A research paper by Didobi

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About ULI

The Urban Land Institute is a global, member-driven organisation comprising more than 45,000 real estate and urban development professionals dedicated to advancing the Institute’s mission of shaping the future of the built environment for transformative impact in communities worldwide.

ULI’s interdisciplinary membership represents all aspects of the industry, including developers, property owners, investors, architects, urban planners, public officials, real estate brokers, appraisers, attorneys, engineers, financiers, and academics.

Established in 1936, the Institute has a presence in the Americas, Europe, and Asia Pacific regions, with members in 80 countries.

The extraordinary impact that ULI makes on land use decision making is based on its members sharing expertise on a variety of factors affecting the built environment, including urbanization, demographic and population changes, new economic drivers, technology advancements, and environmental concerns.

Peer-to-peer learning is achieved through the knowledge shared by members at thousands of convenings each year that reinforce ULI’s position as a global authority on land use and real estate. In 2020 alone, more than 2,600 events were held in cities around the world.

Drawing on the work of its members, the Institute recognizes and shares best practices in urban design and development for the benefit of communities around the globe.

More information is available at uli.org.

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Life sciences is a significant and growing occupier across Europe. Life sciences is a broad category including the fields of biotechnology, pharmaceuticals, biomedical technologies, life systems technologies, nutraceuticals, environmental sciences, and biomedical devices. Its expansion in the past few decades has been created by ecosystems that have successfully combined the triple helix of academia, governments, and private companies to attract industry investment. From fostering innovative start-ups to attracting established international companies, cities such as Cambridge, Dublin, Amsterdam, and Paris have all created successful clusters that thrive on the life sciences sector.

The sector is predicted to see further growth. Societal and demographic factors are driving further growth of the life sciences sector as well as the broader trends that will enable further growth and help shape the life sciences sector across Europe, as outlined in figure 1.

**Figure 1: Macro and micro drivers and trends in the life sciences sector**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Drivers</th>
<th>Trends</th>
<th>Macro</th>
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<tbody>
<tr>
<td></td>
<td>• Demographics – ageing</td>
<td>• Technology</td>
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<td></td>
<td>• Lifestyle diseases</td>
<td>• Urbanisation</td>
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<td></td>
<td>• Health care spending</td>
<td>• War for talent</td>
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<td></td>
<td>• Coronavirus pandemic</td>
<td>• Sustainability</td>
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<tr>
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<td>• Government policy</td>
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<td></td>
<td>• Academia and universities</td>
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<td></td>
<td>• Competitiveness</td>
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<td></td>
<td>• Tax and legal framework</td>
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<tr>
<td>City/location</td>
<td>• Affordable office and living space</td>
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<tr>
<td></td>
<td>• Urban environment attractiveness and amenities</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Triple/quadruple helix</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Venture capital funding and corporate research and development funding</td>
<td></td>
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</tbody>
</table>

Source: ULI.
In Europe, despite the size of the sector and predicted continued growth, the life sciences sector is not yet understood well by the real estate industry or recognised as a distinct investment sector. Although national and local governments are realising the growth opportunity and importance of this sector, the property development and investment community so far have little knowledge of its potential and their involvement in the delivery and management of the sector is limited. Only limited data is available, and that which is available is held by a few. This lack of transparency and information on demand and supply is holding back additional investors and developers.

However, the real estate sector definitely has a role to play, as is visible in the United States where real estate investors have capitalised on the demand, which has resulted in the life sciences sector having become a mature and standalone real estate investment sector, with active, specialised and diversified players, who are focused on mature and emerging clusters with large-scale multi-purpose communities that cater to life sciences businesses at every stage of their life cycle, from start-up to scale-up and developed corporates. Established real estate players in the U.S. life sciences market have started to look further afield for the next top life sciences destinations, and some have started to explore opportunities in Europe and make acquisitions. They are being followed by real estate players within Europe, who are beginning to recognise the life sciences sector as an emerging investment class with space to grow. This research report provides a comprehensive overview of the European life sciences industry, including the drivers for successful locations and the nature of the real estate required by life sciences companies. It describes the wide range of entities that are active in this space and outlines recent investment trends.

The research addresses the following key challenges that the European life sciences sector faces:

1. Lack of suitable real estate;
2. Lack of knowledge about the sector;
3. Lack of data to make informed decisions;
4. Lack of operational expertise; and
5. Lack of alignment between funding and opportunities.

The report concludes that a strong case exists for investment in life sciences real estate, but success in this space will require specialist knowledge and a cross-industry willingness to share data, which is currently not yet in place.

To tap into the opportunities the life sciences sector provides from a structural growth and diversification perspective in Europe, the real estate industry needs to act in the following key ways, helping overcome the barriers to the sector:

- Overcome the lack of reliable data.
- Create a life sciences real estate building specification guide.
- Align interests and build transparency between owner and occupiers.
- Be prepared for continuous adaptation, feedback and complexity.
- Factor in mega-trends in life sciences real estate (LSRE) decision-making.
- Provide hands-on stewardship.
1. INTRODUCTION

Purpose of the report

The life sciences sector has grown significantly over recent years and continues to profit from structural growth drivers, which has been further accelerated by COVID-19. As a result, the sector is an increasingly critical part of national and global economies and their use of real estate is growing in kind. This growth and diversification potential has been recognised already for some time by real estate players in the United States, as a result of which the sector has become a serious real estate asset class. Now a mature sector in the United States, demand for life sciences space remains strong, and income has proved resilient in a turbulent 2020 market. The demand trend is expected to continue, and capital is now looking at other geographical locations for investment outside the United States. ULI/PwC’s Emerging Trends in Real Estate® Europe 2021 report identifies life sciences as one of the top three sector prospects.

More real estate investors, whether from the United States or in Europe, have started to explore sector opportunities in Europe. The purpose of this report is to assess the potential and requirements for the sector to develop into a more mature European real estate investment sector. The report reviews the main trends affecting the growing life sciences sector in Europe and how the drivers and dynamics in the sector are affecting the demand for Life Sciences Real Estate (LSRE).

The ULI global survey forming the basis for this report that went out to ULI members and found that just over a third of respondents were interested in the life sciences sector because of competitive risk-adjusted returns compared with other asset classes and the potential for capital growth.

The specific and widely varying space demands by the various life sciences companies imply more complexity than for traditional offices. The research aims to provide a solid platform to better understand the complexities of the life sciences sector and the challenges of meeting diverse occupational requirements – and to bring some transparency to what remains an opaque market to all but the specialist players. This was demonstrated by the survey, where one of the greatest challenges revealed is the relative scarcity of information. In the top three responses to survey questions about investment in LSRE, respondents noted:

- Lack of suitable real estate, 64 per cent;
- Lack of knowledge about the sector, 31 per cent; and
- Lack of data to make informed decisions, 28 per cent.

Methodology

The report presents insights gained from market participants through ULI global industry survey, case studies, two roundtable discussions with 50 participants, and a series of telephone interviews. An extensive literature review was undertaken, and relevant excerpts from these sources, including reports from government, academia, real estate advisers, professional services companies, media, and websites. A survey of ULI members gathered 100 responses on topics such as growth drivers, leasing models, challenges, and investment purpose. In addition, 16 interviews were conducted with a range of experts and players engaged in the sector to explore some of the interview responses in more depth. More than 250 transactions from 2015 to 2020 were analysed to reveal patterns about the origins of and destinations for capital. The survey, interviews, and roundtable discussions were held in October and November 2020. Natural language processing (NLP) software was used to assist in drawing key messages from the interviews and roundtable discussions.
**Structure of the report**

*Chapter 2* briefly reviews the evolution of life sciences from “modern medicine” through formalised research and development (R&D), to the wide-ranging field of life sciences experienced in the 21st century. It also sets out the definitions and typical characteristics of LSRE, including purpose-built science parks, science clusters, and incubators, to familiarise readers with the types of built environment focused on LSRE. This section also introduces the life sciences ecosystem.

*Chapter 3* considers the key growth drivers and trends for the life sciences sector, all of which are driving demand for LSRE and funding.

*Chapter 4* focuses on country and city selection and details elements that contribute towards the relative attractiveness of locations. How does a location score against metrics forming part of the triple or quadruple helix? Indicators considered include talent attractors such as strength of academia, availability of services and amenities, R&D funding, and affordability.

*Chapter 5* provides an overview of the real estate characteristics of life sciences and the challenges facing a sector seeing strong demand, often from immature businesses with a requirement for flexible space and specialist premises. This chapter also provides an analysis of transactional data across Europe.

*Chapter 6* draws together the conclusions of the research, highlighting the challenges and opportunities for the real estate sector. Recommendations are provided on how the real estate industry can move forward and unlock the potential of this bespoke sector.

The report includes six case studies, each one portraying a leading life sciences cluster (five in Europe and one in the United States).
Evolution of the sector

Several key scholars (Schwartzman, 1976; Gambardella, 1995; and Galambos and Sturchio, 1996) have identified the first three stages in the evolution of “modern medicine” through to the wide-ranging life sciences industry of today:

• c. 1850–1950: characterised by little new product research based on relatively primitive methods and organised in an informal manner.
• c. 1950–1970: an era characterised by relatively rapid rates of new product development based on increasingly formalised in-house R&D programmes.
• Post 1970: “drug development by design,” making use of genetic engineering in the discovery and production of new drugs. This third epoch saw consolidation amongst pharmaceutical businesses, the growth of new biotech businesses working with biological products and systems rather than chemicals, and pharmaceutical companies only re-engaging with biotechnology since 1995.
• A fourth, recent phase is the increasing crossover between health care and technology innovation, given its product development and growth, and further individualisation of treatments.

The life sciences sector has witnessed unprecedented growth in recent years. And a number of macro drivers will continue to support growth and investment in the sector. In addition, COVID-19 has provided a catalyst for large-scale global investment in R&D and medical devices that has resulted in further innovation and increased pace of change.

Brief definitions and characteristics

One key factor for investors in LSRE is the need for specialist knowledge. When asked about the differences between LSRE and traditional real estate in the survey, respondents’ top three answers were:

• Specialised knowledge required to operate/ manage, 40 per cent;
• Capital expenditures required, 35 per cent; and
• Performance benefits of clustering, 24 per cent.

The specialisation and differences are illustrated by the number of property and building types in the life sciences sector, as outlined below.
2. EVOLUTION AND BACKGROUND

Location definitions

Science Cluster: an agglomeration of complementary (and competing) businesses engaged in all aspects of science-based research and development, commercialisation of products, manufacturing, and sales. Occupiers will include academic research, hospitals, science and tech business start-ups, small and medium enterprises (SMEs), and major corporates.

Cluster characteristics: in many ways similar to the Science Park, but not contained within a purpose-built park. Clusters will cover a much broader geography, sometimes crossing international borders, will be on a much larger scale and contain a comprehensive mix of office, R&D, lab and manufacturing premises. Clusters, through their larger geographical spread, will have access to several universities, higher education establishments, and university teaching hospitals. The ultimate goal is the same – academic and business collaboration, nurturing and growth of start-ups and SMEs, cross pollination of ideas and research, innovation of new product, and acceleration to market. The importance of strong digital infrastructure and international connectivity should not be underestimated in the success of large clusters.

Science-based clusters, with a multiple ownership structure, will tend to grow organically at scale, rather than in a more curated fashion associated with single-ownership purpose-built Science Parks.

