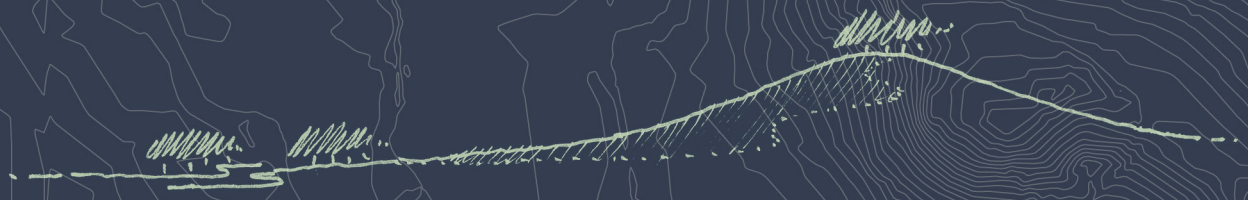

CAMBRIDGE SOUTH

Building a World Leading Innovation District for the Life Sciences

Jesus College Cambridge

St John's College University of Cambridge

Cambridgeshire County Council

Creative Places

April 2021

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1 Introduction

Creative Places is a specialist R&D real estate consultancy advising clients on how to plan, develop, manage and invest in collaborative places for businesses and organisations involved in education, research, R&D and innovation. We have worked across the UK on innovation districts, research and R&D campuses, research intensive hospital environments and innovation centres – and have visited many of the best locations across the world focussing on such activity.

We have been instructed to advise on what the potential demand for floorspace might be into the future at, and close to, Cambridge Biomedical Campus (CBC), and what development might comprise if the campus and the city is to fulfil its potential in the Life Sciences sector. We have sought to learn from what is happening elsewhere, consider historic development of space and likely needs into the future - assessing the factors that may influence future demand. This has helped identify potential scale and nature of future requirements beyond the existing CBC buildings and land allocations.

It is apparent that CBC has rapidly established itself as a centre of national importance and that its foundation of clinical excellence has enabled a cluster of exceptional research and R&D organisations to co-locate and thrive – delivering something of international significance. This platform provides one of the most reliable and exciting opportunities in the UK and the Cambridge sub-region for growth.

This report examines the potential demand for floorspace. It explores the growth of Life Sciences in the economy at international, national and Cambridge specific levels. We analyse demand for Life Sciences R&D space in Cambridge and the needs and preferences of Life Science organisations. We have used international and national economic trends to understand the growth trajectory of the sector and looked at other leading locations around the world. This has helped identify potential scale and nature of requirements – which will require additional development beyond the existing CBC buildings and land allocations.

The concluding part of this report makes the case for expansion of CBC as the means to fulfil Cambridge's Life Science opportunity whilst also benefitting the city as a whole. Cambridge has experienced phenomenal economic growth, driven by the expansion of high-tech and knowledge intensive sectors over the last half century. This has brought with it various pressures that now require pro-active planning if Cambridge is to maintain this success into the future. We believe that expansion of CBC will provide for Life Sciences in Cambridge to thrive into the future, delivering additionality for the population and a strategic solution to Cambridge's economic and social needs.

Into the future it will need to provide for more residential development, as well as clinical, research, R&D and other directly related activity.

2 Background

Cambridge has emerged over the last half century as one of the UK's most innovative economies. Excelling at the collaborative model of innovation between business, academia, and the public sector – the triple helix – science and innovation parks have thrived across Cambridge since 1970. The city has proven excellence in delivering places where experts from different backgrounds mix, share ideas and find commercial applications for research.

Life Sciences is currently Cambridge's fastest growing sector, and, like computer science and engineering, is growing at research parks and innovation districts across the city and beyond. The emergence of the Cambridge Biomedical Campus (CBC) in southern Cambridge as a significant node for a community of frontline healthcare workers, biomedical researchers and innovators is able to offer all of these groups the opportunity to coalesce to deliver enhanced levels of care and productivity – and it is now fast becoming an open innovation hotspot that is not just extraordinary in nature but able to evolve to deliver what the modern research/business world needs to develop further products and services to improve human health into the future.

This platform provides one of the most significant opportunities in the UK for growth. Understanding and planning for that growth potential is the focus of this report.

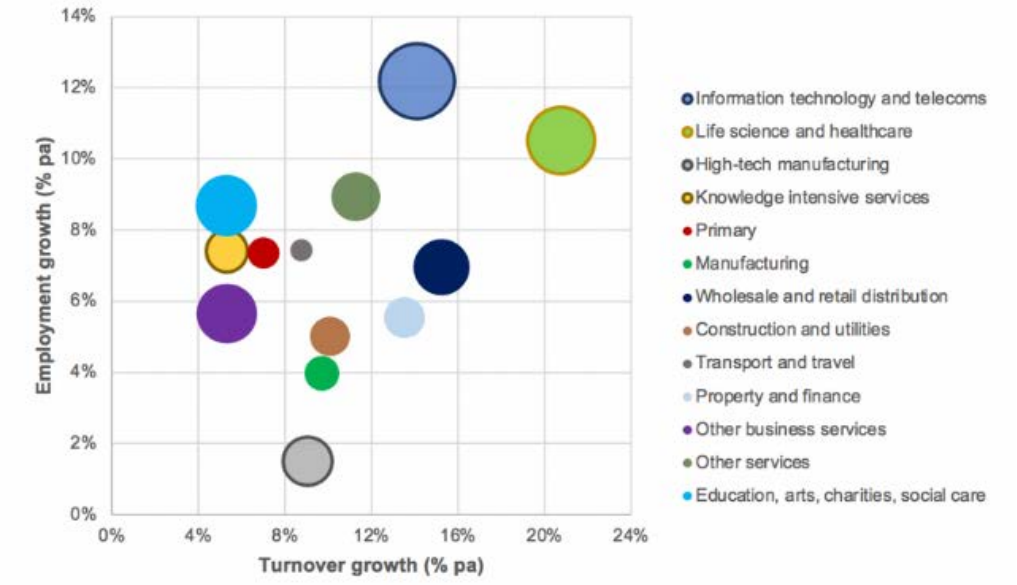
3 Economic Context

Life Sciences activity is growing around the world, driven by demographic, health and economic trends. Between 2000 and 2017, global health spending in real terms grew by 3.9% per year, compared to a 3.0% annual growth in global GDP.[1] Meanwhile, global Life Sciences R&D spending hit a record $179 billion in 2018, a 23% rise on four years earlier. By 2024 global R&D spend is forecast to reach $213 billion[2].

[1] Global Spending on Health: A world in transition, 2019. WHO
[2] JLL analysis of Evaluate Pharma data, 2019. JLL Life Sciences Outlook, 2019

In 2019 the Life Sciences sector employed 256,100 people in the UK[3]. Cambridge is a high growth economy in general, but the pace of growth in Life Sciences has outstripped other sectors. Turnover growth for Cambridge Life Sciences businesses has increased by 20.8% per annum and employment growth by 10.5% per annum over the last six years[4].

Six year annual average employment and turnover growth in Greater Cambridge, 2012/13 to 2018/19

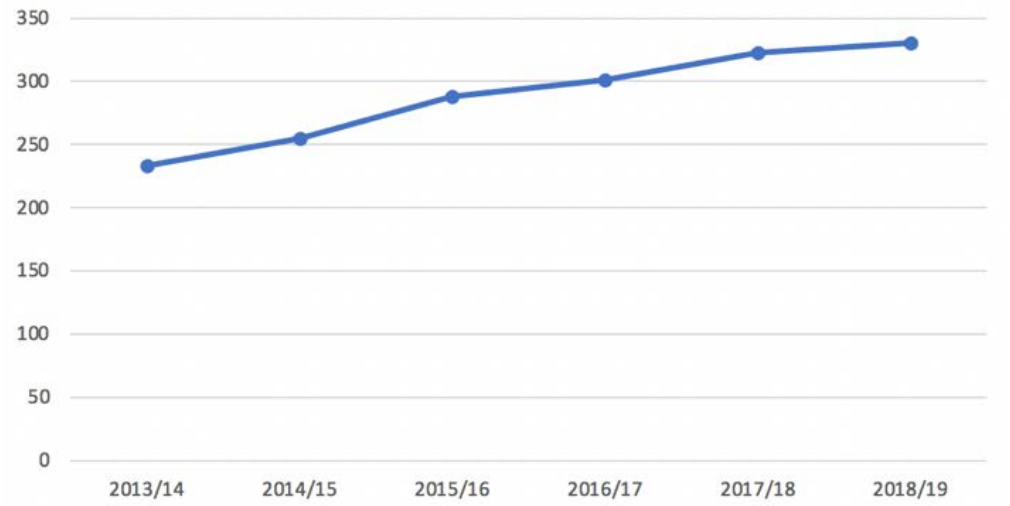


Source: Centre for Business Research, 2020

The size of each bubble is proportionate to the number of employees in 2018-2029 on a continuous scale. Bubbles with an outline identify knowledge intensive sectors.

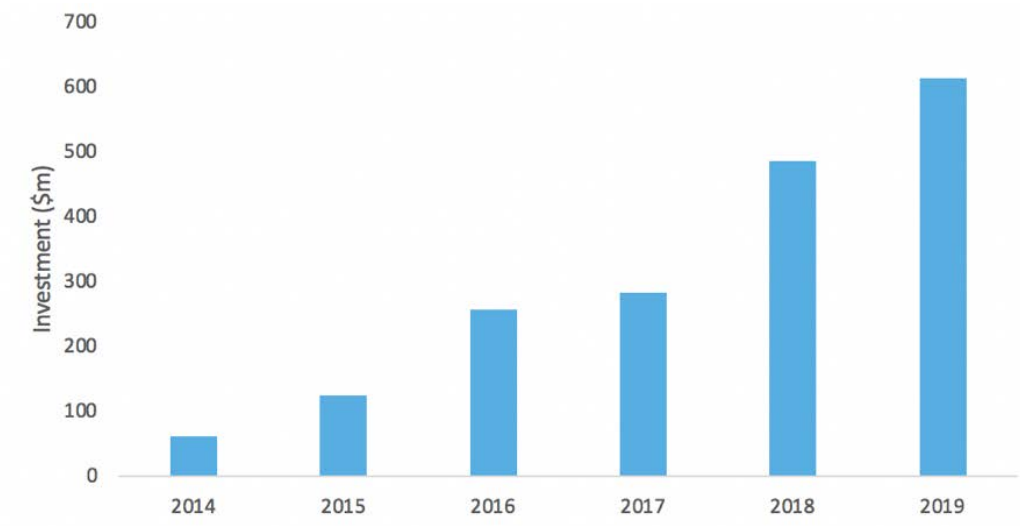
[3] OLS, Bioscience and Health Technology Statistics, 2019
[4] Centre for Business Research, 2020

Number of Life Sciences businesses in Greater Cambridge in years 2013 to 2019



Source: Centre for Business Research, 2020

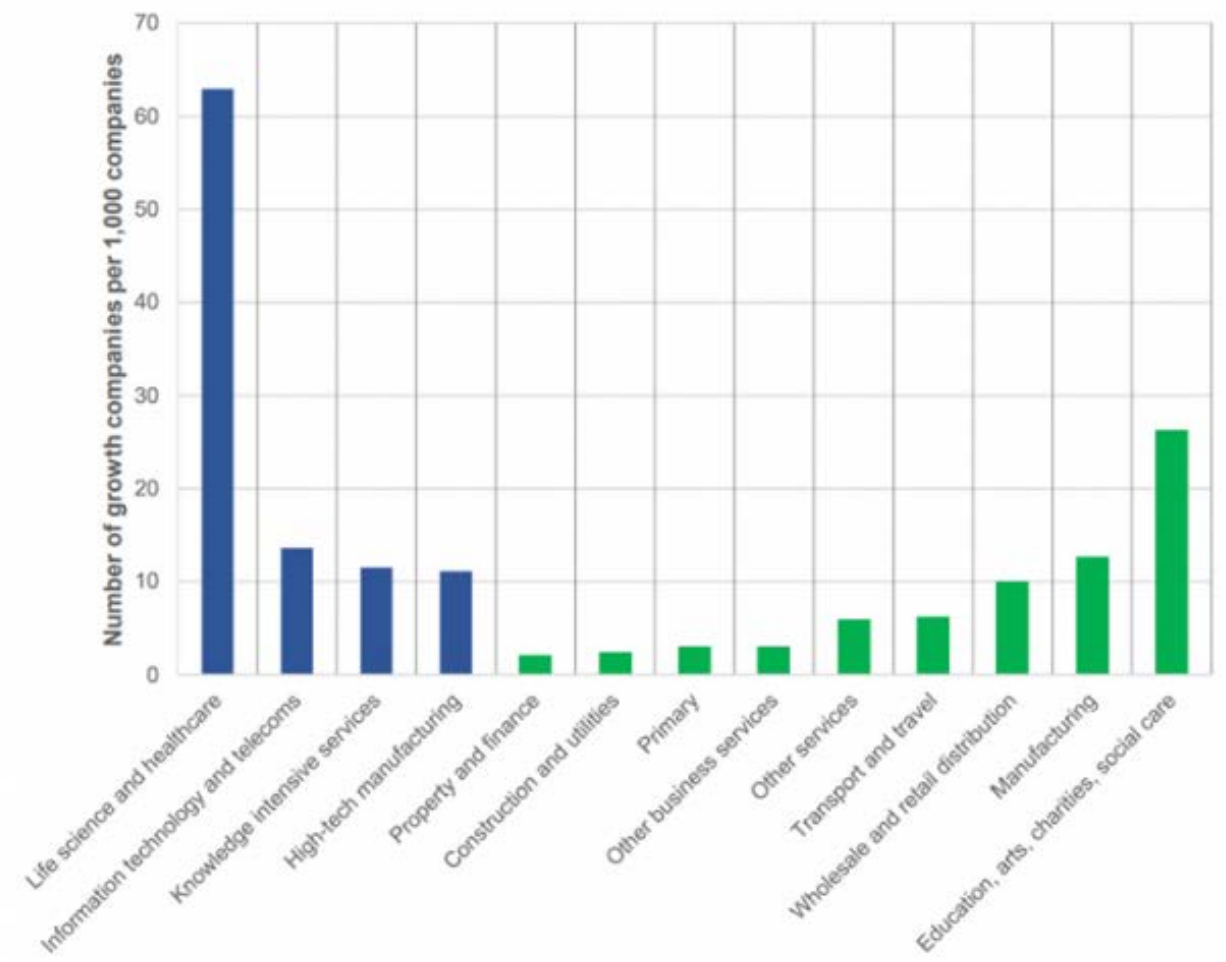
Venture Capital investment in Cambridge Life Sciences between 2014 and 2019



Source: Tech Nation Data Commons for UK Tech, 2020

As the number of firms has grown, so has growth within companies. The Life Sciences sector has an outsized proportion of growth companies – that is, firms that have experienced growth of employment and/or turnover of 10% per annum or more over the five years up to 2019. Within the Life Sciences and healthcare sector around 63 out of 1,000 companies become high-growth companies. This is over 4 x as high as the next knowledge intensive sector – IT and telecoms.

