

BIOMEDICAL SCIENCES

A NICHE ASSET CLASS WITH STRONG
GROWTH PROSPECTS

MARCH 2022





Asia's leading biomedical science hub

Bolstered by increasing biotech investments and accelerating healthcare research, the biomedical sciences (BMS) industry has experienced strong growth in recent years, further reinforcing Singapore's position as a leading biomedical science hub at the heart of Asia.

According to latest data compiled by Enterprise Singapore (ESG), local biomedical companies raised a record of more than US\$600 million in funding during the first three quarters of 2021. This is more than five times from about US\$86 million in 2016 and about 30% higher than 2020's haul of US\$464 million.

A deep base of skilled talent, strong manufacturing capabilities and thriving research ecosystem has helped Singapore in attracting many pharmaceutical and biotechnology firms, from multinational corporation (MNCs) to start-ups to set up here, serving patients / clients from around the world and connecting with the growing Asian market. In terms of innovation, Singapore ranks eighth globally and second within Asia Pacific, according to the Global Innovation Index (GII) 2021 by the World Intellectual Property Organization. The index captures the innovation ecosystem performance of 123 economies and tracks the most recent global innovation trends.

The prospects for the BMS industry look promising which would drive a rise of real estate solutions catered to meet the growing demand.

This report provides an overview of Singapore's BMS industry and its real estate requirements with the focus on key drivers for the industry, demand, future supply and rentals of life science properties.

Biomedical science industry: a key and growing pillar of Singapore's economy

The BMS industry, which comprises pharmaceuticals, medical technology, biotechnology as well as healthcare services, is a key and growing pillar of Singapore's economy and has grown from strength to strength, employing over 24,000 workers¹ in 2019, across research, manufacturing and headquarters' (HQ) functions, compared to 16,000 workers in 2013.

Singapore's BMS landscape is anchored by major research institutes as well as biomedical giants and supported by a vibrant pool of local companies. Major world-renowned pharmaceutical and biologic companies have set up their own facilities in Singapore, while four of the top ten drugs used in the world are made in Singapore.

Companies such as GlaxoSmithKline, Procter & Gamble, Merck Sharp & Dohme (MSD), Takeda Pharmaceuticals and Roche have established many of their regional HQ functions in Singapore, including Supply Chain Management, Regulatory Affairs and Medical Affairs as they position the city state as a BMS hub for Asia.

Figure 1: Top BMS Companies in Singapore



¹ RIE2025 Plan

Biomedical manufacturing - the fourth pillar of the nation's manufacturing economy

Bolstered by its vibrant Research & Development (R&D) community, Singapore has emerged as an ideal location for biomedical manufacturing. Industry leaders like Pfizer, Novartis, Sanofi, AbbVie and Amgen sited their manufacturing hubs in Singapore for a wide range of products including active pharmaceutical ingredients, drug products and biologic drug substances.

Notably, it was announced in April 2021 that pharmaceutical giant Sanofi Pasteur is investing S\$638 million over five years to build a vaccine production centre in Singapore, giving a boost to the city-state's growing biomedical manufacturing cluster. Subsequently, BioNTech has designated Singapore as its regional headquarter for South-east Asia in May 2021 and also planned to set up an mRNA manufacturing facility here. Such moves would contribute significantly to the region's ability to address future pandemic threats. BioNTech plans to open its Singapore office and start the construction of the manufacturing facility in 2021. The site is expected to be operational in 2023.

Recognised as the fourth pillar of the nation's manufacturing economy, alongside electronics, engineering and chemical industries, BMS manufacturing industry has grown strongly over the years. According to data from EDB, BMS manufacturing output reached around S\$19 billion in 2018, a fourfold increase from S\$4.8 billion in 2000. Despite the economic recession caused by the COVID-19 pandemic, BMS manufacturing registered a y-o-y growth of 11.2% reaching S\$16 billion in 2020.

Given the prospects for BMS manufacturing in Singapore, the industry attracts healthy levels of fixed asset investments (FAI). In 2020, biomedical manufacturing attracted FAI of S\$638 million – 7.4% higher than the five-year annual average of S\$595 million between 2015 and 2019. The FAI in biomedical manufacturing continued to rise by almost 60% during the first three quarters of 2021, indicating investors / manufacturers' strong confidence in the outlook of this sector.

