>	19% (54 companies)	<ul style="list-style-type: none"> • 6% greater proportion of foreign-owned enterprise compared to national average for this sector



3.4 Focus on: Space Technologies – a Midlands new economy cluster



Strongly intertwined with the Midlands Established Aerospace Cluster, the Space Technologies New Economy Cluster is distinct due to several unique applications. It includes nascent but fast-growing activity springing from several key innovation bases across the region with high growth companies and highly-paid talent working on aerospace, defence, satellite and related space-uses.

Notable sites include Space City Leicester which has a strong cluster organisation working closely with the University, and is also home to the first approved customs site through the East Midlands Freeport.

In addition, there are also concentrations of space technology manufacturing in the West Midlands, with high growth clusters also found elsewhere including in parts of Worcestershire, Herefordshire and Shropshire. The cluster has seen considerable growth in the past

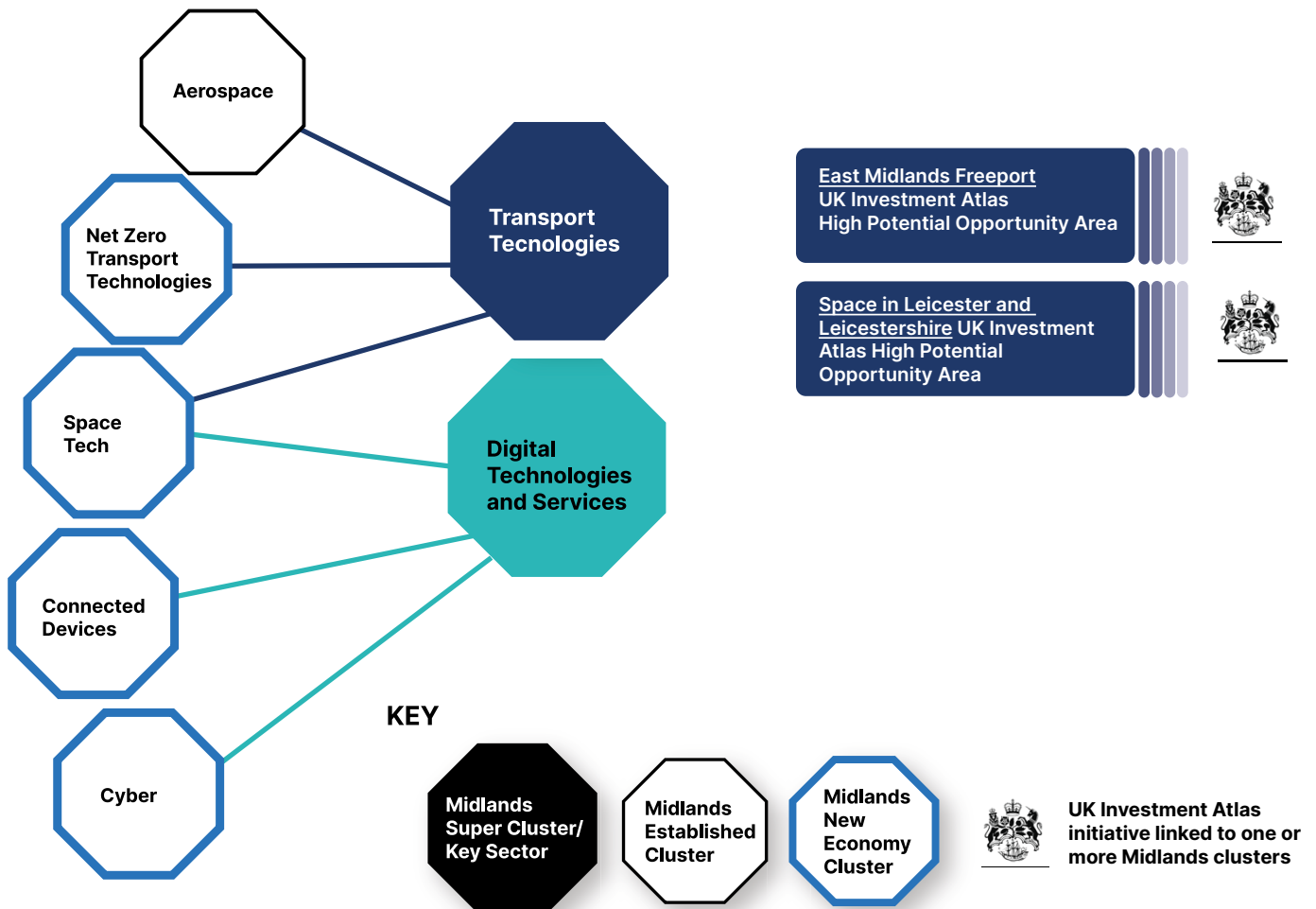
decade (+48% in terms of businesses) with growing domestic investment – the Midlands receiving half of all domestic investment in the wider sector since 2017. Alongside several specialised business parks there is significant talent across several high performing research universities and both HE and FE graduate pipelines, including a strong postgraduate pipeline. Current significant investment opportunities include space at Space City in Leicester, Malvern Science and Technology Park and Infinity Park Derby. ▲

£6.5m to accelerate new pan-regional Midlands Space Cluster

Regional stakeholders have secured a share of £6.5 million awarded by the UK Space Agency to help drive forward the Midlands space industry and develop a space cluster in the region. The money will be allocated to three members of the Midlands Innovation Space Group: University of Leicester, University of Birmingham, University of Nottingham, Midlands Aerospace Alliance and the Manufacturing Technology Centre (MTC). The stakeholders will work to deliver locally led initiatives that will help the space sector grow by leveraging collective research and innovation capabilities.