Number of growth companies per 1000 companies by sector, Cambridgeshire and Peterborough



Source: Centre for Business Research, 2020

4 A globally competitive Life Sciences Innovation District

The creation and growth of specialist Life Sciences innovation districts is one which is playing out across the world. The agglomeration of businesses of different sizes, anchor institutions and research organisations within a district allows networks to form between different economic sectors and across institutional boundaries that would otherwise not exist. Simply put, concentration of talented and intelligent people in the same place allows them to combine their skills, share ideas, collaborate and compete, for mutual benefit.

Innovation districts are geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators. They are also physically compact, transit-accessible and technically wired, offering mixed-use housing, office and retail. Anchor institutions are typically classified as research intensive universities and research-orientated hospitals with extensive R&D activity. The cluster of activity at CBC has extraordinarily strong anchor institutions in this respect, the Laboratory of Molecular Biology alone spawning a very high number of nobel prizes over a long and stellar history since setting up on campus in the 1960s.

These districts do not exist in isolation, each is part of complex networks and there are many inter-relationships. Within the cities where they exist, they operate as engines of innovation, where boundaries between organisations and institutions are porous and allow the cross fertilisation of ideas. This process of open innovation, where firms make use of ideas inside and outside their organisations, collaborating and sharing expertise, is increasingly popular amongst innovative firms. A 2013 survey of European and American companies with annual sales in excess of US$ 250m found that:

- 78% of firms reported practicing open innovation.
- No firms reported abandoning the practice of open innovation.
- 71% reported that top management support for open innovation is increasing.
- 82% reported that, compared to 3 years ago, open innovation is practiced more intensively.

US Genetic Engineering and Biotechnology News ranks clusters based on five quantifiable criteria:

- **Government research funding**
- **Venture capital (VC) funding**
- **Patents**
- **Laboratory floor space**
- **Jobs**

Their top 3 US locations using these metrics to assess quality in 2020 were Boston, San Francisco Bay and New York/New Jersey. Data on what each has in these respects is as follows:

Location	Lab floor space (sq ft)	Government Research Funding	Venture Capital Funding	Patents	Jobs
Boston	35m sq ft	$3.7 bn	$6.2 bn	9,900	79,072
San Francisco Bay	33.1m sq ft	$2.47 bn	$10.8 bn	12,777	145,000

New York/New Jersey	No available data but 850,000 sq ft completed in 2019/20 and 1.1m sq ft is under construction 2021 in NY City alone	$3.31 bn	$3.78 bn	5,332	152,162

When we look at how well Cambridge UK scores in these metrics, it is noticeable that Cambridge enjoys a lead position on research and lead position for accommodating commercial R&D at scale in the UK, and scores highly in the other areas.

Healthcare research

Times Higher Education rankings for research excellence within the Life Sciences and Clinical Health subject areas show Cambridge to not just be extremely good but improving in its relative positioning.

Life Sciences

University	2021 Ranking	2017 Ranking
University of Cambridge	1	3
University of Oxford	2	2
Harvard	3	1
Yale	4	7
Johns Hopkins	5	-
Peking	6	-
MIT	7	12
Stanford	8	6
University of California, San Diego	9	-
California Institute of Technology	10	10

Clinical Health

University	2021 Ranking	2017 Ranking
Cambridge	1	2
Harvard	2	4
Oxford	3	1
University of Toronto	4	5
Karolinska Intitute	5	6
Peking University	6	-
University of Tokyo	7	10

Berkeley	8	7
National University of Singapore	9	-
Imperial	10	11

The clustering of activity at Cambridge Biomedical Campus may be contributing to this enhancement, as it drives on productivity and opportunity for the best, leading edge, research.

Availability of funds

Cambridge has been growing its funds to invest in local businesses. Full year data for 2019 shows the following:

- Cambridge Innovation Capital raised £150m in 2019
- Cambridge based Ahren raised £200m in 2019
- Start Codon raised £15m to invest in Life Science start-ups in 2019
- Illumina launched its Genomics Accelerator in Cambridge in 2019

Patents

The 2018 CPIER report identifies Cambridge as the city in the U.K. with the highest number of patent applications per 100,000 population, with 341 patent applications. It's closest competitor city had 118 per 100,000. London probably lags on this metric because of its large population size. However, the East of England region performs well against the London region in terms of total numbers of patents granted per year. In 2017, 461 patents were granted in the East of England compared to 530 in London. In 2018, 466 patents were granted in the East of England compared to 477 in London. The U.K. as a whole had an increase of 7.8% in the total number of patents granted in 2018 compared to 2017 (European patent office). This was the fifth consecutive year of growth in the number of patents and was above the average growth of 3.8% experienced by the 38 European member states.

Laboratory space

Cambridge has over 2.5m sq ft of wet laboratory space available for occupancy by the private sector, in comparison to Oxford and London that each have less than 500,000 sq ft.

It is very important that Cambridge stakeholders plan to grow and support the Life Sciences cluster in the city given its pre-eminence in some of these key areas, which will have been hard won and have relied on significant pioneering work to secure. Oxford is now planning significant development at its Churchill Hospital campus, having built a bio-incubator and bio-escalator; in London there are initiatives to not just expand innovation districts like King's Cross with the relocation of Moorfields Eye Hospital and UCL's Institute of Ophthalmology to the location, but plans for new Life Sciences led districts around hospitals that include St Thomas', Guy's, the Royal London and UCLH. Across

London we are aware of plans to promote circa 10m sq ft of space by property owners over this next decade.

Innovation and Life Sciences

This model of innovation requires variety, the mixture of large and small firms, academic and public sector institutions. For Life Sciences, the value of this mix is clear, because of the relevance of frontline healthcare provision to researchers and entrepreneurs in biological and medical sciences. Interactions with healthcare research and R&D professionals allow first-hand insight into the nature of diseases and up-to-date and practical understanding of their treatment. In turn, healthcare providers can benefit from the faster development of ground-breaking new treatments and their tailoring to their needs.

The success of this model is borne out by the rise of Life Sciences innovation districts around the world. As R&D activity increasingly focusses on open innovation hotspots, key locations in the US, Europe and China, are demonstrating how this changing demand picture drives striking growth. It also highlights the quality of global locations with which Cambridge competes. Later in this paper we will provide some detail on the lead US cluster in and around Cambridge, US.

Residential accommodation to serve a growing community

Delivering homes in relatively close proximity to the other activities at Cambridge Biomedical Campus enables place making and community development necessary for a sustainable 21st Century development. It enables it to truly develop as an innovation district that enjoys diversity and vibrancy in line with the best in the world. It will be important to plan for a reasonably significant level of appropriate housing not too far from the campus.

5 Historic Take Up Analysis

Historic take up is a helpful starting point in thinking about what to plan for the future.

With the publication of the 2020 Vision in 1999 by Addenbrooke's NHS Trust, the University of Cambridge and the Medical Research Council signalled the intention to develop an innovation district in South Cambridge. Subsequent development on CBC proceeded at a fast pace. New facilities for the Cancer Research UK Cambridge Research Institute, Addenbrooke's Treatment Centre, and Institute of Metabolic Science were built in 2008. Over the last decade this was followed by the new Medical Research Council's Laboratory of Molecular Biology building and an extension to the Rosie Hospital which were officially opened in 2013, and in 2015 the Royal Papworth began building its new hospital, which was opened four years later.

This concentration of clinical and research expertise has attracted major businesses to CBC. In 2015, the global pharmaceuticals giant AstraZeneca transferred its UK R&D hub and corporate HQ to Cambridge, an investment of over £330m which will bring thousands of jobs to CBC. In 2019, Abcam, which emerged from the first wave of innovation activity in Cambridge, opened their new HQ on the campus as an established multinational Life Sciences giant.

These businesses and institutions have come to CBC because of the accumulated concentration of clinical and research excellence at the campus. There is mutual value, as researchers can see health problems first-hand and respond to them, while healthcare workers benefit from state-of-the-art techniques and treatments. This 'bench to bedside' cycle of Life Sciences development is what brings research-intensive businesses here, and the sheer concentration of healthcare providers is what sets CBC apart from other Life Sciences clusters around the world. This creates considerable potential for further growth, as sector organisations increasingly seek co-location opportunities to benefit from and add to what has emerged as a world class specialist biomedical cluster.

Since detailed planning permission was granted for the new Laboratory of Molecular Biology at CBC in 2008, shortly followed by outline permission for Phase 1 of the expanded campus in 2009, there has been significant new development of floorspace across clinical, research and biomedical R&D uses. Based on recent planning consent data, a total of almost 2m sq ft has been built or is under construction, as follows:

Clinical

Royal Papworth Hospital	33,300 sq m GEA
Rosie Extension	8,025 sq m GIA
Sub-total	41,325 sq m (445,000 sq ft)

Research

Laboratory of Molecular Biology	25,209 sq m GEA
Heart & Lung Institute	6,639 sq m GEA
Anne McClaren Building	9,033 sq m GEA
Jeffrey Cheah Building	18,000 sq m GIA
CRC Extension	4,017 sq m GIA
Sub-total	62,898 sq m (677,000 sq ft)

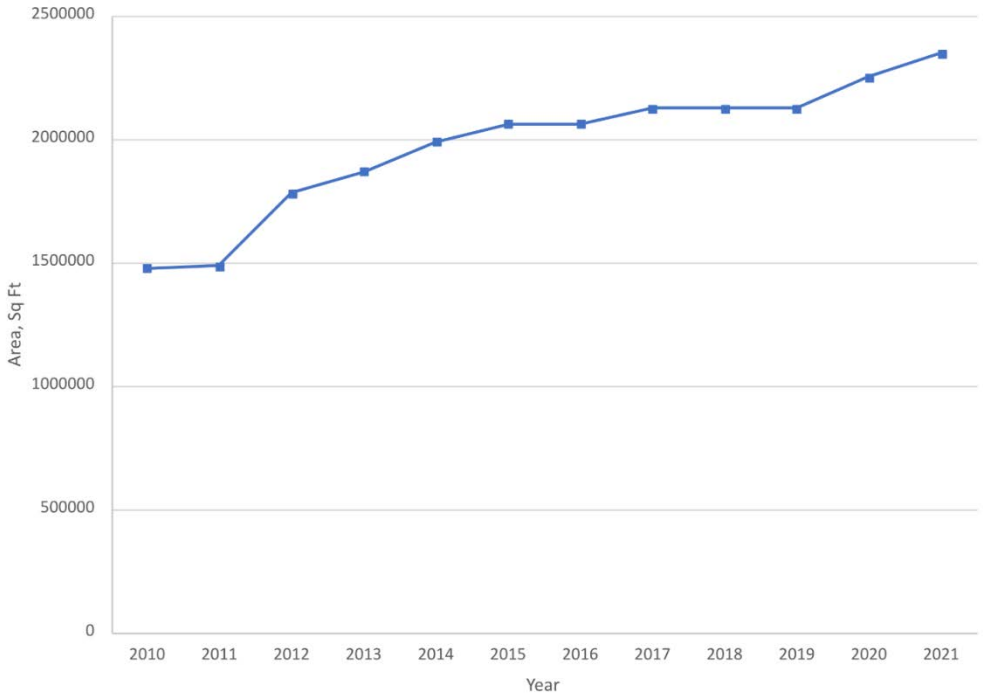
Commercial R&D

AstraZeneca (Phase 1)	59,821 sq m GEA
Abcam	11,495 sq m GEA
Sub-total	71,316 sq m (767,600 sq ft)

Over a 13 year period this represents a development rate of around 145,000 sq ft per annum. Further development is expected in the near future as Cambridge University Hospital plans major new facilities (a Cancer Hospital, Children's Hospital and Addenbrooke's 3) and new commercial floorspace (1000 Discovery Drive) is progressed.

When we look at Cambridge laboratory supply for commercial R&D, development rates have been relatively modest through the sub-region for a number of years. This is set to witness a step-change as the AstraZeneca facility opens at Cambridge Biomedical Campus.

Cambridge laboratory floor space (Sq Ft)



Source: Bidwells Databook, 2021

6 Demand levels into the future

The accumulated concentration of clinical and research excellence at CBC creates huge potential for growth, as sector organisations increasingly seek co-location opportunities to benefit from and add to what has emerged as a world class specialist biomedical cluster.

Healthcare provision and research/R&D associated with it are growing sectors, globally. There are a variety of reasons for this, including those related to ageing populations, rising expectations of the

populations of emerging economies and greater levels of ill health that are associated with modern lifestyles. Collaborative scientific discovery has also opened up new horizons for what may be achievable. We explain below why we expect demand for floorspace for Life Sciences activity across clinical, research and R&D uses close to Cambridge Biomedical Campus to grow – with potential for higher annual rates of development than seen historically.

The Snowball Effect of Open Innovation

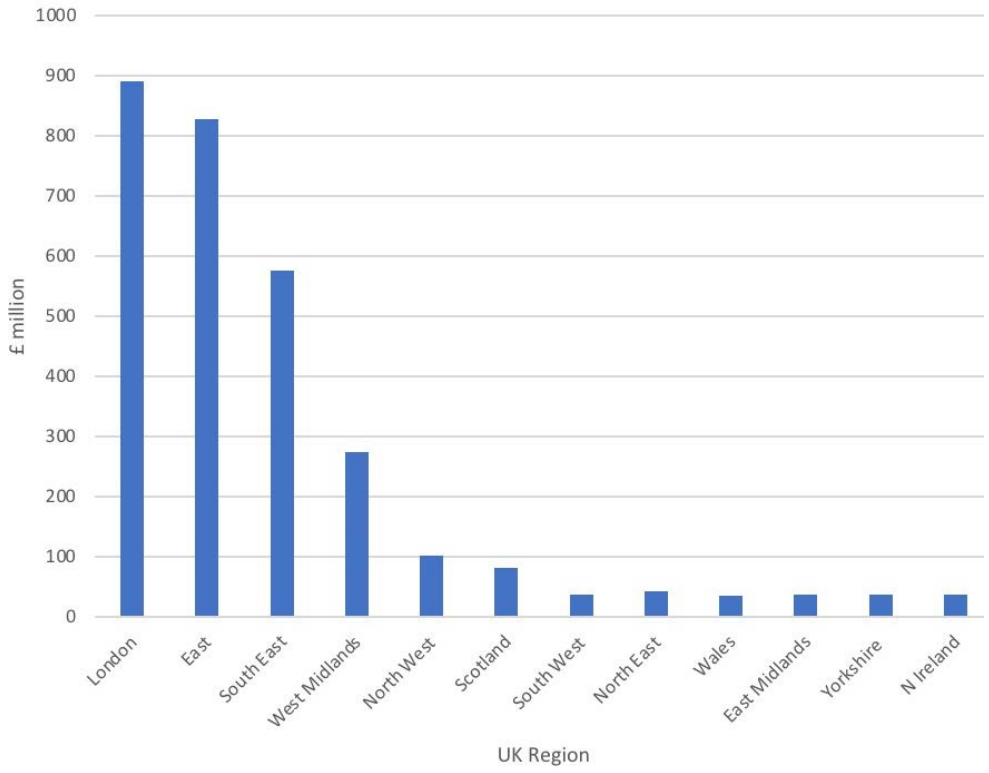
Geographically, research and R&D is being polarised to Open Innovation hotspots where businesses can accelerate R&D activity and drive efficiency through partnering with the research and clinical base, SME and other corporate activity. In the Life Sciences, Cambridge is the leading location in the UK, looking across this breadth of activity. The concentration and excellence of activity here is driving further demand, and particularly because businesses across diverse sectors are increasingly looking to work together.

