MIDLANDS ENGINE

OBSERVATORY

Insights

Engineering biology ‘New Economy’ cluster snapshot

INSIGHTS

Engineering biology is the design, scaling and commercialisation of biologically-derived products and services. It has the potential to revolutionise the way we treat diseases and feed a growing global population. As outlined in the **National Vision for Engineering Biology,** it is “predicting and controlling biology with the precision needed for industrial-scale production”.

The **UK government** has highlighted five key applications: agriculture and food; biofuels; health; environment and carbon capture; and chemicals and materials.

According to the Council for Science and Technology’s 2023 **Report on Engineering Biology**, the UK is among global leaders in engineering biology research, with programmes like Synthetic Biology for Growth (SBfG) supporting over 9,000 relevant research publications and over 23,000 engineering biology patents in the last decade. A new National Engineering Biology Programme (NEBP) is now being established to build on existing foundations and to develop momentum and bridging capability.

The Midlands’ strong biosciences base, encompassing both health and non-health related bioscience and biotechnology, as well as profound engineering excellence, means it is well-placed to make a considerable contribution to UK engineering biology. Underpinning the emerging Midlands’ engineering biology cluster is the research excellence and expertise in the region’s universities. This includes representation from the University of Birmingham within the **UK’s Engineering Biology Leadership Council (EBLC)**, Loughborough University’s **Centre for Biological Engineering**, the University of Nottingham’s **Synthetic Biology Research Centre**, and many more research centres and groups across the region as detailed below.

INSIGHTS

The Midlands also has a growing set of private companies active in engineering biology – including startups and spinouts – supported by a wider ecosystem of manufacturing, engineering, life science and bioscience firms.

This provides a strong foundation for the commercialisation drive needed to propel engineering biology as an impactful regional and national cluster.

Engineering biology is one of the five critical technologies identified within the UK Science and Technology Framework (2023) which defines engineering biology as:

> *"The application of rigorous engineering principles to the design of biological systems".*

Methodology

Given the emergent nature and relatively recent framing of this activity, there is currently limited data available to accurately quantify engineering biology activity in the UK and its regions.

This document attempts to pull together available information about engineering biology in the Midlands[1], produced by Midlands Engine Observatory. Due to the rudimentary nature of data in this sector, the findings should be taken with some caution.

This document's evidence collection has followed a similar process to the recent Midlands Engine "Exploring the Investment Potential of Midlands Clusters" report and its individual cluster snapshots.

It has been supported by the expert company and cluster data collection of The Data City, especially its Real-Time Industrial Classifications (RTIC) methodology. The principal data sources are the Engineering Biology Application and Engineering Biology Supply Chain RTICs, utilising The Data City's AI-driven tool to identify companies operating in new economy clusters.

This tool allows us to investigate cluster features at the local level, helping us understand economic value and the firms driving it. The Data City identifies companies within its Engineering Biology RTICs as companies working within engineering biology application and relevant supply chain-specific technology areas.

The Midlands Engine Observatory has collated further relevant evidence from other sources to supplement the insight provided by The Data City.

Cluster in context

200 businesses – 10.3% of the UK total. 96% growth since 2013

5,200 jobs – 2.8% of the UK total

21 high growth companies (6.9% of the UK)

7 companies with £100m+ turnover

8% of Midlands university graduates (over 11,000 total) in 2021 studied subjects relevant to engineering biology, including from 11 of the top 25 UK universities for relevant subjects.

1. For the purposes of this document, the "Midlands" is defined as the 65 local authorities that form the Midlands Engine Partnership geography; slightly different to the traditional West Midlands and East Midlands regional (ITL1) geographies.

