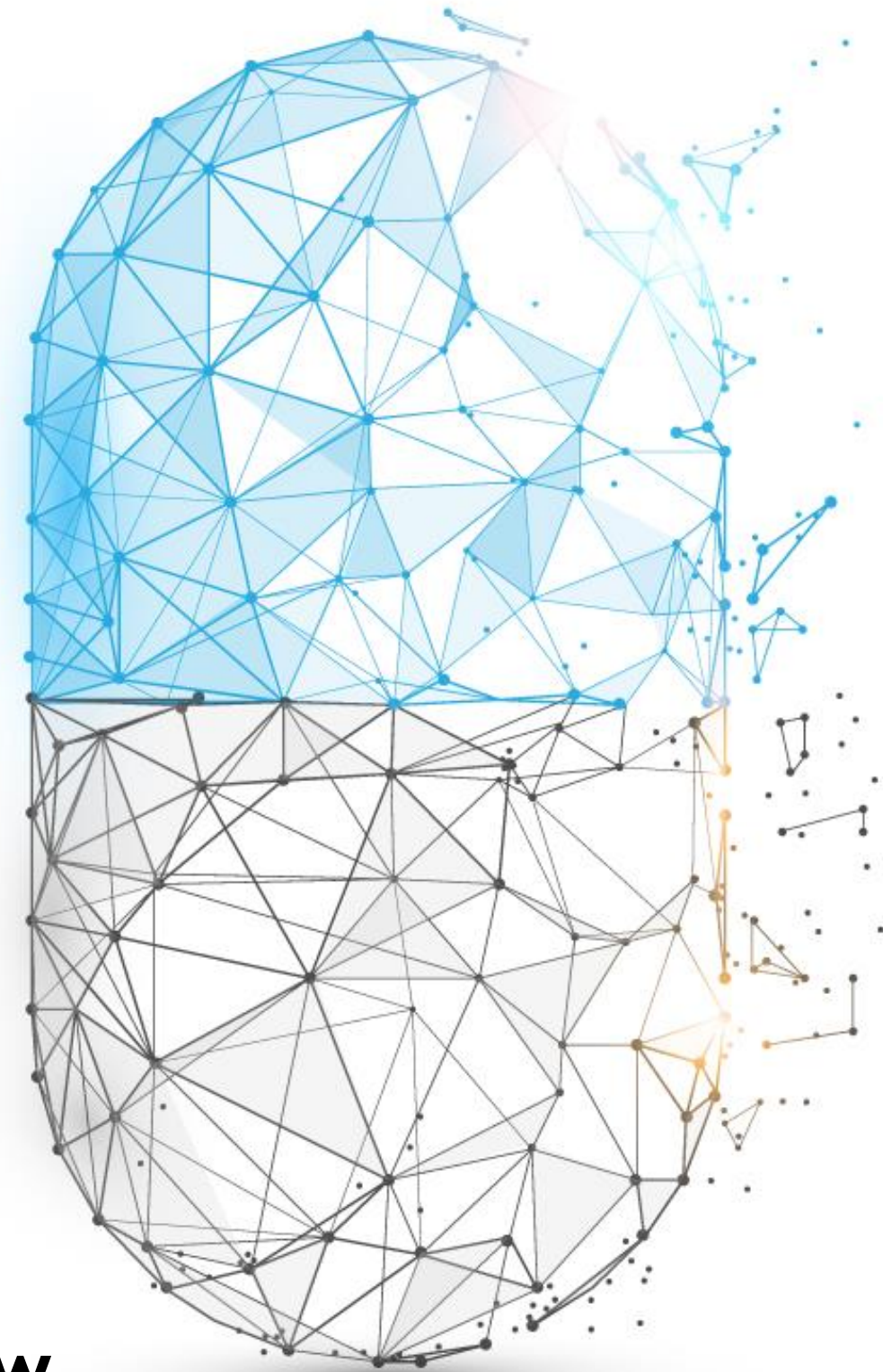


SHANGHAI

PHARMACEUTICAL &
LIFE SCIENCES INDUSTRY

2021 Real Estate Market Overview



A STRATEGIC GROWTH INDUSTRY

PHARMACEUTICAL AND LIFE SCIENCES REAL ESTATE IN SHANGHAI

“ China's pharmaceutical and life sciences industry has seen rapid growth in recent years as the country's technological and industrial revolution gains momentum, with the onset of the COVID-19 pandemic in 2020 providing the sector with added impetus for expansion.

Much of this growth has been focused on Shanghai, which has already established itself as one of Asia Pacific's leading high-end R&D, manufacturing, and outsourcing service centres. As China's fastest-growing international biomedical innovation hub and industrial cluster, the city is home to nearly 100,000 enterprises in the life sciences and pharmaceutical field.

The report by CBRE identifies the factors driving the expansion of the life sciences and pharmaceutical industry in Shanghai; assesses how these trends are impacting the city's office, business park and logistics property sectors; and explains how investors can access real estate catering to this rapidly growing sector. ”