Companies such as Microsoft, Amazon, Apple, Samsung and AstraZeneca have chosen Cambridge as a location to expand their R&D activities, seeing it as a place to partner with a variety of organisations and recruit high quality staff. Collaborations across disciplines are increasing – Microsoft's Cambridge Research Lab reported recently that it had deployed its artificial intelligence models to detect cancerous tumours at Addenbrooke's Hospital; and AstraZeneca, GSK and Cambridge University have established the Cambridge Centre for Artificial Intelligence in Medicine. According to the McKinsey Global Institute in 2019, the United Kingdom leads Europe in the density of AI start-ups launched in the areas of health and medical technology. Cambridge is probably the lead centre for such activity in the country.

Not only do businesses find that they can enhance their productivity by locating in key locations where other relevant activity takes place, they also find it easier to raise money. Data shows that far more money flows into businesses located in core geographies, linked to clustering of excellence.

Venture Capitalist investments into Life Sciences Start-Ups across the UK, £ million

Evidence of it successfully growing collaborations between healthcare providers, researchers and industry is the holy grail that will attract in many other potential collaborators. Enabling this growth is an important responsibility and Cambridge should plan to accommodate accelerating space requirements in specialist locations such as the Biomedical Campus and its environs.



Source: BioCity, 2019

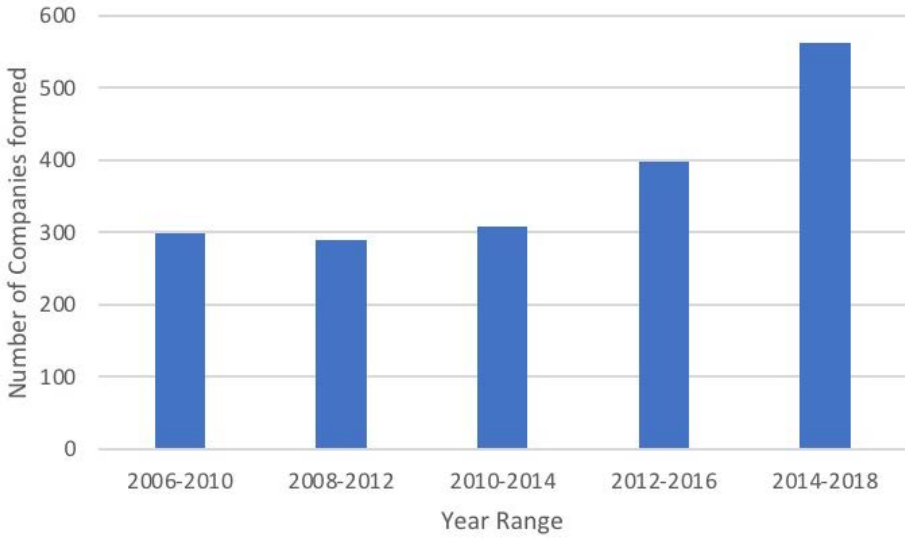
Healthcare R&D Growth

Across the world there are a number of factors supporting very significant growth in research and R&D in healthcare. Advances in genomics and AI etc mean that therapies and devices can be developed with ever more opportunity for efficacy/application – such as Cell and Gene Therapy. These growing needs are driving investment by public and private bodies into healthcare R&D across a range of sub-sectors, fuelling growth in activity and floorspace needs.

Investment into Life Sciences businesses, across a range of activities from biotech and pharma to artificial intelligence and medtech, reached record levels in 2020, with over $80bn of investment into companies in the sector globally[5]. The picture was replicated in the UK with 2020 representing a record year for investment into UK-based biotechs – over £2.8bn of investment representing a ten-fold increase on the figure for 2012[6].

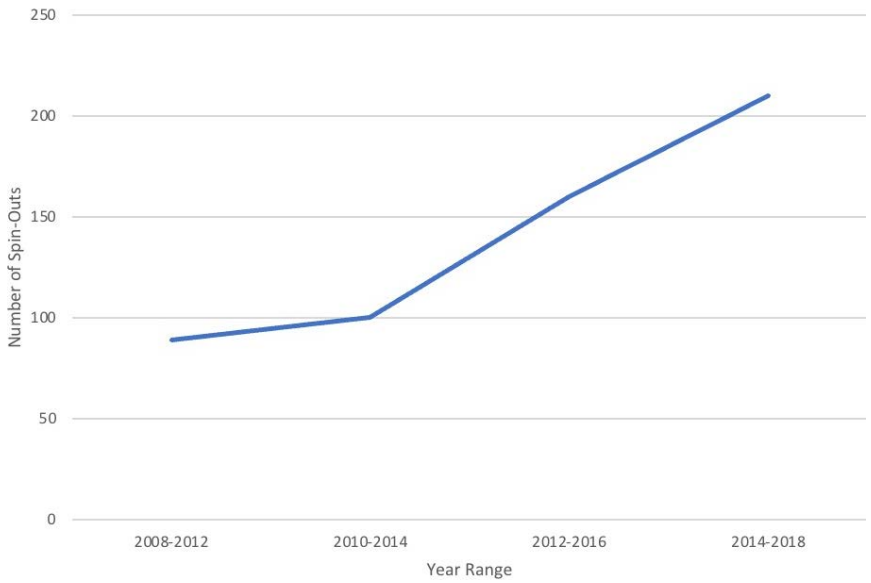
[5] CBInsights State of Healthcare Report Q4 2020
[6] BioIndustry Association: UK Biotech Financing in 2020

UK Life Sciences Company formation levels, 2006 to 2018



Source: BioCity, 2019

Number of University Life Sciences spin-outs in the U.K. is growing



Source: BioCity, 2019

Spin-out companies take time to establish themselves and scale. Into the future we can expect the growing number of company formations and the growing availability of money to fund their growth to feed through to increased property demand.

Finance raised by UK-based biotech companies

Source: BIA The Sciences of Success: UK Biotech Financing, 2020

Central and Regional Government Support

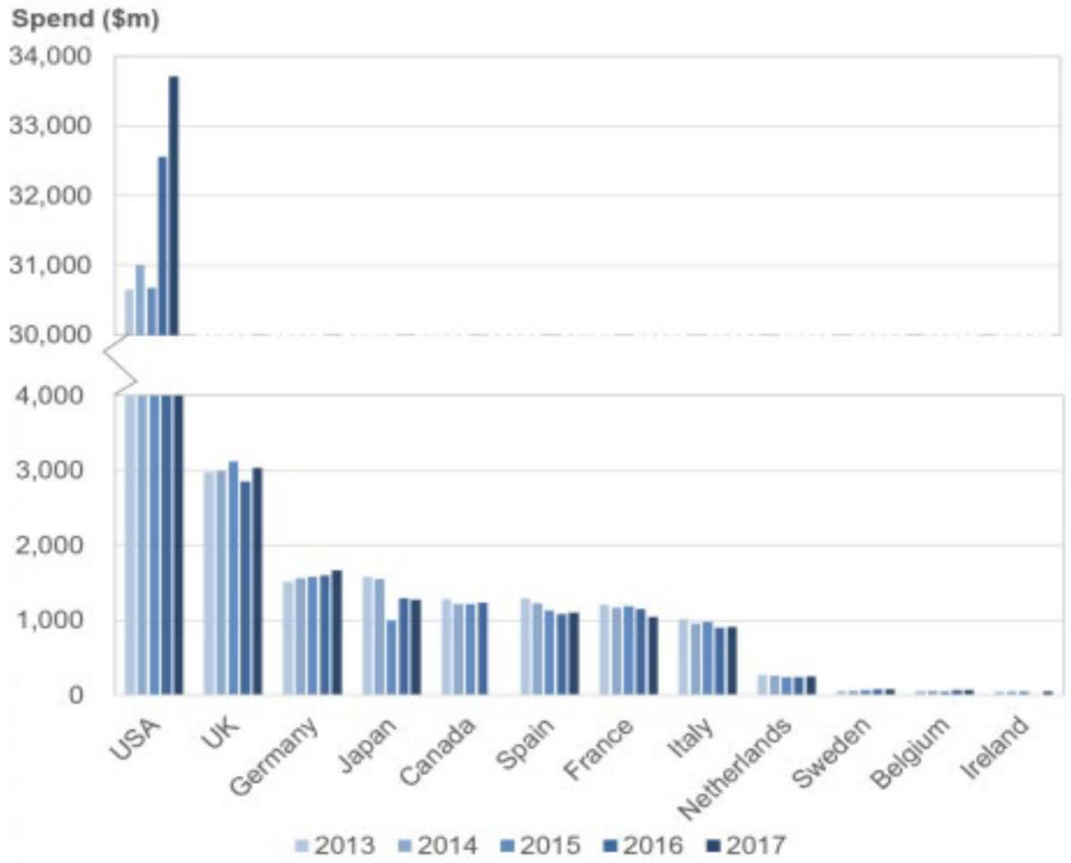
Central and Regional Government has recognised the key role innovation will play in growing the UK economy. The UK's Industrial Strategy, published in 2017, identified five foundations for enhanced productivity, identifying our ability to innovate – to develop new ideas and deploy them – as one of Britain's great historic strengths. Central government has set a policy to raise total R&D investment to 2.4% of GDP by 2027 and to invest in programmes to capture the value of innovation. The UK's Life Sciences Strategy and sector deals have focussed investment on medicines manufacturing, advanced therapies and infrastructure to support growth. It has recommended ways to increase collaboration between businesses and the NHS.

The March 2020 Budget saw the UK Government announce the largest and fastest ever expansion of support for research and innovation, increasing public R&D investment to £22 billion a year by 2024/5, with £10.36 billion being allocated in 2020/1.

The Government has set up a new research agency, the Advanced Research Projects Agency, to drive for change in R&D so that it becomes ever more challenge-focussed, agile and ambitious.

Government spend on health R&D is very high – ranked second only to the US at $3 billion in 2017 and double that of comparator countries[7]

Government spend on health R&D by countries between 2013 and 2017



Source: OECD Research and Development statistics, 2019

The Cambridge and Peterborough Independent Economic Review (CPIER) published in 2018 recognised the growth in employment focussed on innovation in the region but noted that housing and transport investment had not matched this, risking companies choosing not to remain or locate in the city – recommending that the UK Government adopt a "Cambridge or overseas" mentality towards knowledge-intensive (KI) businesses in the area and ensure that Cambridge continues to deliver for KI businesses, which should be considered a nationally strategic priority.

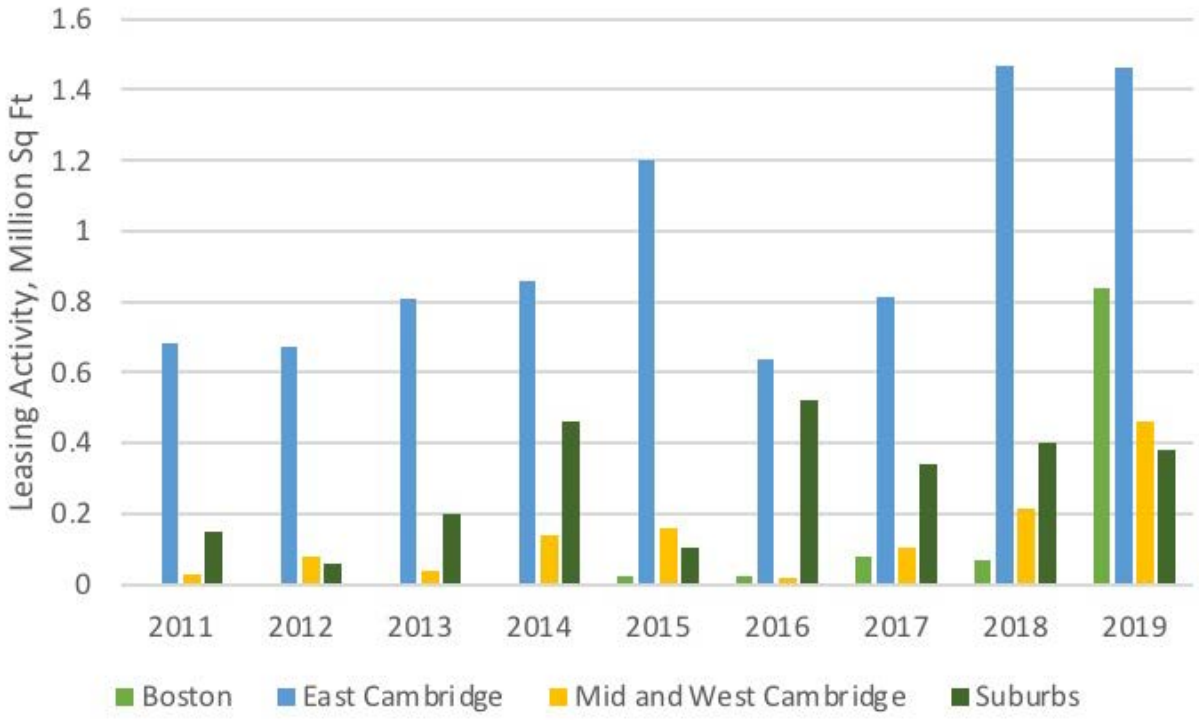
[7] OLS Life Science Competitiveness Indicators, 6.19

This vital public sector support will fuel demand for healthcare research and could reasonably be expected to push R&D activity to grow even more successfully in the city. The Life Sciences Strategy recognises that fulfilling this potential is nationally important.

Growth experienced in other innovation hotspots

As R&D activity increasingly focusses on open innovation hotspots, key locations in the US are demonstrating how this changing demand picture drives striking growth. Fuelled by significant levels of public and private sector funding, Life Sciences activity has increased notably, for example, in Boston, with major R&D businesses making significant investments in new facilities alongside research and clinical activity. Boston's story demonstrates the power and importance of the co-location of University based research and clinical excellence – but it also highlights the quality of global locations with which Cambridge competes.