Science Park: a purpose-built development of office space, labs, workrooms, and collaborative space designed to support research and development in science and technology.

Science Park characteristics: the park will have a close relationship with at least one leading university and will be involved in promoting the university’s research and development through industry partnerships, assisting growth of new ventures through incubation and spin-off processes, product innovation and commercialisation, and the transfer of technology and business skills between university and industry. The out-of-town/edge-of-city locations tend to benefit from good domestic and international infrastructure, the availability of a range of science and technical skilled labour, and high quality-of-life credentials.

A Science Park forms part of the “knowledge economy” by creating an ecosystem of partners, industry professionals, and suppliers. The curation of tenants is extremely important in driving the success of the park, the right mix bringing collaboration between public and private sectors at a national and international level. Such curation is often easier if the park is under single ownership. Some parks, such as Oxford and Cambridge Science Parks, in the UK, are owned by university colleges.

The scale or size of Science Parks across Europe varies, but research suggests that they range from less than 50,000 square metres to more than 300,000 square metres. Genopole, south of Paris, is reported to be 109,000 square metres, but forms part of the 70-hectare Villejuif-Évry life sciences cluster. Amsterdam Science Park is currently 280,000 square metres, with development land available to allow expansion to 400,000 square metres.

Occupiers will range from business start-ups within dedicated incubator or innovation centre premises through to spin-offs, SMEs, and major corporates representing specialisms across the spectrum of life sciences and technology.

Science Incubator: the primary role of a science incubator is to assist in the establishment and growth of early-stage companies by providing resources, access to industry mentors and specialists, interactions with other entrepreneurs and, importantly, access to patient capital to facilitate survival and growth.

Characteristics of an incubator: a science incubator can take the form of a purpose-built unit or the conversion of existing premises. It will normally form part of an existing park or cluster, thus benefiting from academic links and highly skilled labour. Typically, an incubator will provide access to flexible “ready-to-go” lab and office space/write-up suites, high-end equipment, technical rooms, collaborative and social space, meeting rooms and conference facilities, flexible office space and storage, business support and training, and IT and administrative support.
Paris, Genopole, France

Genopole life sciences cluster is France’s oldest and largest biotech and biotherapy cluster, established in 1998. It is located south of Paris, within range of the University of Paris-Saclay and close to three colleges plus the University of Evry-Val d’Essonne (UEVE) and the South Ile-de-France Medical Centre (Centre Hospitalier Sud Francilien, or CHSF). It has direct road and train links to central Paris and Charles de Gaulle airport with a number of connected motorways.

This major cluster covers 2,800 hectares and provides 109,000 square metres of floor space to cater for a broad spectrum of occupiers. A further 5.5 hectares is reserved for future development.

Genopole’s current industry focus is in the areas of biopharmaceuticals, biotherapies, synthetic biology, genetics, genomics, and DNA therapy. As of 2018, it contained 19 academic research laboratories, 86 biotechnology companies, and 20 scientific platforms and technical platforms shared around UEVE. There are currently 105 member organisations within the cluster employing 2,300 staff. It is a mature and fertile biotech ecosystem, supporting entrepreneurship and SMEs with dedicated staff providing access to SHAKER (incubator) and BOOSTER (accelerator) programmes.

In terms of funding, Genopole is a public interest group (GIP) supported by the French government, the Ile-de-France Regional Council, the Essonne Departmental Council, the city of Évry, and the AFM-Téléthon (the French Muscular Dystrophy Association). A semi-public company, SEM Genopole, builds and manages the real estate at Genopole and assists companies in the process from site acquisition through design, financing, and implementation. Major occupiers include Pharming, New England Biolabs, Ariane Clinical Research, Santen, and Illumina.

Prime office rents in Évry (exclusive of taxes and charges) are €118 per square metre per month (£18 per sq ft per annum), with average rents in the range of €9.20 to €12.50 per square metre per month (£9.50 to £12.50 per sq ft per annum). The yield on occupied space is about 7 per cent. As of the third quarter of 2020, prime office rents in Paris were €77 per square metre per month (£77 per sq ft per annum); the central business district prime yield was 2.75 per cent and 4.25 per cent in La Défense, respectively (per Colliers International, Knight Frank). The office vacancy rate for the Greater Paris Region was 6.1 per cent (per Savills).

Genopole’s strategic plan for 2025 focuses on its internationalisation to attract foreign talent through major global initiatives. Future fields of interest will focus on personalized medicine, innovative therapeutic solutions, digital genomics, and biotechnologies related to environmental matters and agri-food. It also aims to develop a centre of excellence in genomics and post-genomics research (with a special focus on gene therapy) in close collaboration with UEVE. It envisages a triangular layout with each corner point representing a cluster for research, higher education, and industry. Genopole also has plans to create a biopark in Évry-Corbeil from the ground up, interfaced with academic research and shared-access technology platforms and services.

Genopole d’Évry – University
Cambridge, Granta Park, UK

Granta Park is a purpose-built science and innovation park located at Great Abington, southeast of Cambridge city centre. Cambridge is a UK regional city with a population of 120,000, with the wider catchment of Cambridgeshire and Peterborough having a population of 856,000. It has quick road links to the M11 (to London) and A14 (to the Midlands and North) and fast train connections to London King’s Cross/St Pancras International. With three airports nearby — London Stansted, London Luton, and London Heathrow — Granta Park has excellent international connectivity.

The idea for the park came from the former chief executive of The Welding Institute (TWI Ltd), Bevan Braithwaite OBE. TWI Ltd is a research and technology organisation. He started negotiations in 1992 for an option to buy the key 35.2 hectares (87 ac) of farmland on which Granta Park is now built and obtained planning permission from South Cambridgeshire District Council for a high-quality, low-density, fully landscaped development. A joint partnership was formed between TWI Ltd and MEPC plc (a British-based property investment and development business), and Granta Park Ltd was created. The development was launched in 1997.

Granta Park now forms part of the Cambridge life sciences cluster — a €8.4 billion (£7.6 billion) powerhouse that continues to attract record levels of interest from investors and occupiers. Cambridge itself forms part of the broader UK Golden Triangle cluster comprising Oxford, Cambridge, and London.

In June 2012, BioMed Realty acquired Granta Park, and the park is managed in partnership with TWI. BioMed Realty owns 13 buildings encompassing 712,830 rentable square feet.

Granta Park comprises 21 buildings totalling 120,800 square metres (1.3 million sq ft) set in 48.5 hectares (120 ac) of inspirational woodland and landscaped surroundings. There are 30 businesses on site employing 3,700 staff drawn from a wide catchment area of Cambridgeshire, Hertfordshire, Suffolk, and Essex.
Major occupiers include Sosei Heptares, AstraZeneca, Illumina, Pfizer, and PPD. The industry focus of the park includes R&D, therapeutics, oncology, biopharma, cell therapy, and genomics. Granta Park benefits from a broad talent pool in the area and its proximity to world-class academia and hospital facilities, including the University of Cambridge, Anglia Ruskin University, Cambridge Judge Business School, Addenbrooke’s Hospital, Nuffield Health Cambridge Hospital, Spire Cambridge Lea Hospital, and Royal Papworth Hospital.

The park provides a range of supporting services. A key to Granta Park’s success and contributing to the park’s ecosystem has been the investment in a 4,180-square-metre (45,000 sq ft) amenity building, the Apiary, to improve collaboration, crossover, community, and healthy living. The facilities include a restaurant and café and a Nuffield health, fitness and well-being centre. The park has a conference centre and nursery on site, with a wide range of state and private schools available in the Cambridge area. Two shuttle bus routes serve the Granta Park site linking to Cambridge station and Whittleford Parkway station and there is an active car share scheme.

Funding of the occupiers comes predominantly through venture capital, and proximity to London helps in this regard.

The rents and yields on the park remain confidential, but the vacancy rate is reported to be 13 per cent. This is largely because of the ongoing comprehensive refurbishment of the Portway building, which will provide 9,140 square metres (98,400 sq ft) of fully fitted flexible lab and office space. Additional future plans include the development of Zone 2, under TWI’s control.

Already home to Illumina’s new European Head Office and Research HQ, the Park also has outline planning permission for five new buildings with lakeside positions in an extensive landscaped setting. These range in size from 4,600 to 7,400 square metres (50,000 to 80,000 sq ft) overall with typical floor plates of 1,860 to 2,300 square metres (20,000 to 25,000 sq ft).

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**Occupational property types**

- **Clean room/lab:** a room specifically designed to limit the number of airborne contaminants. Special air filters and air distribution systems keep the environment clean.

- **Collaborative lab:** modern science is a highly collaborative activity. The best lab designs not only facilitate but also encourage collaboration, providing meeting spaces where ideas can be discussed as well as labs that encourage teams to work together. Office space and write-up areas are also important design elements to be included. These allow people working in different areas to come together and work in teams on developing and analysing research, which is often the foundation of breakthroughs. From meeting area and communal spaces, to labs that can be reconfigured to facilitate collaboration between interdisciplinary team members, labs that promote collaboration are often the cornerstone of successful teams.

> “Flexibility is required because lab requirements follow the business cycle; different types of labs are required at different stages of growth.”

– European developer/investor

- **Dry lab:** an environment that focuses on applied or computational research and analysis and, as such, requires the requisite power and cabling. With advances in technology and lab automation, there is a trend towards more dry space. This “office plus” environment is more attractive to landlords/developers as it is not as expensive to deliver as sterile lab space.

- **Flexible lab:** allows the space to be adapted to new teams and new research without having to employ a team of contractors to reconfigure the lab. Involving a larger initial outlay, the flexibility will generally pay off in meeting the changing needs of tenants.
2. EVOLUTION AND BACKGROUND

- **Generic lab**: part of a group of labs that are all the same size and have the same basic fit-out and engineering services. The best generic labs will have an element of flexibility. Extractors and sinks will be fixed, but storage can be in mobile units for flexibility.

- **Wet lab**: a wet lab is a type of laboratory where drugs, chemicals, and other biological matter can be analysed and tested using various liquids. The space will usually include fume hoods, sinks, chemical-resistant surfaces, and other bespoke equipment. Wet labs should be designed, constructed, and controlled to avoid spillage and contamination.

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“Incubators are facilitators – rather than originators – of wider commercial success.”
– Bidwells Review of Wet Lab & Incubator Space for Life Sciences at Cambridge, 2008

**The life sciences ecosystem**

The creation or curation of the right ecosystem is critical to the innovation and collaboration that form a fundamental part of the life sciences business life cycle, from seed idea to start-up, through to SME, product launch, and commercial success.

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**Figure 2: Life sciences ecosystem and spatial structures**

Source: Adapted by ULI from Majava et al., 2016.
There are several ways of defining the life sciences ecosystem. Both the triple and quadruple helix approach reflect the belief that innovation is an outcome of an interactive process involving several stakeholder groups.

The triple helix model of innovation describes the interaction between three stakeholder groups: industry, university-science, and government.

The quadruple helix brings in a fourth stakeholder group – the public or civil society. This fourth element has become a backbone of several national science, technology, and innovation policies, strengthening regional innovation systems and enabling better evaluation of research organisations and research proposals (Schutz, Heidingsfelder and Schraudner, 2019). A good example of engaging with the public has been through use of UK National Health Service (NHS) patient records to recruit volunteers for COVID-19 vaccine trials. This allowed for a rapid roll-out of testing, which was of significant benefit to the Oxford University/Astra Zeneca team in conducting trials for a successful COVID-19 vaccine.