LUKE MOFFAT

REGIONAL MANAGING DIRECTOR, EASTERN CHINA & HEAD OF
ADVISORY & TRANSACTION SERVICES, GREATER CHINA, CBRE



5-6

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HEAT MAP

PHARMA TENANTS IN OFFICE
PHARMA TENANTS IN BP

PHARMA CHAIN OUTSOURCING
SERVICE CHART & SMART
MEDICAL SYSTEM DIAGRAM

APPENDIX

INDUSTRY FOCUS

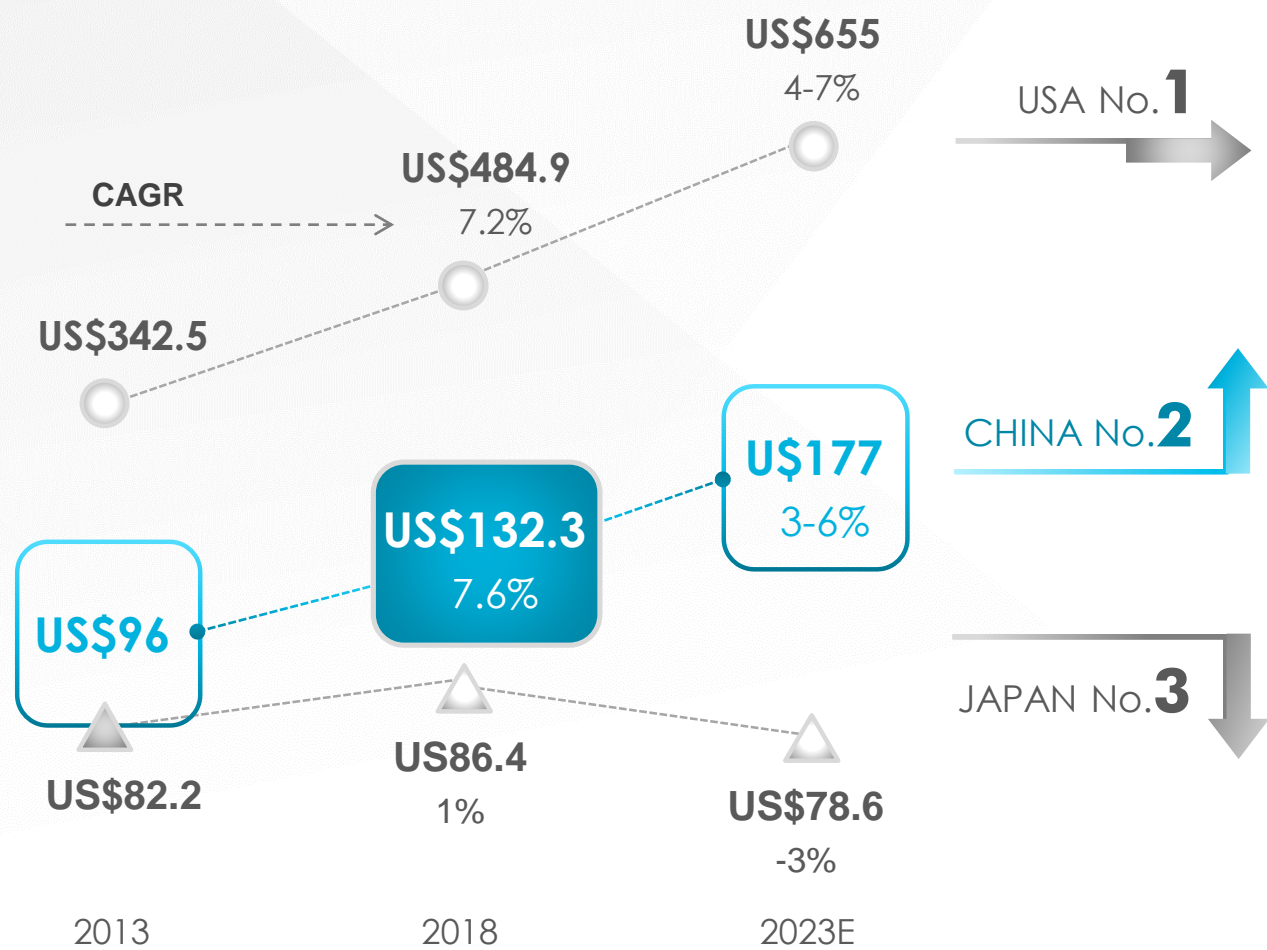


Macroeconomy
and Local Market

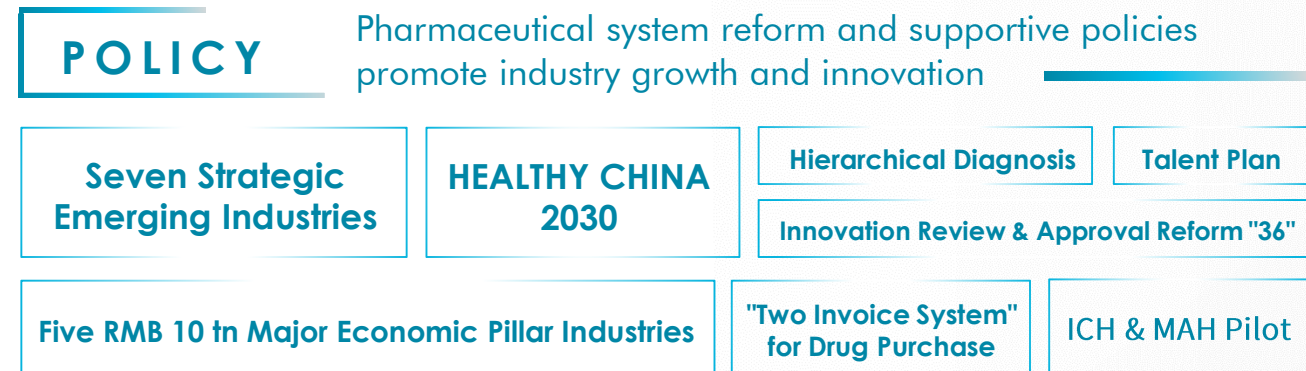
1 INDUSTRY OVERVIEW

RAPID PHARMACEUTICAL INDUSTRY GROWTH

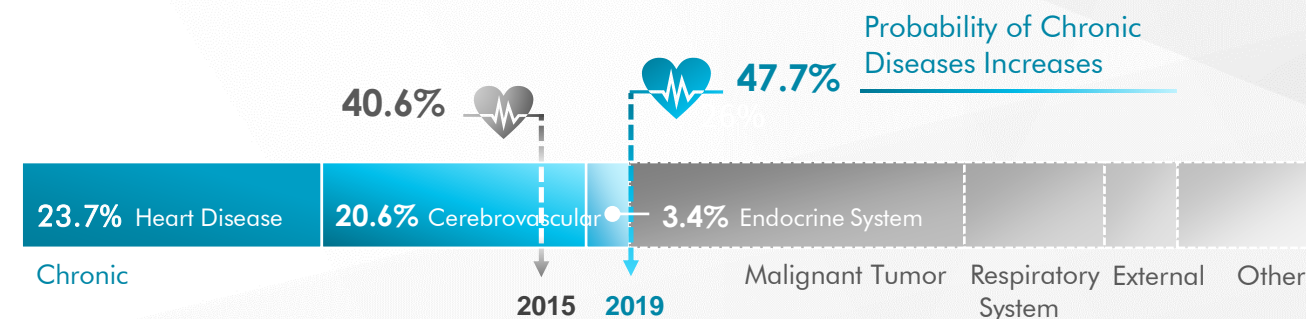
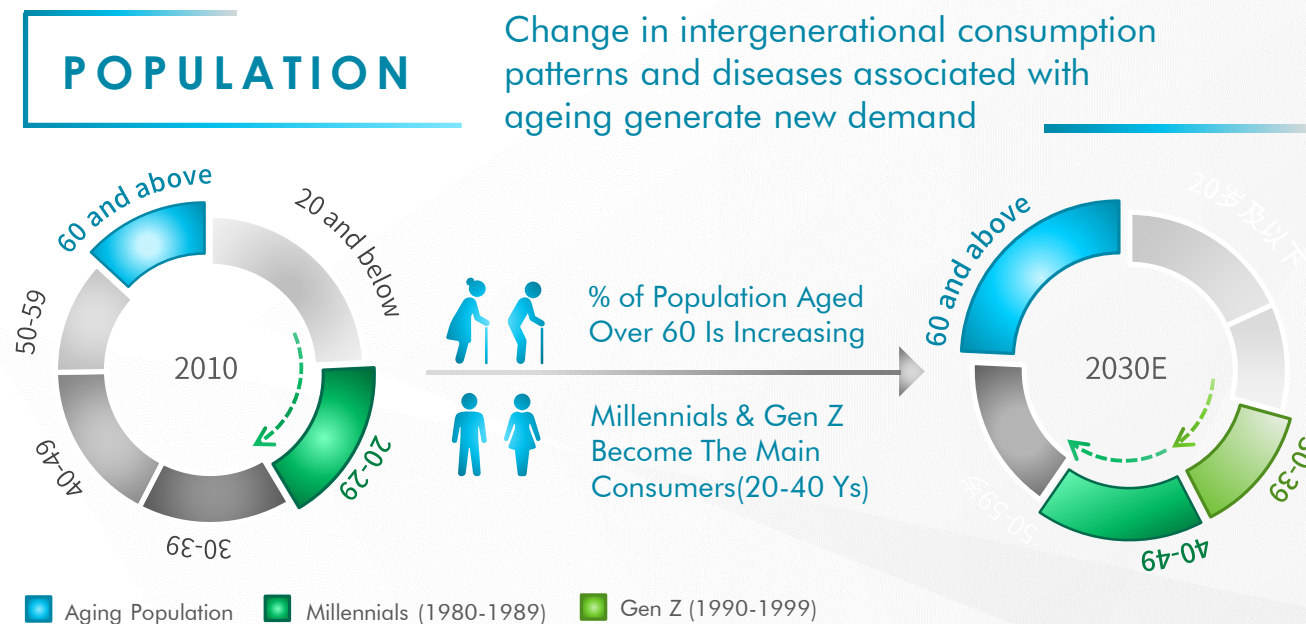
China is the world's largest Active Pharmaceutical Ingredient (API) exporter and the second largest pharmaceutical market globally, with US\$137 billion in total spending in 2018 representing growth of more than 20% over the past decade. Driven by central government reforms of the health insurance and modern hospital system, as well as rising demand for quality healthcare from a growing and ageing urban population, pharmaceutical market growth is expected to achieve expansion of around 3%-6% per year through 2023.