Business ecosystem[2]

180 businesses identified as utilising engineering biology in their products and services are active in the Midlands

- 10.3% of the UK engineering biology population with 96% growth between 2013 and 2022
- 7 strategic (£100m+ turnover) companies
- 18.9% of the strategic engineering biology companies in the UK have a Midlands location

21 high growth companies[3]

- 6.9% of the high growth engineering biology companies in the UK have a Midlands location

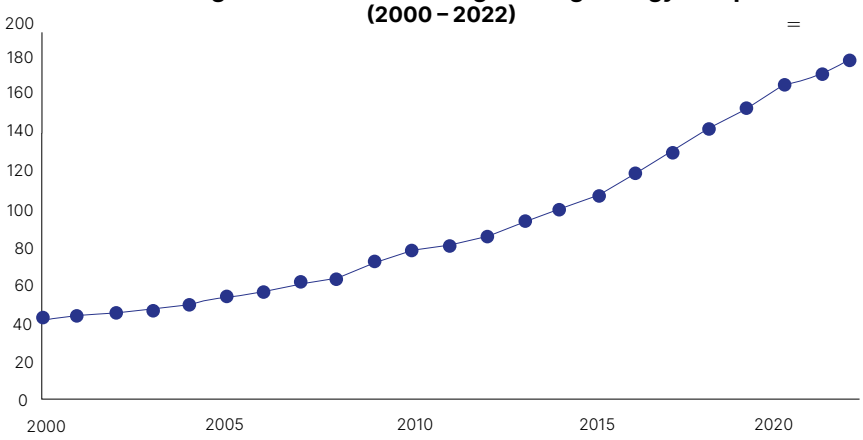
61 incorporations between 2017 and 2022

- 9.2% of UK engineering biology incorporations between 2017 and 2022 have a Midlands location
- 19 engineering biology companies in the Midlands are identified as "scale-ups" and a further 13 "large scale-ups"

Engineering biology companies by company stage (UK and Midlands)

Company stage	UK companies	Midlands companies	Midlands % of UK
Seed	0	0	N/A
Start-up	457	42	9.2%
Scale-up	270	19	7.0%
Large scale-up	148	13	8.8%
Unicorn	13	0	0.0%
Established	398	47	11.8%
SME	458	58	12.7%
Total	**1,744**	**180**	**10.3%**
Linked to university spinout	**174**	**15**	**8.6%**

Cumulative growth of Midlands engineering biology companies (2000 – 2022)



Engineering biology companies include:

Binding Site Group (Birmingham)
The Binding Site Group is a UK-based international diagnostics business specialising in the research, development and manufacture of innovative, high-quality tests used for the detection of certain cancers and other serious disorders. The firm provides clinical diagnostic tools and assays for laboratories to diagnose and monitor diseases, attempting to drive innovation in the medical field.

DevelRx (Nottingham)
DevelRx is a R&D-based consultancy organisation that specialises in providing strategic and scientific support on the discovery, safety, toxicity and regulatory approval of molecules that enter the central nervous system (CNS), from traditional CNS drug candidates to psychedelics and cannabinoids and peripherally-acting agents that may penetrate the brain.

Gifford Bioscience Ltd (Birmingham)
Gifford Bioscience is a laboratory-based contract research organisation (CRO) specializing in receptor-ligand interactions. The firm supports pharma companies, biotechs and university researchers around the globe.

Phenotypeca Limited (Nottingham)
Phenotypeca was founded in 2018 to enable the manufacture of a new generation of recombinant protein therapeutics based on industry-acknowledged leadership in rational yeast strain engineering and genomics. The company's groundbreaking QTL technology now makes it possible to customise a new generation of premium biosimilars in a way that exactly matches the commercial requirements of the marketplace, heralding a transformation of drug development and manufacturing.

2. The Data City 2023
3. Estimated 20%+ company growth per year

Innovation ecosystem

Relevant high-performing HEI research[4]

- Loughborough University
- Nottingham Trent University
- Aston University
- University of Birmingham
- Coventry University
- De Montfort University
- Keele University
- University of Leicester
- University of Lincoln
- University of Nottingham
- University of Warwick

Innovation assets

1. BioCity Nottingham (Nottingham)

2. Birmingham Health Innovation Campus (University of Birmingham)

3. Precision Health Technologies Accelerator (Birmingham)

4. NIHR Leicester Biomedical Research Centre (Leicester)

5. Institute for Digital Healthcare (University of Warwick)

6. Imaging, Materials and Engineering Centre (Nottingham Trent University)

7. Synthetic Biology Research Centre (University of Nottingham)

8. Centre for Biological Engineering (Loughborough University)

Engineering biology funded innovation / R&D projects include:

UK High-Field Solid-State NMR Facility (University of Warwick – £16.8m)
The proposed 1.2 GHz ultra-high magnetic field NMR facility will enable experiments that provide unique information for applications, ranging from materials for catalysis and light harvesting, batteries and drug delivery, to the life sciences – plant cell walls, protein complexes, membrane proteins and bone structure.