This ecosystem and helix models are explored in more detail in chapter 4, where a number of indicators have been scored to provide a relative attractiveness score for a select number of European countries.
This section reports on the key drivers of growth and trends that are affecting the sector as a whole. This, in turn, has resulted in increased demand for appropriate real estate, a mix of generic, flexible, and specialist space, in dedicated science parks, in urban clusters, and near university and medical institutions.

**Growth drivers**

**Demographics – an ageing population**

People are living longer and healthier lives due to advances in treatments, medication, and technology. Even those with pre-existing conditions and chronic or long-term illnesses can now live longer and more productive lives. The ageing population drives continued development of preventative treatments, prescriptive drug cures, and innovation across all aspects of life sciences and development of advanced medical equipment. With continued step changes in technology, there is a recognisable trend towards personalised solutions and e-health (health care services provided electronically via the internet).

Eurostat’s long-term population forecasts\(^1\) to 2100 demonstrate the changing shape of the population age pyramid for males and females. The growth in the relative share of the elderly is nothing new and has been witnessed for decades. The trend reflects increasing longevity and consistently low levels of fertility. Figure 4 shows a squeezing of the middle age bands and a significant expansion of those in the elderly profile as we enter the next century.

“\[The ageing population and growing middle class are becoming less dependent upon the State for health care; at the same time, the State is under demographic pressure to keep older citizens out of hospital.\]”

– UK developer

**Figure 4: Population pyramid**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>2019</th>
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<tbody>
<tr>
<td>0-14</td>
<td>5.8%</td>
<td>14.6%</td>
</tr>
<tr>
<td>15-24</td>
<td>10.4%</td>
<td>9.0%</td>
</tr>
<tr>
<td>25-34</td>
<td>15.6%</td>
<td>14.1%</td>
</tr>
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<td>85+</td>
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</tr>
</tbody>
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Another aspect of population ageing is the progressive ageing of the older population itself, as the relative significance of the aged is growing at a faster pace than any other age segment of Europe’s population. Figure 5 shows that the share of those 80 years or older in Europe’s population is projected to increase by 250 per cent between 2019 and 2100, from 5.8 to 14.6 per cent.

\(^1\) Created in 2020 using 2019 data.
For a more medium-term outlook of the ageing population, figure 6 shows the World Bank forecast increase, for a selection of European countries, in the percentage of the population 65 years and older through to 2040. For the EU as a whole, the proportion increases from 21 to 28 per cent, but for Italy, Greece, and Spain, the proportion of those aged 65 plus in 2040 is in excess of 30 per cent.

The increasingly elderly profile of the population across Europe will place additional demands on the respective country health service providers and governments to provide the necessary funding and support for the latest drugs and supporting services. This investment in longer life well-being will continue to drive demand for the wide variety of life sciences.

**Lifestyle diseases**

Lifestyle diseases are associated with the way people live their lives. The prevalence of such diseases has increased as, generally, large parts of the world population have seen increasing wealth and greater access to technology and services that have led to more sedentary lifestyles. Lifestyle diseases are often caused by a lack of physical activity, unhealthy eating, alcohol, drugs, and smoking. This leads to heart disease, stroke, obesity, cancer etc. Life expectancy decreases with each additional chronic condition. A 67-year-old with no chronic conditions will live for another 22.6 years, but with five chronic conditions life expectancy will reduce by 7.7 years and with 10 or more chronic conditions life is shortened by 17.6 years (Lippincott, Williams & Wilkins, 2014).

There has been significant success in launching new drugs to extend life and improve the quality of life of those suffering long-term health issues. For example, data from Macrotrends shows that average life expectancy in the UK has risen from 72 years in 1970 to 81 years in 2020.

A crucial contribution to life expectancy and improved well-being amongst the elderly and chronically ill has been the development of personalised medicine, which is based upon each patient’s unique genetic make-up. Advances in this area are beginning to overcome the limitations of traditional treatments. Importantly it is allowing health care providers to shift from reaction to prevention and to better predict susceptibility to disease (see figure 7).
The shift into preventative medicine and genetic R&D is being accelerated by the influence of technology and, in particular, the application of digital tech, artificial intelligence (AI), and machine learning. This transition is generating new start-up and SME businesses that, in turn, drive demand for specialist and appropriately located real estate. Labs become more flexible and adaptable to changing technology. Lab design is based around humans and robots working side by side. Scientists spend more time in an office-like environment as wet lab processes become more automated. Medical products are being transferred to manufacturing sites to upscale products to market. All of these require a unique set of real estate provision and design that is flexible and adaptable to cover a broad range of activities.

**Health care expenditure**

Health care expenditure is a key driver of investment in life sciences R&D. This expenditure is only increasing as governments strive for leadership in meeting the challenges and demands of an ageing population. The latest data from Eurostat (2017) indicates that, with the exception of Greece, all European countries (where data is available) increased health care expenditure between 2012 and 2017, several by over 20 per cent.

France, Germany, and Sweden reported the highest health care expenditure relative to gross domestic product (GDP). In France and Germany, the expenditure equated to 11.3 per cent of GDP, which compares with the EU-27 average of 9.9 per cent. Twelve Member States had a ratio of less than 7.5 per cent of GDP, with Romania (5.2 per cent) being the lowest. The national level of spending on health care is a key driver of the life sciences sector and R&D supporting advances in health care provision. Figure 8 shows health care expenditure per inhabitant growing across all of Europe between 2012 and 2017, with the exception of Greece and Luxembourg.
**COVID-19**

COVID-19 has been the catalyst for huge additional health and R&D-related funding, worldwide, into R&D and medical supplies. In response to the pandemic, the European Commission leaders agreed a total recovery package of €1.8 trillion (£1.6 trillion) that combines the EU budget for 2021–2027 and NextGenerationEU. Under this agreement, the Commission will be able to borrow up to €750 billion (£680 billion).

The UK response was initially a package of €8 billion (£7.3 billion) but, as the seriousness of the pandemic has escalated, the support has been raised to €32 billion (£29 billion).

Some may view life sciences as critical security infrastructure. Any country that has the life sciences infrastructure in place to pivot and respond to new viruses and bioterrorism quickly is in a more secure position.

Details of additional COVID-19 health support measures and expenditure are in Appendix 1.
3. GROWTH DRIVERS AND SECTOR TRENDS

Sector trends

Urbanisation

Location is a critical part of driving innovation, and finding the right location is key. Life sciences firms are rethinking where they want to be based and who their neighbours are in a bid to boost innovation and stay competitive. Increasingly, bigger life sciences companies are opting for urban spaces rather than the out-of-town science parks. King’s Cross Knowledge Quarter and Imperial College’s I-Hub in White City, both located in London, are examples of this life sciences urbanisation trend. Not just closer to “talent,” but a cluster location is also more attractive to a range of occupiers, and to investors and developers who understand the sector and its potential (JLL, 2019).

Understanding what makes a successful life sciences ecosystem, as illustrated by the urban case studies, is key to success. This is seen by an increasing preference for urban clusters. This point was emphasised by many research respondents and is well summarised by one participant:

“LSRE needs an innovation hub around it with a vibrant anchor and a thriving community of uses not in the LS industry. Retail, homes, civic, fitness, green space, education, entertainment . . . ”

– North American fund manager

Figure 9: Why innovation is moving back to the city

London, King’s Cross Knowledge Quarter, UK

Innovation activity in major cities is now often heavily concentrated in inner-city areas, near established business, financial, and creative industry districts. Evidence from cities such as London also suggests a strong clustering of innovation activity around areas with very good public transport. This excellent connectivity allows King’s Cross Knowledge Quarter (KQ) to access a broad range of talent from the Greater London population of 9.3 million. The urban lifestyle and cultural proximities are key in drawing in talent, and companies follow talent.

The KQ is a key example of life sciences situated in an urban location. Its 1.6-kilometre (one-mile) radius encompasses a 260-hectare area of King’s Cross, Bloomsbury, and Euston Road in London. It is “home to the world’s greatest knowledge cluster” (https://bank.knowledgequarter.london) and exists as a unique urban cluster in a global city.

The KQ has evolved around the Francis Crick Institute (FCI). One important factor in deciding its location is the working environment. The building is a shared space for several institutions and designed to foster close connections and cooperation in research between scientists in varying fields. Formerly known as the UK Centre for Medical Research and Innovation, the project was launched in 2007 in response to the Cooksey Report. The report proposed a central coordinating funding body, the Office for Strategic Coordination of Health Research, with a joint Medical Research Council/National Institute for Health Research Transactional Medicine Funding Board to direct money towards projects that promise “health and economic benefits.” Eleven new biomedical research centres were targeted to help translate advances in basic medical research into clinical practice. In 2011, with a pioneering vision in place and a state-of-the-art 91,000-square-metre (100,000 sq ft) building under construction, the project was given the title of the FCI, acknowledging the contribution of one of Britain’s most notable scientists.

The KQ captures a broad mix of science, tech, art, history, and culture. The FCI itself focuses on growth and development (of organisms), health and ageing, human biology, cancer, immune system, infectious disease, and neuroscience.

The KQ is in multiple ownership, but anchoring the KQ, the FCI is a unique partnership between six of the world’s leading biomedical organisations which all originated from the UK – the Medical Research Council, Cancer Research UK, the Wellcome Trust, University College London, Imperial College London, and King’s College London.

The KQ area employs 57,000 staff, including 3,000 scientists and 13,700 academics in addition to 98,500 students. Some of the partners in the KQ include the Aga Khan University, Birkbeck University of London, Camden and Islington NHS Foundation Trust, City University London, Royal College of General Practitioners, Royal College of Physicians, Royal Veterinary College, University College London, and University of the Arts London. The breadth of science and arts-related knowledge and talent promoted by these institutions, amongst others, is a critical element of KQ’s success in the cross pollination of ideas and innovation.

In addition to a number of universities in the KQ, some of the major occupiers include the British Library, the British Museum, Google, the Guardian, and RIBA. The regeneration around King’s Cross station and Pancras Square will also accommodate a host of tech and media businesses, including Google’s new UK ground scraper HQ, Facebook, and Universal Music.
The inner-city urban environment around the KQ is unique and creates its own challenges in terms of accommodating the physical growth and expansion of existing occupiers and attracting new entrants within the confines of a dense urban streetscape, existing historic buildings, and a wary planning system. While rents and land values are not the highest in London (prime West End rents are £116 per square foot per annum/€117 per square metre per month), prime office rents in King’s Cross at £83 per square foot per annum (€83 per sq m per month) exceed the City at £81 per square foot per annum (€81 per sq m per month) and Canary Wharf at £51.50 per square foot per annum (€52 per sq m per month). Vacancy rates are 3.4 per cent for Kings Cross and Euston combined and close to zero for King’s Cross Central as it is almost fully let (per Savills).

This high rental cost and tight supply creates challenges for occupiers given the additional costs associated with fitting out lab and flexi-space and has led to a number of landlords looking to repurpose existing office space, especially as working from home related to COVID-19 has affected occupancy rates. In this respect, landlord and developer activity in London seems to be driven, in part, by opportunity. However, the specialist demands of life sciences occupiers in terms of floor-to-ceiling heights, floor loadings, extraction, power, hazard safe storage, and additional monitoring and evaluation can be prohibitively capital intensive.