U.S., Japan, and China Drug Expenditure Scale & CAGR / bn US dollars

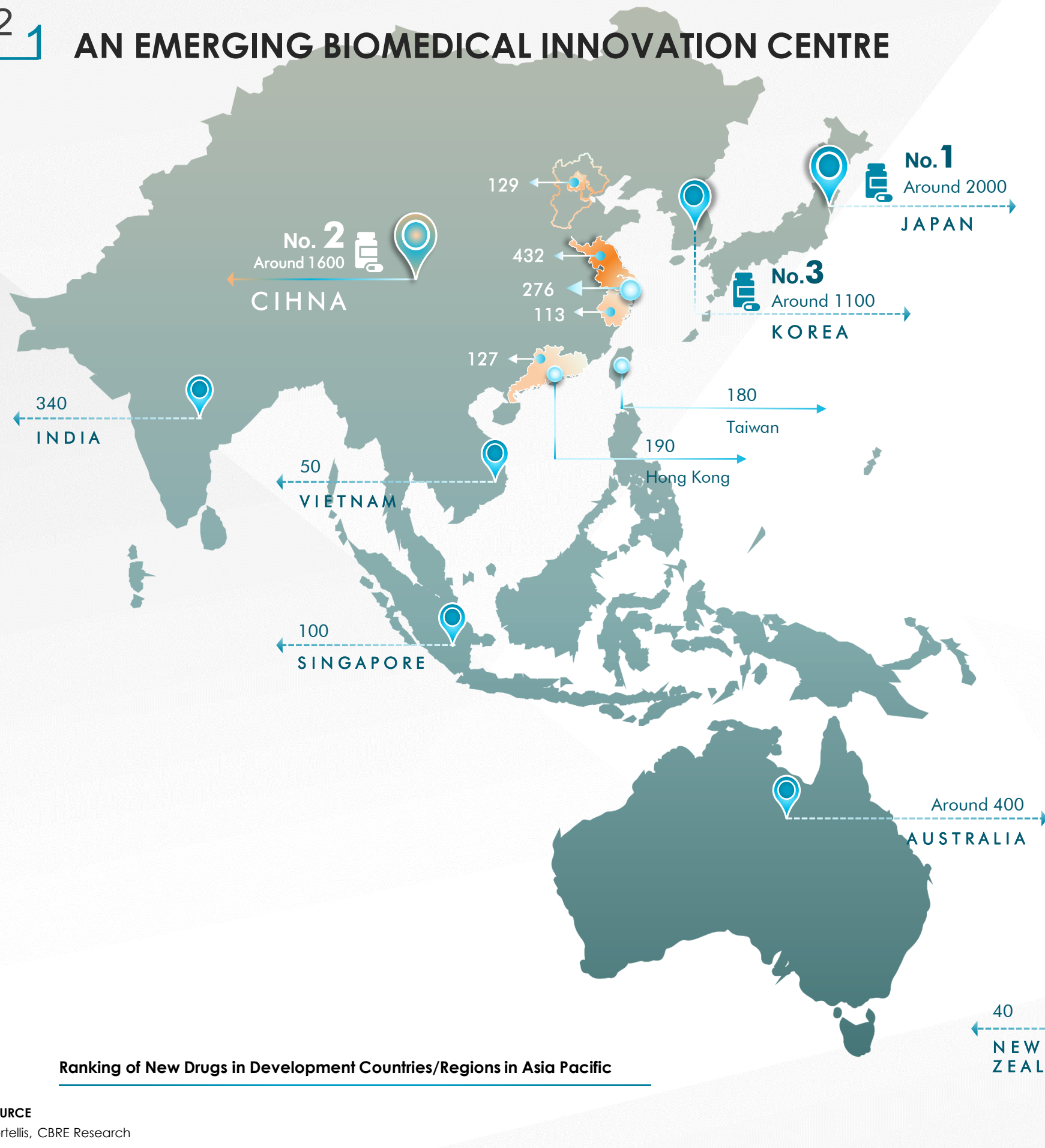


The biological industry, led by biomedicine, has long been established as one of China's seven Strategic Emerging Industries. Driven by the goal of building a "Healthy China 2030", the bio-industry has grown into one of the five pillar industries with a value of RMB 10 trillion, ensuring one of the goals of the 13th Five-Year Plan has been successfully completed.



With China's death and fertility rates gradually decreasing, the country's population is ageing rapidly, bringing with it a higher incidence of chronic disease and generating huge new demand for biomedical products and services. These changes in intergenerational consumption patterns are set to underpin the expansion of China's pharmaceutical market.

AN EMERGING BIOMEDICAL INNOVATION CENTRE



INNOVATION HEIGHTS

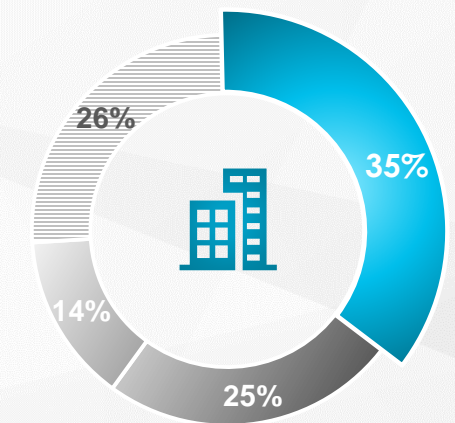
Pharmaceutical industry clusters such as Shanghai and Beijing emerge as key Asia Pacific R&D hubs

China has significantly ramped up its biomedical R&D capabilities in recent years, with over 1,600 new drugs in the discovery pipeline (Q1 2019, Cortellis), the second highest number in Asia Pacific after Japan. With an influx of venture capital and top talent to foster industry development, Yangtze River Delta, Bohai Bay and Greater Bay Area are China's major life sciences clusters, while Shanghai and Beijing are the country's most competitive key innovation hubs.

R&D CLUSTERS

China's huge market lures pharmaceutical companies to establish operations to promote innovation industry chains

A recent Cortellis survey of 929 biopharmaceutical R&D companies in Asia Pacific found that 335 (40%) are headquartered in China, the largest number of any country in the region. Most of these companies are SMEs with active R&D operations. SMEs are increasingly driving the biopharmaceutical R&D outsourcing industry globally, and China is no exception.



Distribution Of World's Top 100 SMEs In Asia Pacific

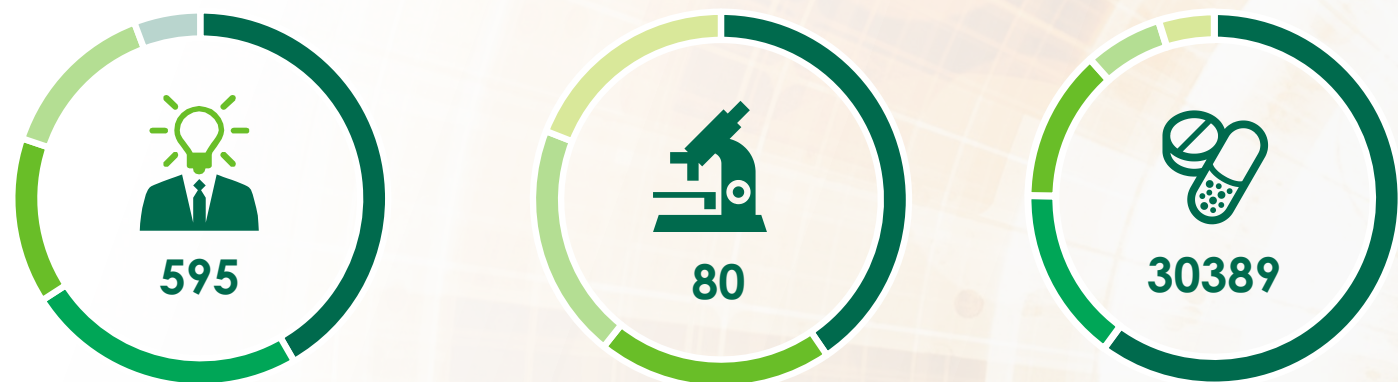
- Mainland China | 35
- Japan | 25
- Australia | 14
- Others | 10

Based on the 929 pharmaceutical companies in 14 Asia Pacific countries in the Cortellis™ Database

Ranking of New Drugs in Development Countries/Regions in Asia Pacific

2 MARKET OUTLOOK

STRATEGIC FOCUS – R&D IN SHANGHAI



- Thousand Talents Plan | 248
- CAS Hundred-Talent Program | 144
- The Yangtze River Scholars | 85
- Academicians of the CAS | 84
- National 863 Scientist | 34
- First-class Clinical Resources | 34
- National Industry Incubator | 17
- Universities & Colleges | 17
- Key National Labs | 16
- Patents | 18261
- Medical Device Registrations | 4602
- Domestic Drugs | 3999
- CDE New Drugs Accepted | 2055
- Clinical Trials | 1472



The innovation chain covers early research, pre-clinical and I/II/III phase trials, approvals and launch, creating a closed loop covering talent input, platform resources and R&D transformation.