Boston Life Sciences leasing activity since 2011



Source: CBRE Boston Life Sciences Report, 2020

Today there are over 500 Life Sciences and biotech companies in the Boston/ Cambridge, MA area with over 100 more in the surrounding areas[8]. Total laboratory space at the end of 2019 stood at over 29.7m sq ft, with a further 3.9m sq ft currently under construction. Leasing of laboratory space

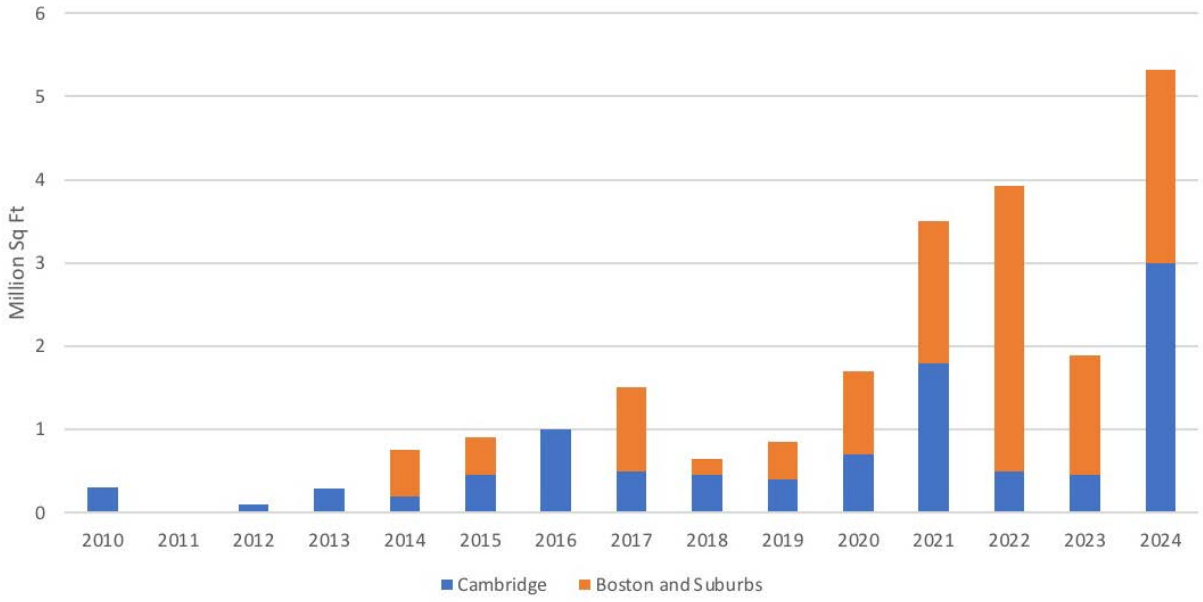
[8] CBRE: 2020 Boston Life Sciences report

has increased, with significant demand being concentrated in East Cambridge alongside MIT and Kendall Square and close to Massachusetts General Hospital, where a total of 7m sq ft has been leased since 2015.

Boston's major cluster of clinical and healthcare research activity is at Longwood Medical Center, a 213 acre campus with 20m sq ft of floorspace, housing 22 institutions to include three major Harvard affiliated teaching hospitals and three research treatments centres. Recent developments include a 525,000 sq ft new research building, housing researchers for the Department of Genetics, Microbiology and Immunobiology as well as a conference centre that hosts over 450 events a year. There are major facilities for the Dana-Farber Cancer Institute, Immune Disease Institute, CBR Institute of Biomedical Research. Commercial activity includes the Merck Research Laboratory and Pfizer Center for Therapeutic Innovation.

Cambridge's (Mass, USA) international competitors are building development pipelines to expand their facilities to new levels.

New laboratory deliveries since 2010 in Greater Boston, USA



Source: NKF Research, 2020

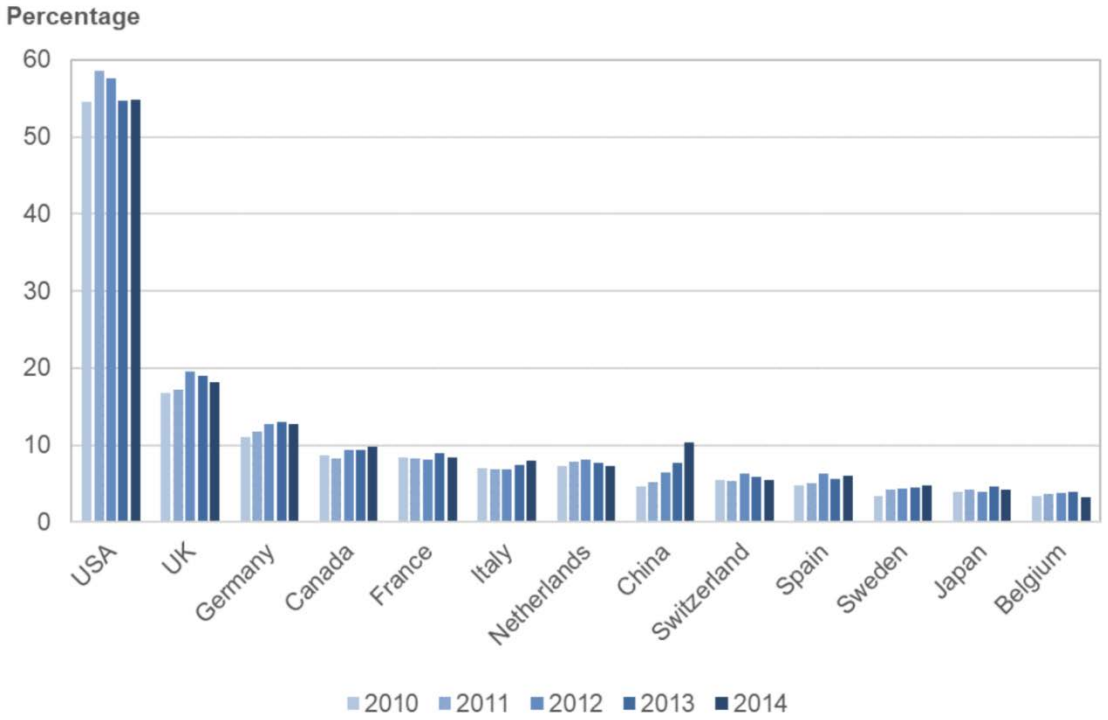
A significant proportion of healthcare related commercial activity is drawn to where there is excellent research taking place relevant to healthcare. Historically this has been more relevant than co-location with clinical activity. Proximity matters, however, and Kendall Square in East Cambridge is still relatively close to Massachusetts General Hospital. Notably, Kendall Square provides a high quality mixed use centre, with homes, shops and leisure facilities, all enhancing the attraction of 'place' for footloose research companies.

Cambridge, UK is a significantly different scale to Boston/Cambridge, US today, with overall commercial laboratory provision standing at around 2.5m sq ft. Comparisons need to be made with care, but nevertheless the experience from Boston shows how demand for clinical, research and commercial R&D activity can grow at significant pace once a critical mass is established and as funding (public and private) increases and business R&D activity concentrates in open innovation hotspots. It is relevant that relatively close to Kendall Square there is a range of residential accommodation types.

Growth in Cambridge research

The UK is a research powerhouse. In the Life Sciences it comes second only to the USA for its share of the top 1% academic citations.

Share of top 1% (most cited) Life Sciences academic citations by country



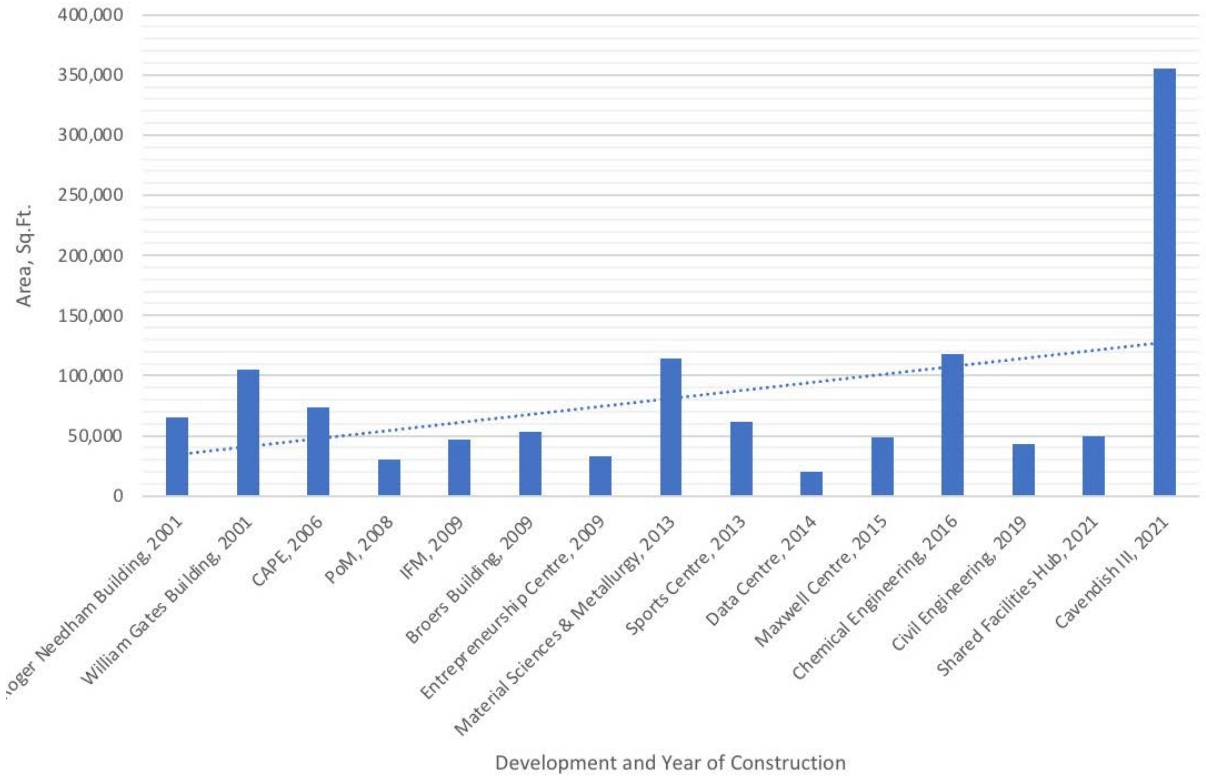
Source: OLS Life Science Competitiveness Indicators, 6.19, 2019

Across Cambridge and within all sectors new development of research floor space has been quickening decade on decade for the last 30 years. At CBC major investments have been made in the Laboratory of Molecular Biology, Anne Mclaren Building, Jeffrey Cheah Building and the Heart & Lung Institute, all in the last 13 years. New facilities have been built at West Cambridge for the Departments of Material Sciences and Metallurgy, Chemical Engineering, Physics (Cavendish III) and Engineering (CAPE and Civil Engineering). As UK public sector funding for research is set to grow,

we can anticipate research activity in Cambridge growing further, adding to the globally significant attraction that already exists.

Cambridge Biomedical Campus is not the only location growing at a quickening pace. The University of Cambridge's West Cambridge Campus is accelerating its floor space as a new Cavendish Laboratory and new facilities for the Engineering Department are under construction.

New developments in West Cambridge since 2011



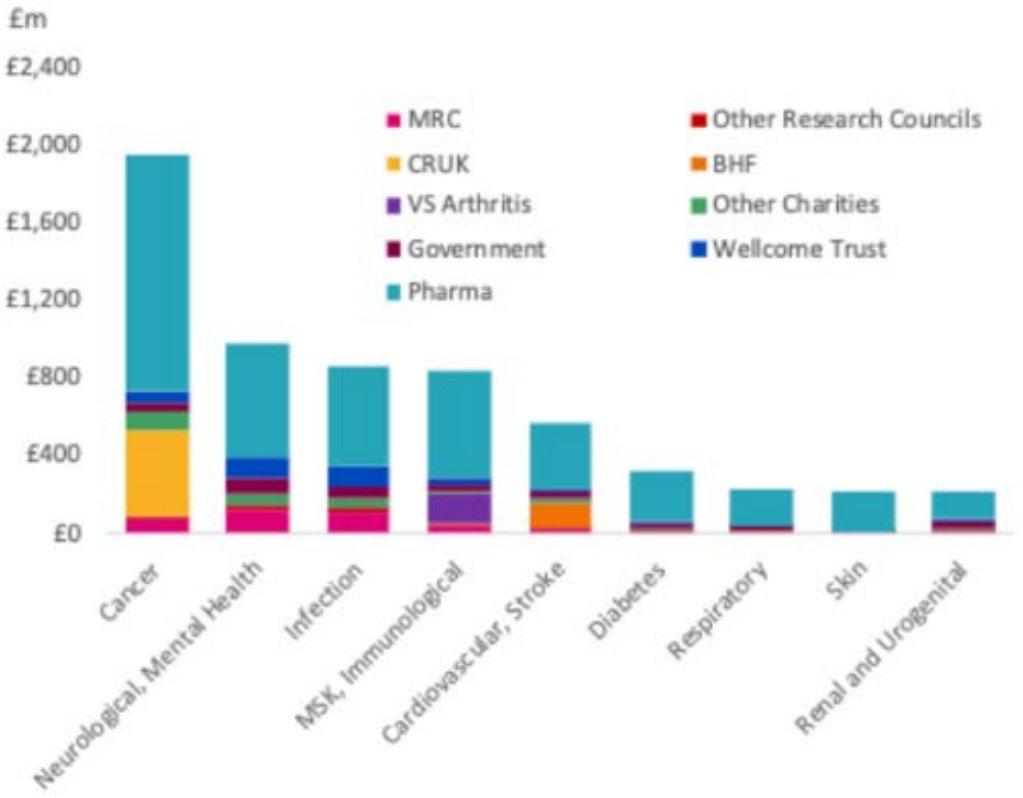
Source: Creative Places, 2021

Growth in Cambridge Clinical Activity

Major new facilities have been developed at CBC for Royal Papworth Hospital and are planned by Cambridge University Hospitals. As demand for healthcare services increases, further growth in clinical activity can be anticipated, not all of which will be best located in the heart of the current concentrations of such facilities today. Outpatient activity might be located close to but not immediately within acute care, providing benefits of proximity. Other services, including mental health, could conceivably seek to locate within the cluster and providing for this overall growth is important if the campus is to achieve its potential.

Cambridge University Hospitals plan new specialist hospitals in both cancer and children. Cancer is the UK's most significant area of spend in R&D and most of this comes from the pharmaceutical industry.