A leading real estate agent reported that life sciences real estate rents and costs data are extremely opaque in London but suggested that much of the let space is in incubators, which are let on an all-inclusive rate rather than splitting out rent, business rates, and service charges. These all-in costs are reported to be in the range of €74 to €98 per square metre per month (£74.50 to £99 per sq ft per annum).

In terms of future plans, the KQ 2025 Strategy states that the Knowledge Quarter in 2025 will be the sum of the ideas that it generates over the next five years. One of its four strategic priorities is to increase the area’s profile through advocacy and stakeholder engagement, both nationally and internationally (KQ Strategy, 2019).
War for talent

Hiring the best and brightest is important if a life sciences company of any size is to hit its research milestones. Today, access to a pool of skilled workers is equally critical to growth. Attracting and retaining the most talented employees is competitive (hence the phrase “war for talent”), and the location of the company’s premises is an important weapon. Location in this sense is both micro (that is, the amenities in and near the premises) and macro (at city level).

- **Micro-location:** an urban location with proximity to cultural activities, shops and restaurants, and the fun factor makes for happy employees. Not everyone relishes the business park lifestyle or, as one of our interviewees noted, “Top talent from abroad won’t wish to work in a field in Kent.”

- **At city level,** things that matter in the war for talent include the affordability of housing and the cost of living. Notably, life sciences employees may not always be the highest-paid employees in academia or hospitals. If the employees cannot afford house prices in the city and have to live farther out, they face longer commutes with high travel costs, and this could deter talented and skilled workers.

The Golden Triangle of Oxford, Cambridge, and London remains the pre-eminent location for UK R&D and, therefore, investment, although a number of emerging urban clusters around the UK and Continental Europe are also generating interest. A new community in Eddington planned as an urban extension just outside Cambridge is catering to its sector growth and affordability to house university workers.

**Eddington Masterplan, Cambridge**

The University of Cambridge is undergoing one of the most significant expansions in its 800-year history. At Eddington, the master plan vision is to create a new urban district and city extension centred on a mixed, academic and urban community. It will be a place that is sustainable, long-lasting, and ambitious, enhancing the city and the university. The first phase of development provides a thoroughly mixed-use urban centre as a focus for the emerging new community.

To maintain its international reputation and competitive strength, the university aims to provide for its future needs, including vital, affordable homes. The transformation of the 150-hectare site will ultimately provide 3,000 homes, half of which will be genuinely affordable homes for qualifying staff, as well as accommodation for 2,000 post-graduates and 100,000 square metres of academic research space, all set within extensive new parklands and a connective pedestrian and cycle network.

Eddington is distinguished by providing social and green infrastructure from the outset, including a primary school, a community hall and nursery, a food store, shops, and an energy centre supporting the first wave of affordable homes. The university has carefully selected architects to work collectively with the master plan team, defining a coherent new built environment within a framework of materials and building technologies, enhancing the natural context. Buildings, public spaces, and garden courts have all been designed to the highest standards of inclusion and environmental sustainability.

A more recent trend is the broadening of the occupier base to include tech and fintech businesses as crossover and collaboration becomes more prevalent. The wave of digital disruption has reached the health care sector, changing the way care is provided. Digital ecosystems are playing an increasingly important role. Using data will further boost the life sciences sector as it provides transparency into product performance. Advanced analytics, automation, and the cloud are making it easier to improve the quality of decision-making and increase manufacturing and productivity of new products. Personalised medicines are being offered (McKinsey, 2020b).

Sustainability
Industry leaders believe climate change and sustainability will have the biggest impact on real estate in the future (ETRE 2021). This is also relevant for life sciences companies. Science and technology are evolving at such a rapid pace that it is difficult to predict future needs, and bespoke spaces can become obsolete before they are even occupied. Life science facilities, by nature, are high demand users of various energy types and water, highlighting the need for a more sustainable approach. Firms that pursue a sustainable strategy and solidify their reputation as a sustainable company will gain the trust of governments, global institutions, and other stakeholders – partners on whom the long-term success of the industry depends.

Spaces that can easily adapt to changing needs not only support the science long term, but they can provide the most sustainable solution as well. The sustainable lab is arguably a growth trend rather than a definition but, as environmental, social, and corporate governance climbs the corporate agenda, labs are being built with sustainability in mind, using ethically sourced materials and designed to make the most of natural resources. From using sunlight to reduce the need for artificial heat and light, to reducing the exhaust rate through fume hoods to get a better balance between safety and sustainability, there are many examples of sustainable lab design. These not only provide significant cost savings over time, but they also reduce the environmental impact.

Given that the life cycle of a life sciences company is very different from a typical office user and is less likely to live out to a full seven or 10-plus-year lease in a space, it is important that the second-generation space will be just as attractive to the next tenant and a building can pivot to service the needs of those companies (Goodwin Insights, 2020).
4. CRITERIA FOR SELECTING LOCATIONS

In this chapter, we analyse the potential for life sciences to develop in cities and countries that display certain characteristics in terms of the life sciences (innovation) ecosystem as well as the triple and quadruple helix.

Innovation ecosystems today play a key role in the economic development of cities in Europe and beyond. They attract mid- and high-income jobs talent and offer opportunities for more efficient land use, movement patterns, and better liveability and environmental outcomes.

The real estate community is starting to play an active role in these ecosystems. Real estate is making space for invention and meeting the changing needs of new enterprises including the life sciences sector. More players and more opportunities are creating the impulse to innovate in emerging sectors with high impact and high growth potential.

At the micro-scale, the innovation ecosystem is fuelling the demand to locate in cities. Cities are the 21st-century “Petri dishes” for commercial innovation and cross fertilisation (Storper and Venables, 2004). They bring together a wide range of sectors, deep international networks, customer and client opportunities, and cultural and artistic quality. For the innovation ecosystem, the workplace is a key enabler of organisational success, talent attraction, and company brand (ULI, 2015). The cities and countries that are best placed for life sciences are those with the ability to attract and retain top life sciences talent and the best functioning innovation ecosystems.
Assessing attractiveness of countries, cities, and locations

When assessing the ability of a location to attract and retain top talent, comparing the quality of the amenities between one location and another can be difficult; however, it is reasonable to assume that an out-of-town location such as a business park or university campus will have less to offer than a city centre location. An incubator or accelerator in a city centre location may have the best of both worlds, offering urban vibrancy and the opportunity for cross-disciplinary collaboration that comes from close proximity during work hours and afterwards.

The following set of key indicators has been chosen because they are thought to indicate the macro-location’s ability to attract and retain top life sciences talent:

1. Reputation of pharmaceutical sector (Seboio survey for Johnson & Johnson);
2. Cost of living (Numbeo);
3. Affordability of housing – purchase (Deloitte);
4. Affordability of housing – rental (Numbeo); and
5. Jobs currently available (Indeed).

The Seboio survey for Johnson & Johnson provides a detailed study of a range of country metrics to establish relative attractiveness. For simplicity, this analysis has referenced just the “Reputation of the pharmaceutical sector” metric because this adds to the overall attractiveness of the public landscape. Countries with poor pharma reputation will have less willingness at a political level to have policy measures that encourage industry to invest, leading to fewer career opportunities and possibly a less impressive curriculum vitae for individuals who work there.

The cost of living varies considerably across global cities and is a major consideration for any business employing large numbers of staff and for individuals considering a move there. Numbeo provides this data at country and city levels.

The life sciences industry employs many people across junior to middle-ranking roles as lab assistants and technicians, research assistants, data analysts, programmers, and the like. The affordability of housing for employees, from both purchase and rental perspectives, is a critical factor for companies looking to establish and grow their businesses. This data has been sourced from Deloitte and Numbeo.

The fifth factor is referencing jobs available in the life sciences industry. Those countries with more jobs advertised (by Indeed) are deemed to be more attractive in having the relevant employment skills base to draw upon.

This elementary analysis is intended only to provide indicative relative rankings across a select sample of European countries. However, these are the types of metrics that should be understood in detail by investors and businesses seeking to establish new business locations. Belgium and Ireland are the best placed in this regard, followed by the UK and Germany. The Netherlands and France are ranked fifth and sixth, respectively. Denmark and Switzerland both suffer from a high cost of living and a lower number of available jobs, and this results in these two countries being placed seventh and eighth, respectively.

“Proximity to venture capital is a key location factor, so proximity to London is important in the UK.”
— Global real estate adviser

<table>
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<th>Figure 10: Attractiveness factors</th>
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<tr>
<td>Reputation of pharmaceutical sector (J&amp;J survey)</td>
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<tr>
<td>Cost of living (Numbeo)</td>
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<td>Affordability of housing to purchase (Deloitte)</td>
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<td>Affordability of housing to rent (Numbeo)</td>
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<td>Number of jobs currently available (Indeed)</td>
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Sources: Seboio survey for Johnson & Johnson, Numbeo, Deloitte, and Indeed.
Measuring a location’s ecosystem

We now turn to a comparison of innovation ecosystems. There are innumerable ways to measure a location’s ecosystem and, based upon our reading and research, we have chosen a basket of seven key indicators, which are listed here with the data source shown in round brackets:

1. Competitiveness of economy (World Economic Forum);
2. Scientific publications among top 10 per cent cited (EU Innovation Scoreboard);
3. Availability of qualified staff (INSEAD Global Talent Competitiveness Index or GTCI);
4. Med tech trade balance (MedTech);
5. Corporate tax level (KPMG);
6. Quality of life sciences academia (Leiden Ranking); and
7. Number of biotech start-ups over time (McKinsey).

Using these indicators, eight European countries (including all those covered in this report’s case studies) are ranked according to their relative performance. This is not an exhaustive analysis, and several caveats are needed: first, this is clearly not a full sample; second, there are dozens of indicators that could be chosen, and each would generate a different pattern; third, life sciences is a very diverse sector, and excellence in specific sub-sectors may not be reflected in the broad indicators.

What this analysis provides is an example of how, based on the seven metrics selected, a sample of countries in Europe measure up against each other. The metrics chosen (e.g., corporate tax) should be familiar and self-explanatory with the exception of the Leiden Ranking and the INSEAD Global Talent Competitiveness Index.

For each of the metrics, the top-scoring country is ranked 1, the second country is ranked 2, and so on down to the last country, ranked 8. The countries’ rankings are then added up and divided by eight to give an average ranking; therefore each metric is equally weighted. This crude league table indicates Switzerland and the UK lead the pack, followed by the Netherlands and Denmark. Ireland and Belgium are ranked fifth and sixth, respectively, with Germany occupying the seventh spot, and France coming last.

As stated previously, using different metrics (and applying different weightings) would undoubtedly result in changes to the rankings.

Figure 11: Sample countries relative performance in the ecosystem

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<th>Belgium</th>
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<td>Competitiveness of economy (WEF)</td>
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<td>Scientific publications (EU Innovation Scoreboard)</td>
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<td>Availability of qualified staff (INSEAD GTCI)</td>
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<td>Med tech trade balance (MedTech)</td>
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<td>Corporate tax level (KPMG)</td>
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<td>Quality of life sciences academia (Leiden Ranking)</td>
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<tr>
<td>Number of biotech start-ups over time (McKinsey)</td>
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4. CRITERIA FOR SELECTING LOCATIONS

Funding R&D

Choice of location for companies and employees will also depend on the availability of funding, which comes from a variety of sources including venture capital, government funding, public markets, and R&D expenditure by established life sciences companies. In terms of choosing locations, total spend on R&D per capita is one useful indicator. Figure 12, which is based on UNESCO statistics, shows that Switzerland, Denmark, and Germany lead the group of eight European countries in this regard.