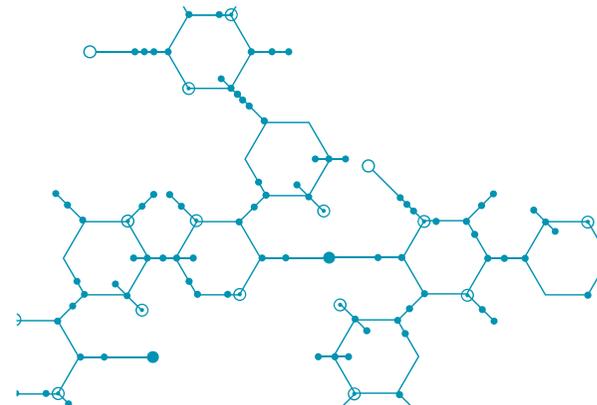
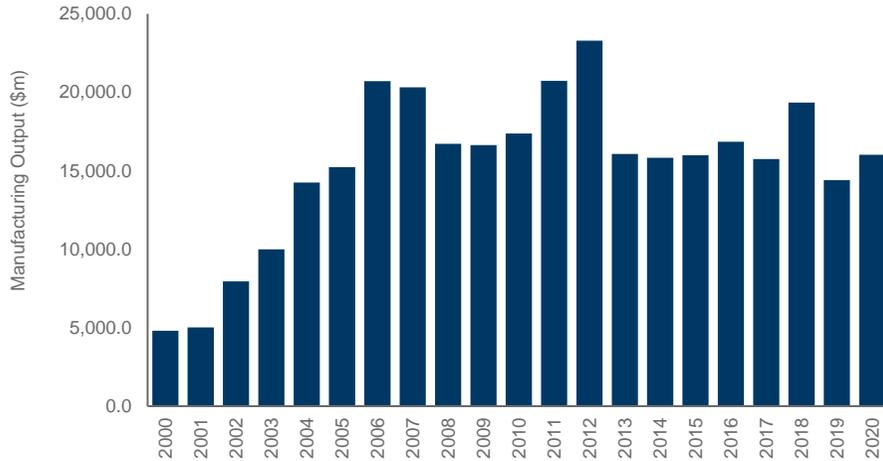
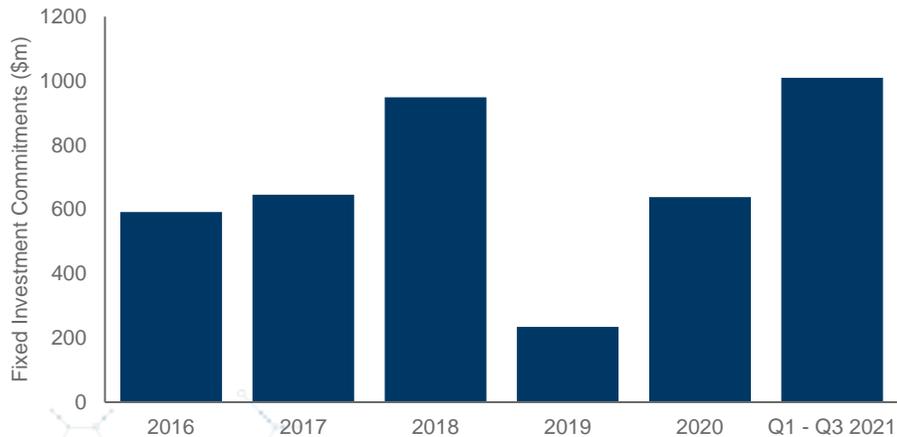


Figure 2: Manufacturing Output for Pharmaceuticals & Biological Products



Source: EDB, Cushman & Wakefield Research

Figure 3: Fixed Investment Commitments in Biomedical Manufacturing



Source: EDB Singapore, Cushman & Wakefield Research

Significant increase in public sector funding to fuel growth

The Research, Innovation and Enterprise (RIE) 2025 Plan will channel S\$25 billion into research and innovation. This represents a 32% increase compared to RIE2020, when the government committed S\$19 billion². This is testament to the government's commitment to establish Singapore as a global research and development hub.

RIE 2025 kicked off in 2021, guiding Singapore's budget allocation on R&D to "meet a broader spectrum of national needs in the next five years - and to build a knowledge-based and innovation-driven economy and society".

RIE 2025 efforts will be organised along four strategic domains, supported by three cross-cutting horizontals. Human Health and Potential (HHP) is one of the four prioritised verticals in the RIE2025 framework. The HHP domain has its origins in the BMS initiative, which was launched in 2000 to develop the life sciences as a pillar of Singapore's economy. Under the RIE 2020 plan, the BMS efforts were driven under the Health and Biomedical Sciences (HBMS) domain. In RIE 2025, the HHP domain will build on Singapore's existing HBMS capabilities and incorporate a new emphasis on furthering human potential.



² Research Innovation Enterprise 2020 Plan: Winning the Future through Science and Technology

Figure 4: Research, Innovation and Enterprise Framework

Manufacturing, Trade and Connectivity (MTC)

Leveraging R&D to reinforce Singapore's position as a global business and innovation hub for advanced manufacturing and connectivity

Human Health and Potential (HHP)

Better transform and protect health, advance human potential and create economic value for Singapore

Urban Solutions and Sustainability (USS)

Renew and build a liveable, resilient, sustainable and economically vibrant city for tomorrow

Smart Nation and Digital Economy (SNDE)

Develop technology leadership to drive our Smart Nation ambition, and anchor Singapore's position as a trusted digital innovation hub

Academic Research

Build a robust base of research capabilities and peaks of international excellence

Manpower

Nurture a strong research and innovation talent pipeline

Innovation and Enterprise

Accelerate enterprise innovation

Under the RIE 2025, funding for investigator-led research will be increased to encourage bottom-up research ideas and sustain a healthy research ecosystem. New expertise will be developed in Health Tech, Population Health and Health Services Research.