The funding will help coordinate the growing cluster activities in the East and West Midlands and bring them together under a single umbrella. The Midlands Innovation Space Group forms one of the largest collections of space expertise in the world, combining 900 academic, research and technical staff within the Midlands, this funding allows us to further leverage our expertise in this area.

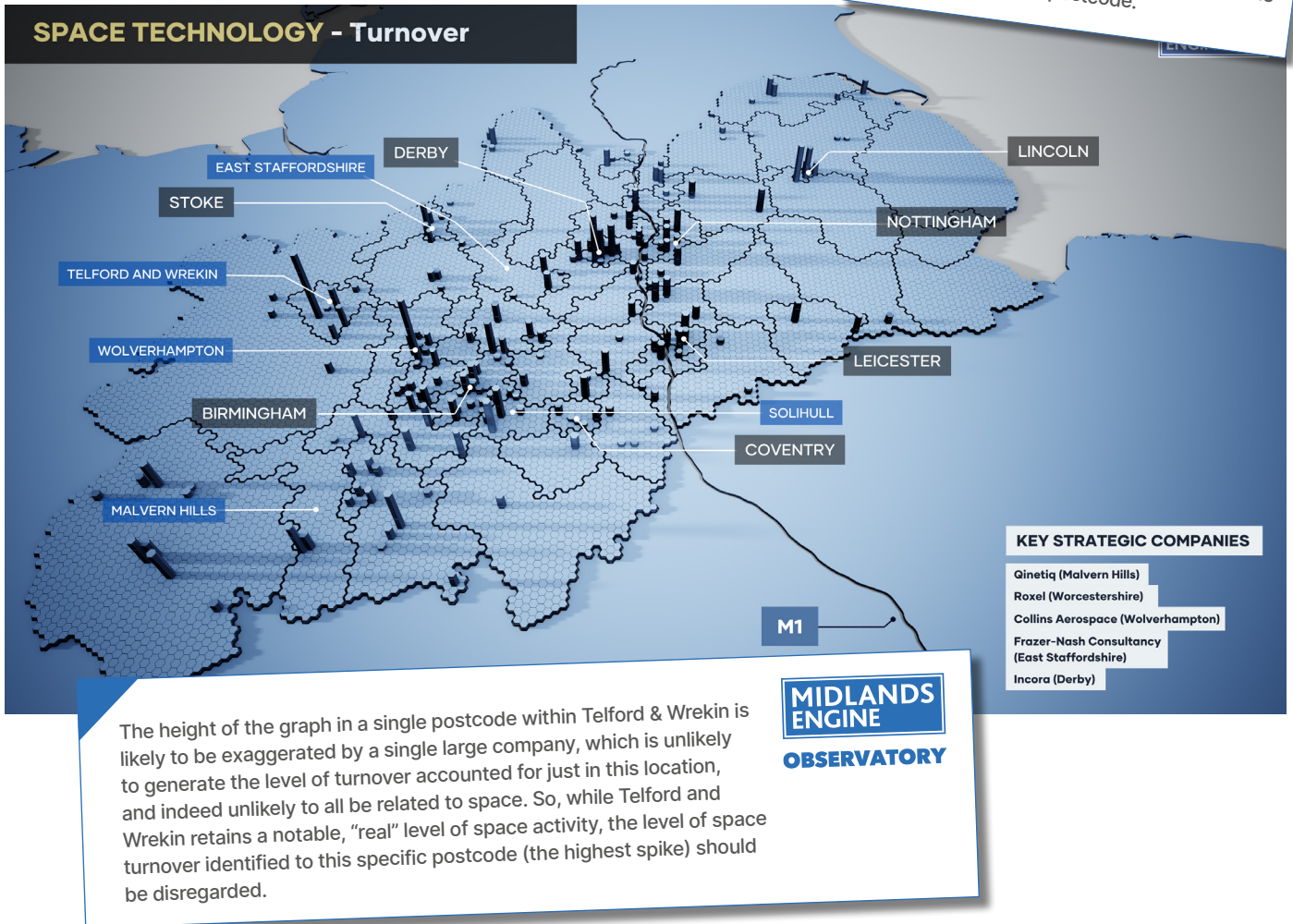
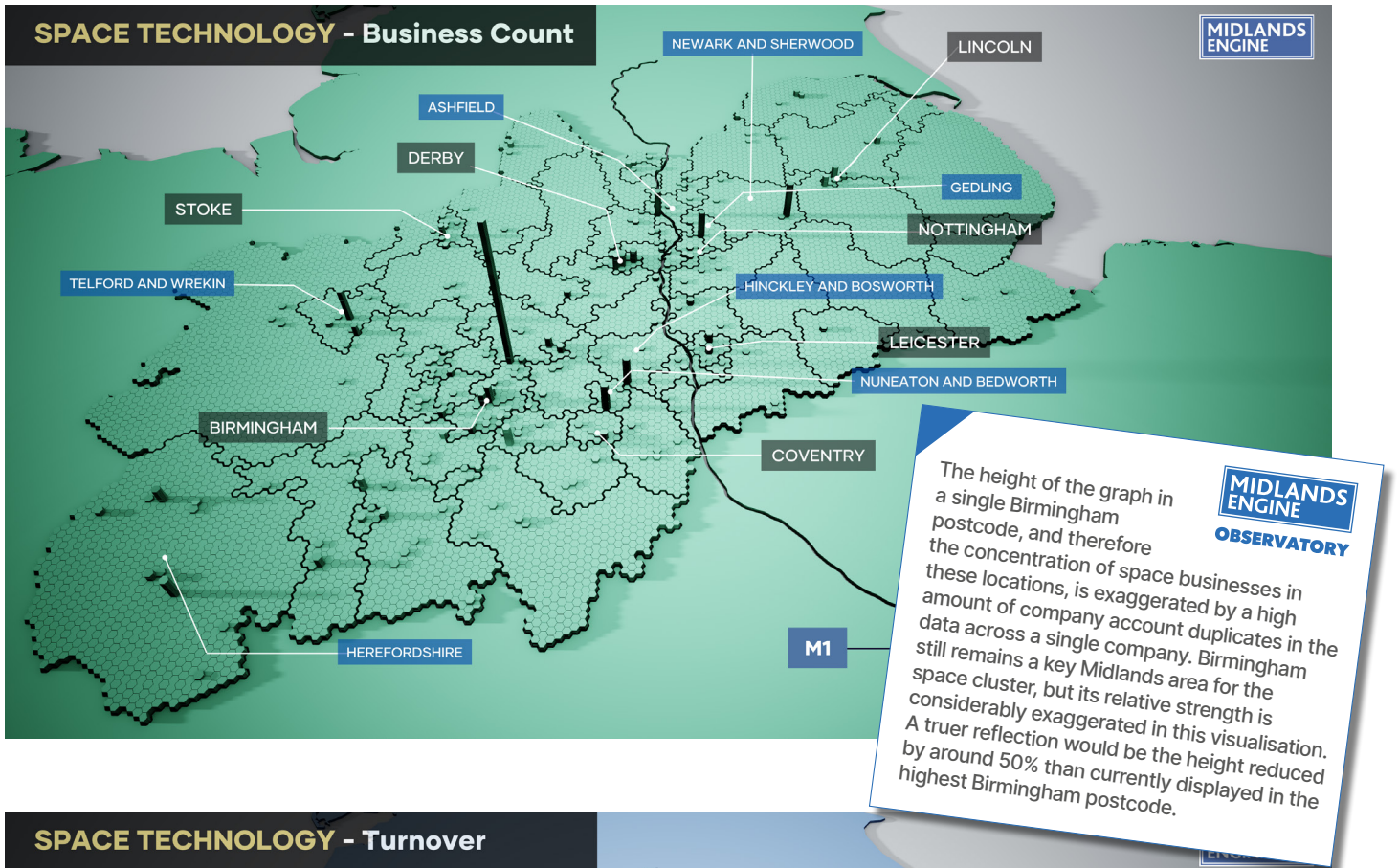
Connection to other Midlands Clusters and UK Government investment support initiatives