High-quality Promotion of Shanghai's Biomedical Industry (2018—2020)

Aims to raise the industry scale to RMB 400 billion. Shanghai to maintain a leading position in the country and establish a high-end **biomedical R&D, manufacturing, outsourcing service centre** in Asia Pacific. Build a modern medicine and medical device circulation system with global resource allocation capabilities.

Establish a world-renowned innovative biomedical industry cluster.



Revenue Rank
No. of New Drug Applications

Most large pharmaceutical companies in Shanghai have established **R&D Centres** for new drug development.

Ranking of New Drug Applications in China for Top 20 Pharma Firms With R&D Centres In Shanghai (Based On 2020 Revenue)

ROCHE	NO. 9	NOVARTIS	NO. 2	MERCK SHARP & DOHME	NO. 1
170		248		259	
GLAXO SMITH KLINE	NO. 12	PFIZER	NO. 3	ASTRA ZENECA	NO. 5
147		237		223	
BAYER	NO. 8	AMGEN	NO. 61	BOEHRINGER INGELHEIM	NO. 10
184		32		165	

Recent years have seen the industrial formation of China's pharmaceutical industry, with the Yangtze River Delta and Bohai Rim as its core. Thanks to its advantages of a coastal location and "opening-up" strategy, Shanghai has established itself as a hub for high-quality talent, high-end R&D institutions and other innovative resources, laying a solid foundation for the accelerated development of the entire biomedical industry chain.

Shanghai's biomedical industry reached a size of more than RMB 600 billion in 2020, with the industry now firmly established as a major pillar of Shanghai's economy. Total biomedical manufacturing output exceeded RMB 140 billion in the same year, an increase of 1.6 pts higher than the national average. The city's biomedical industry currently employs just under 250,000 people, with employment of R&D talent such as academics and scholars accounting for around 25% of the nationwide total. The total number of pharmaceutical and healthcare companies with a presence in Shanghai now exceeds 100,000. Of the world's top 20 pharmaceutical giants, 17 have established headquarters in Shanghai, 14 have R&D centres, and five have manufacturing operations. The presence of substantial innovation resources together with a mature industry supply chain in nearby provinces such as Jiangsu and Zhejiang, has helped accelerate the development of R&D, further promoting Shanghai as one of the world's leading industrial clusters for pharmaceutical innovation.

INNOVATION POLICY

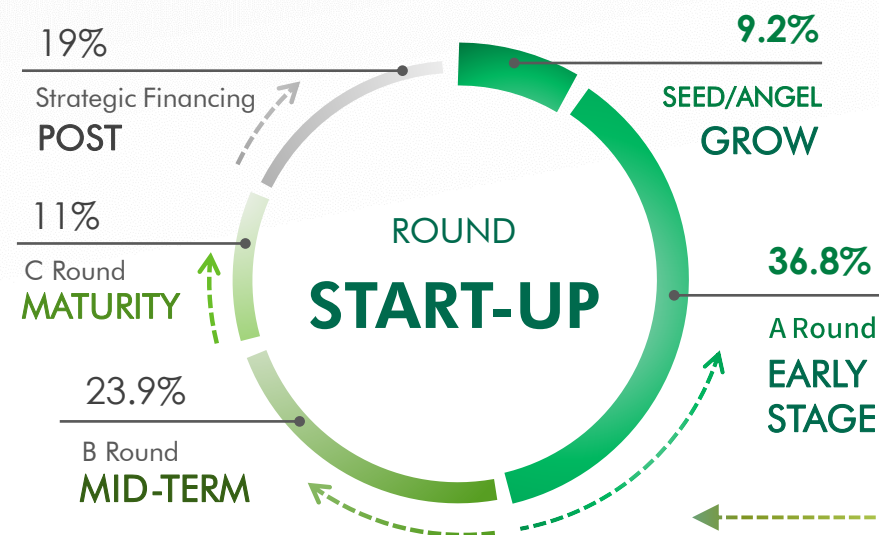
INNOVATION CHAIN PROMOTES INFUX OF CAPITAL

Recent years have seen large pharmaceutical companies and emerging startups in Shanghai collaborate and complement each other to form a competitive innovation chain. In terms of pharmaceutical innovation, the city eclipses China's other cities, and is set to become a focal point for global innovation capital.

Between 2019 -2020, the total financing scale of Shanghai's biomedical industry's primary market was RMB **38.3 billion**, the highest of any city and accounting for more than **40%** of the national total.



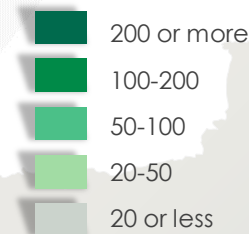
Venture capital and private equity is displaying a strong interest in investing in biotechnology and R&D companies in Shanghai. Funding focused on Angel & A rounds has provided resources for innovative companies in early and growth stages.



Innovation has driven a strong rise in venture capital and private equity investment scale in Shanghai.