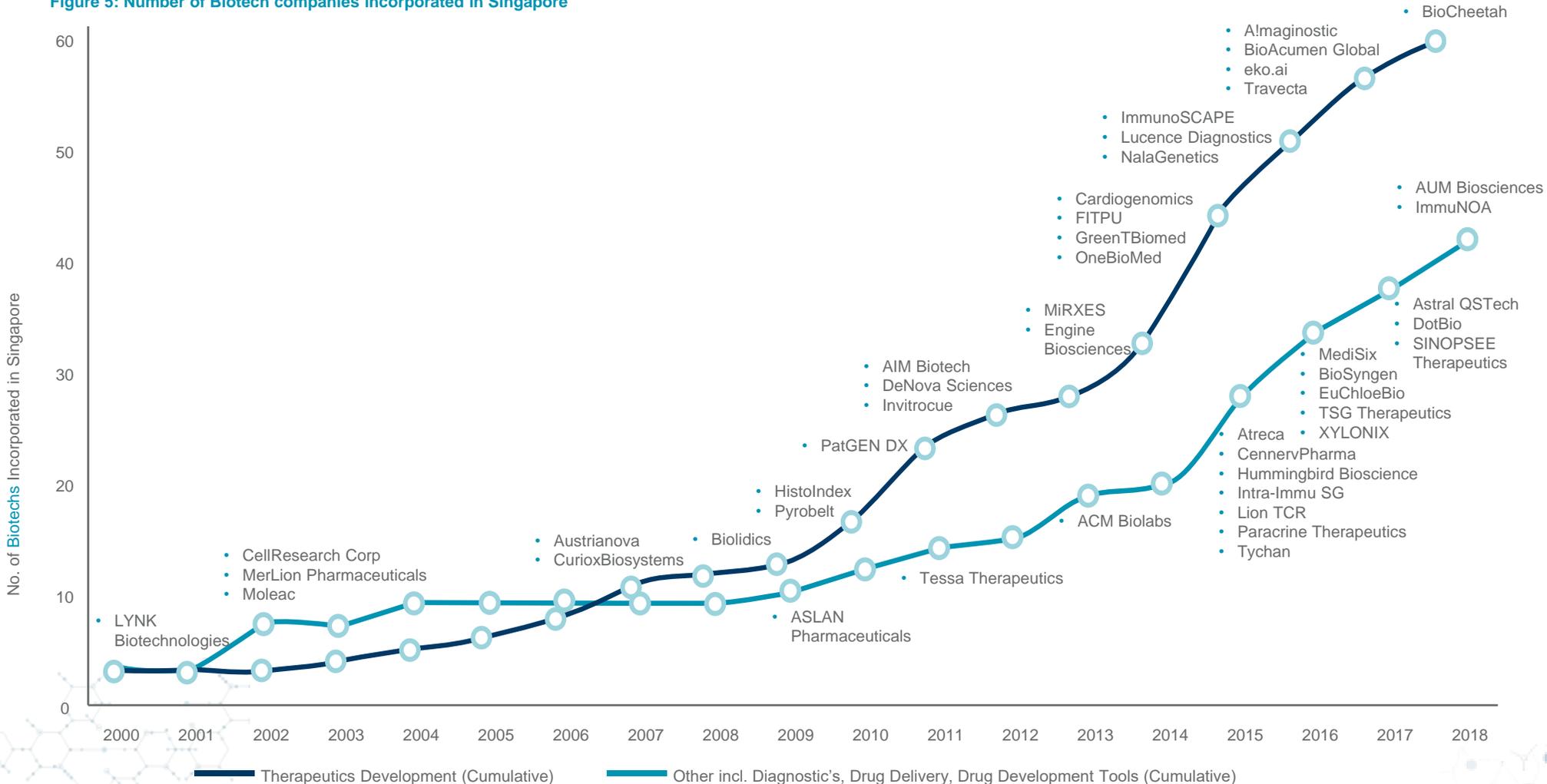
Source: National Research Foundation



Biotech expected to be key driver of future economy

Given that innovation will be a key driver of the new economy, Singapore has continued to invest and nurture start-ups in the biotech sector which is rich in intellectual property and deep in technology. This is evidenced by the rapid growth of biotech start-ups over the past decade. In 2018, there were 100 home-grown biotech companies in Singapore, a 26.6% increase compared to 79 in 2017.

Figure 5: Number of Biotech companies incorporated in Singapore



Source: A*Star



The growth of food tech driving up demand for space

With the city-state's "30 by 30" goal – producing 30% of its nutritional needs locally by 2030, Singapore is transforming itself into the food tech hub of Asia given its land scarcity for intensive farming activities. MNCs and start-ups from around the world have set up their facilities here to take advantage of the emerging trends on the back of strong governmental support for the sector.

A*STAR launched the Singapore Institute of Food and Biotechnology Innovation, a new research institute focusing on research in food structure engineering, biotechnology, agri-food technology and food safety at Biopolis in 2020. Additionally, Temasek has signed an agreement with A*STAR in late 2020 to establish a Food Tech Innovation Center. Recently in November 2021, Temasek has launched a new company named Asia Sustainable Foods Platform to drive the sustainable food initiative and establish an ecosystem for food tech across Asia, supporting food tech companies from product development to commercial production. This firm together with A*STAR are said to invest more than S\$30 million over the next three years in the Food Tech Innovation Centre. The center will be outfitted with

laboratories and test kitchens for start-ups that lack such facilities, aiming to accelerate the commercialization of promising food technologies in Singapore.