UK R&D spend in different disease areas by source (2018/2019)



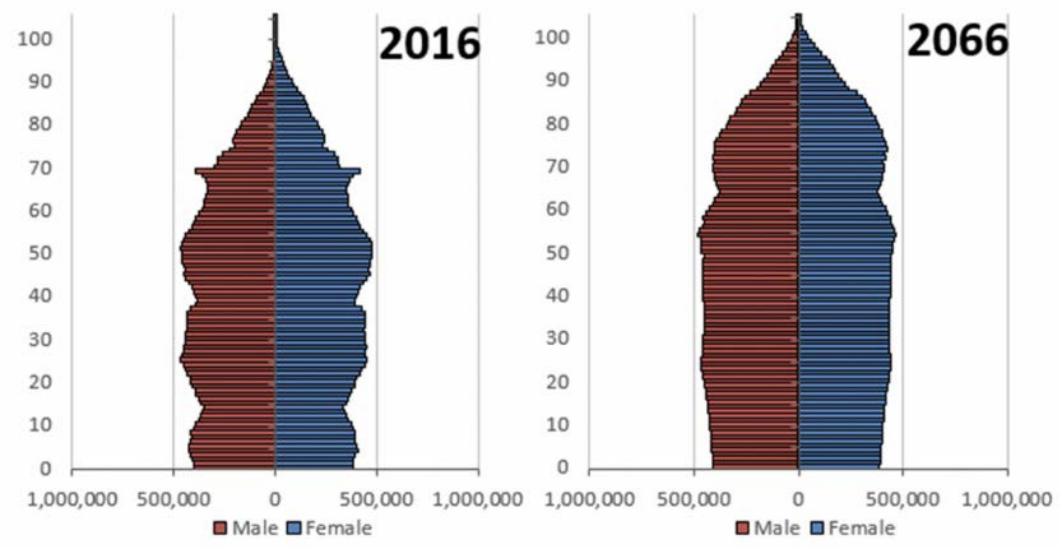
Source: ONS, Nomis, Pharmaintelligence whitepaper, MRC annual report, CRUK annual report, BHF annual report, CF analysis

With Cambridge's propensity to build R&D activity alongside clinical/research activity, it would be reasonable to assume that when the new cancer hospital opens there will be a significant ancillary growth in research and R&D. Similarly with the new children's hospital.

It is important to note that there should be an anticipation that into the future, hospital needs will grow.

Growing needs of an ageing and less healthy population into the future

A study in the Lancet in 2011 reported an expectation of 11 million more obese adults by 2030 in the UK, accruing an additional 6 to 8.5 million cases of diabetes, 5.7 to 7.3 million cases of heart disease and stroke, circa 500,000 to 670,000 cases of cancer.

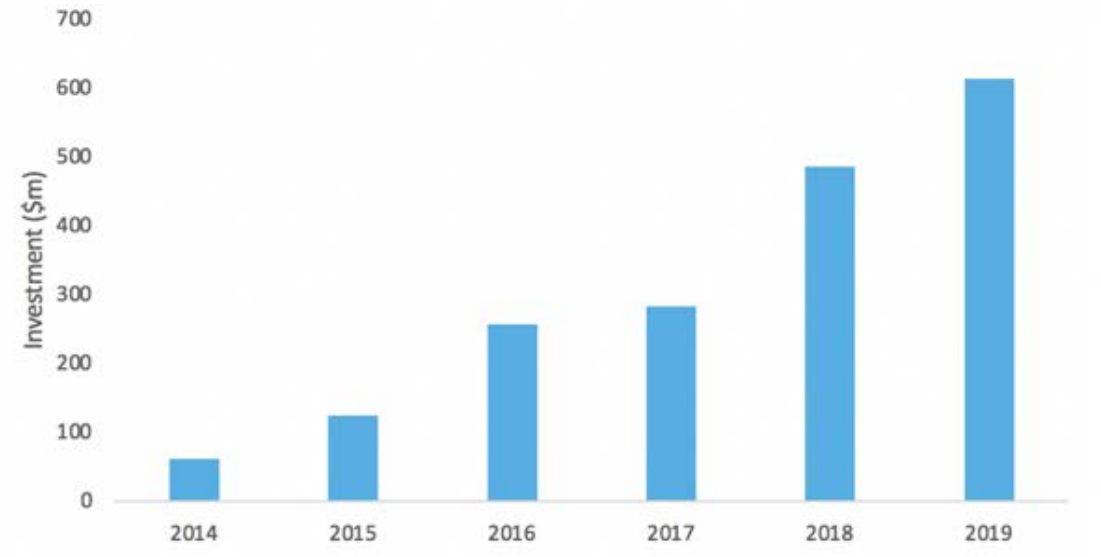


Source: ONS Population Estimates, 2018

Growth in Cambridge Life Sciences R&D activity

Projects that feed the pipeline of healthcare R&D businesses - such as those at Babraham Research Campus, the Genome Campus at Hinxton, TUS Bioincubator at Cambridge Science Park and IdeaSpace at CBC - have been growing in areas that are providing a significant pipeline of ever more company formation and growth. As SMEs are set up and grow, not only do they need more floor space, but their presence will drive interest in the city from larger corporates keen to collaborate with the SME base. Importantly, Cambridge start-up companies can grow very quickly on the back of the significant rise in funding available for investment in Life Sciences businesses.

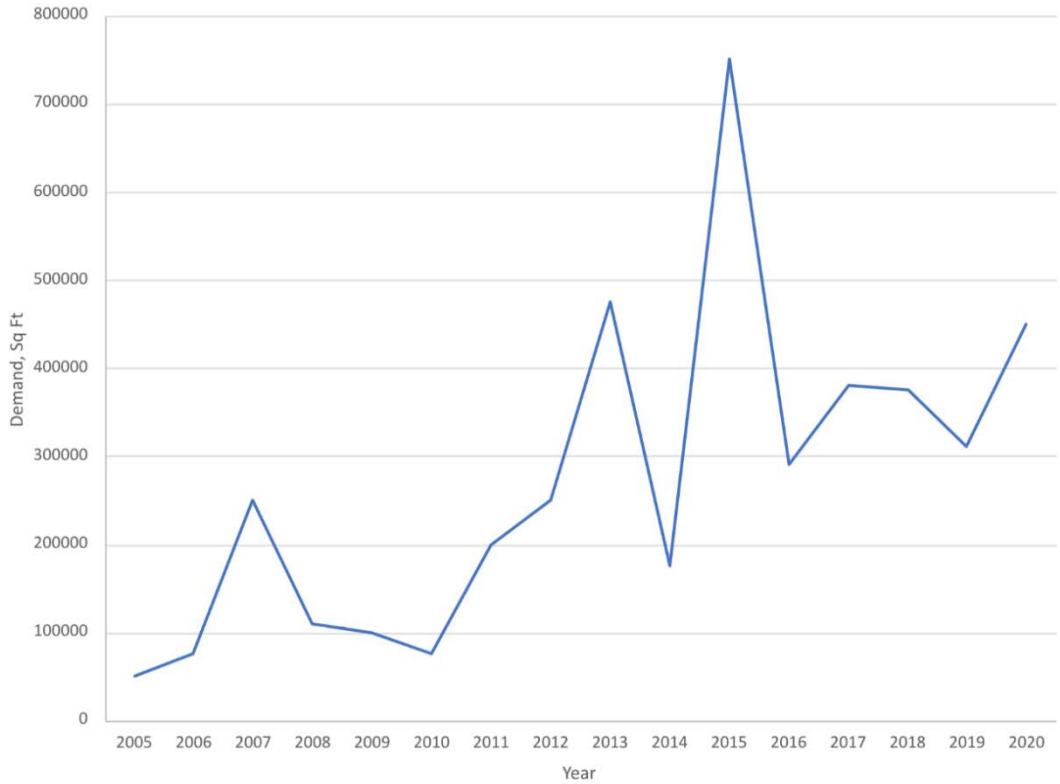
Venture Capital investment in Cambridge Life Sciences



Source: Tech Nation Data Commons for U.K. Tech

Cambridge Laboratory demand is growing.

Laboratory floor space requirements from 2010 to 2020



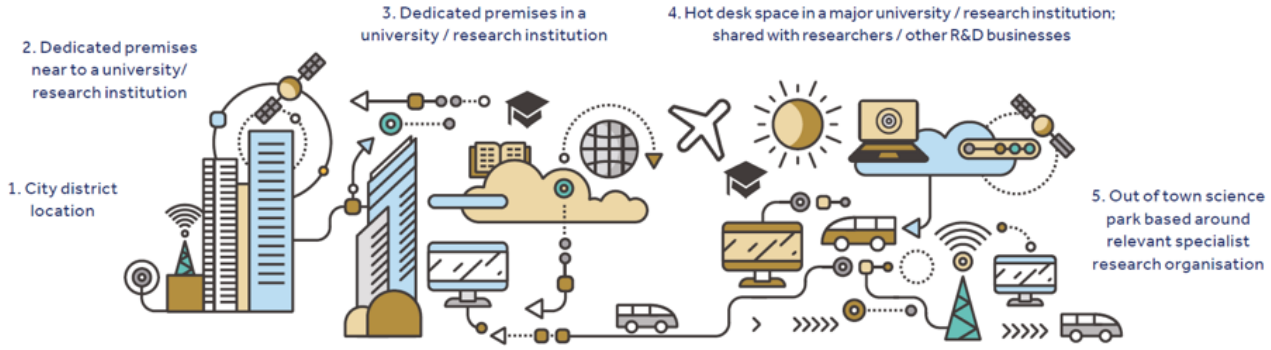
Source: Bidwells Databook and Creative Places, 2021

Note: 2015 was an extraordinary year as it was the point in time when the requirement from AstraZeneca came onto the register for Cambridge. Once their requirement had been satisfied, the trend line dropped quickly but has again subsequently resumed an upward trajectory.

Growing demand for urban locations for innovation

As businesses seek to attract and retain the best talent to grow their R&D activity, they are increasingly choosing urban locations. In a 2018 survey undertaken by YouGov on behalf of Bidwells/Creative Places, leading European R&D businesses cited city district locations as their top location choice, noting accessibility and amenity provision as important factors.

Top location choices (Top five out of ten)



Source: Bidwells and Creative Places, YouGov, 2018

CBC's position within the city, close to transport connections that are being enhanced by the proposed CSET scheme and Cambridge South railway station, will continue to make it an attractive place for R&D businesses to locate.

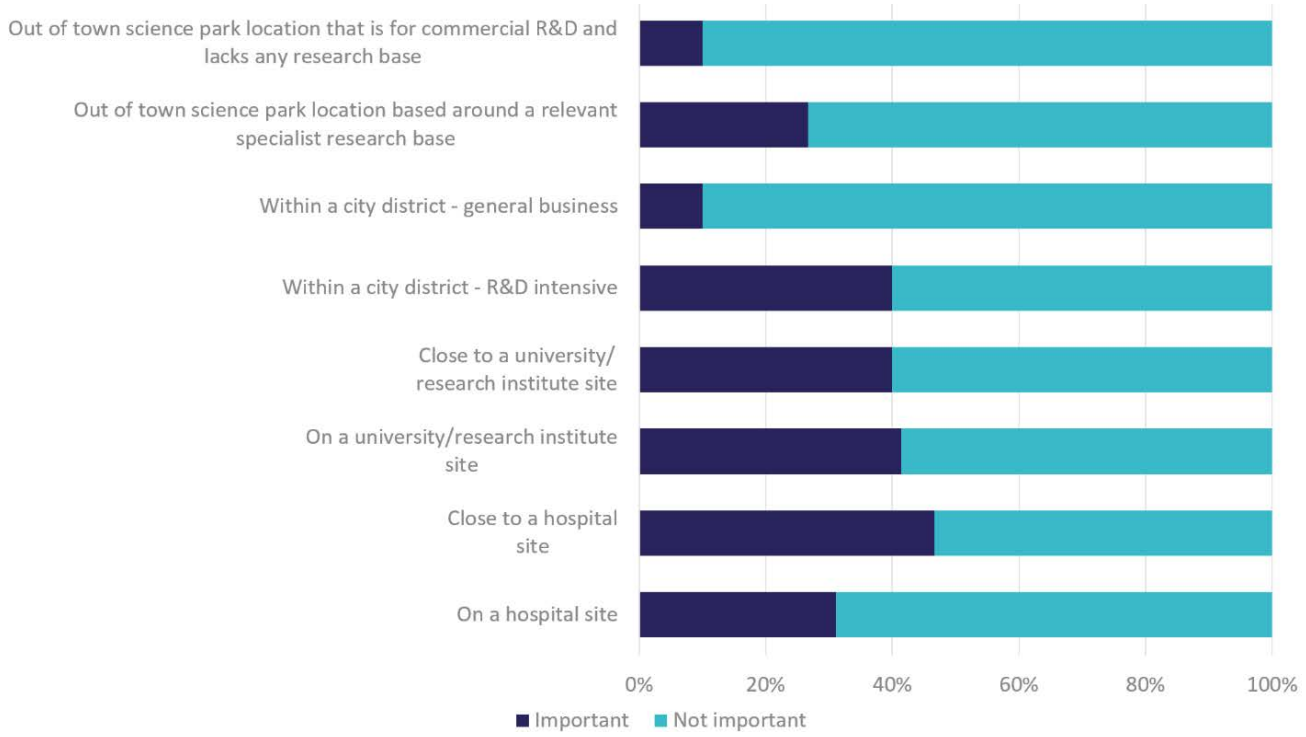
Growing demand for hospital proximity

The growth in novel cell and gene therapies, which tailor medicines to individual needs, and the need for improved healthcare product development/adoption is part of a trend for activity to locate close to hospital clusters. Into the future, pharmaceutical and biotech companies are likely to need to demonstrate more than ever the efficacy of their products and refine them so that they are more effective for the people they seek to treat. As an example, Johnson & Johnson subsidiary Janssen opened a new Centre for Dementia Prevention at Edinburgh's BioQuarter in the UK in 2016, close to the Edinburgh Royal Infirmary.

In 2016 Creative Places undertook a Demand Study in relation to Healthcare R&D focussed on London. Businesses were asked about the locations that would be particularly appealing to them – enabling us to explore open innovation co-location matters in very specific detail. Results showed

that into the future companies see locations that offer hospital and research activity, as well as business environments, as particularly important.

Desirability of various location types



Source: Creative Places and MedCity London healthcare R&D demand study, 2016

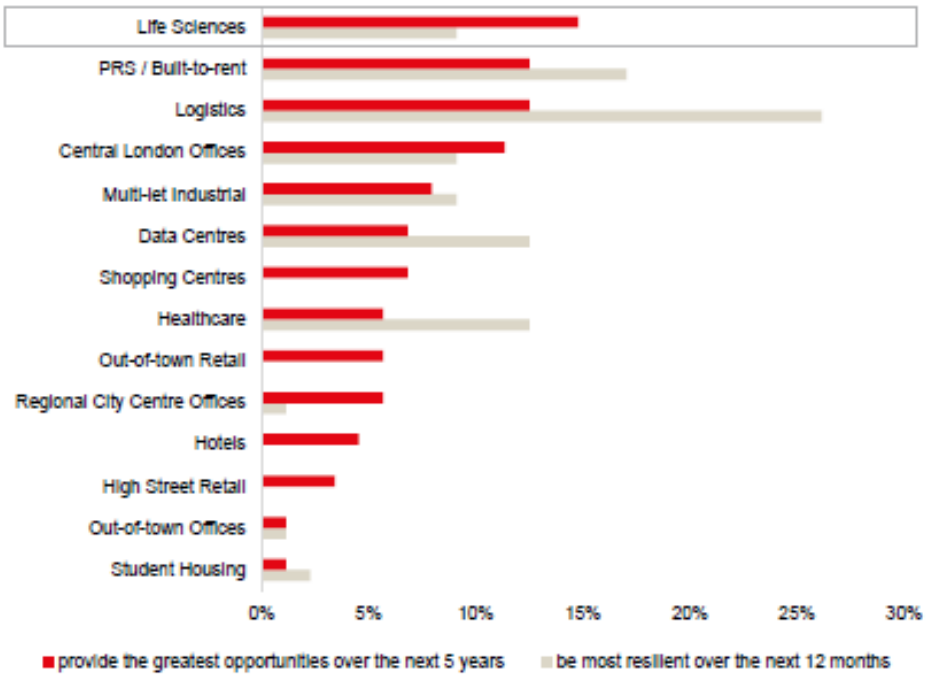
Dark blue shows the percentage of participants identifying a location as important to their company into the future. Light blue shows the percentage of participants who believed the location not to be important for their company.