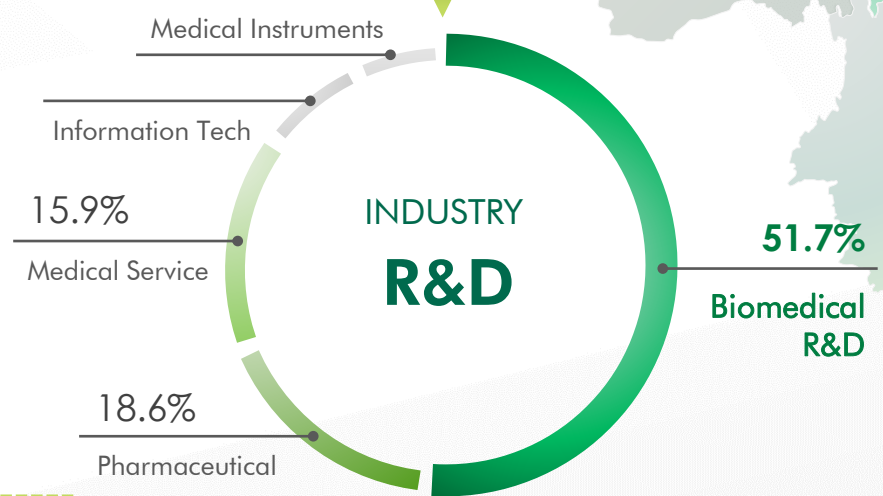
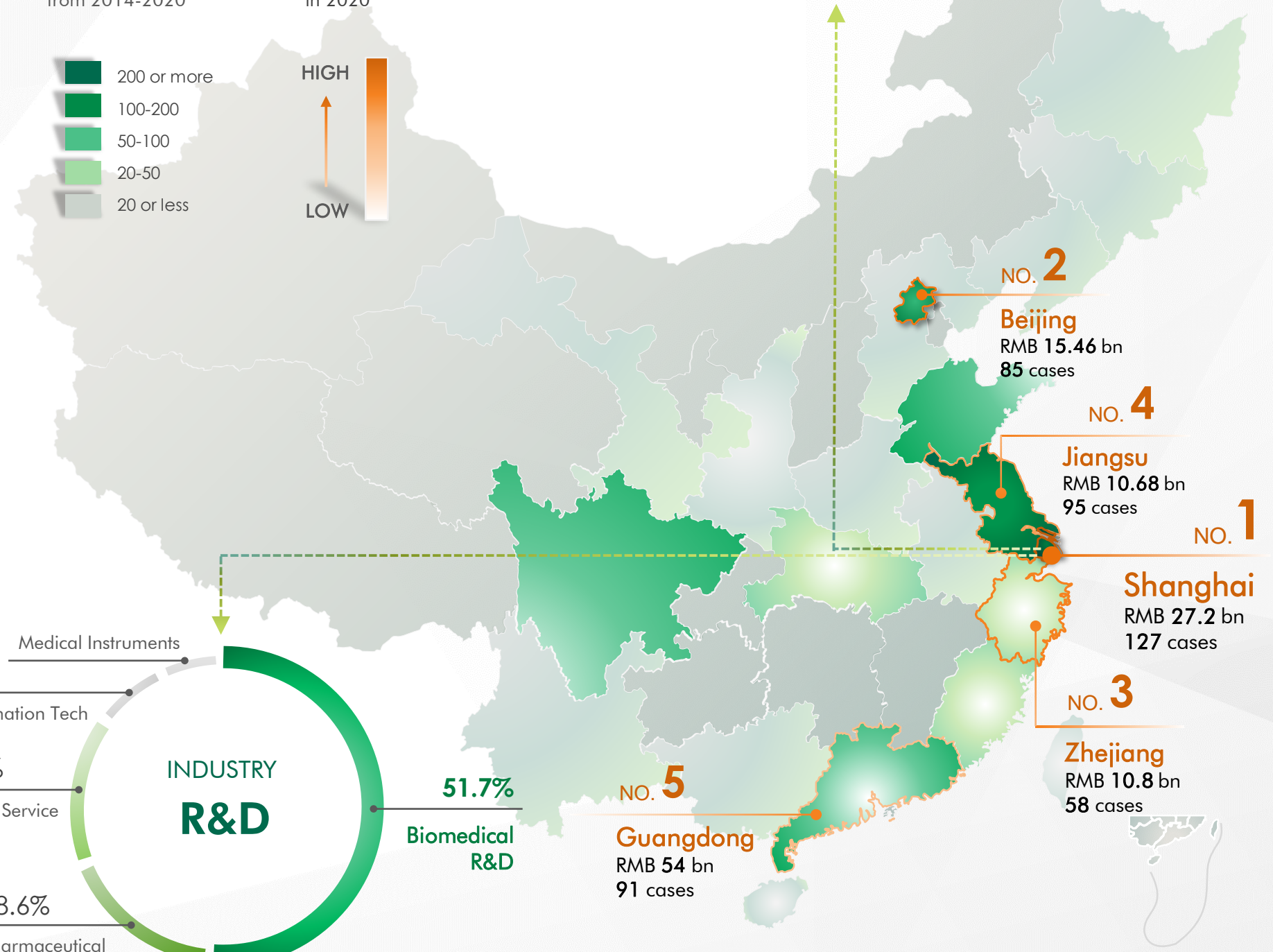
Innovation Activity

Distribution of clinical trials of no. of new drugs from 2014-2020



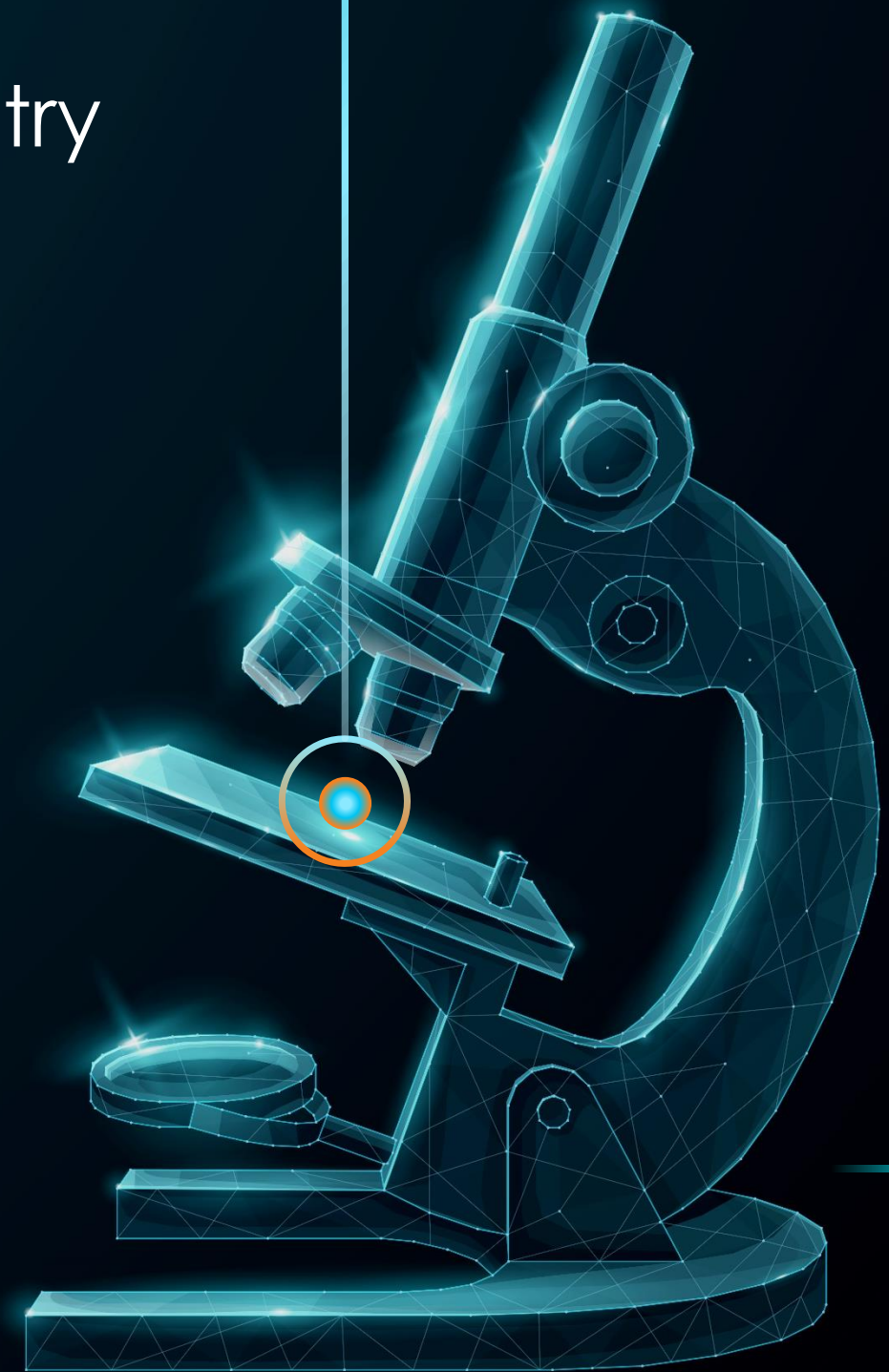
Financing activity

Top five VC/PE Scale/Cases Areas In Pharma & Medical Sector in 2020



Pharmaceutical and Life Sciences Industry
Growth Creates Strong Demand For
Commercial Real Estate