Traditional vegetable farming and livestock production consume large amounts of water and are a major culprit in greenhouse gas emissions. Food tech has the potential to lighten the environmental impact and ensure sustainability as well as reduce Singapore's dependency on food imports, especially after lessons learned from major supply chain disruptions during the pandemic. Therefore, we anticipate more firms setting up their labs and facilities in Singapore, fueled by increased demand for food tech coupled with Singapore's business-friendly environment and continued government support for food R&D. According to EDB, the government has recently set aside S\$60 million in 2021 to facilitate businesses in adopting better technology for food production. This emerging sector would drive demand for biomedical space.



Prevailing megatrends to drive increased pharmaceutical spending

The potential growth of Asia's pharmaceutical markets would be further boosted by prevailing mega trends in Asia over the next decade. This includes an emerging middle class in Asia, increasing populations, ageing societies, and political pressure to expand healthcare services. These combined factors would lead to increases in medical purchases, driving Asia's pharmaceutical market growth.

Though most of this growth will occur in the region's large emerging markets, each country is expected to see a compound annual growth (CAGR) of 5-10% from 2018 to 2022. Singapore is poised to ride this wave of growth given its position as a biomedical hub in Asia-Pacific.



More than 1 billion Asians are set to join the global middle class by 2030

Source: World Lab Data



By 2030, labor force of Asia Pacific will have grown by

85 million people,

while in contrast North America and Europe together will only add 18 million

Source: Moody's Analytics



Asia to be home to **60%** of the world's over 65s by 2030

Source: Deloitte



SG healthcare spending to reach **S\$45.9 billion** in 2030

Source: Fitch



Figure 6: Annual Growth of pharmaceutical spending (\$US) in Asian countries

Country	2013-17 (Actual)	2018-22 (Projected)	Change in Percentage Point
China	8.3%	8.0%	-0.3%
India	9.5%	9.3%	-0.2%
Indonesia	2.0%	9.6%	+7.6%
Japan	2.5%	6.4%	+3.9%
Malaysia	0.8%	8.9%	+8.1%
Philippines	6.1%	9.0%	+2.9%
Singapore	6.0%	6.1%	+0.1%
South Korea	2.7%	5.7%	+3.0%
Thailand	2.6%	5.2%	+2.6%
Vietnam	7.6%	8.1%	+0.5%

Source: EIU

A promising outlook for Singapore's BMS industry

The prospects for Singapore's BMS industry look favourable, supported by a thriving pro-business environment, research infrastructure and talent, strong intellectual property laws, world-class manufacturing capabilities as well as its strategic location in Asia. This confluence of drivers is not easily replicated and takes years to build and develop.

Though Singapore continues to face competition from neighbouring countries such as Thailand, Malaysia and China where labour and land costs are lower, the city-state remains as a compelling location for the BMS industry given its established infrastructure and continued government support.





Major biomedical clusters in Singapore

There are currently a few biomedical clusters located across various parts of Singapore. Different regions cater to varying business needs of tenants in the BMS industry. Singapore's western region is the main location for biomedical manufacturing. Within the Central Business District and Alexandra / Harbourfront areas, many BMS firms have set up their front offices and HQ functions. Developments at the city-fringe markets such as Science Park and Biopolis are where R&D work, business and HQ functions of biomedical companies are concentrated.

Located in the West Region of Singapore, Tuas Biomedical Park and MedTech Hub are key localities for biomedical manufacturing and R&D activities. Developed by JTC Corporation (JTC), Tuas Biomedical Park is envisioned to be a manufacturing hub for pharmaceuticals and medical technology, providing purposed built spaces and laboratories. It is home to around 14 global biomedical companies and 7,000 employees.

MedTech Hub was also developed and managed by JTC, aiming to be dedicated development for companies in the medical technology (MedTech) industry. It features special facilities catering to the needs of MedTech manufacturers, suppliers and service providers.

Within the Central Region of Singapore, the Alexandra / Harbourfront locality and the Central Business District (CBD) are popular markets that have attracted well-established names such as Sanofi, Novartis and AstraZeneca among others, who have located their front office and business functions .

Similarly, the clusters at Science Park and Biopolis – which are located nearer to the city centre would mainly cater to research and business functions for BMS firms.

Singapore Science Park - first developed in the early 1980s by a subsidiary of JTC was envisioned to provide infrastructure for the critical manufacturing sector, especially to support applied R&D for multinational corporations and local industries.

Science Park provides both purpose-built R&D (laboratory) units and office space, catering to a wide range of industries including BMS. BMS tenants such as Johnson & Johnson and Merck are currently locating their laboratories and business functions in Science Park's Ascent building.