Naturally, there are many cross overs between the space and aerospace clusters, given many companies are likely to provide products and services to both aerospace and space, as well as other industries. Hence the data and visualisations presented between aerospace and space are not too dissimilar, albeit with space considerably smaller – given its less established market – and some different spatial elements. Space can be seen as a sub-cluster of aerospace but also a cluster in its own right, reflecting the many examples of cluster cross-fertilisation highlighted in this work. This broader incorporation of aerospace companies (that also supply the space sector) into the space definition is likely to overestimate the number of Midlands space cluster employees (18,000); particularly compared to national datasets such as from the UK Space Agency (under 3,000). However, the true number is likely to be somewhere in between, something which may be part of wider work ongoing by Midlands partners to build the Midlands Space Cluster, of which the data presented can support as a baseline.



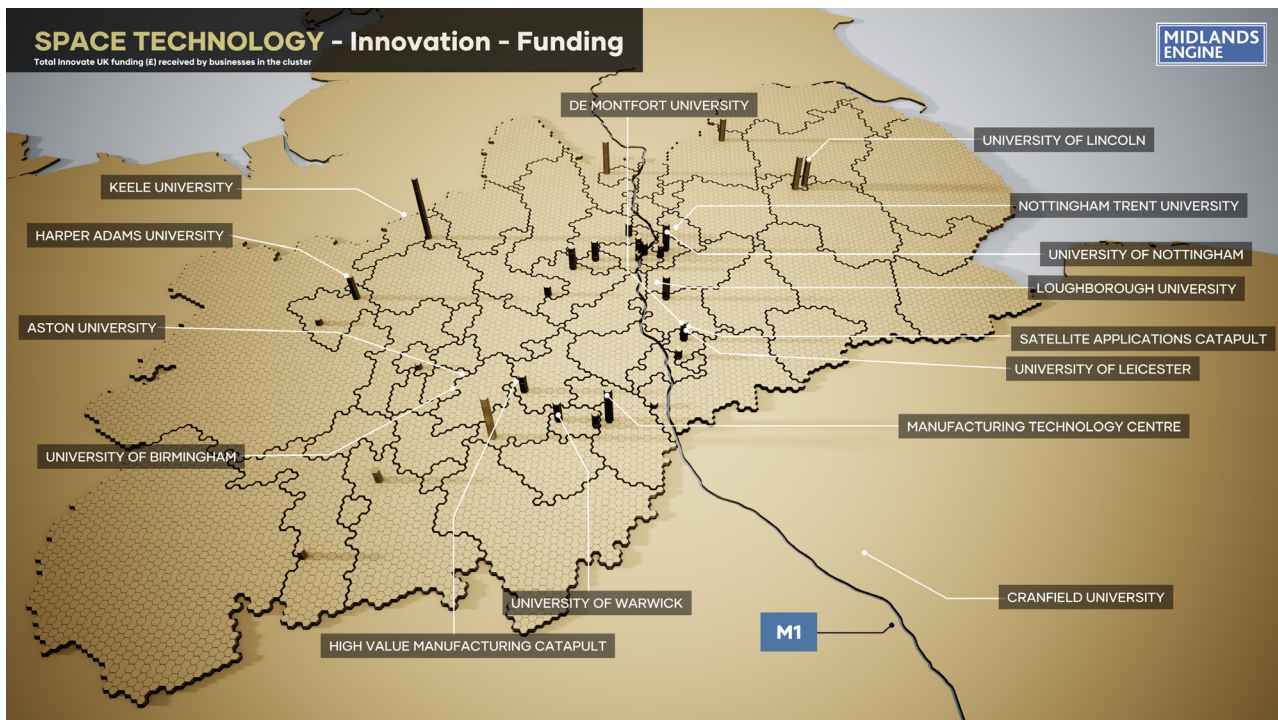
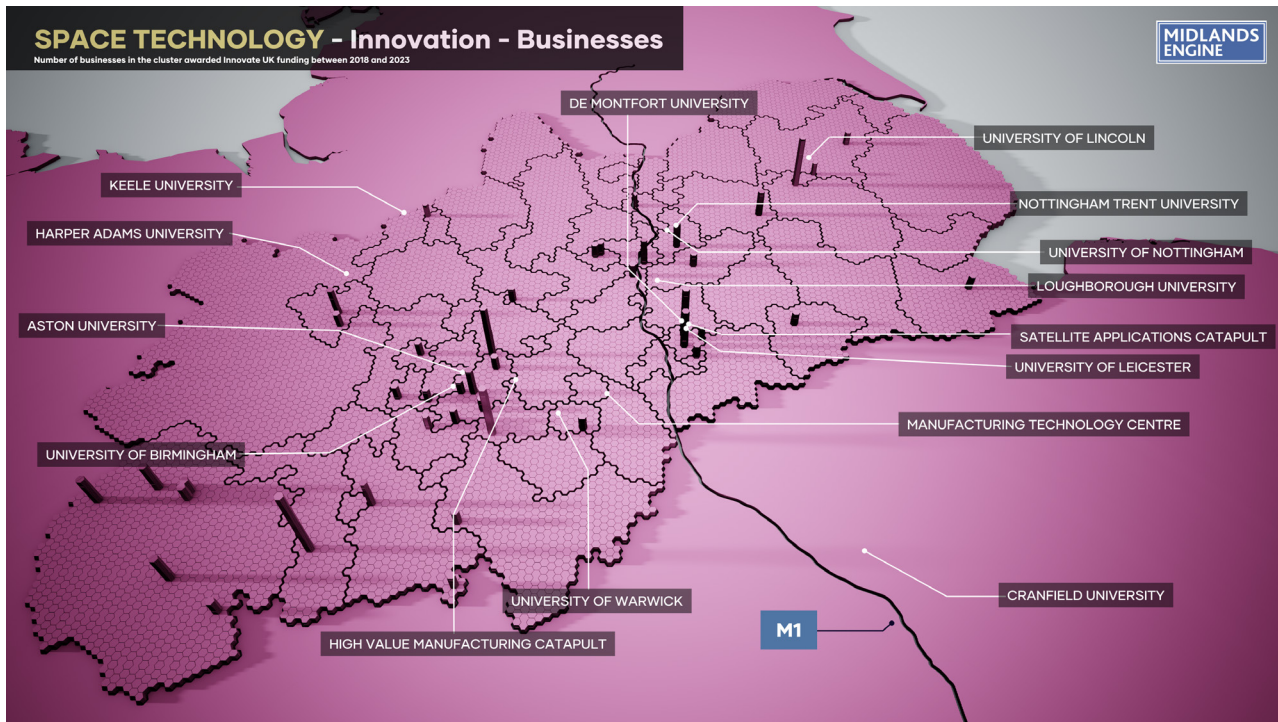
Business ecosystem



	Cluster metric	Source	Score	Cluster in context
1.1	Total Cluster Business Count	<i>Data City, 2023</i>	488	<ul style="list-style-type: none"> • 21% of UK companies in this sector are located in the Midlands Cluster; • 48% growth in Midlands companies in the Cluster since 2013
1.2	£100m+ Turnover Companies	<i>Data City, 2023</i>	13	<ul style="list-style-type: none"> • 25% of £100m + UK companies in this sector are based in the Midlands Cluster.
1.3	High Growth Companies	<i>Data City, 2023</i>	26	<ul style="list-style-type: none"> • 14% of High Growth companies in this sector based in the Midlands Cluster.
1.4	Incorporations 2017-22	<i>Data City, 2023</i>	103	<ul style="list-style-type: none"> • 17% of UK incorporations in this sector between 2017 and 2022 are located in the Midlands Cluster.
1.5	Relevant Cluster Organisations	<i>Midlands Engine Observatory</i>	<ul style="list-style-type: none"> • Space Park Leicester; • Midlands Aerospace Alliance 	