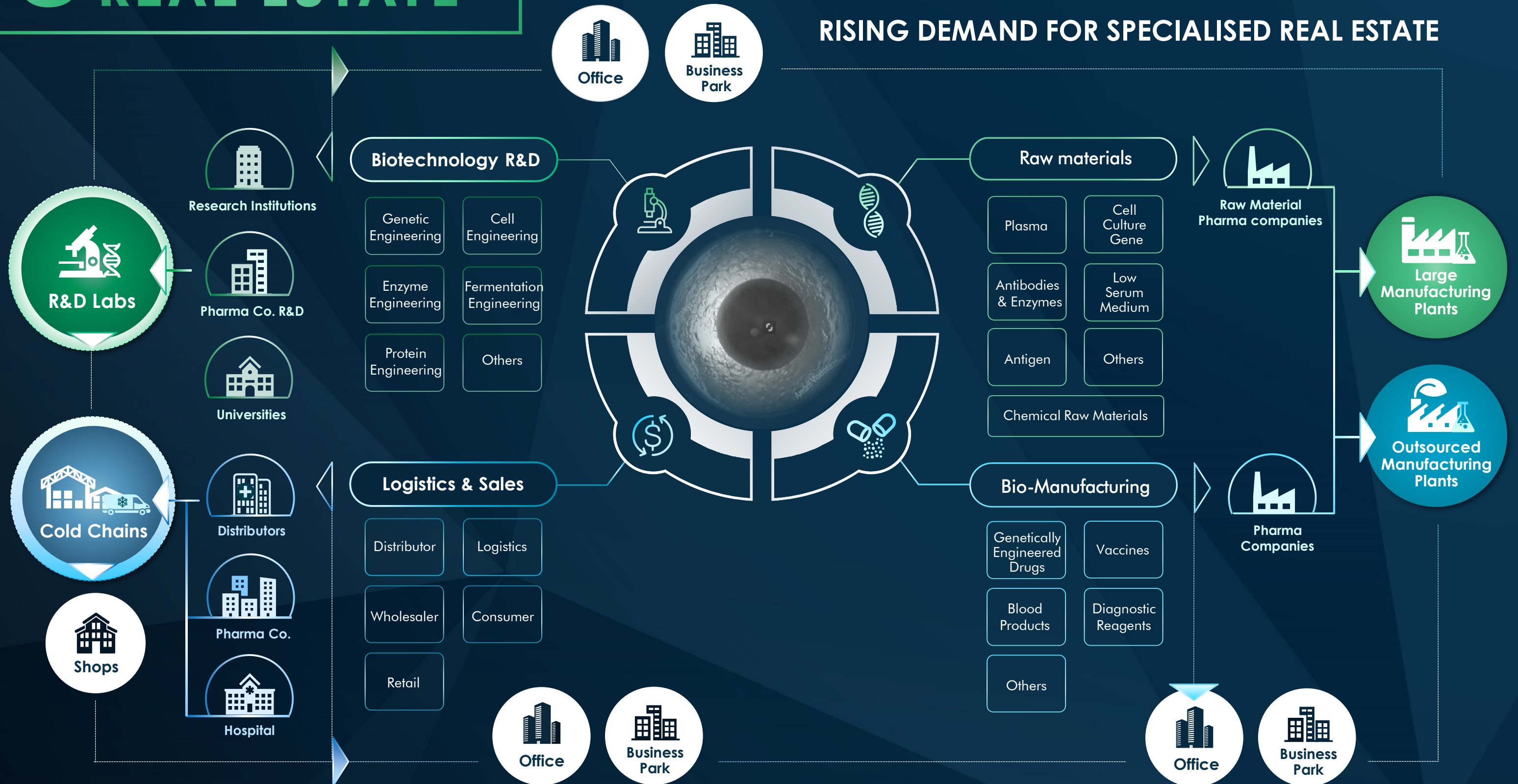
REAL ESTATE



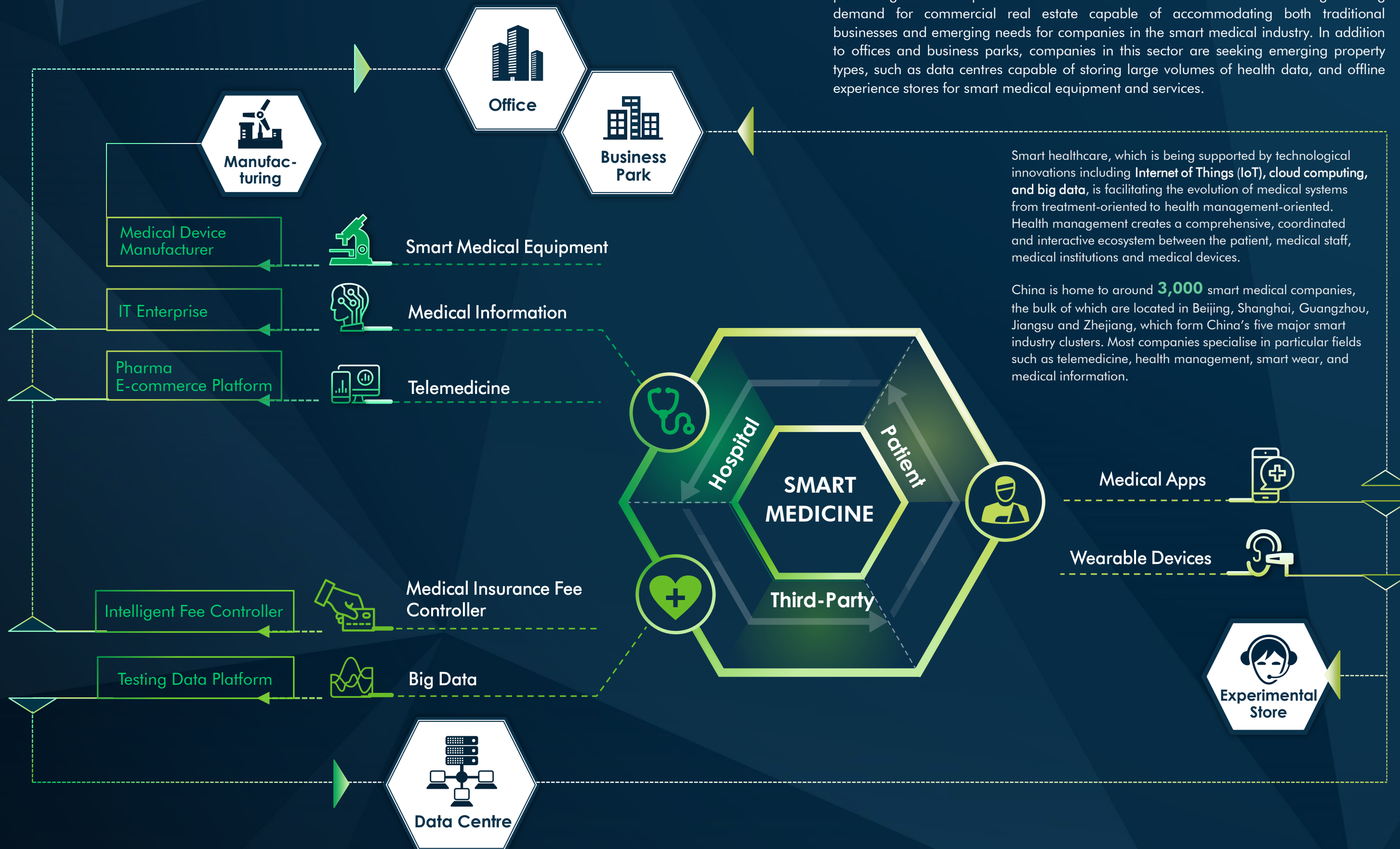
3 REAL ESTATE

The rapid development of life sciences industry has led to the closer integration of the biotechnology and pharmaceutical sectors, with the biopharmaceutical industry set to emerge as one of the fastest-growing subsectors. Biomedicine industry growth is generating property demand from a wide range of industry participants such as pharmaceutical companies, drug distribution firms and R&D organisations. Shanghai's commercial real estate industry is responding to these emerging requirements by creating innovative new formats such as shared laboratories (Co-Labs) that meet pharmaceutical companies' R&D needs and third-party professional cold chain cold storage.

RISING DEMAND FOR SPECIALISED REAL ESTATE



23 SMART MEDICAL CHAINS



China's ageing population, uneven distribution of medical resources, and rising demand for high quality medical and health services are triggering the further development of the smart healthcare market. Change in intergenerational consumption patterns are also promoting the development of online and offline smart medicine. This is generating demand for commercial real estate capable of accommodating both traditional businesses and emerging needs for companies in the smart medical industry. In addition to offices and business parks, companies in this sector are seeking emerging property types, such as data centres capable of storing large volumes of health data, and offline experience stores for smart medical equipment and services.