Nonetheless, Biopolis remains Singapore's biomedical research and development hub and the key destination for BMS companies. Biopolis currently hosts more than 60 biomedical companies and ten A*STAR's research institutes with thousands of employees comprising of both researchers and non-researchers. Biopolis is part of the one-north precinct, and within close proximity to several educational institutes such as National University of Singapore, Singapore Institute of Management, Ngee Ann Polytechnic and Singapore Polytechnic, enabling it to tap potential linkages with academia and the constant supply of graduating talents. The presence of A*STAR in Biopolis allows the clustering of public and private research laboratories with JTC launchpad which nurtures start-ups also located nearby. The colocation of research institutes and companies in a single vibrant ecosystem, supported by shared infrastructure and scientific services, provides an ideal environment for cross disciplinary research and collaboration.

The development of Biopolis has gone through six phases, with JTC undertaking Phase 1 while the remaining phases were developed by private developers. It was announced in 2019 that Biopolis would be expanded to meet the needs of biotechnology start-ups with the construction of phase 6 - the latest development in this precinct. In March 2020, JTC awarded the tender to build, own and operate Biopolis Phase 6 to Ho Bee Land Limited. The upcoming development, Elementum, is expected to be finished in 2023.

Figure 7: Map of Biomedical Clusters³ in Singapore



Source: EDB, Cushman & Wakefield Research

³ Not an exhaustive list of tenants

Figure 8: Development Phases of Biopolis

PHASE 1

- Seven buildings completed in 2004
- Several government agencies, publicly funded research institutes and research labs of pharmaceutical and biotechnological companies are located in these buildings

PHASE 2

- Two buildings completed in 2006
- High quality space to meet the demand for biomedical research and development

PHASE 3

- Two buildings completed in 2011
- These are purpose-built, multi-tenanted biomedical research facilities suitable for research institutes, incubator research activities, translational and clinical research and medical technology research.

PHASE 4

- The S\$250 million P&G Innovation Centre was opened in 2014
- The centre covers more than 18 fields of study from seeking consumer insights to developing and testing new prototypes, as well as designing new packaging.



PHASE 5

- Nucleos was completed in 2014
- It is a seven-storey twin-tower biomedical research facility. It offers innovative, modular units with dedicated lab-friendly features

PHASE 6

- Expected to complete in 2023
- Approximately 35,000 sqm of business park space for BMS research and supporting activities

BMS end-users' requirements can vary widely

While BMS demand is on a rise, not all properties can cater to their demand. End-users' requirements can vary widely, depending on their research purpose. Some may even require a variety of spaces specified for their needs. It could range from office spaces for front office functions to dry labs for applied or computational research and wet labs for research involving chemicals or other biological materials.

Figure 9: Common Spaces

Types of spaces	Uses	Typical requirements
Office	Front office, business or HQ functions	<ul style="list-style-type: none"> • Typical requirements for office usage • Desirable floor plate and floor-to-ceiling heights • Easy for reconfiguration of space, catering to changing business needs
Dry Lab	Applied or computational research	<ul style="list-style-type: none"> • Required power and cabling • Storage space for equipment • Heating, ventilation, and air conditioning control to support cooling and humidity levels of computers and equipment's labs • Sensitive instruments / equipment would need vibration control to maintain calibration
Wet Lab	Research involved chemicals or other biological materials	<ul style="list-style-type: none"> • Required power and cable network • Storage space for gas cylinders or other equipment • Required ventilation fume • Required dedicated exhaust systems and waterproof, chemical-resistant flooring / surfaces • Designed, constructed, and controlled to avoid spillage and contamination.

Source: Urban Land Institute, Cushman & Wakefield Research

As such, lab units tend to be leased out bare, with the provisions for end-users to do up their fit-out and piping. For BMS research that involves chemicals or other biological hazardous materials, laboratory units must have dedicated exhaust systems and water-proof flooring (such as vinyl flooring and stain-resistant). End-users would also require corrosion-resistant piping, equipment storage space (equipment typically takes up 40-50% of the lab space) as well as lab benches with heat and stain-resistant material. Given the increased provisions, construction costs for wet lab space tends to be higher as compared to offices or dry lab spaces.

Given the wide range of BMS requirements, a one size fit all approach would not work and landlords would need to have a deep understanding of the market via regular consultations with end users. Life science spaces should be designed with flexibility in mind to cater for varying requirements.

Healthy demand for lab space

Even before the pandemic, demand for BMS space was already robust. This is evidenced by strong demand for Biopolis, with consistently healthy occupancy rates in recent years. This is evidenced by reported strong occupancy rates at Neuros, Immunos and Nucleos with reported occupancy rates of over 90% as of end 2020.

Demand remains strong into 2021, with Nucleos occupancy rates estimated to be around 98% at the end of 2021. Space at Biopolis remains highly sought after, with new BMS tenants including ADM which opened their plant-based laboratory at Nucleos and A*STAR Infectious Diseases (ID) Labs at Immunos.