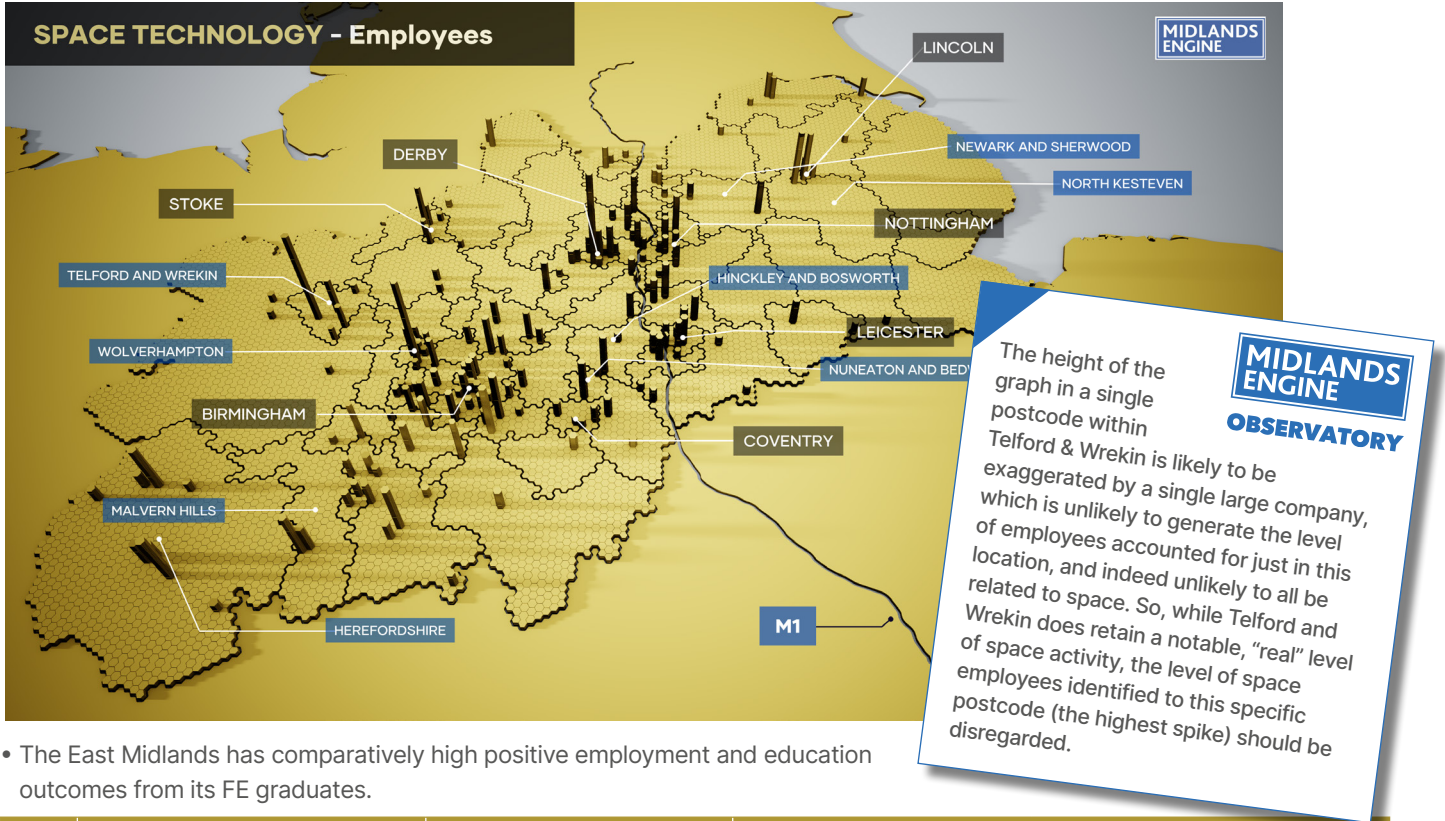
Innovation ecosystem



	Cluster metric	Source	Score	Cluster in context
2.1	Accelerator Engagement	<i>Beauhurst 2022: High growth companies utilised accelerators</i>	2	
2.2	Relevant Spinouts	<i>Beauhurst 2022</i>		
2.3	Relevant high performing HEI research	<i>Midlands Engine Observatory, REF 2021</i>	Universities of Leicester, Birmingham, Lincoln, Loughborough, Keele, Nottingham, Warwick, Nottingham Trent	<ul style="list-style-type: none"> • 8 Midlands universities have a GPA >3.0 in a related research unit (Computer science and informatics; Engineering; Physics)
2.4	Significant Innovation Hubs	<i>Midlands Engine Observatory,</i>	Pioneer Park; Space Park Leicester; Manufacturing Technology Centre; Malvern Science and Technology Park	
2.5	High Growth Company Grants	<i>Beauhurst, 2022</i>	23	
2.6	Innovate UK funding	<i>Data City, 2023</i>	£167m since 2005	<ul style="list-style-type: none"> • 43% of total Innovate UK funding to firms operating in the sector was to companies within the Midlands Cluster



Talent ecosystem



- The East Midlands has comparatively high positive employment and education outcomes from its FE graduates.