Smart healthcare, which is being supported by technological innovations including **Internet of Things (IoT), cloud computing, and big data**, is facilitating the evolution of medical systems from treatment-oriented to health management-oriented. Health management creates a comprehensive, coordinated and interactive ecosystem between the patient, medical staff, medical institutions and medical devices.

China is home to around **3,000** smart medical companies, the bulk of which are located in Beijing, Shanghai, Guangzhou, Jiangsu and Zhejiang, which form China's five major smart industry clusters. Most companies specialise in particular fields such as telemedicine, health management, smart wear, and medical information.

4 OFFICE MARKET

INCREASE IN NEW LEASES RELATED TO UPGRADING AND EXPANSION

The rapid development of Shanghai's pharmaceutical industry has helped accelerate the growth of domestic enterprises of all sizes in the pharmaceutical, medical and health service segments. Since the onset of the pandemic, leading International pharmaceutical and life sciences companies have also scaled up their operations, ensuring the industry remained among the top five drivers of leasing demand in the city in 2020.

Pharmaceutical & Life Sciences New Lease Transactions %
(Note: Based on a CBRE sample of 300+ Office Buildings / by Size)

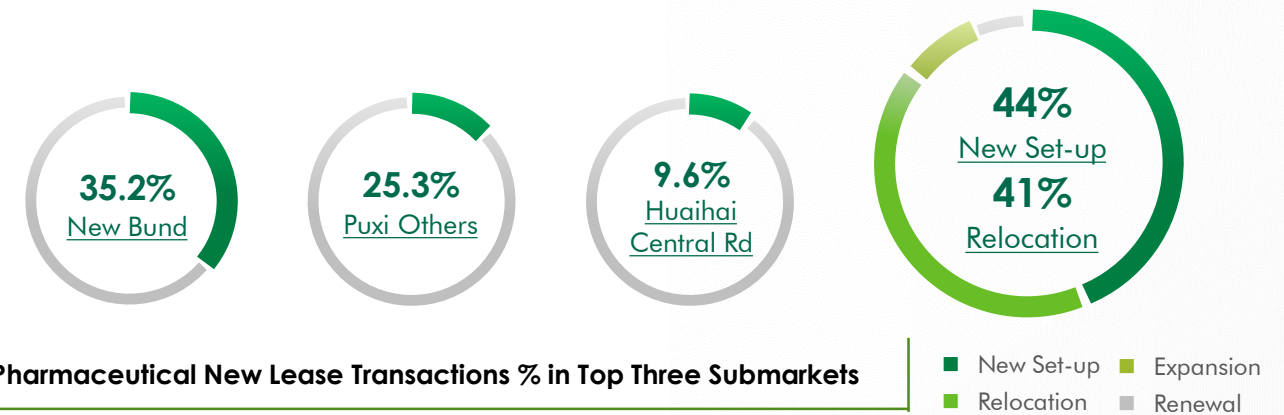


New leases by pharmaceutical and life sciences rose by 9.7% in 2020, making the industry the fifth largest driver of leasing demand

Companies in the pharmaceutical and life sciences industries committed to a total of 115,000 sq. m. of new office space in 2020, accounting for 9.7% of overall leasing volume. New Bund (35.2%), Puxi Others (25.3%), Huaihai Central Road (9.6%) and Huangpu Riverside (5.2%) were the most popular locations for new leases, just under half of which involved relocation, upgrading and consolidation. Key trends witnessed in 2020 included relocations to emerging markets such as the New Bund, led by the likes of Siemens Healthineers and Becton Dickinson, etc. The movement of these large occupiers is likely to stimulate further activity by similar organisations in the coming years.

SOURCE
CBRE Research, Q2 2021

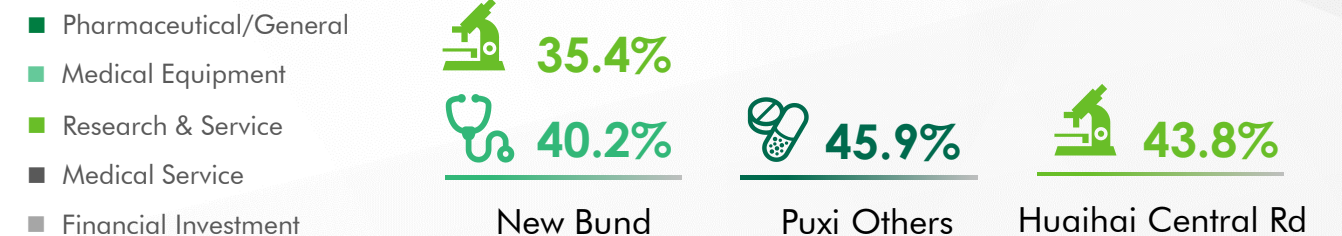
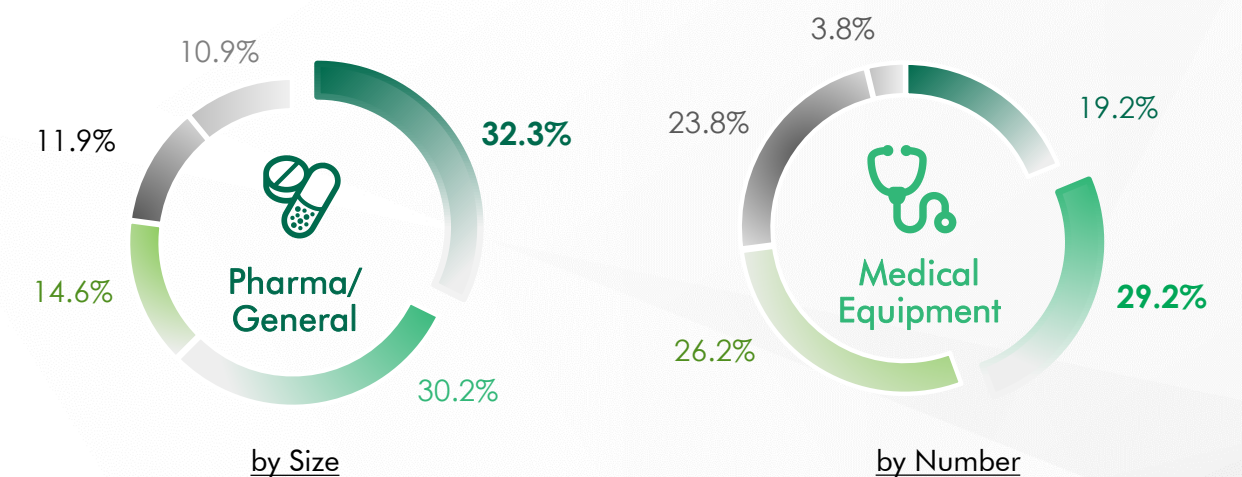
New Lease Analysis in Major CBD from CBRE Sample (by Size)



Pharmaceutical New Lease Transactions % in Top Three Submarkets

Pharmaceutical and Life Sciences drive relocation and expansion demand

Active sub-sectors include Pharmaceutical/General, Medical Equipment, Research & Service and Pharma-related Financial Investment. Large enterprises from General Pharmaceuticals (32.3%) and Medical Equipment (30.2%) accounted for most new leases signed in 2020, closely followed by Research & Outsourcing Services (26.2%)