Figure 10: Occupancy Rates at selected developments at Biopolis (Neuros, Immunos and Nucleos)

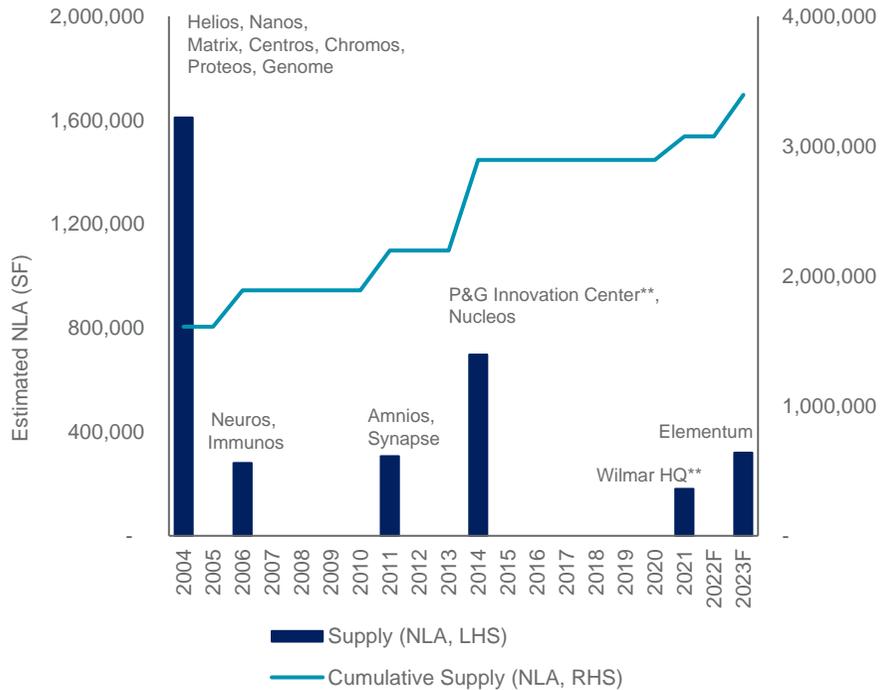


Source: Ascendas REIT's annual reports

Note: * Occupancy rates for Nucleos are only available from 2019 onwards

Biopolis tight occupancy rates was driven by a dearth of new multi-user supply since the completion of Nucleos in 2014. The latest completion in Biopolis was the Wilmar HQ, which is fully pre-committed by Wilmar International. The next BMS development at Biopolis is Elementum which is only expected to be finished in 2023 and would increase existing total supply by around 10%. Notably, post completion of Elementum, future supply in Biopolis will be tight with most of the precinct being developed. Based on our estimates, there are only three parcels of business park land left within the Biopolis precinct after development of phase 6.

Figure 11: Limited Supply in Biopolis



Source: JTC, Cushman & Wakefield Research

Note: **Wilmar Headquarters and P&G Innovation Center within Biopolis, but they are owner-occupied and not for lease.

Figure 12: Map of Biopolis



*The Metropolis is a commercial development and not part of Biopolis

(Phase) Name of Development

(F) Future Developments are sites in Biopolis which have not been sold

Source: JTC, Cushman & Wakefield Research



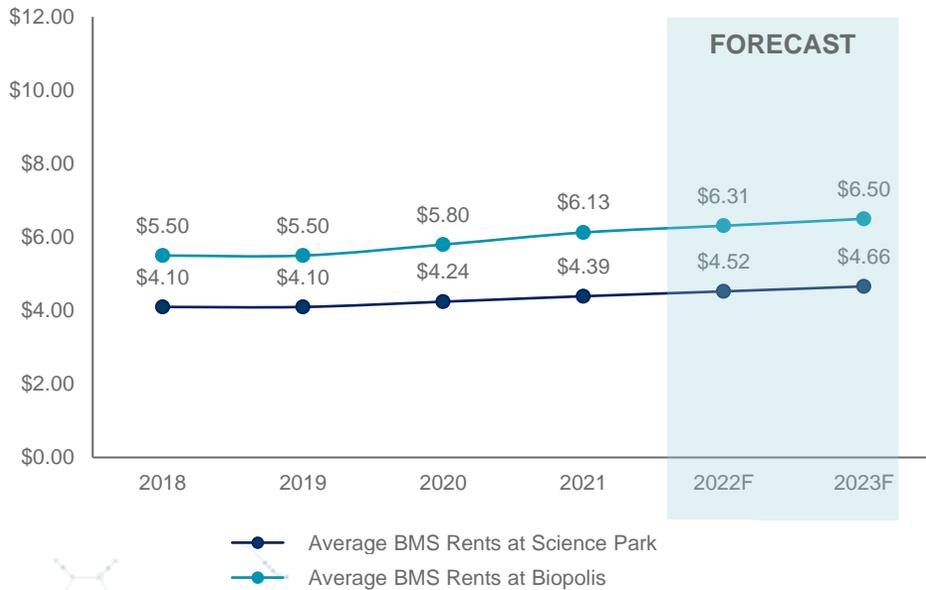
Strong rental growth underpinned by robust demand and tight supply

Given tight occupancies and buoyant demand due to the pandemic, BMS lab rents at Biopolis and Science Park surged during 2020 and 2021. Biopolis is able to command higher rents and stronger rental growth compared to Science Park due to its newer infrastructure and the clustering of biomedical firms, creating a vibrant ecosystem for research and collaboration.