Biochar demonstrator addressing key deployment barriers for carbon sequestration (University of Nottingham – £4.4m)
The UK aims to achieve net carbon neutrality by 2050 and is exploring Greenhouse Gas Removal (GGR) technologies like biochar. This interdisciplinary proposal seeks to assess biochar's viability for carbon sequestration and its impact on ecosystem services through a comprehensive demonstration program, addressing challenges and informing future policies and business models for GGR efforts.

How do RNA-binding proteins control splice site selection? (University of Leicester – £4m)
In complex organisms, genes can produce multiple proteins through a process called splicing, which determines which protein is made. How cells identify and switch between splice sites is critical for understanding various biological processes and disease. Despite recent progress in RNA splicing, many questions remain about the mechanisms involved in identifying and controlling splice sites, which this research aims to address using innovative methods to study protein interactions and binding patterns in real-time.

Deep Branch (Nottingham Trent University – £3m+)
Deep Branch uses microorganisms to convert clean CO2 into high-quality products. Rather than using sugar, (the main feedstock that is normally used) its microbes are fed carbon dioxide. They then produce a protein that offers a comparable nutrient profile to fishmeal but comes with a 90% smaller carbon footprint. Building on previous Innovate UK funding to help develop the proprietary gas fermentation technology, the REACT-FIRST project is now testing and trialling this radically more sustainable way of making feed, and the new type of single-cell protein, called Proton™, is the result.

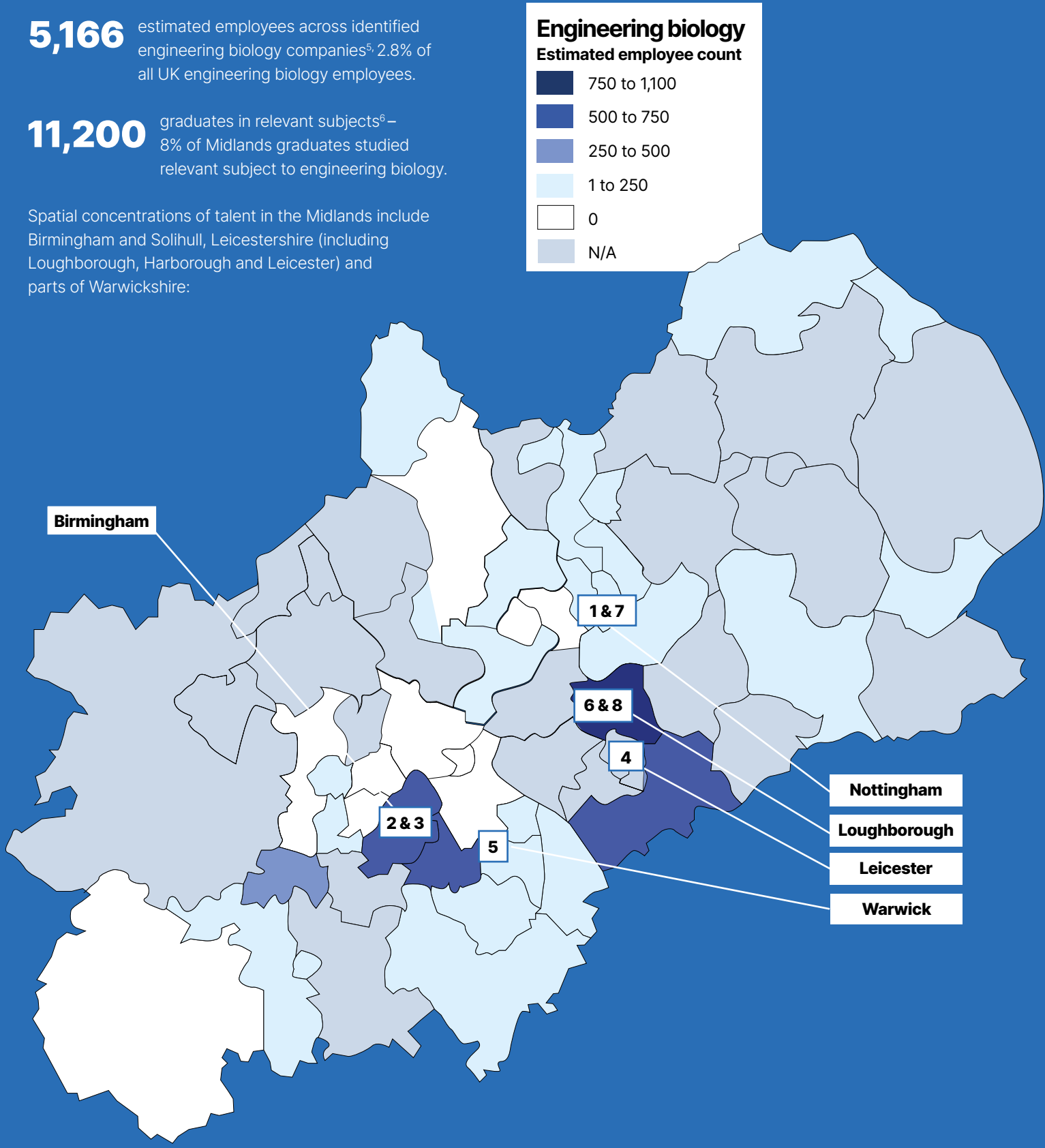
4. REF 2021 GPA >3.0 in any in any of allied health professions, Dentistry, Nursing and Pharmacy; Biological Sciences; Chemistry; Clinical Medicine; Computer Science and informatics; Psychology, Psychiatry and Neuroscience; Public Health, Health Services and Primary Care; Social Work and Social Policy