The latest data is for 2018 and clearly much has changed in the last two years. Anecdotally, the UK has seen millions of dollars invested in life sciences, far outstripping its peer group in Europe. In 2019, 333 high-growth UK companies in the life sciences sector raised equity, securing a total of £1.10 billion in funding, according to the UK Science Park Association. With the advent of COVID-19, one can assume that these sums have been exceeded in 2020. Arguably, the discovery and approval of the Oxford University/AstraZeneca and Pfizer/BioNTech vaccines will further encourage investment, particularly in the UK and Germany.

“Europe is seen as very attractive currently because good-quality assets can be sourced 40 per cent cheaper compared to equivalent U.S. assets, and the cost of running a biotech business in Europe is 50 per cent lower compared to the U.S.”

– Global life sciences investor

Understanding levels of demand is difficult because of the lack of data and the complexity of demand requirements. Demand is influenced by four key factors.

- The number of university spin-outs. The success rate of spin-outs determines the level of real estate demand in a location.
- The availability of venture capital (VC) funding that facilitates the non-linear growth of life sciences businesses.
- Understanding demand by type, that is, renters (early-stage businesses) versus owners (established businesses such as manufacturing).
- The challenge of meeting rapid expansion.

“You need to understand where your demand is coming from and at what scale and trajectory.”

– Real estate developer

The biopharma sector continues to see significant investor interest and has seen a shift in the rationale behind fundraising and how they are choosing to raise funds. Pharma has seen an exponential increase in debt capital raising as it seeks to fund costly acquisitions, while VC and equity capital raising remain popular with biotech firms. Licensing deals between biotech and pharma companies are also on the rise as the appetite for risk and cost sharing increases.

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*Some data for Ireland and Switzerland is missing from this UNESCO source.*
Refinitiv (a global provider of financial market data and infrastructure) reports that equity capital raised by biotech and pharma globally was €42.4 billion (£38.4 billion) in 2019, accounting for one-third of capital raised, down from 45 per cent of capital raised in 2017. Private equity and VC-backed exits have been on the decline since 2017 as companies have stayed private for longer, with Pitchbook reporting a 33 per cent decline in number of offerings. Where there has been growth is in the debt capital markets, driven almost wholly by pharma companies issuing larger debt offerings to fund mega-acquisitions. €83.2 billion (£75.4 billion) was raised through debt in 2019, up from €40.8 billion (£37.0 billion) in 2017 (Baker McKenzie, 2020). There is no shortage of funding for the sector, and this was underlined by comments received in the interviews:

“The capital is there, but finding the right opportunity and overcoming nervousness among investors are barriers.”
– Global real estate adviser

Global forecasts for R&D spend by pharma and biotech companies from EvaluatePharma (July 2020) indicate a slowdown in spend and a reduction in the proportion of R&D spend to pharmaceutical revenue. Worldwide pharmaceutical R&D spend is forecast to grow at a compound annual growth rate of 3.2 per cent between 2019 and 2026 to €189.9 billion (£172.1 billion) (see figure 13). This is a little slower than the 4.6 per cent compound annual growth seen between 2012 and 2019. The decrease in the proportion of R&D spend to global prescription sales, from 21.3 per cent in 2019 to 16.7 per cent in 2026, suggests that the industry expects to reap the benefits of current investment in the years to come, with much higher sales. It should be noted that despite the fall in the proportion of R&D spend, the actual spend increases from €151.9 billion to €189.9 billion (£137.7 billion to £172.1 billion) over the same period (up 25 per cent). This aligns to the trends towards more specialised personal treatments amongst smaller population groups along with investment in greater R&D efficiencies through tech and AI and facilitates faster commercialisation of new ideas.

**Figure 13: Worldwide total pharmaceutical R&D spend, 2012–2026**

Source: EvaluatePharma, World Preview 2020.
The availability of VC is crucial to the growth of life sciences businesses as they move through the product life cycle. Pitchbook data allows the review of VC investment in Europe and specifically within life sciences–related areas of business. Figure 14 generally shows consistent growth in VC funding across the three broad areas of Health Care Devices and Supplies, Health Care Services and Systems, and Pharma and Biotech, with the latter growing significantly following a dip in 2016/17. VC funding for the year to end of September 2020, at €6.8 billion (£6.2 billion), is at its highest-ever level, exceeding the total for 2019 and almost double the level of funding achieved in 2016.

The global impact of COVID-19 has brought the importance of the life sciences sector sharply into focus and has created a “tailwind of opportunity” (JP Morgan, 2020). This is not just restricted to companies engaged in COVID-19-related R&D, but across the industry spectrum. As a result, investors have a renewed interest in exposure to the sector.

“Investors are taking a lead from what is happening in the U.S., which has a huge life sciences industry.”

– International lawyer

As reported by JP Morgan, the funding environment is evolving, and there is uncertainty about where it will end up. Pre-COVID-19, company valuations were increasing, partnerships were flourishing, and start-ups were able to access a growing pool of liquidity through venture capital and public markets. Figure 15 shows the evolution of health care and life sciences deals by structure with the two key areas of funding being VC and corporate R&D partnerships. These two sources of funding consistently exceed 50 per cent of deals globally over the last 10 years and represent a 10-year high of 57 per cent of deals in the first half of 2020. This demonstrates the importance of VC to the sector with consistently high levels of demand to deploy capital. It also shows the increasing importance, in terms of the number of deals, of the partnering up of businesses, often linking pharma and biotech to create mutual benefits and increase the pace of product delivery to market.
Definitions for figure 15

- Academic Research/Licence: licence product research at early stage of development
- IPO: initial public markets offering
- M&A: mergers and acquisitions
- R&D partnerships: mutually beneficial business partnerships bringing together different specialisms, often led by pharma
- Pipeline/business unit purchases: the purchase of future product in the development pipeline
- Sales/Co-promotion: combining marketing and sales of a product under same brand and strategy
- Venture rounds: VC capital raising

In chapter 4 we examined the potential for life sciences to develop in cities and countries that display certain characteristics in terms of the life sciences ecosystem. Here we analyse the ownership of LSRE and its spatial dimension, what occupiers want, and link these to leasing models, investment trends, and costs.

**Occupier requirements**

The specialised demands of innovation economy occupiers are often closely linked to the fledgling nature of their businesses. Start-ups in the volatile early stages of their business cycles require flexible space and contract terms as well as room to grow both their teams and their ideas. The importance of ideas to innovative firms means that shared and collaborative space are imperatives, and occupiers look for office and lab design that stimulates creativity and fresh thinking.

Of course, innovators in particular sectors may have specific real estate requirements. In pharmaceutical and biotech, for example, the rise of independent R&D providers means that there is demand for wet and dry lab space. Almost all occupiers will have exacting technology requirements, including high-quality fibre broadband connectivity and power systems (ULI, 2015) see figure 16.

**Stakeholders and property types**

Life sciences real estate buildings are owned by an extremely diverse group:

- Fund managers;
- Government agencies;
- Hospitals;
- Institutional investors;
- Integrated developer/owners;
- Listed and unlisted property companies;
- Local authorities;
- Owner-occupiers;
- Private investors;
- Real Estate Investment Trusts (REITs); and
- Universities.

**Figure 16: Innovation occupier requirements**

Source: ULI, 2015.
To better understand how such a mixed collection of owners are involved, one needs first to delve into the different target groups for LSRE (start-ups, scale-ups, and established companies) and the physical settings of life sciences real estate (incubator, accelerator, science park, and cluster).

Accelerators and incubators are often linked to and co-located with universities and teaching hospitals, whereas science parks and business parks are standalone locations, often set up by government agencies or local authorities. “Cluster” is a more flexible term, and a cluster can (a) feature elements of all the other location types and (b) be polycentric, extending over multiple locations within one city or region or even between adjacent countries. Note that incubators, accelerators, and parks can be multi-disciplinary in nature, catering for life sciences and other sectors (often high-tech sectors) alongside each other, whereas a life sciences cluster will have a clearer focus on life sciences.

The survey used for this report asked people for their view on the most productive types of location for life sciences. The answers were as follows:

1. Urban clusters, 44 per cent;
2. Science park, 26 per cent;
3. Business park with some science/R&D facilities, 17 per cent; and
4. University space, 8 per cent.

When a university, teaching hospital, local authority, or government agency owns and leases life sciences real estate, the objective is not primarily an investment objective, such as maximising the risk-adjusted return; the objective is more likely to be solving scientific problems, fostering a culture of collaborative innovation, or job creation. One incubator consulted for this report emphasised that it deliberately seeks to avoid a landlord-tenant relationship with its client companies.

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**Utrecht, Utrecht Science Park, Netherlands**

Utrecht Science Park is the largest science park in the Netherlands with the highest concentration of knowledge institutions. The site covers 322 hectares (796 ac), of which 260 hectares (642 ac) is owned by Utrecht University. Multi-tenanted workspace environments are offered by Utrecht Holdings (the Knowledge Transfer Office) of Utrecht University and University Medical Centre Utrecht (UMCU) in the LSI and Alexander Numan (buildings), and the University of Utrecht offers some space in the Kruygebouw and Androclusgebouw. Kadans, a Netherlands-based developer/operator, recently bought by AXA-IM, is the only commercial provider of multi-tenanted space. It owns the Genmab R&D Centre and is developing the adjacent 18,000-square-metre (193,750 sq ft) Accelerator building over 11 floors.

Most research institutes, medical buildings, and single-let buildings on the campus are university owned, although the Nutricia Research facility is owned by an institutional investor.

The park provides about 1.3 million square metres (14 million sq ft) of floor space (larger than Kendall Square, Boston) and employs 27,000 alongside a daily student population of 51,000. The park hosts over 120 businesses and is home to 20 start-ups (see utrechtsciencepark.nl).

It is located to the east of the city and is connected by a new tram line completed in 2019 to improve accessibility to the campus. The park is close to Utrecht city centre and readily accessible by public transport to Amsterdam. International connections are via Amsterdam Schiphol airport. The 2020 metro population of Utrecht is 544,000.

Construction started on site in 1960, with the first lecture theatres opening in the (now closed) Transitorium complex in 1961. Although unconfirmed, it is likely that the establishment of a science park was an initiative by the long-established university. Growth has been
considerable over the intervening years. Founders of the Utrecht Science Park include Utrecht University, City of Utrecht, UMCU, University of Applied Sciences Utrecht, and Provincie Utrecht with support from Utrecht Ondernemersfonds and the European Fund for Regional Development of the European Union.

Early-stage companies are often funded by Utrecht Holdings (the university and hospital), complemented by VC backing and incubator funding from UtrechtInc. ROM Utrecht, a regional government body, also provides growth funding.

The industry focus of the park is life sciences and health, and sustainability. Academic and medical institutions that are located on or near the park include Utrecht University, UMCU, University of Applied Sciences Utrecht, and Princess Maxima Centre. The park also hosts the only veterinary medicine faculty at Utrecht University and five faculties of the Hogeschool Utrecht (University of Applied Sciences). Life sciences and servicing companies located on the park include Merus, Genmab, and Nutricia Research.