Improving viability of laboratory development for the private sector

The global pandemic has shone a light on R&D activity across the world and particularly in Life Sciences. The growth in funding for Healthcare R&D is fuelling growing demand for floorspace as companies are able to scale up their activities. In turn, real estate investors have identified the sector as one to target, with over £15bn of capital allocated to UK Life Sciences real estate, according to research by Jones Lang Lasalle. Their 2020 investor survey identified Life Sciences as the real estate sector with the potential to provide the greatest opportunities over the next five years.

Investor appetite is now higher than ever

This increased demand from occupiers and investors is driving up rental and capital values. This is improving the viability of development of laboratory floorspace, which is more expensive to develop than conventional office space. This shift offers the prospect of accelerated rates of new development in locations where demand is greatest – Cambridge being at the forefront of UK, if not European, locations in this respect.



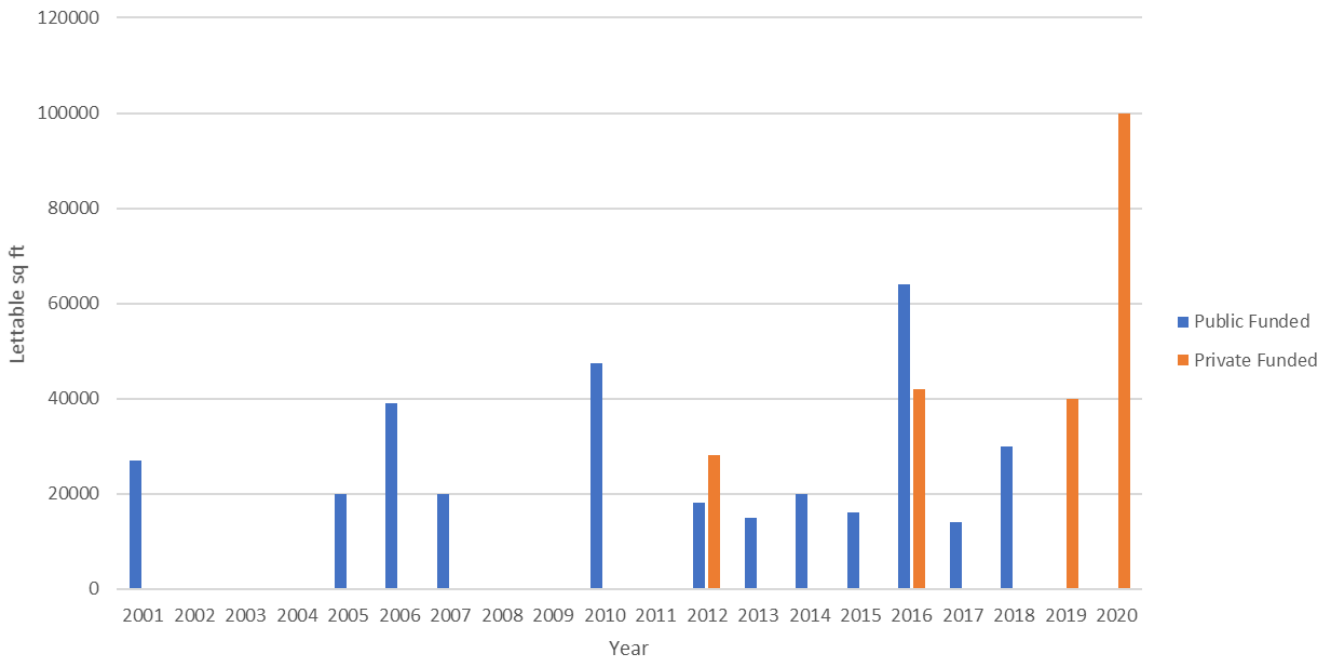
Source: H1 Investor Survey, JLL, 2020

Analysis of development of multi-occupational laboratory space in Cambridge, Oxford and London shows that private sector development of speculative, multi-occupational laboratory space is now starting to become more viable than it has been in the past. All of the privately funded space on the chart below has come, in recent years, to Cambridge, including BioMed Realty's latest phase of development at Babraham Research Campus. Coupled with the increased money flowing into the sector for property investment this can provide enhanced confidence that to meet occupier demand, development can be progressed speculatively even when there may be quite high infrastructure burden.

As development of multi-occupancy space comes forward at places like Babraham, it does, of course, help accommodate more younger, growing companies, that may ultimately become more substantial and want to move to Cambridge Biomedical Campus to be closer to clinicians and a wider research base. Babraham, Cambridge Science Park, Granta Park and others like it grow businesses and a number of their growing businesses ultimately conclude that their long term future needs lie

at Cambridge Biomedical Campus. Whilst AstraZeneca appears to have come in from outside the cluster, their subsidiary Medimmune had been growing significantly at Granta Park prior to the move in.

Lettable sq ft of new build multi-let laboratory buildings in Cambridge, Oxford and London



Source: Creative Places, 2021

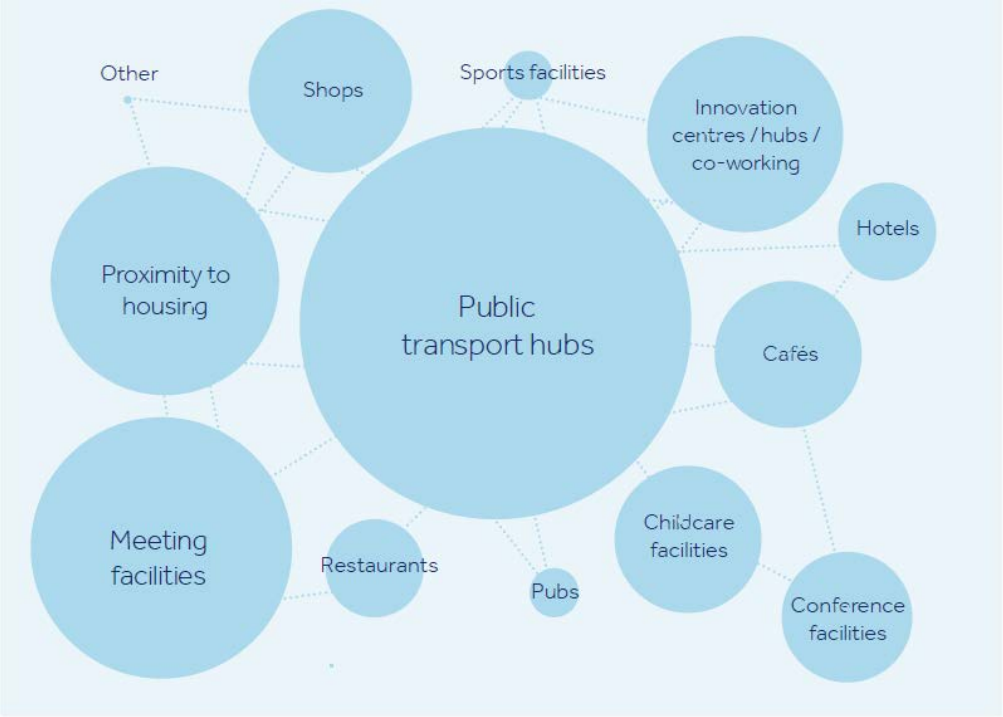
Draw of enhanced amenity

Global businesses looking to make strategic locational decisions, on the back of open innovation, will compare opportunities in Cambridge with other globally strong locations. In a 2018 survey[9] undertaken by YouGov on behalf of Creative Places and Bidwells, leading European R&D businesses identified a hierarchy of facilities that were important when considering where to locate R&D activity. Key transport investments are now planned and further provision of conference and amenity provision is required to maintain CBC's position as a major asset for UK Life Sciences economic growth. Delivering new facilities will also serve to attract more research and business activity.

[9] YouGov/Bidwells/Creative Places: Delivering R&D Potential for the UK 2018

Hierarchy of facilities important to large R&D business

These findings support what organisations across CBC tell us – that attracting and retaining the best global talent is a key priority and that good quality affordable housing, reliable transport connections and a range of amenity provision is essential to maintain the campus' position.



Source: Bidwells and Creative Places, YouGov, 2018

Need for centralised logistics hubs

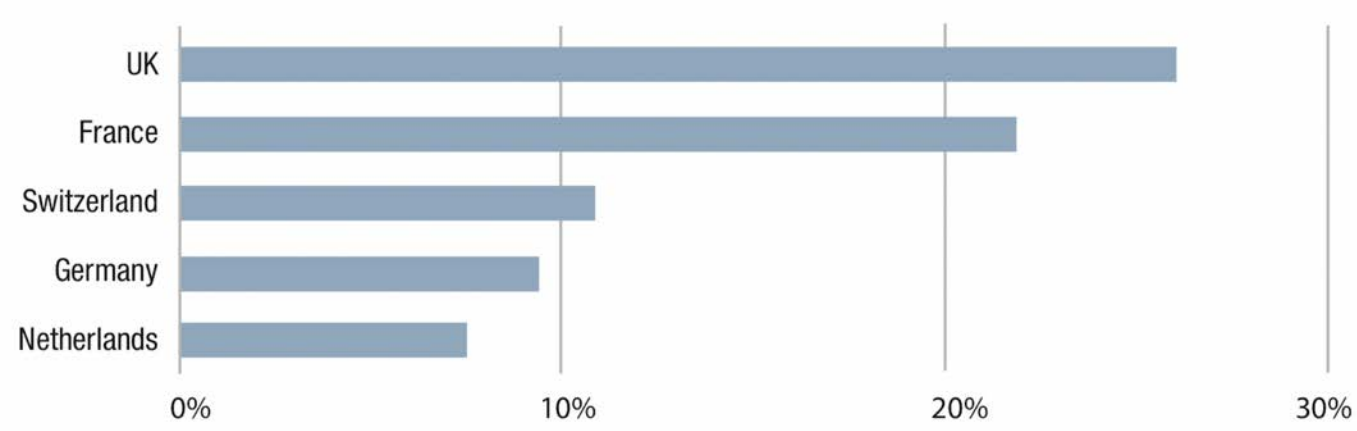
Growth in clinical, research and business activity at CBC and in Cambridge as a whole is driving demand for logistics services, better processing and waste management, and better transportation models. As journeys to the campus and Cambridge grow, there is increasing sense in making provision for centralised logistics hubs, to keep larger vehicles out of congested inner locations and reduce overall traffic movements – where possible utilising greener vehicles in much smarter local delivery methods. Making provision for facilities that can afford a progressive approach to travel management at the Biomedical Campus and in the district as a whole is desirable.

Brexit

Whilst it is still not clear as to how Brexit will affect the UK economy and Life Sciences, recent research/commercial market activity, now over four years from the Brexit referendum, is suggesting that the research and commercial markets are still strong. Businesses such as MSD and Novartis have been making significant lease commitments and property investors are seeing it as the best

country in Europe to invest into reference the Life Sciences – indicating that they feel the sector is in good health for the future.

Top destinations for investment in European Life Sciences real estate



Source: Real Capital Analytics, 2020

7 Planning for growth at CBC

Cambridge Biomedical Campus is the most successful healthcare innovation campus in Europe, combining world leading clinical care, healthcare research and commercial R&D at significant scale within a city that has a long established innovation ecosystem. Considerable investment has been made over the last 20 years, creating a strong platform for future success. With further investment commitments coming along in the near future, including a new railway station and new hospital development, there is an extraordinary opportunity for growth in world leading healthcare related activity that now needs to be planned for.

Demand for healthcare services is increasing and clinical care, research and commercial R&D activity is evolving to meet this challenge. However, with major change underway at other leading places across the world that offer the opportunities for innovation activity and recruitment of the best talent, CBC stakeholders need to be bold in their planning if it is to fulfil its potential as one of the world's most significant healthcare innovation districts and hold onto its competitiveness into the future. As highlighted in the sub-section on the snowball effect of open innovation, the pace needs to be maintained or indeed quicken if it is to keep up internationally.

CBC is the lead place to ensure that growth in biomedical activity can be accommodated within and around the city of Cambridge. It is the only place where clinical activity, healthcare research and

commercial activity can be co-located within a district, at scale, in combination with amenity provision, excellent transport connections and much needed housing. This helps drive productivity. Global businesses looking to make major investments in innovation hotspots will focus on the availability of high quality real estate, the opportunity to sit alongside relevant SME activity and the ease with which staff can find housing, access their workplace and have access to high quality leisure, retail and other amenity. With property lead times significant, there needs to be a comprehensive long term plan that can tackle constraints as well as realise opportunities. If space to grow is not available, facilities are inadequate, housing constrained and transport connections insufficient, businesses will choose to locate elsewhere. This would be a significant missed opportunity for Cambridge and the UK.

Cambridge Biomedical Campus has seen significant growth in clinical, research and commercial R&D activity over the last 15 years or so, responding to the Addenbrooke's Hospital 2020 Vision. In planning for the next 30 years of activity, we see a variety of factors driving demand from organisations to locate here, detailed in this paper. And there is data to suggest that demand is growing – see the chart on Cambridge laboratory demand, 2010 to 2020 in this report.

To inform the consideration of the amount of floor space it is prudent to plan for at CBC we have produced an annex to this report, **Appendix 1** – drawing on its content but enabling standalone scrutiny. In that paper we have set the scene for growth consideration against what central and regional government is looking for in its industrial strategy and as part of the Cambridgeshire and Peterborough Devolution Deal of 2017.

Concluding numbers are shown in **Appendix 2**. We believe that it is prudent to provide for these levels of potential need into the future – so that the powerhouse of Cambridge's Life Sciences sector is not at risk of being constrained and so that objectives of the Cambridgeshire and Peterborough Combined Authority can be realised.

Attached at **Appendix 2** is a table setting out our assessment of the historic rate of take up, looking at average annual rates over the last 13 years (green section). We then show our assessment of future needs, identifying increased rates of take up to respond to the factors identified in this paper, broken down into categories of use (yellow section). Known remaining capacities on phases 1-2 (using quantities approved in outline consents) are then identified and assumptions made as to potential capacity on Phase 3, as well as that which could be created within the current Addenbrooke's campus when future developments release development capacity (blue section). Finally, we then identify what range of uses and capacity will be required over the next 30 years to meet our assessment of required need (grey section) – a total of around 4.8m sq ft – and to fulfil the aspirations of the 2050 Vision.