	Cluster metric	Source	Score	
3.1	Estimated Employees	<i>Data City, 2023</i>	18,105	<ul style="list-style-type: none"> • 12% of UK employees in companies in this sector are located in the Midlands Cluster;
3.2	Earnings	<i>ONS ASHE, 2021 - relevant sectors</i>	£45,752	<ul style="list-style-type: none"> • Salary is 10.3% lower in the Midlands Cluster than the national average for this sector
3.3	Further Education Leavers	<i>DfE Unit for Future Skills: Further Education leavers 18/19 in relevant fields</i>	23,710	<ul style="list-style-type: none"> • More FE leavers (including higher level) in relevant subjects than all other regions
3.4	Relevant HEI High-Ranking Department	<i>QS World University Rankings (Subject Area Rankings) 2022</i>	University of Nottingham; University of Birmingham; University of Warwick; Loughborough University	<ul style="list-style-type: none"> • 4 Midlands universities ranked within the Top 25 of UK universities for relevant subject areas
3.5	University Graduates	<i>Higher Education Statistics Agency Graduate Leavers (HESA) 2021</i>	10,620	<ul style="list-style-type: none"> • 8% of graduates from the Midlands who graduated with a degree in a relevant subject area to Space Technologies
3.6	Graduate Retention: change over 3 years	<i>DfE Graduate Outcomes by Industry 2019</i>	79%	<ul style="list-style-type: none"> • Manufacturing retention is relatively strong but technology / IT aspect performs poorly.

Investment ecosystem

- Wavteq forecast a UK FDI Capex of \$94mn in this sector in 2025
- The top countries for foreign ownership of businesses in this cluster are the USA, China, Sweden, Spain and Germany.

	Cluster metric	Source	Score	Cluster in context
4.1	FDI into High Growth Companies	<i>Beauhurst, 2022</i>	19%	• 7 of 36 (19%) of investments into UK Agri-Tech High Growth Companies were made into the Midlands Cluster
4.2	FDI Capex 2017-21	<i>Wavteq, 2022</i>	\$29.30mn	• 8% of UK total FDI related to this sector was into the Midlands Cluster
4.3	DDI Capex 2017-21	<i>Wavteq, 2022</i>	\$28.31mn	• 50% of UK total DDI related to this sector was into the Midlands Cluster
4.4	Fundraising Volumes	<i>Beauhurst, 2022</i>	<ul style="list-style-type: none"> • Mean ave. £630,933 fundraising investment • £22.7m in 36 investments 'aerospace' (inc. £50k across 15 seed investments; • £360k across 7 venture investments) 	
4.5	FDI Jobs 2017-2021	<i>Wavteq, 2022</i>	213 jobs	• 11% of UK total FDI jobs related to this sector were into the Midlands Cluster
4.6	DDI Jobs 2017-2021	<i>Wavteq, 2022</i>	200 jobs	• 38% of UK total DDI jobs related to this sector were into the Midlands Cluster
4.7	FDI Projects 2017-2021	<i>Wavteq, 2022</i>	2 projects	• 7% of UK total FDI projects related to this sector were into the Midlands Cluster
4.8	DDI projects 2017-2021	<i>Wavteq, 2022</i>	2 projects	• 22% of UK total DDI projects related to this sector were into the Midlands Cluster
4.9	Foreign-owned enterprises	<i>Data City, 2023</i>	18% (87 companies)	• 1% lower proportion of foreign-owned enterprise compared to national average for this sector

4.0 Conclusions and recommendations for partners and policymakers

Initial conclusions

The process of developing this report included an extensive review of multiple sources of data, the development of a bespoke analytical framework and consultation with Midlands Engine partners and roundtables focused on eight of the clusters selected for deeper exploration of investment potential. From the data, the conversations with partners and our experience of developing the report, the following conclusions emerged:

- The highest growth clusters (overall business growth or portion of high growth companies) typically have the stronger cluster support environment, with significant innovation activity and connections, and prominent regional bodies including enterprise zones. This is particularly apparent in clusters such as those featuring advanced manufacturing activities, and software, with links to leading innovation support such as the Warwick Manufacturing Group, Midlands Aerospace Alliance, Cyber Valley and more.
- Our partners and the UK Government are predominantly promoting highly specialised clusters with significant talent and innovation linkages as demonstrated through high spinout and accelerator usage in clusters such as Cyber, Disruptive Technologies, and some Advanced Manufacturing. For each of these there are multiple universities delivering internationally competitive research and teaching, and a number of accelerators and other innovation support initiatives.
- Other significant pan-regional clusters that appear less closely tied to early-stage innovation activities (such as brownfield regeneration, logistics, offshore wind, and extractive industries, with fewer grants, etc.), are significant employers and appear to be explained through geographical factors – the Midlands' central location, coastline and land uses.
- Although the data reveals significant employment and strong pipelines for future talent, both within further and higher education, with most overarching sectors there are challenges in graduate retention and education outcomes for the Midlands. This may be in part due to less competitive earning opportunities compared to national averages for many clusters, although this in turn could attract investors.
- The investment figures reveal interesting differences in foreign and domestic investment market share. Some pan-regional clusters have a disproportionately high share of domestic investment, such as aerospace with 49% of domestic capex⁴ and 51% of domestically created jobs, versus just 7% and 6% of foreign capex and jobs. While for some there may be wider factors such as security affecting such trends, for others (such as advanced materials and cyber), this difference in domestic and foreign investment market share possibly highlights an opportunity

for the Midlands to raise its profile internationally and secure a greater share of international investment.