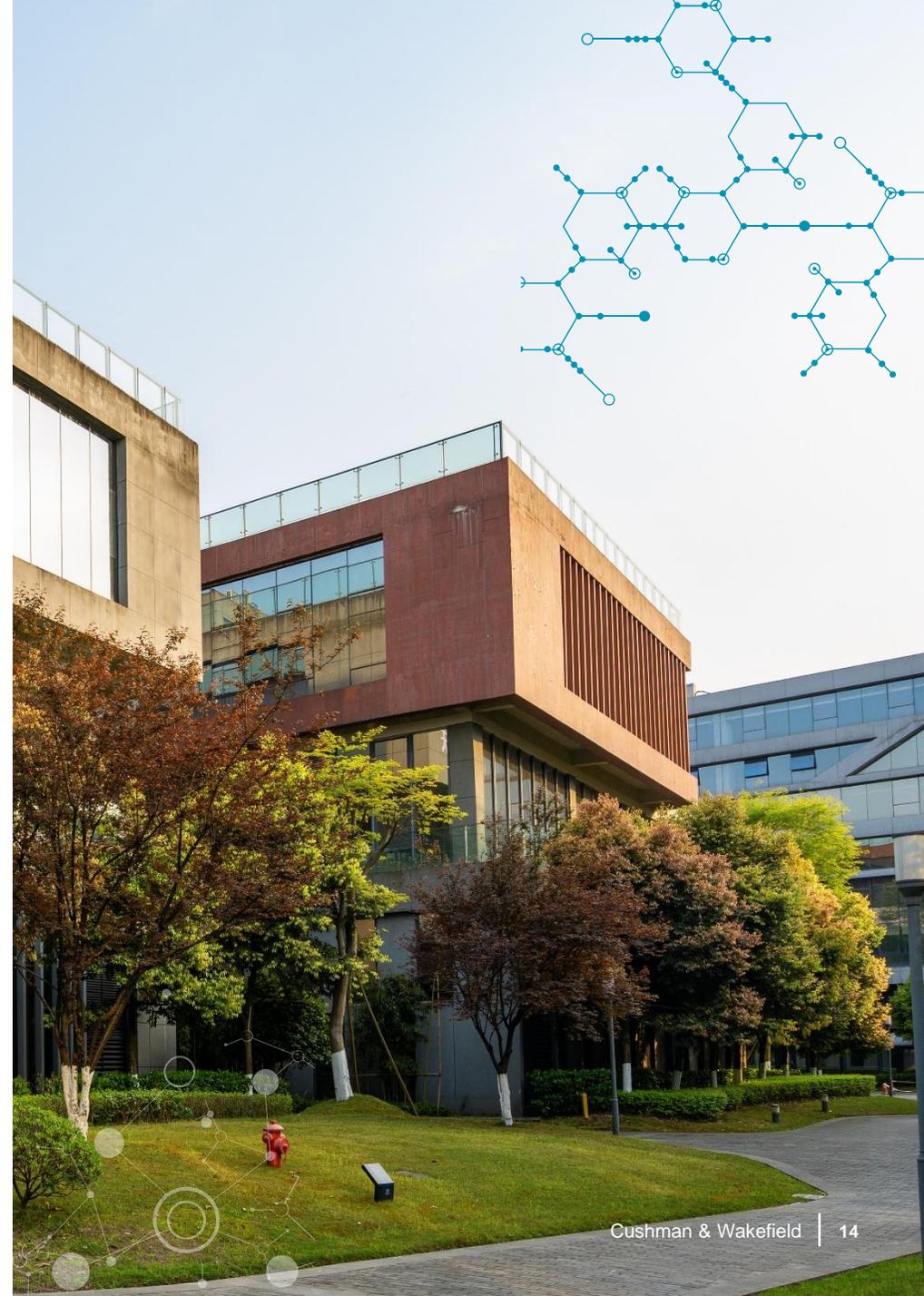
Indeed, Biopolis and Science Park BMS lab rents increased by 5.7% and 3.5% yoy, respectively in 2021, reaching about S\$6.13 and S\$4.39 psf pm. This extended rental growth of 5.5% and 3.5% yoy in the previous year for BMS spaces at Biopolis and Science Park, respectively.

Going forward, rents are expected to follow continued rising trend of around 3.0% per annum, supported by healthy demand due to increasing biotech investments and accelerating healthcare research.