Place making and relationships between the various uses and transportation solutions will be key to delivering this in a way that doesn't just work but helps the city evolve very positively. We suggest a flexible yet managed approach to how the location works. Recent consents granted at the campus have enabled some flexibility between research, clinical and R&D uses. This would seem to be a sensible way to plan for further development into the future. New ways of moving people and goods around the Biomedical Campus and this district into the future will be necessary, and we have introduced a quite significant warehousing element for the west site, which may help reduce traffic movements around the biomedical campus, and particularly in peak times.

Residential needs

Whilst Creative Places is not expert in residential development, consultant advisors Savills have undertaken work to analyse need for this essential component of innovation district development in this location. In order to better understand the specific needs of the hospital workers at CBC, Cambridge University Hospitals NHS Foundation Trust (CUH) commissioned a report from Savills, published in 2020 titled '*Assessing the Housing Need of Hospital Workers'*. It confirmed that the macro issues identified in the CPIER report have serious practical consequences for health care workers at the Campus. The key issues identified in the report are as follows:

- Cambridge is one of the least affordable housing markets in the country, a challenge furthered by the range of salaries afforded to staff.
- There is an affordability gap between incomes of £25,000 to £45,000, above the threshold to qualify for social rent but below the threshold to be able to comfortably meet costs in the Private Rented Sector (PRS).
- There are a large number of households within the PRS unable to make the jump to owner occupation due to cost.
- High rents in the local market require a higher-than-average proportion of household salary paid towards rent, leaving households unable to save to buy a home.
- An increase in outward migration for 30–44-year-olds indicates that worsening housing affordability is also not allowing current owner occupiers to move to homes within the area that better meet their needs, so they are moving elsewhere.[10]

The Savills findings demonstrate how far home ownership is out of reach for many CBC employees, with up to 40% of the CUH staff finding it a challenge to meet housing costs, and that a high proportion of staff earn under £40,000 and so have very limited opportunities for home ownership. Whilst the desire to buy is clear from many, the report demonstrates that larger households, families and more professionals live in the private rented sector as house prices are unobtainable on typical household incomes.

[10] Assessing the Housing Need of Hospital Workers: A report for Cambridge University Hospitals NHS Foundation Trust. Savills, January 2020.

The Savills report also identifies poor local housing stock quality and a lack of access to local facilities as sources of dissatisfaction for CUH staff. Accommodation in the PRS in Cambridge is frequently poorly managed and is sometimes in locations that do not support easy accessibility to the Campus or offer proximity to the services that residents need. These sources of dissatisfaction are particularly acute for those who are stretched in meeting housing costs and it subsequently encourages outward migration, particularly for 30–44-year-olds who make up a significant proportion of CBC employee demographic.

Issues such as dissatisfaction over commuting presents a challenge to staff retention as over 80% of residents cited connectivity to CUH and to Cambridge city centre of key importance.[11] The difficulty in finding home ownership opportunities within a reasonable commuting distance of the Campus means that for some, the easiest way to improve their housing situation is "to simply relocate out of the area".[12]

Campus-wide housing need

The hospitals employ medical professionals at all levels: administrative and clerical staff, estates and ancillary staff, as well as a large pool of bank workers. Alongside the hospitals at the Campus, there are commercial R&D occupiers, research institutes and higher education institutions. The workforce employed by such a broad range of occupiers is very mixed; from management and executive roles in global head offices through to graduates and support staff, as well as short and long-term research positions within commercial and university institutions. CBC currently employs approximately 20,000 people, with an additional 7,000 employees anticipated from on-site planning permissions that are yet to be implemented.

This creates a need for a mix of tenures and types of housing, including a substantial requirement for smaller, flexible-term units as well as family homes and first-time buyer properties. As the local market is not adequately meeting these demands, those who work at the Campus are faced with several challenges when seeking housing, including high house prices and rents, poor quality accommodation, inflexible tenures and a lack of access to affordable housing.

Whilst the Savills Report looks only at the needs of CUH staff, the barriers experienced by their staff are felt across the wider Campus. These issues paint a stark picture for staff attraction and retention at CBC. The highly skilled workers that CBC requires for the commercial R&D companies, higher education institutions and CUH are increasingly pushed out of the area, live in accommodation not

[11] Page 12, Assessing the Housing Need of Hospital Workers.
[12] Page 12, Assessing the Housing Need of Hospital Workers.

suitable for their needs or are deterred by high prices and inadequate choice. Those on lower salaries cannot afford to buy in the area at all, resulting in staff living in expensive and often poor-quality rental accommodation. Employees that move to Cambridgeshire's cheaper rural hinterland are faced with longer commutes which puts pressure on transport infrastructure. Others may choose to leave Cambridge and the Campus entirely to find alternative work and more affordable housing elsewhere. These are serious structural issues which can only be addressed by growth – otherwise the future of CBC is at risk.

The Savills Report demonstrates intervention in housing delivery is therefore needed at scale. Supply should be at a level that can support further growth at the Campus, taking into account its future growth forecasts and the need to provide a range of housing products. Only then will pressures on employee salaries and on staff attraction and retention lessen.

Appendix 1

Floorspace need consideration

Appendix 1

South Cambridge and Life Sciences growth planning - Floorspace need consideration, April 2021

Political background

Cambridgeshire and Peterborough councils signed up to doubling GVA by 2040 in order to secure a Devolution Deal in 2017, increasing GVA from £22bn in 2017 to over £40 bn by 2040. This requires productivity growth at 0.8% pa - a significant challenge. Realising success will require focus on upskilling and employment growth in the most productive areas of activity, in the most productive locations.

The UK Government has made investment in R&D a core part of its Industrial Strategy and set a target of 2.4% of GDP to be spent in this activity by 2027. Whilst the Industrial Strategy has been set to one side at the current time the target still remains relevant. The percentage of GDP invested in R&D crept up from 1.6 to 1.7% over the 10 years to 2018 (circa 0.5% pa)[1]. For the period 2019 to 2027 it will need to be increased significantly.

The Cambridgeshire and Peterborough Independent Economic Review of 2018 considers how a coherent economic growth strategy can be developed for the sub-region. It sets out three scenarios for growth – each being a combination of employment growth and productivity growth. It confirms that 'the dial needs to be pushed firmly in the direction of productivity improvement' and that key themes relating to productivity that include those on health, skills and business culture are of paramount importance. It goes on to say that the agglomeration of knowledge intensive businesses enhances productivity. It cites Cambridge as a good example of a city where productivity in the Life Sciences has increased as a direct consequence of the spatial concentration of knowledge intensive businesses. On top of cluster activity, it states the importance to productivity of high employment quality and availability of local labour with 'knowledge leadership' in areas of expertise. The report even goes as far as to suggest that the cluster of activity in Cambridge makes it the only viable location within the U.K. for some of these businesses, and if it was not possible for them to locate here, they would be forced to move overseas.

It is therefore clear that the Cambridge Biomedical Campus (CBC) can and should stand at the very forefront of helping to realise these various ambitions and constraint would be very harmful.

Reasons to believe in significant growth opportunity into the future

Cambridge is a world-stage powerhouse in the Life Sciences sector. Whilst the US leads the way in most areas, within Europe the UK has the most companies involved with biotechnology, biotech therapeutics and the pharmaceutical sectors - only in medtech does one country, Germany, get ahead of it[2]. Within the UK, Cambridge has at least five times more wet laboratory floor space serving the private sector than either London or Oxford, and employment growth has been running at over 10% per annum over the last five years.

[1] ONS Gross domestic expenditure on R&D, UK: 2018

[2] KPMG Site Selection for LS Companies in Europe, 2018 edition and www.biotechgate.com 2018

Appendix 1

In the subject area of the Life Sciences the University of Cambridge is no.1 in the world[3]; and in terms of turnover growth in Greater Cambridge between 2012/13 and 2018/19, the Life Sciences and Healthcare grew at over 20% per annum, ahead of all other sectors by a significant margin[4]. There is evidence of growing need for commercial property to serve the Life Sciences sector in Cambridge[5].

Cambridge has phenomenal productivity in the knowledge economy, with over 50% more patent applications per 100,000 population than any other city in the UK[6].

Reasons to be concerned about inadequate response to need

Commercial rents in Cambridge have been rising at significant pace, particularly since 2017/18, showing that demand is exceeding supply. If sustained success is to be realised, more floor space needs to be delivered. Evidence and floor area suggestions put forward in the emerging Local Plan do not appear to either maintain established levels of growth to 2050 (let alone reflect the evidence of accelerating demand), or provide the platform needed to meet the ambition to double GVA by 2040. Indeed, the maximum scenario in the Plan appears to only deliver an additional 79,000 jobs in the area by 2041, not the additional 126,000 needed. The Local Plan evidence base also over-estimates the existing pipeline of sites to meet the area's real economic needs by suggesting that only 100,000 sq m of additional floor space is required – particularly when of the 625,000 sq m of B1A/B supply in the planning pipeline much is away from Cambridge City - Northstowe at 37,000 sq m, Waterbeach at 48,000 sq m, and Cambourne West at 6.3 hectares, all of which would inevitably deliver lower productivity rates than at CBC. Such locations do not have the inbuilt advantages of established, high demand clusters.

Adopting a highly simplistic approach to sectoral modelling that assumes all growth sectors perform in a similar manner fails to recognise the growth evident in the Life Sciences industry in Cambridge and ignores the changing nature of the industry, which will continue to concentrate on established innovation clusters, where co-location and proximity to research and clinical excellence drives better outcomes and higher productivity for the sector. The Covid-19 pandemic has shown both the resilience and the necessity of the Life Sciences sector into the future, which is particularly relevant as we plan to rebuild the economy. The Economic Case: Economic Analysis and Projections document prepared by Metro Dynamics to support the CBC Vision 2050 (the Economic Analysis) notes that the Greater Cambridge Local Employment Land and Economic Development Evidence Study of 11.20 identifies a shortfall of 50,000 to 100,000 sq m of Life Sciences floor space by 2041. However, if historic patterns are interrogated to specifically analyse growth in the Life Sciences sector at CBC since 2009 the true shortfall of floorspace provision by 2041 is more significant. The Economic Analysis echoes the CPIER report's conclusions on barriers to future growth – that for the Life Sciences a lack of R&D space resulting from a failure to plan for true levels of job growth, alongside high housing costs, both threaten.

Life Sciences in South Cambridge: Capacity for growth and unmet demand

There has been growing capacity for the Life Sciences on the southern side of Cambridge, including a significant allocation of land for development at the Genome Campus in Hinxton. Further development allocation may well come through at key Life Science locations such as Babraham Research Campus and Granta Park. Rather than take up demand and potentially reduce needs at CBC, growing activity at these locations is likely to have the reverse effect. Effectively Cambridge is growing its capacity to spawn and accommodate new and emerging businesses, which will further feed into a pipeline of demand

[3] THE World University Rankings, 2021

[4] Centre for Business Research, 2020

[5] Bidwells Databook, Spring 2021

[6] https://www.consultancy.uk/news/19242/cambridge-leads-uks-top-10-cities-for-new-patent-applications

over time for CBC. When Cambridge Antibody Technology was founded in 1989 its operations started within the MRC laboratories and shortly thereafter moved to Babraham, before growing further and leasing space at Granta Park - before the company was taken over by AstraZeneca and ultimately involved in a planned move to space at CBC. We expect further businesses to grow on the south side of Cambridge and for a number of them to favour a location at CBC as their productivity needs to be enhanced.

Cambridge Biomedical Campus needs and the forthcoming Local Plan

Creative Places as specialist property advisors to the research and R&D sectors have undertaken needs testing work on behalf of the landowners for the Life Sciences at CBC. We have reflected on the historic uptake on site and available capacity that exists today. Our work draws on historic trend benchmarks against similar competitor locations and innovations clusters which tend to show broad patterns of mixed uses, general placemaking and density characteristics and, as they mature, certain key attributes achieved from scale. We have also sought to recognise changes in working patterns that have established themselves during the Covid-19 pandemic and may become more permanent thereafter. It is likely that there will be a further acceleration of investment into Life Sciences driven both by the need to have a much more resilient set of research, commercialisation and care systems in place to limit future impacts, and by the recognition of the critical role Life Sciences and Life Science research plays in protecting humanity.

Our forecasts are based on our view of general Cambridge Life Sciences sector demand, how that demand will coalesce around key anchor institutions where that is advantageous to do so, and how businesses need to be based in accessible places that benefit from sustainable transport. Our work does not include any specific requirements from existing occupiers, neither is it informed by any on-going commercial negotiations for new space that may be underway, beyond those that are known in the public domain. But we consider that the projection is reasonable, clearly based on evidence and appropriate for consideration in the Local Plan.

The owners and occupiers at CBC have created Vision 2050. This is intended as a catalyst to build on the campus's success as a centre of excellence for healthcare provision in Cambridge and as a global innovation hub, using its collection of institutions and businesses to propel further success at an international level. It has considered existing shortcomings and future development needs, which are further intensified by the need for renewed scientific advances as a result of the Covid-19 pandemic, the pressures of climate change, and of urbanisation and globalisation. The vision also needs to address support/amenity deficiencies and provide a flexible environment that responds to the needs of its occupiers and employees, thus enabling it to fulfil its true economic potential.

In order to realise success, the CBC partners envisage development of a campus with a wide range of complementary spaces for business, research and healthcare institutions. Vision 2050 also recognises that access to homes that workers can afford (whether protected for key workers, or at a suitable price point for other employees) is fundamental to maintaining CBC's highly effective clinical and research anchors, as well as attracting new businesses and talent.

The simple reality is that this cannot be achieved within the boundaries of the existing campus, even taking into account Local Plan allocations that can facilitate Phase 3. Much of the land that remains undeveloped is already reserved for more clinical care facilities to support the region, or University labs. More land is required and while we have taken the view that some additional capacity could be achieved at CBC through higher densities on available plots, there is such a lack of space that CBC will not be able to address its existing needs on site, far less plan effectively for sustainable growth or help support delivery of affordable homes for key workers without more progressive planning.

Appendix 1

Detailed analysis

Current opportunities for providing additional floor space
Relatively little floorspace remains on CBC to grow research and R&D today, beyond space already developed or spoken for. Undeveloped land is subject to high levels of use planning already:

Phase 1 land
95,500 sq m of floorspace remains to be developed within the outline permission but 60,000 sq m of this is committed to CUHFT for identified hospital development and the other land not yet developed is made up of two modest sized plots held by Cambridge University and AZ for their own future growth immediately alongside their respective developments. So, whilst this land may appear available, it is in fact already committed to meet specific needs.