Kadans reports office/lab rents of €23 to €31 per square metre per month (£20.80 to £28.10 per sq ft per annum), depending on the specification. Yields (NOI) are in the range of 4.0 to 5.0 per cent. Commercial space offered by the university “always has limited availability,” while Kadans reports full occupation of the Genmab building and full pre-letting of bespoke space in the under construction Accelerator building.

€2.1 billion (£1.9 billion) is earmarked for future commercial and student accommodation development between 2020 and 2025. Immediate future expansion plans include the construction of the David de Wied building for the Electron Microscopy Centre, a facility for the faculties of Science, Geosciences, Veterinary Medicine, and the UMCU. In addition, on the plot of the former Went building, a new development will accommodate the Ministry of Health, the National Institute for Public Health and the Environment (RIVM), and the Medicine Evaluations Board (MEB). Kadans is also actively looking to deliver a third development and reviewing refurbishment opportunities.
Spatial point of view

We now examine how the different life sciences settings work from a spatial perspective, using examples from the case studies woven into this report.

**Incubators** cater for start-up companies that are too small to need, or cannot afford to rent, dedicated office buildings or labs; therefore, incubators are dominated by shared space. The incubator in the picture below is located on the grounds of University College Dublin in the city’s suburbs. The incubator, called UCD Nova, houses 49 start-up companies across a series of interlocking buildings arranged in two courtyards on either side of a house built in the 1750s.

In addition to high-quality business units, labs, and co-working space, the incubator offers **within walking distance**:

- Access to the university’s researchers and R&D facilities;
- Peer-to-peer networking with a community of high-tech start-ups; and
- Facilitated access to the university’s pool of students for placements and recruitment.

Walkability is key because the start-up businesses collaborate with the university’s researchers and may use their labs. Collaboration does not stop within the university: UCD is located four kilometres south of Dublin’s city centre and therefore within a short cycle or bus journey from another life sciences incubator, the one belonging to Trinity College Dublin.

**Accelerators** focus on existing businesses that have the potential to grow, and therefore their scale and layout are different from incubators. An accelerator may have buildings close to but separated from each other; it may also offer production facilities, unlike an incubator. A good example, again from Dublin, is DCU ALPHA, which describes itself as a commercial innovation campus promoting the growth of research-intensive businesses. DCU ALPHA is co-located with Dublin City University, which lies about four kilometres north of the city centre. Forty companies employing more than 800 staff operate across the 3.6-hectare campus of office, lab-enabled office, industrial, and research space. In spatial terms, the buildings are within walking distance of the university and within easy reach of two other university-housed incubators (Trinity College Dublin and the Technical University Dublin Hothouse).
Figure 17: DCU ALPHA, innovation campus

The ALPHA campus is rich in extra capacity for companies that need space in which to grow. Ambitious plans to develop the site will amplify the available accommodation, extending the existing 200,000 sq.ft of office, lab and production space to 500,000 sq.ft by 2025.

Figure 18: Dublin – wider ecosystem

In the past ten years, over €3bn has been invested by companies in their facilities at Grange Castle and almost 2,500 people are currently employed in Grange Castle Business Park.
5. OVERVIEW OF PROPERTY CHARACTERISTICS AND PLAYERS

Parks cater to more established businesses, and their scale is a further step up from incubators and accelerators. Parks are not co-located with hospitals or universities, and they are generally found in suburban or out-of-town locations. Each business in a park can have its own dedicated building – this is another differentiating characteristic. An example from the Dublin case study is Grange Castle, a 200-hectare business park that can accommodate the largest-scale facilities, such as Pfizer’s bio plant, one of the largest integrated biotechnology plants in the world. This location also houses a Microsoft data centre and a Google data centre, which could be beneficial if life sciences and data science move closer.

Dublin, Ireland

Dublin’s life sciences cluster is polycentric rather than focused on a single location, although within the Dublin ecosystem Grange Castle business park stands out, occupying about 200 hectares. Owned by South Dublin County Council, Grange Castle is 10 kilometres (6.2 mi) from Dublin city centre and within easy reach of Dublin airport for international connections.

Ireland’s life sciences sector has grown rapidly from modest beginnings in the 1960s (Pfizer established an Irish base in 1969) to now being of global importance, having attracted a significant number of international corporates from the life sciences and tech sectors. Nine of the world’s top pharmaceutical companies are represented in Ireland. Ireland’s foreign direct investment (FDI) strategy is built on four pillars: pharma, medtech, financial services, and tech. Two of these pillars are closely associated with life sciences, and a third (tech) is increasingly connected.

Collaborative clusters in pharmaceutical, biotechnology, medical devices, and diagnostics have fuelled growth, with the IDA Ireland, previously known as Industrial Development Authority (IDA), reporting that the sector accounts to 32 per cent of GDP (about €140 billion/£126.9 billion in exports). Ireland is the third-largest exporter of pharmaceuticals globally (CSO, 2019). Further demonstrating the importance of the sector, COVID-19 has helped boost sector exports by 15 per cent in the first nine months of 2020 – accounting for 66 per cent of total exports as reported by Russell Lynch in the Daily Telegraph (14 Dec. 2020). About €2 billion is being invested annually in R&D by IDA client biopharma companies, with a further €1 billion of annual capital expenditure. Major occupiers include AbbVie, Medtronic, Pfizer, Roche, Sanofi, Aryzta, and Grifols.

Dublin has a city catchment of 1.9 million and an extensive network of colleges and universities to provide the necessary talent and skilled workforce. Relevant institutions in the city include Nova UCD (University College Dublin), Trinity Technology and Enterprise Centre (Trinity College Dublin), Trinity Biomedical Science Institute (Trinity College Dublin), TUD (Technical University Dublin), and the Royal College of Surgeons.

Expansion of the life sciences sector is through a mix of private venture capital and public-sector funding. FDI is funded by the IDA, with start-ups funded by Enterprise Ireland. Further financial support is available through local authorities (e.g., South Dublin County Council). Ireland has a long-standing policy of providing “advance” facilities to attract multinationals. In other words, the State is a speculative developer who gets paid in future taxes. For the incubators and accelerators on campus, the land and buildings are owned by the college but often partly
funded by philanthropists (e.g., the late Tony Ryan, who established Ryanair). Grange Castle Business Park, owned by South Dublin County Council, includes tenants such as Pfizer (which announced a €300 million investment in its three Irish sites in November 2020), Takeda, and Microsoft. Lease terms for major occupiers are difficult to confirm, but the *Dublin Gazette* reported on 20 February 2020 discussion of the sale of 8.1 hectares (20 ac) to Microsoft for a data centre – a 999-year lease with ground rent and a cost of €242,800 per hectare (€600,000 per ac/£545,000 per ac), which would bring in €12 million (£10.9 million) in fees to the Council. Prime office rents in the city are about €47 per square metre per month (£42.40 per sq ft per annum) with a vacancy rate of 9.5 per cent. A combination of a strong economy in Dublin, demand from world-class tenants, and the shortage of class A office space have proved Dublin a popular home for international capital, driving prime office yields down to 4.0 per cent.

In terms of the future, Ireland’s Innovation 2020 plan lists medical devices, therapeutics, and diagnostics as priority areas for investment. In November 2020, Trinity College appointed Savills to provide financial management and advise for the €1 billion (£910 million) Trinity East project – the potential development of a 100,000-square-metre (1.08 million sq ft) innovation campus at Trinity’s Grand Canal Dock site. The scheme is at the pre-planning stage, and the timeline is uncertain at present, but upon completion, the 2.2-hectare (5.5 ac) site will deliver 40,000 square metres (430,500 sq ft) of academic space, 40,000 square metres (430,500 sq ft) of commercial space, and 20,000 square metres (215,300 sq ft) of cultural and supporting uses.

Trinity East will house a major new research institute to be known as E3RI, focused on bringing together multiple disciplines – engineering, computer science, natural sciences, and material science – which will work at scale to tackle some of the most challenging research problems facing enterprise and society. In addition, Trinity’s four national centres – the SFI Centres AMBER, CONNECT, and ADAPT and the EI/IDA Technology Centre Learnovate – will be housed at the new campus, allowing enhanced interaction, collaboration, and industry engagement.

This next-generation campus development will recognise the importance of not just creating a collaborative ecosystem, but also providing a level of amenity and service that will contribute to a vibrant working and social environment that is becoming so critical in attracting and retaining talent.
As outlined before, a more recent trend is the broadening of the occupier base to include tech and fintech businesses as crossover and collaboration becomes more prevalent. At Alderley Park, near Manchester, Bruntwood SciTech has recently introduced a 14,000-square-metre (150,700 sq ft) tech hub including a range of AI, digital, and fintech occupiers. It would be no surprise to find parks curated to align with specific university science expertise and/or university hospitals. The number of businesses in occupation will depend on the size of the park and facilities for start-ups but are likely to range between 75 and 200.

Lease terms

According to our survey, the predominant arrangement is a lease with traditional rent (that is, a fixed amount with mark-to-market or inflation-related reviews) only. Hybrid leases featuring base rent plus a share of profit or base rent plus a share of revenue are uncommon. In life sciences there is extra focus on who pays for the fit-out. On the one hand, VC-backed tenants have funding but no steady cash flow so they might pay for fit-out in exchange for lower rent; established players, on the other hand, may prefer to pay higher rent and contribute less to the fit-out to reduce upfront costs. Within a park setting, long-term leases are signed, but in practice leases are often torn up as occupiers outgrow one location and move to another within the park. Leases really depend on the company’s stage of development: larger, more established companies have deep enough pockets to sign a more traditional office-type lease, but for the spin-outs and scale-up companies, it is all about flexibility.

In the United States, life sciences space tends to be leased on full repairing and insuring terms because a tenant manages its own space and is responsible for the ongoing expenses of the property. Tenants typically keep properties to the highest standards because the industry is highly regulated.

Regarding tenant improvements, fit-outs for life sciences companies can be complex and expensive. A property owner will work closely with the tenant to ensure the space is properly designed and in compliance with all relevant laws. More detail is needed on the lease terms to understand the legal side and contractual agreement for revenue. Particularly for owners and investors converting office to life sciences space on a smaller scale, understanding their leasing risk and downside protection is important, since some life sciences start-ups can be unsuccessful.

In terms of rent levels, European data is scarce, but the more mature U.S. market provides information. In Boston, the average asking rent for lab space is €83 per square metre per month ($108 per sq ft per annum), which is €7.70 per square metre per month ($10 per sq ft per annum) more than the asking rent for office space (Cushman & Wakefield, 2020).

Boston/Cambridge, Kendall Square, United States

Life sciences as a real estate sector was established in the United States where there are strong, established science and investment opportunities. The sector is also a key economic driver in the United States. Kendall Square in Cambridge, Massachusetts, is often described as “the smartest square mile on the planet” and forms part of the world’s premier life sciences supercluster of Greater Boston. The success of the life sciences cluster of about 314 hectares (776 ac) adjacent to MIT, close to Harvard University, and facing downtown Boston has attracted top companies and employees, driving population growth and tenant demand. Kendall Square employs 60,000.

The Greater Boston area has a population of 4.9 million. It is internationally connected by Logan International Airport. A revolution of life sciences began in Kendall Square as companies pursued their R&D in suburbia. Pooling the resources of
many small companies, affordable large office spaces provided opportunities for tech entrepreneurs to collaborate and inspire each other. Venture capital firms came calling and moved into Kendall Square. As Kendall Square is at its full evolution circle, a new wave of reinvestment and life sciences companies have located here.