Talent ecosystem

5,166 estimated employees across identified engineering biology companies[5], 2.8% of all UK engineering biology employees.

11,200 graduates in relevant subjects[6] – 8% of Midlands graduates studied relevant subject to engineering biology.

Spatial concentrations of talent in the Midlands include Birmingham and Solihull, Leicestershire (including Loughborough, Harborough and Leicester) and parts of Warwickshire:



5. The Data City 2023
6. Graduates from relevant subjects 2021 (HESA): Biosciences (non-specific); Medical Sciences (non-specific); Medicine (non-specific); Pharmacology; Pharmacy; Medical Technology; Healthcare Science (non-specific); Biomedical Sciences (non-specific); Anatomy, Physiology and Pathology; Health Sciences (non-specific); Biology (non-specific); Microbiology and Cell Science; Genetics; Molecular Biology, Biophysics and Biochemistry; Others in biosciences; Chemistry; Biotechnology

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Investment ecosystem[7]

Wavteq finds the following about Midlands investment in health and life sciences industries more broadly (not specific to engineering biology due to lack of available data):

Investment metric	Investment amount
FDI CapEx 2017-21	$266.3m; 3% of UK total
DDI CapEx 2017-21	$544.2m; 15% of UK total
Fundraising volumes	Mean av. £688k fundraising investment; £68.2m in 99 investments (inc. £25.1m across 43 seed investments; £19.4m across 33 venture investments)
FDI jobs 2017-2021	889 jobs; 5% of UK total
DDI jobs 2017-2021	3,321 jobs; 17% of UK total
FDI projects 2017-2021	27 projects; 7% of UK total
DDI projects 2017-2021	47 projects; 20% of UK total

Over £450m worth of investment funding identified within engineering biology companies registered or active in the Midlands since 2009[8]. Companies who received investment include:

- **Deep Branch Biotechnology Ltd** (Nottingham)
- **Phenotypeca Limited** (Nottingham)
- **NanoSyrinx** (Coventry)
- **MirZyme** (Birmingham)
- **PBD Biotech** (Birmingham)

7. Wavteq 2022; note broader health / life sciences sector definition than just engineering biology
8. Dealroom and The Data City, 2023