- The clusters identified reflect the Midlands Engine area as an industrially diverse economy, but also as a conurbation that connects clusters across traditional regional, county and local authority boundaries – for example through automotive, aerospace, rail and advanced materials supply chains; and the food / agriculture system; all enabled by pan-regional logistics and utilities provision. Equally, there are hyperlocal centres of cluster excellence, such as in dedicated innovation parks like MIRA Technology Park.
- Some of the identified clusters are unsurprising and reflect many traditional or known sectors of strength in the regional economy in different places (e.g. Textiles in Leicester, Digital and Creative in Warwickshire and Rail in Derbyshire), with this exercise highlighting other, possibly less known, localities of strength. While some of these clusters have a long-standing base in the Midlands, they are also constantly evolving in line with economic, societal and technological changes.
- A key theme for this more emerging set of clusters, and indeed the changing nature of traditional clusters, is the integration and application of digital and net-zero into the economy. Cluster expertise in the new economy is now consolidating in the Midlands Engine area: from Circular Economy, Net Zero Transport and Offshore Wind, to Connected Device Technology, Cyber and Space Technologies. At the same time, more traditional sector across services and production are evolving to meet the major demands of today (e.g.

Disruptive Technologies for Professional and Financial Services; Agri-Tech and Education Technology).

- Attracting and retaining future talent and skills is critical to capitalise on new cluster opportunities, representing a need for strong relationships between business, education providers like universities and colleges, and the public sector. Large anchor businesses play an important role in Midlands clusters – some more than others – but cluster strength is not solely driven by the location of big business; SMEs and startups are an integral part of value chains that drive specialisation and growth. Many clusters interrelate and overlap and should not be viewed in different silos or independent parts of the economy.
- The Midlands Engine's blend of key clusters has the characteristics and scale to be at the heart of economic recovery and growth in the UK, building on strengths through further domestic and foreign investment. This would support the challenges and gaps identified by the data across clusters to ensure their sustainability and continued success, including further digitalisation and decarbonisation. While the private sector will ultimately drive cluster consolidation and growth, providing a supportive environment in the Midlands will be a critical endeavour for steering cluster success in the right direction. ▲

We would therefore seek to make the following recommendations for policymakers and partners.

⁴ Capital Expenditure, i.e. total volume of investment by its monetary value: value of investment.

Recommendations for partners and policymakers

Our forthcoming programme of engagement with businesses, partners and policymakers focused on specific clusters will seek to develop a series of evidence-based recommendations for policy and practice to help that cluster secure greater investment and grow. However, there are a number of key recommendations related to the future development of clusters that have already emerged from the analysis, business and partner consultation already undertaken by the Midlands Engine Partnership.

These include:

- **Fund local partners to create Cluster Development Companies**

Clusters need dedicated, focused support to grow and thrive. The importance of a central cluster network was highlighted by businesses, partners and in the academic literature. These organisations were seen as vital to the creation of knowledge and innovation spillovers, providing a concierge service to help attract investment, convening within the clusters and advocating externally for funding and more favourable policies.

The Government should fund the creation of 'Cluster Development Companies', which would be devolved and run by coalitions of local government and economic growth partners, universities and industry associations. The [recent investment into the Midlands Space Cluster](#) should be seen as a pilot for this model of support.

- **Improve the quality and accessibility of the evidence-base for clusters in the UK. Establish a national programme of research, analysis and insight that includes the development of a toolkit and open-access data set for local organisations to aid better policymaking.**

The evidence-base upon which clusters in the UK can be readily understood, analysed and articulated by local, regional or national policymakers needs to be improved. Our report has drawn from multiple data-sources, several of which are provided by commercial organisations and are therefore not readily accessible by local partners without significant duplication of investment. The complexity of England's sub-national geographical units of analysis also complicates any assessment of clusters, which don't neatly fit into existing administrative boundaries. Our report is similarly limited by the Midlands Engine regional geography, but we know that many of our clusters overlap with neighbouring regions.

The scale and complexity of research required can only be met by a serious programme of national research and analysis. We welcome recent developments led by the Department for Science, Innovation and Technology (DSIT) to develop this programme and, the Government should seek to establish a UK-wide dataset and toolkit that is accessible for local and regional decision-makers.

- **Simplify the inward investment landscape whilst increasing support for ‘product development’ and ‘concierge services’ to attract investment into clusters.**

As we explore in the report, the inward investment landscape in the Midlands (and across the UK) is highly-complex, with multiple agencies and organisations operating with overlapping remits and across geographies. This complexity is not desirable for investors looking for clarity and stability in decision-making. As a corollary to this, the Government should seek to increase long-term and consistent support to local partners for ‘product development’ and ‘concierge services’ aimed at attracting investment into Clusters. The Department for Business and Trade’s High Potential Opportunities programme has been praised by local partners across the Midlands Engine Partnership as a valuable, long-term initiative that has helped them develop and launch propositions seeking to attract investment into clusters.

The Government is currently reviewing its approach to attracting foreign direct inward investment into the UK and we would recommend it considers how it integrates continue support for these value-added activities whilst simplifying the current landscape of organisations, initiatives and decision-making.