The East Cambridge/Kendall Square area provides close to 1.1 million square metres (12 million sq ft) of office and lab space. Major real estate owners include Alexandria, Blackstone, BioMed Realty, Brookfield, Boston Properties, and King Street Properties. Its size and development has led to the success of a world-leading science cluster, and these real estate companies are looking to expand their operations worldwide, especially in Europe.

In addition to MIT and Harvard University, the academic talent pool is drawn from Boston University, Tufts University, Lesley University, and Hult International Business School. In addition, the area hosts six major hospitals, including Boston Medical Centre, Massachusetts General Hospital, and the Dana-Farber Cancer Institute.

Milestones in the evolution of Kendall Square include the 1978 selection of Boston Properties to develop a 140,000-square-metre (1.5 million sq ft) “Golden Triangle” mixed-use district. In 1982, Biogen established its headquarters in Kendall Square, and the Whitehead Institute was founded as a major centre for genomics and the Human Genome Project. The year 2000 saw the launch of Cambridge Innovation Centres by Tim Rowe, now claiming to house more start-ups than any other building on earth.

Although the original focus of the area was biotech, including cancer research, the spectrum of science, tech, and supporting services is now far broader. The last 20 years have seen an impressive range of science and tech companies move into the area, including Google, Microsoft, Pfizer, Moderna, and Apple.

The whole ecosystem is very well supported by VC and private equity funding from the likes of MPM, Atlas Venture, Polaris, and Interwest, plus real estate giants such as Blackstone, who can provide equity and real estate solutions.

Average asking rents for lab space are €84 per square metre per month ($109 per sq ft per annum), a 59 per cent premium over office rents. Vacancy rates are an extremely low 1.5 per cent and, as a result, developments (and existing assets) earmarked for office are now being repositioned as lab space, which will bring more lab supply to the market as office values continue to degrade (per Savills).

Future plans to relieve pressure on the area include a migration to the Seaport area, which has the potential for significant growth and where Ginkgo Bioworks and Vertex are already key tenants.
Chapter 3 discussed how demographic trends and other indicators point to sustained, strong growth for the life sciences industry, which can potentially make life sciences properties an attractive proposition for investors and developers. The investment background is also favourable, given the ongoing strong interest in real estate as an asset class in today’s low-interest-rate environment and a lack of core product at attractive prices in the traditional sectors. The life sciences sector has also been more resilient in terms of income in comparison to other office sectors, because of its structural growth, anticyclical nature during a pandemic and the specific office layout which makes working from home more difficult. The life sciences industry has been in the spotlight for much of 2020 as government officials and the public pin their hopes for economy recovery on the discovery of a COVID-19 vaccine. This involves the resilient supply chain of research and innovation, clinical trials, and manufacturing. Life sciences real estate could therefore provide investors with two benefits: yield and the diversification benefits of an anti-cyclical play.

The various disciplines within life sciences and the respective space needs of this diverse set of companies will demand industry knowledge, specialised real estate expertise, and local market knowledge. Even with the proper skill set, however, investors and developers will need to be forward-looking to provide state-of-the-art, flexible-use space that not only fosters collaboration and innovation, but also can accommodate tenants’ evolving requirements (see Institutional Real Estate, 2020).

In Europe, despite the predicted continued growth, the life sciences sector is not yet understood well by the real estate industry or recognised as a distinct investment sector. This is partly due to lack of transparency or, as one participant in our roundtables noted:

“If you have the data, it benefits you to keep it close to yourself.”

– Global real estate adviser

Investor trends

Investment data is hard to come by in Europe. At present, no forum or centralised data hub exists where a diverse group of owners could, if they wished to, share data, and as a result it is very challenging to get a clear picture of the total LSRE investment market in Europe.

However, a handful of sources are available. One of these is Real Capital Analytics, who have gathered details on 262 deals over the five-year period from Q3 2015 to Q3 2020. Life sciences real estate is still a niche part of overall real estate investment in Europe, as figure 19 illustrates, accounting for less than 1 per cent of average quarterly volumes when the other sectors (apartment, hotel, industrial, office and retail) are included.

Figure 19: Life sciences investment in Europe as a percentage of total real estate investment

Top destinations and sources of capital

Figure 21 shows the top five investment destinations for investment in European LSRE over the period Q3 2015 to Q3 2020. The top five countries together account for 76.3 per cent of total volumes. In order, these are the UK, France, Switzerland, Germany, and the Netherlands. The other countries, ranked from sixth to last by investment volume, are Sweden, Italy, Norway, Austria, Denmark, Finland, Belgium, Poland, Ireland, Spain, Romania, Hungary, Portugal, and Serbia. There has been movement from year to year over that five-year period: for example, the Netherlands has been ranked fifth, fourth, and second during different years.

As figure 21 demonstrates, the main countries of origin for investors in European LSRE are France, the UK, United States, Switzerland, and Germany. These countries account for 70 per cent of total investment. The next five, ranked from sixth to 10th, are Sweden, Norway, Canada, the Netherlands, and Finland. There has been considerable movement from year to year, just as there has been with investment destinations. For example, in 2015 the American investors outspent the French and the British investors, whereas one year later it was the French investors on top.
Most transactions involve assets that are smaller than 50,000 square metres. There were only 14 instances of larger assets changing hands over the five-year period, and in 13 of those cases, the asset was described as a “park” or “campus”.

### Pricing of deals

In terms of the pricing of deals, it is very challenging to get reliable data on cap rates (yields) in this market. Less than 20 per cent of the deals in the Real Capital Analytics database have an attached cap rate, and the rates are spread all the way from 2.5 per cent to 11.7 per cent. Such a wide variety suggests that the investors cover the full risk spectrum from core to opportunistic. It may also reflect the fact, noted previously, that some owners have objectives for their real estate that are not investment objectives. There is no clear correlation between cap rate and deal size (in €) or between cap rate and asset size (in square metres).

### Scale and property type

During the structured interviews, we asked: “Which is your preferred investment in terms of physical scale and property type?” Owning an entire park or “geography” is seen as preferable to owning individual buildings. Bigger is generally better because scale gives the ability to create and control an ecosystem, which allows active management.

In the ULI global member survey conducted in November 2020, participants showed a clear preference for scale. When asked about their preferred scale of investment, they answered as follows:

- Entire science park or similar large scale (37.8 per cent);
- Major blocks exceeding 10,000 square metres in size (20 per cent); and
- Mixed-use life science campus (20 per cent).

“Invest in the strength of the ecosystem and not the building. The successful ecosystem will generate high corporate and real estate returns.”

– International consultant
Investment purpose

Competitive risk-adjusted returns and the potential for capital growth are the two main reasons for investing in European LSRE, according to the ULI member survey conducted in November 2020.

If investment in European life sciences real estate is to follow the same path as in the United States, more transparency is needed. Transparency around rental levels, yields, vacancy rates, and valuations would give confidence to investors and would also encourage speculative development. There seems to be no shortage of capital, but without data a “leap of faith” is required; or to put it another way, the key is finding the right opportunity and overcoming nervousness among investors.

“There are three major challenges: lack of data, lack of expertise, and lack of suitable investment opportunities.”
– Global real estate lender

“Investors and developers need to understand the language. These are not real estate people; they are heads of R&D or chief technical officers, and the language is different.”
– International consultant

“The more consistent level of occupation, compared with office-based companies suggests that life sciences companies, on the whole will have a much higher willingness to maintain or increase their office and laboratory real estate footprint.”
– Savills, 2020
5. OVERVIEW OF PROPERTY CHARACTERISTICS AND PLAYERS

Repurposing existing buildings for life sciences

There are some overlaps between high-tech sector environments and traditional urban industrial and office developments; they also have many distinct needs which real estate and urban development have to respond to. LSRE in an urban setting poses the challenge of repurposing existing stock.

Retail buildings are one possibility as they tend to have delivery access, goods storage areas, plant space, and high floor-to-ceiling heights. Industrial buildings can also lend themselves well to repurposing because of adaptability and cheap build. One could put a new box within an existing box in an industrial building, and this is probably cheaper and faster than repurposing an office building, where one might need to install a new plant on the roof.

As working practices change and landlords reconsider the highest and best use of their office stock, pivoting towards the life sciences may be attractive. A vibrant city centre can help attract and retain top talent.

In central locations in older cities such as London, such a change of use will likely require planning permission and could prove to be prohibitively expensive; however, the degree of change needed may reduce over time if data science plays a bigger role and lab work a smaller role going forward, as many predict.

Comparative costs analysis

AECOM has provided a comparative costs analysis example to demonstrate the difference in build costs for a standard office development versus a lab/office hybrid (figure 26). The data is limited to the central London market of King’s Cross.

Assumptions common to lab/office hybrids:

GIFA is 220,000 sq ft
Offices = 60% of Net Area
CL2 Dry Labs = 28% of Net Area
CL2 Wet Labs = 12% of Net Area

Note: GIFA = Gross internal floor area
NIFA = Net internal floor area
CL2 Lab = Containment Level 2 labs are used for work with medium-risk biological agents and hazards, genetically modified organisms, animals, and plants. Details of the different biosafety levels can be found on this website: www.labmanager.com.

Figure 26: Central London costs analysis example (all figures in £s and £ per sq ft)

<table>
<thead>
<tr>
<th>New-build BCO office</th>
<th>New-build lab/office hybrid</th>
<th>Office conversion lab/office hybrid</th>
<th>New-build lab/office hybrid low storey</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S&amp;C CAT A build cost</strong></td>
<td>£330/sq ft GIFA £73m</td>
<td>£405/sq ft GIFA £89m</td>
<td>£290/sq ft GIFA £64m*</td>
</tr>
<tr>
<td><strong>Net:Gross ratio</strong></td>
<td>80% to 85%</td>
<td>65% to 70%</td>
<td>65% to 70%</td>
</tr>
<tr>
<td><strong>Expected rental value</strong></td>
<td>£54.50/sq ft NIFA</td>
<td>£75/sq ft NIFA £125/sq ft in prime locations</td>
<td>£70/sq ft NIFA £110/sq ft in prime locations</td>
</tr>
<tr>
<td><strong>Annual gross rent on 220,000 sq ft GIFA</strong></td>
<td>£9.6m to £10.1m</td>
<td>£10.7m to £19.2m</td>
<td>£10.0m to £17.0m</td>
</tr>
<tr>
<td><strong>Approx. construction cost yield</strong></td>
<td>c.13% to c.14%</td>
<td>c.12% to 21%</td>
<td>c.15% to 27%</td>
</tr>
</tbody>
</table>

Source: AECOM.
Note: All figures in £s and £ per sq ft.
* Excludes facade replacement
We have drawn on expertise from AECOM to highlight why there are differences in costs between new-build standard offices and new build office/lab space:

**Shell and Core Premium:**
- Net space is a larger proportion of GIFA, i.e., lab materials distribution, plant, and riser space
- Landlord MEP plant (capped at risers) serves greater demand, e.g., higher air changes, lower heating and cooling deviation for tighter environmental control, BMS capability, main LV switchboard capacity
- Dedicated lab plant; cat. 5 water, general lab extract
- Min 500 mm higher storey heights in a lab, increasing W:F ratio
- Greater structural mass

**“CAT A Lab” Premium:**
- Achieving Containment Level 2
- Hardwearing finishings; walls, floors, and ceilings
- Lab benching, storage, sink, and safety stations
- MEP on floor distribution to above landlord systems
- BMS monitoring to more onerously serviced space
- Security to protect tenant assets/equipment

**“CAT B Lab” Premium:**
- Whilst “CAT B Lab” fit-out is excluded, tenants may require “CAT B Lab” elements in future, i.e., dedicated fume extraction, lab gases, steam generation. Future fit-out of these elements should be considered in Shell & Core provision to enable tenants to fit-out/contribute financially.