Phase 2 land
63,500 sq m remains under the outline permission, but development of a speculative building (of 10,350 sq m) has been granted detail consent and is expected to start on site later in 2021, and a potential pre-letting has been identified for a further building – on top of which 15,900 sq m out of the consented area is reserved for Addenbrooke's growth.

Phase 3 land
Further land was allocated in the last Local Plan review for development. Initial masterplan testing has indicated a capacity of approximately 91,500 sq m.

Built area excluding phases 1, 2 and 3
There is believed to be some capacity for intensification of use within the older phases of development at CBC. At this stage we do not know the full extent of additional floor space that may be deliverable but for the purposes of our analysis of further need into the future we have assumed that there may be as much as say a million square feet that could be squeezed out of the real estate at the campus today, principally for use by owners the hospital and the University. We have assumed that they will principally use their property for their own purposes, as patient care requirements grow into the future and as the University evolves its own research needs. We are aware, for example, that some of the University's research institutes based elsewhere in Cambridge would find it attractive to relocate here, something which we can envisage into the future. Some of that may be accommodated on existing estate, some on land as yet not built upon.

Capacity
At **Appendix 2** we project take up rates reflecting an increase on what has been seen over the last 12 years. At these rates we estimate there to be around 12 years of remaining development capacity for research and R&D space and 20 years of clinical space capacity. Development of retail, leisure and conference/hotel space within the existing allocated land would reduce these further, and all of this assumes that the hospital and the University are able to free up space for redevelopment to the full extent we estimate may be available – which may, in practice, prove difficult.

Appendix 1

Planning beyond

In order for CBC to truly meet its potential as a cornerstone of innovation, local employment and the Life Sciences sector, growth needs to be planned for at a scale that comprehensively addresses the needs of CBC and its occupiers as well as establishing CBC at a scale that helps to optimise its overall productivity. Potential new occupants will want to know that there is land available for them and also that there is a long term plan in place to enable further growth/address current deficiencies on the campus. The most successful innovation districts tend to operate at a significant scale while also sitting within a wider hinterland of complementary innovation clusters (often across multiple sectors and specialisms). For CBC to therefore fulfil its potential, support the GVA targets of the combined authorities' Devolution Deal, and continue to contribute to establishing the UK as a knowledge and skills based economy, it needs scale.

In response to growing evident need and an emerging CBC Vision 2050, the Cambridge South landowners have created a draft Development Brief. An important part of the Vision for CBC is that it should develop to provide a more comprehensive and holistic innovation district with the core Life Sciences occupiers supported by complementary office, hotel, conference, retail and leisure uses, as well as new homes that can accommodate employees of the expanded Campus, together with associated community space.

Creative Places has endeavoured to look at the likely space drivers to form a view on the needs that may need to be accommodated at and close to CBC over the next 30 years. This is to inform consideration of the Development Brief and to enable the Local Authorities to consider the extent of opportunity and land allocation that it may be appropriate to make in land to the south of CBC. Our detailed thoughts are set out above and in the main paper that this document is an annex to.

Data to provide a platform for 'need' consideration	**Interpretation of data in projecting need**	**Floor space requirement for period 2021 to 2050**
Clinical The Rosie Maternity Hospital was extended by 86,500 sq ft (including roof plant) in 2017 and Royal Papworth Hospital opened in 2019 comprising 360,000 sq ft GEA, excluding plant. Benefactor supported initiatives are starting to be realised in the UK, following the US trend. Alongside the Edinburgh Royal Infirmary, the JK Rowling Regenerative Neurology Clinic opened in 2013 thanks to an initial donation of £10m and in 2020 JK	The UK Government is already encouraging Addenbrooke's Hospital to plan for new Cancer and Children's Hospitals and there is a need to provide new A&E facilities – which Addenbrooke's is planning to deliver through what it calls Addenbrooke's 3. We assume that each new hospital requires similar area to Royal Papworth Hospital and on top of this there are pending requirements from private hospital and care providers keen to come onto the site for facilities ranging up from 25,000 sq ft (Wellbeck Health) as well as other public sector hospitals. There is a desire to build mental health services at the campus, in a similar approach to Royal Papworth Hospital wishing to co-locate for operational benefits. See table below for detailed assumptions reference potential need.	2,100,000 sq ft.

Rowling donated a further £15.3m to help pay for expansion. At Edinburgh BioQuarter, another UK location seeking to create a healthcare focussed innovation district, their latest Royal Hospital for Sick Children, which is combined with the Department for Clinical Neurosciences, is of a combined size of 49,500 sq m (532,000 sq ft)		
Research Existing research space on the campus includes accommodation occupied by Cambridge University, the UK Government's Medical Research Council, Cancer UK, the UK Government's National Institute of Health Research, the Addenbrooke's Centre for Clinical Investigation and a number of partnership facilities. There is growing evidence of benefactors donating money to establish new research facilities in the UK – following the huge trend for this in the US. At Imperial College in London the Sir Michael Uren Biomedical Engineering Research Hub is a 250,000 sq ft facility that opened in 2019, part paid for with a £40m donation.	Research activity continues to grow at pace in Cambridge, given its enormous strengths and desire by the UK government to build the platform for economic prosperity into the future. In our experience universities tend towards a balanced approach to their research investment in real estate and with over half a billion pounds being invested into new facilities at West Cambridge over the last 10 years, and with healthcare needs coming to the fore because of the Covid-19 pandemic, the expectation is that enhanced commitment beyond the 678,000 sq ft of space built on campus since 2008 will be sought by the University of Cambridge before too long. We assume a 30% increase on the rate of take up into the future, compared to the period since planning permission was granted for Phase 1 in 2008. Universities are having a more difficult, uncertain period around their finances at the current time. Covid-19 has had an impact on their ability to function and plan. Our belief is that commitments to new development will return in the not too distant future and it is critically important for Cambridge University and the economy of the Cambridge sub-region that this critical engine for growth is not constrained into the future. As an 800 year old + institution if its needs may suffer a short term 'blip' it will be really important not to box them in without land into the future. Without making the reservations we talk about in this paper reference planning through to 2050 there is a danger of an unhelpful constraint.	2,100,000 sq ft
Commercial R&D Over the last 10 years only a small amount of commercial space at the Biomedical Innovation Hub within the former LMB and the 124,000 sq ft at the	Commercial R&D at CBC is about to increase very significantly. When AZ opens it will more than quadruple the commercial space and a further building (1000 Discovery Drive) is already on the drawing board, to start in 2021 too. A further building is the subject of pre-letting discussions, similar size.	3,000,000 sq ft

new Abcam building has opened at CBC. In 2021 AZ expect to open 644,000 sq ft and CML plan to start on site with a new speculative development of 132,000 sq ft. We are witnessing an uptick in demand and development.	Our assumption is that the growth in Life Sciences R&D in Cambridge UK will continue to grow, as the UK's Golden Triangle becomes ever more significant and as accessibility between the three locations of Cambridge, London and Oxford is enhanced. All of these locations are growing – with London having recently secured a 250,000 sq ft pre-letting of space for MSD and where there is now a planned 10 m sq ft plus of Life Sciences laboratory space being considered by property owners at various sites across the capital. We expect Cambridge to continue to be the favoured location for many businesses seeking to set up healthcare R&D in the UK – because of its special qualities that enhance productivity, and issues relating to relatively low price (vs London and Cambridge Massachusetts), ease of staff recruitment and the new railway station being built at Addenbrooke's, providing ease of access to London and beyond. The next 30 years is not a time when Cambridge should be constrained against growing centres elsewhere. Into the future a wider range of facilities needs to be made available for R&D, including an innovation centre facility. Typically, these need to be at least 30,000 sq ft to be sustainable and in a location as good as CBC a 50,000 sq ft facility would be good to plan for, as a minimum. The Oxford centre at Old Road Campus, alongside the Churchill Hospital, was originally built to circa 30,000 sq ft and was subsequently extended to 50,000 sq ft. Abcam, AZ phase 1 and 1000 Discovery Drive add up to 900,000 sq ft, all to open within a 6 year period of 2018 to 2023. This 150,000 sq ft pa of take up would add up to 4.2m sq ft if it was consistently running through to 2050 at this level. We have sought to temper this and round down to 3m sq ft – although the data in the body of our report is all pointing to a time of likely increasing demand (more money coming into the sector, more focus on patient centric work and new breakthroughs/technologies driving new imaging, therapies and approaches at ever growing rates). Since the Covid-19 pandemic Life Sciences laboratory demand for Cambridge has increased by over 40%, to 450,000 sq ft registered in 2020, up from 310,000 sq ft in 2019. It may be that we have been too cautious, but how an AstraZeneca transaction is interpreted and managed can be argued from many directions and it is probably reasonable to temper the anticipated take up into the future.	
Support office space Hospital, research and R&D activity requires some office support functions to	Businesses providing specialist research and R&D support services such as data processing and AI, integrated into the work of others on campus, as well as professional service firms, will help the cluster to function well if they can be accommodated at the campus or very close by.	600,000 sq ft

be delivered close at hand. Addenbrooke's leases floor space off site, for example, which would be better brought closer, thus making it more efficient and sustainable.	In London Synlab is refurbishing a 100,000 sq ft property to provide pathology lab services, to serve a number of hospitals but with a location close to Guy's Hospital at London's Southbank. Work is required to interrogate the nature of support activities that it may be appropriate to provide for at CBC, so that organisations at the campus are well supported by businesses they work with and so that the efficiency and productivity of those businesses can be high.	
Support logistics When the new Abcam facility was designed an area for packing and distribution of goods was included, as ancillary. Addenbrooke's has storage of laundry and blood storage/management uses, for example.	Creating dedicated storage facilities close by, into the future, will help reduce pressure for floor space at the campus. On the south side of Cambridge, a 20,000 sq ft facility may help reduce traffic movements in the city. Additional space being delivered here can help CBC function better too. We believe that a 100,000 sq ft facility is prudent to plan for, possibly delivered through more than one building.	100,000 sq ft
Education use Today this includes the University of Cambridge Medical School, etc., etc. for clinical, nurses, staff and off-campus … training needs. The Deakin Centre was opened in 2012, providing around 28,600 sq ft of space.	Noting the nature of CBC occupiers (including Cambridge University) and Addenbrooke's role as a teaching hospital, along with the expected heightened need of increased training into the future, delivering a scaled up Deakin Centre equivalent of say 50,000 sq ft every decade seems prudent to provide for.	150,000 sq ft
Retail/Leisure No data as yet sourced reference quantum of retail and leisure facilities at CBC today.	A world class leisure and retail experience to complement the other components at CBC is required for the future. This not only enhances the experience of those at the campus, but it can also lead to changes in travel patterns. It also enhances the likelihood and productivity of collaboration. The retail and leisure offer within CBC requires rigorous analysis and consideration. Today it appears outdated and in need of refresh, even without plans to build an innovation district that will be globally competitive in the 21st century. The food and beverage offer to patients and staff at the hospital requires an overhaul and as the campus grows amenity needs to develop at the same time. Catering facilities need to be developed for clinicians, nurses, researchers and those involved with R&D so as to foster a community of healthcare providers and advancers. The Frank Lee Centre is a fraction of the size of a modern, multi-purpose health and	225,000 sq ft

	fitness centre that can offer not just swimming and gymnasium facilities but indoor sports pitches and tennis courts. Modern day health and fitness facilities are circa 100,000 sq ft. Some retail facilities will also be required within residential development that may be progressed. Additional children's nursery provision will also be required.	
Hotel/Conference	When Addenbrooke's' Forum development was being considered in 2013 - 2015 it totalled approximately 400,000 sq ft and included a 200 bed hotel, a 500 to 900 delegate conference centre and a range of ancillary support activity. Part of the development delivered retail/catering and some education facilities, but the scope of hotel/conference was significant. The hotel proposed at Cambridge Science Park today is approaching 100,000 sq ft in scale and at a hospital campus not only is there potential for a good quality general hotel and possibly a budget hotel, but there is also need for dedicated hotel space for the families of sick children. In Manchester a health focussed innovation district has emerged on Oxford Road and the growing campus there now incorporates Ronald McDonald House.	225,000 sq ft

Clinical Support Information

If we assume that neither the new Rosie Maternity Hospital nor the new Royal Papworth Hospital require further expansion over the 30 year period, we have assumed that additional clinical uses for the period to 2050 might call for:

Clinical activity	Floor area requirement
New Cancer Hospital	350,000 sq ft
New Children's Hospital	350,000 sq ft
Addenbrooke's 3	350,000 sq ft
New facilities for Cambridgeshire and Peterborough Mental Health Trust	200,000 sq ft
New private hospital space	200,000 sq ft
Additional new hospital not yet identified	350,000 sq ft
Growing population needs	500,000 sq ft
Total clinical need	2.3m sq ft

Some of this need for space may be accommodated within the existing campus – and indeed we might reasonably assume that as space is freed up by activity involving cancer, children's health and A&E that 200,000 sq ft of existing accommodation soaks up 200,000 sq ft of need. The other 2.1m sq ft will need to be found a home in Phases 1 and 2 of CBC, and beyond – it is unlikely that Addenbrooke's will want to give up property of its own or land that it has options over for third party activity (including clinical) and some of the needs will have to be provided for beyond the existing campus and Phases 1 and 2 land.

Appendix 2

Future floorspace assessment

Appendix Two

Projected Requirement for Additional Land (to support CBC growth to 2050)

	Historic Growth Trend		Projected Need							
	2008-2020 incl. *(Built and Under Construction)*		2021-2050 incl. *Projected Requirement*		*Estimated available capacity on Campus (including redevelopment)*					*Residual Need*
Uses	**Total sq.ft**	**Average pa**	**Total sq.ft**	**Average pa**	***Historic Cluster***	***Phase 1***	***Phase 2***	***Phase 3***	**TOTAL**	**TOTAL**
Clinical	450,000	34,615	2,100,000	70,000	600,000	650,000	170,000	0	1,420,000	680,000
Research	675,000	51,923	2,100,000	70,000	400,000	155,000	0	325,000	880,000	1,220,000
Commercial R&D	775,000	59,615	3,000,000	100,000	0	225,000	515,000	650,000	1,390,000	1,610,000
Support office space	0	0	600,000	20,000	0	0	0	0	0	600,000
Support logistics	0	0	100,000		0	0	0	0	0	100,000
Education (Life Sciences)	30,000	2,308	150,000	5,000	0	0	0	0	0	150,000
	1,930,000	***148,462***	***8,050,000***	***268,333***	*1,000,000*	*1,030,000*	*685,000*	*975,000*	***3,690,000***	***4,360,000***
Retail/Leisure	0	0	225,000	7,500	0	0	0	10,000	10,000	215,000
Hotel/Conference	0	0	225,000	7,500	0	0	0	0	0	225,000
	1,930,000		**8,500,000**		*1,000,000*	*1,030,000*	*685,000*	*985,000*	**3,700,000**	**4,800,000**

Aerial Image Key:	Green Border	Historic Cluster
	Red Border	Phase 1
	Blue Border	Phase 2
	Yellow Border	Phase 3