- **Work with universities to develop an integrated approach to foreign direct investment into R&D.**

Universities and Research and Development (R&D) are integral to any consideration of the future investment potential of clusters. Therefore, we strongly endorse the twelve recommendations for Government, universities and local economic growth partners made by the recent report, *The role of universities in driving overseas investment* into UK Research and Development, produced by the Higher Education Policy Institute in partnership with Universities UK International, the National Centre for Universities and Business and Midlands Innovation.

The economic future of clusters across the Midlands is dependent on harnessing the growth potential of new technologies and high-innovation sectors. This will require significant international investment across the Technology Readiness Levels (TRLs) and we welcome the Report’s call for greater partnership working between all parties to target the world’s Top 200 investors in R&D, develop bigger and bolder FDI into R&D propositions and unleash the levelling up potential of the UK’s world-renowned universities. With support from the Midlands Engine Partnership, our region hosts the trailblazing Universities as drivers of trade and investment Pilot, which will share an evidence-base with our Clusters Programme over the next two years. ▲



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Appendix I – Literature review

APPENDIX I

Overview

Clusters play an important role in the discussion around competitiveness, productivity, and business development. While there are common themes that come up during the literature, there is no one agreed or fixed definition accepted by all authors. The original concept⁵ from Michael Porter is the one referred to most for the purposes of this study.

The common themes of clusters include the characteristics of both the people and businesses involved within a cluster, as well as considering the structural make up of a cluster. These are all linked by a spatial dimension – a cluster must have a geographical boundary, although the literature does not specify any restrictions on the potential size.

The relationship between clusters and FDI is a complex one, as the literature has not typically focused on this relationship. Instead, researchers are more likely to have studied the behaviours of foreign-owned versus domestic-owned firms. Some research has been focused on the challenges of successfully attracting FDI to a cluster and what this might look like, which links to the concept of “sustainable FDI attraction”. These studies, in turn, link into discussions in the policy space around cluster management, promotion, and strategy.

Cluster definitions & key themes regarding clusters

There is no consensus on an official definition of “a cluster”. The broad idea is not new; in the early 1900s the economist Alfred Marshall was already writing about localised industries and industrial districts. The concept of a cluster as we consider them today was first discussed by Michael Porter of Harvard in 1990, and his definition⁶ forms the basis of a large amount of subsequent work on the topic.

The term “agglomeration”, and the concept of agglomeration effects, features heavily in the cluster concept literature. In this context, agglomeration refers to the effects (both benefits and otherwise) realised due to a concentration of business activity in a certain place.

Geography

A key feature of a cluster is the idea of a geographical concentration. A cluster’s geographical boundaries are determined by firms’ access to inputs and demand and vary by industry. However, clusters rarely correspond exactly to pre-defined boundaries e.g.: city boundaries. This means that, when identifying clusters, it is important to consider different scales of geographies, looking both locally and at a broader regional level to understand activity linkages. However, this also makes a formal definition difficult to land upon. Proximity of activity is a key feature, but it is practically impossible to accurately specify the boundaries of the area in which this can occur.

Cluster boundaries are generally defined by access to resources and the main sources of demand. These resources include materials, employees, suppliers, and, in some cases, natural resources, whilst sources of demand focus on proximity to customers. Different industries will exhibit different clustering behaviours. Export-intensive, knowledge-intensive, and labour-intensive industries will typically cluster around their resources to minimise production costs and maximise productivity, whilst service industries are more likely to gravitate towards their customer base ^{xiii,xiv}.

Equally, there is no real evidence for a limit (either large or small) for the geographical areas in which these agglomeration benefits can occur. Some are large, with perhaps the best-known example being the Silicon Valley cluster which spans a large part of the San Francisco Bay Area. Others are small, with strong localisation effects being found down to postcode level in the manufacturing sector in some cities in the USA^{xv}.

This idea of geographical concentration, co-location, and agglomeration plays an important part of each of the other characteristics of a cluster, and, indeed, the benefits of clustering.

Business and employment: scale & concentration

Business concentration is a specific key feature falling under the umbrella of geographical concentration. Many definitions of clusters describe concentrations of firms, predominantly small and medium in size in one or a few related industries. The benefits come from the important relationships and key interdependencies created by a dense network of competitors, buyers, and suppliers^{xvi}.

The nuances of cluster development mean that it can be difficult to define a cluster according to a single industry. Economic activity within a cluster often goes across industries as typically defined in internationally agreed classifications, such as the System of National Accounts. Porter explicitly refers to the additional industries which can be found within a cluster: the supporting industries providing specialised inputs and services, and those industries which may naturally exist alongside the initial industry, either through production of complementary products through usage of common skills and technologies. The propensity to be closely linked to downstream consumer industries is also specifically called out. Consequently, some authors differentiate between “narrow” and “broad” clusters, with the former referring to one or a few related industries and their supply chains, and the latter to a “variety of products in related industries”^{xvii,xviii}.

Employment concentration is closely linked to clusters, as clusters cannot function without people. Business concentration is linked to employment concentration within the same geographical area.

⁵⁴Clusters are geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services, and providers of specialized infrastructure. Clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products and to companies in industries related by skills, technologies, or common inputs. Finally, many clusters include governmental and other institutions – such as universities, standards-setting agencies, think tanks, vocational training providers, and trade associations – that provide specialized training, education, information, research, and technical support.” Porter (1998)