**Note:** The principles of CAT A and CAT B fit-out are the same for offices and labs. CAT A takes a building from landlord shell and core responsibility (shared reception, cores, lifts, lift lobbies, communal areas, plant/shared amenity space, facilities management offices etc., including all life safety plant/services that the landlord is duty bound to provide and to validate their own insurance), allowing a level of fit-out in tenant demise (usually raised access floor, suspended ceiling, office area basic lighting), allowing for a tenant to undertake their specific CAT B fit-out (including kitchen facilities, restaurant, conferencing, executive and other meeting room requirements, specific IT/AV requirements etc.).

For labs, tenant requirements will often include additional items such as lab benching. There are multiple variations of this, depending upon the nature/maturity of the tenant — everything from plug-and-play desks with all services being brought in and covered as a service charge to the tenant, to more mature tenants who know what they want, with the developer only providing shell and core, with the rest being the tenant’s responsibility.

The preceding London example demonstrates a potential considerable premium in rent (NIFA) of about 35 per cent or more, but this will depend upon the “primeness” of the location. This compares with a rental premium of nearer 60 per cent seen in Boston/Kendall Square. However, caution does need to be applied to this data as there are many variables around location and precise property type to consider.

The office conversion costs look favourable, but there are many issues and challenges in undertaking this route, including planning, floor-to-ceiling heights, floor loading, the ability to accommodate additional monitoring and evaluation, fume extraction, waste, hazardous storage, and so on. It is an area that demands a detailed knowledge of tenant requirements both now and in future, to accommodate growth and life-cycle changes in requirements.
6. CONCLUSIONS AND RECOMMENDATIONS

At a time when investment in the life sciences sector has been boosted by (hopefully) a one-off global pandemic, there is a genuine opportunity for the real estate industry to engage in and benefit from a structurally growing sector that has government, private sector, and society support. In addition to COVID-19, a number of structural growth drivers and broader sector trends further spur the growth of the life sciences sector, which requires suitable real estate. The growth of the sector presents an investment opportunity for those who are willing to get fully acquainted with the sector’s nuances, which range from the specific requirements of life sciences buildings (including wet labs and dry labs) to the layout of life sciences locations (such as incubators, accelerators, and parks).

Understanding what makes a successful life sciences ecosystem, as illustrated by the case studies, is key to success. This is seen by an increasing preference for urban clusters.

The report has highlighted throughout the societal and demographic factors that drive further growth of the life sciences sector as well as the broader trends that will enable further growth and help shape the life sciences sector, see figure 27.

The qualitative research for this report identified five key weaknesses and opportunities for the European LSRE, as detailed in figure 28.

Figure 27: Macro and micro drivers and trends in the life sciences sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Drivers</th>
<th>Trends</th>
<th>Macro</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Demographics – ageing</td>
<td>• Technology</td>
<td></td>
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<tr>
<td></td>
<td>• Lifestyle diseases</td>
<td>• Urbanisation</td>
<td></td>
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<tr>
<td></td>
<td>• Health care spending</td>
<td>• War for talent</td>
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<tr>
<td></td>
<td>• Coronavirus pandemic</td>
<td>• Sustainability</td>
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<tr>
<td>Country</td>
<td>• Government policy</td>
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<td></td>
<td>• Government funding</td>
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<tr>
<td></td>
<td>• Academia and universities</td>
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<tr>
<td></td>
<td>• Competitiveness</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Tax and legal framework</td>
<td></td>
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<tr>
<td>City/location</td>
<td>• Affordable office and living space</td>
<td></td>
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<tr>
<td></td>
<td>• Urban environment attractiveness and amenities</td>
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<tr>
<td></td>
<td>• Triple/quadruple helix</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Venture capital funding and corporate research and development funding</td>
<td></td>
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</tbody>
</table>

Source: ULI.
The learning curve is steep, and business case data is not as readily available to investors as it is in the more established real estate sectors such as offices, retail, and industrial; however, experience from the more mature U.S. market indicates that the effort will be rewarded.

**Recommendations**

The opportunity exists now, more than ever before, to create the transparency a maturing real estate market requires by agreeing on common definitions and creating knowledge of demand, supply, costs, rents, ownership, and lease terms through structured data that is verified and maintained.

To tap into the opportunities the life sciences sector provides from a structural growth and diversification perspective in Europe, the real estate industry needs to act in the following key ways, helping overcome the barriers to the sector.

- **Overcome the lack of reliable data.** Investment research companies should collect and incorporate medical offices and laboratory space in their quarterly index reporting from specialist investors and developers, according to pre-agreed, common definitions. Encourage real estate players and investors to publish rental rates and ownership/management for health care properties, offices, and labs. Having this data would give investors confidence and attract capital by removing a lot of the assumptions as to risk and return.

- **Create a life sciences real estate building specification guide.** Better information and knowledge sharing is needed on specific space requirements for investors and developers to understand what real estate is required, the time frame and building specifications. Both start-up flexible space and large corporate spaces should be included. This would inspire confidence in life sciences development and investment.

- **Align interests and build transparency between owners and occupiers.** Landlords might work with their tenants to better understand their real estate requirements, or even become a venture capital partner with a direct stake in the success of their businesses. Real estate must become a collaborating partner.

- **Be prepared for continuous adaptation, feedback, and complexity.** Real estate developers and investors need to design tailor-made solutions when it comes to access, location, workplace, building layout, and rental terms. Given the volatile user requirements, a new business model is essential.

- **Factor in mega-trends in LSRE decision-making.** Real estate investors need to track global mega-trends such as housing affordability, ageing populations, competitiveness, and reliance on technology as part of life sciences investment decision-making.

- **Provide hands-on stewardship** to address the broader framework for innovation. This means not only managing relationships between big companies and start-ups, but also exploring opportunities to provide accommodation or social infrastructure. It also means engaging with the life sciences innovation ecosystem to address gaps: be they skills, capital, affordability, or density. Real estate must actively help grow its tenants.
EU COVID-19 additional expenditure

In response to the COVID-19 pandemic in 2020, the European Commission leaders have agreed a total recovery package of €1.8 trillion (£1.63 trillion) that combines the EU budget for 2021–2027 and NextGenerationEU. Under this agreement, the Commission will be able to borrow up to €750 billion on the markets.

In respect of life sciences and public health investment, the Coronavirus Global Response pledging marathon has raised €16 billion (£14.5 billion) from donors worldwide to provide universal access to treatments, tests, and vaccines. The EU Commission donated €1.4 billion (£1.3 billion).

The following list highlights significant areas of EU spend specifically in relation to COVID-19:

- Participation in the COVAX Facility for equitable access to affordable COVID-19 vaccines - €400 million (£363 million) in guarantees;
- €660 million (£599 million) under Horizon 2020 to develop vaccines, new treatments, diagnostic tests and medical systems;
- €75 million (£68 million) loan to CureVac, an innovative European vaccine developer;
- European Investment Bank (EIB) - €100 million (£91 million) financing agreement with immunotherapy business BioNTech SE to develop a vaccine programme;
- In support of public health, an allocation of €3 billion (£2.7 billion) from the EU budget, matched by €3 billion (£2.7 billion) from member states to fund the Emergency Support Instrument and RescEU’s common stockpile of equipment; and
- €100 million (£91 million) from the Emergency Support Instrument is invested in testing strategies, including rapid antigen tests.

UK COVID-19 additional expenditure

Figures for additional UK health-related expenditure on COVID-19 have been extracted from the National Audit Office report of September 2020. A number of the initiatives were announced between March and May with initial cost estimates that have subsequently been revised, sometimes significantly.

Initial additional spend was projected to be up to €8 billion (£7.3 billion). As the seriousness of the pandemic has become clear, additional spend is now estimated to be up to €31.9 billion (£29 billion).

The following illustrate significant areas of spend:

- Funding to accelerate the construction of the Vaccine Manufacturing and Innovation Centre – up to €102 million (£93 million).
- Funding to support and accelerate the University of Oxford and Imperial College vaccine programmes – initially €140 million (£127 million), revised to €184 million (£167 million).
- Funding for a Cell and Gene Therapy Catapult Manufacturing Innovation Centre intended to accelerate the mass production of a successful vaccine – €116 million (£105 million).
- Design and manufacture of new ventilators in addition to those procured by the health sector – up to €500 million (£454 million).
- Procurement of medical equipment, including ventilators – €661 million (£600 million).
- €661 million (£600 million) for an Infection Control Fund, ringfenced for adult social care, specifically to control the spread of COVID-19 in care homes in England, in addition to funds made available to local authorities to support key public services.
• An initial estimate of €4.4 billion (£4 billion) spend on acquiring and distributing personal protective equipment (PPE) for frontline staff has risen to in excess of €16.5 billion (£15 billion).

• €9 billion (£8 billion) on health services, including the use of private-sector facilities, enhancing the NHS discharge process, keeping pharmacies and GP practices open on bank holidays, a life assurance scheme for eligible health and social care workers, and the roll-out of the flu vaccination programme.

• Up to €220 million (£200 million) in support of hospices.

• Non-ringfenced support to local authorities and other local services to include the social care workforce helping the most vulnerable – an initial estimate of €1.75 billion (£1.6 billion) has now risen to €4.1 billion (£3.7 billion).

• In the November 2020 government spending review, a further €61 billion (£55 billion) was announced in support of COVID-19 related issues. €16.5 billion (£15 billion) of funding was announced for R&D in an effort to make Britain a “scientific superpower”, to be targeted at areas including quantum technologies for cryptography to managing new imaging technologies for cancer treatment.

• In a separate announcement, the government declared a €22 million (£20 million) funding package for AI. The Turing AI Acceleration Fellowships will support 15 businesses with resources to advance their research.
APPENDIX 2: TOP FIVE SURVEY FINDINGS

1. For investors, advisers and lenders, what are the main differences between traditional real estate and life sciences real estate?

- Specialised knowledge required to operate/manage: 45%
- Capex required: 40%
- Performance benefits of clustering: 35%
- In-house skills required: 30%
- Intensive operational management: 25%

2. If you invest in life sciences real estate, what is your investment purpose?

- Competitive risk-adjusted returns compared with other asset classes: 40%
- Potential for capital growth: 35%
- Diversification: 30%
- Relatively stable cash flows: 25%
- Higher returns than traditional real estate: 20%
3. In your firm, what do you consider the greatest challenge in life sciences real estate?

- Lack of suitable real estate: 60%
- Lack of knowledge about the sector: 40%
- Lack of data to make informed decisions: 30%
- Lack of expertise: 20%
- Lack of available capital: 10%

4. In your view, which are the most productive types of location for life sciences?

- Urban clusters: 50%
- Science park: 40%
- Business park with some science/R&D facilities: 30%
- University space: 20%
- Other: 10%

5. Which types of real estate are of interest to you?

- Research labs: 100%
- Wet labs: 90%
- Office: 80%
- Collaborative spaces: 70%
- Manufacturing facilities: 60%
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