Figure 13: Average BMS Lab (wet and dry) Rents



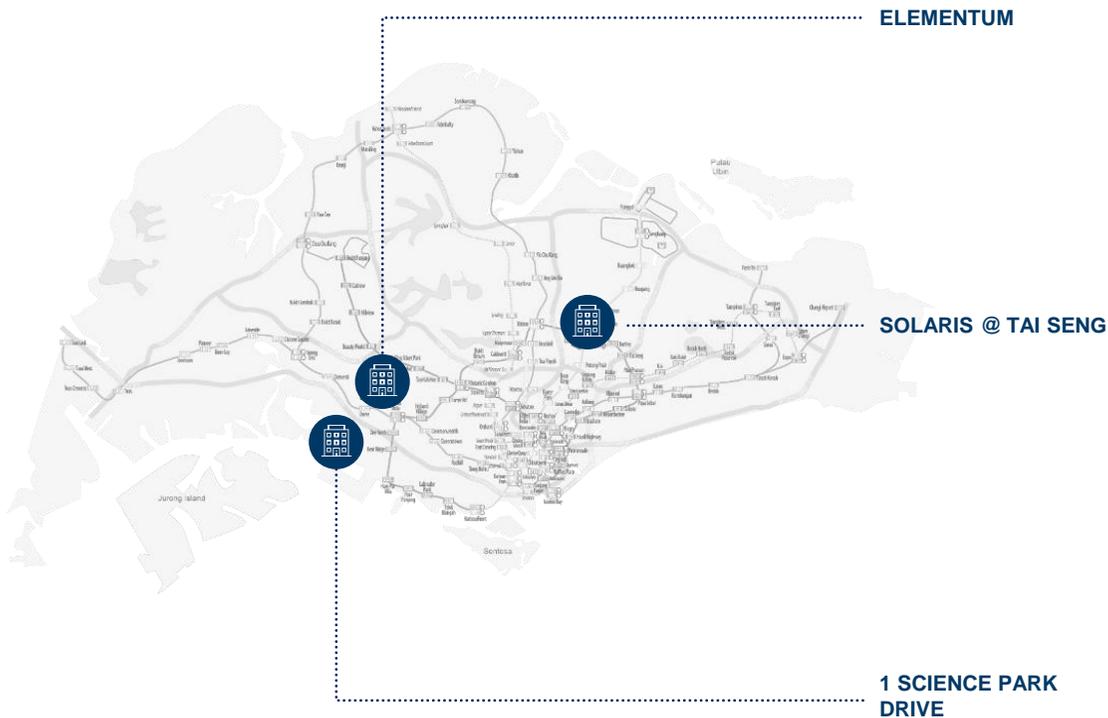
Source: Cushman & Wakefield Research



Current pipeline looks tight, but more asset conversions could be in the works

The rise in BMS demand and limited supply of quality BMS lab space has created a mismatch in demand and supply. The future supply of BMS lab space looks tight. Only two new major multi-user BMS developments will enter the market in the near term, namely Solaris @ Tai Seng (Estimated Completion: H2 2022) and Elementum (Estimated Completion: H2 2023). Over the longer term, new BMS supply will come from the redevelopment of 1 Science Park Drive, which is scheduled for completion in 2025.

Figure 14: Pockets of Future Developments



Phase 6 - Elementum

Expected to be completed in 2023, Elementum would provide 35,200 sqm of business park space for BMS research and supporting activities as well as 6,200 sqm of space for office and retail uses. On the back of rising demand for semi- or fully-furnished laboratories as more BMS start-ups were founded, around 2,000 sqm of business park space would be reserved for fitted-out laboratory spaces, which help to reduce set up costs for start-ups. A conducive and collaborative environment for research partnerships could be fostered by the co-location of start-ups, MNCs, local enterprises and research institutes.

Solaris @ Tai Seng

Located within Paya Lebar iPark precinct, this development is expected to be finished in 2022. It is a campus-style development consisting of four main blocks of eight and nine-storey high-tech business space and lab infrastructure (for selected units).

Redevelopment of 1 Science Park Drive

1 Science Park Drive is poised to be redeveloped into a life science and innovation campus. The future development would have a total GFA of 116,200 sqm with an estimated 80,000 sqm of space dedicated for biomedical research and development (R&D) activities. The redevelopment is expected to complete in 2025.

Source: JTC, Cushman & Wakefield Research



The continued growth in BMS rents would entice landlords / investors to convert part or all of existing developments into BMS-ready developments, accommodating the rising demand for BMS space.

For example, major developers such as Ascendas REIT and CapitaLand Development are taking the lead with the redevelopment of 1 Science Park Drive into a life science and innovation campus. Also, specialist engineering services provider Acromec and Tako Ventures have teamed up to launch co-working BMS lab spaces in German Centre at International Business Park.

As rents continue their upward trajectory and demand remains healthy, we could see a gradual revamp of Science Park with existing building being redeveloped/ or partially converted to accommodate tenants in the BMS industry.

Investors or landlords looking to jump on the life science bandwagon via conversion of existing industrial spaces, would see more opportunities at Business Parks or B2 spaces. As BMS lab spaces need to cater for the potential handling of hazardous materials, industrial developments

located near to residential catchments would face more restrictions.

Industrial clusters at Kallang and Tai Seng would be interesting areas to watch as more BMS companies move into that locality. For example, American biotech company 10x Genomics opened its manufacturing and commercial hub in Singapore, taking up more than 53,000 sf of space at Solaris@Kallang. Also, Kolam Ayer 2 cluster, an upcoming high-tech industrial precinct located at Kallang, will be anchored by a German medical device multi-national company.

Nonetheless, BMS spaces remain a complex asset class as end-user requirements can vary widely. Therefore, investors should do their due-diligence before diving into this niche asset class to ensure that the right product could be delivered to the market.



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