Pharma Sub-Sector New Lease Transaction %

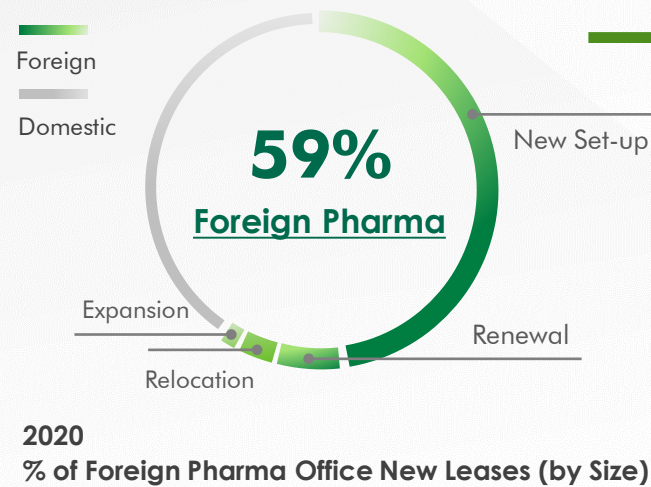
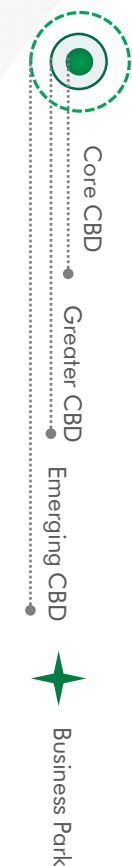
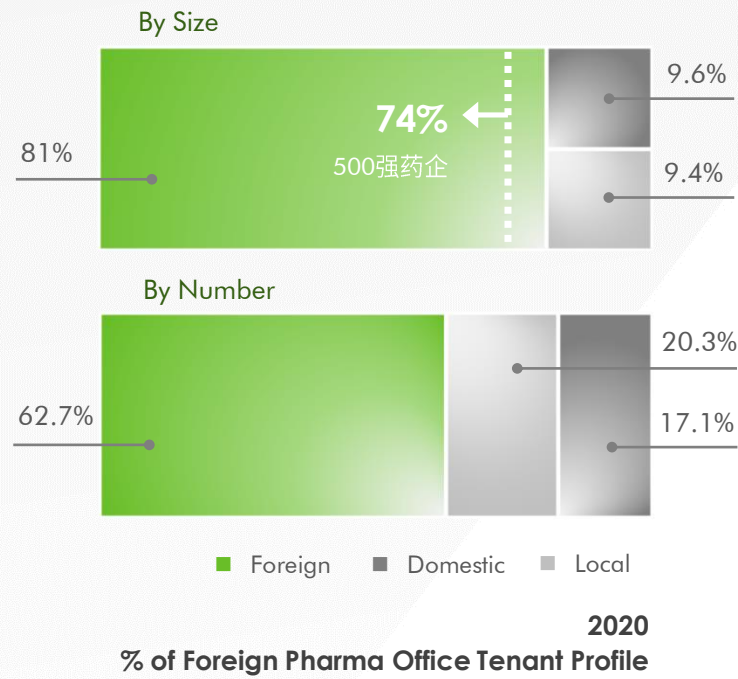
Major sub-sectors include Pharmaceutical/General, Medical Equipment and Research & Service, which drive demand in different CBDs

24

FOREIGN PHARMACEUTICAL COMPANIES DOMINATE THE MARKET

Foreign companies account for 81% of occupied area and 62.7% of the total number of pharmaceutical companies in the Shanghai office market.

In 2020, most of the 33 pharmaceutical companies listed in the Global Fortune 500, such as Roche, Pfizer, Novartis, MSD and Sanofi, maintain a head-quarters presence or representative office in one of Shanghai's CBDs or emerging districts. CBRE Research data show that within its 300+ sample offices, 74% of the total volume of office space occupied by pharmaceutical companies in 300 of the city's major office buildings belongs to firms in the Global Fortune 500.



Foreign companies drive new leases in the pharma sector, with Nanjing West Rd and New Bund established as key clusters

Overseas pharmaceutical companies accounted for 59% of new leases involving new set-up and expansion in 2020, reflecting the sector's resilient performance amid the COVID-19 pandemic.

CROs/CMOs/CSOs emerge as new source of leasing demand

Recent years have seen most of the world's top Contract Research Organisations (CROs) establish a presence in Shanghai. These include IQVIA, which recently consolidated its office space to the New Bund. Together with CMOs (Manufacturing) and CSOs (Sales), CROs account for around 30% of all foreign pharmaceutical tenants in Shanghai.



Partial List of Fortune 500 Pharma Company Office Locations in Shanghai (2020)

Name	Origin	Sub-sector	Submarket	Location	Rank
CARDINAL	US	Medical Care	Railway Station	Core CBD	37
WALGREENS	US	Pharmaceutical Retail	Pudong Expo	Greater CBD	41
SIEMENS	US	Medical Equipment	New Bund	Greater CBD	74
J&J	US	Pharmaceutical/General	Caohejing	Greater CBD	104
ROCHE	CH	Pharmaceutical/General	Zhangjiang	Emerging CBD	171
BAYER	DE	Pharmaceutical/General	New Bund	Greater CBD	214
PFIZER	DE	Pharmaceutical/General	Nanjing West Rd	Core CBD	215
NOVARTIS	CH	Pharmaceutical/General	Zhangjiang	Emerging CBD	225
MSD	US	Pharmaceutical/General	Caohejing	Greater CBD	256
GSK	UK	Pharmaceutical/General	People Square	Core CBD	282
SANOFI	FR	Pharmaceutical/General	Nanjing West Rd	Core CBD	289
FRESENIUS	DE	Medical Care	Xujiahui	Greater CBD	313
ABBVIE	US	Pharmaceutical/General	Nanjing West Rd	Core CBD	378
ABBOTT	US	Medical Equipment	Nanjing West Rd	Core CBD	393
WYETH	US	Pharmaceutical/General	Nanjing West Rd	Core CBD	401
MEDTRONIC	IE	Medical Equipment	New Bund	Greater CBD	408
TAKEDA	JP	Pharmaceutical/General	New Bund	Greater CBD	414
ELLI LILLY	US	Pharmaceutical/General	Nanjing West Rd	Core CBD	454
BMS	US	Pharmaceutical/General	Nanjing West Rd	Core CBD	487

Note: The above list includes only leased offices for Fortune 500 pharmaceutical companies. Enterprises such as United Health Group, GE, CR Pharma, Sino Pharma, 3M, Shanghai Pharma and Thermo Fisher with R&D centers in business parks or owner-occupiers are not included.

PHARMACEUTICAL COMPANIES' LOCATION OPTIMISATION STRATEGY

High Degree of Agglomeration Among Foreign Firms

When considering potential locations for headquarters or other offices, many multinational pharmaceutical companies prefer to locate themselves in areas where other similar companies are based. This has led to **Nanjing West Road** and **New Bund** emerging as hubs for the industry.

AGGLOMERATION

- ✓ Use peers' and counterpart companies' locations as references to inform location decision-making.
- ✓ Clusters of upstream and downstream companies can enhance operational efficiency.

QUALITY OFFICE STOCK

- ✓ Prefer CBDs possessing a large number of Premium/Grade A offices.
- ✓ Emerging office districts are more likely to provide a wide range of large-sized offices for headquarters consolidation and expansion.

Tenant Affordability

Nanjing West Road is one of Shanghai's leading CBDs and is home to 90+ Premium/Grade A offices. The New Bund also has many high-quality offices suited to pharmaceutical companies' requirements for large floorplates or whole building customised space.

Government-supported Strategic Industry

Many districts in Shanghai provide supportive policies and incentives to attract tenants from strategic industries such as pharmaceuticals. For example, Jing'an offers the **Global Service Provider Programme**, a special investment mechanism, while Pudong implements a biomedical talent incentive policy.

ENVIRONMENT

- ✓ Pharmaceutical industry-related supportive policies and tax incentives.
- ✓ Investment mechanism and government services.
- ✓ Continual optimisation of the business environment.

TOP TALENT POOL

- ✓ Core CBDs tend to host more skilled and experienced staff.
- ✓ Talent development and comprehensive amenities are key elements for talent attraction and retention.

Strong Demand for Top Talent

While a range of criteria inform real estate location selection, most pharmaceutical companies in Shanghai place a strong emphasis on the availability of talent. Core CBDs tend to attract skilled and experienced staff.

PHARMA TENANTS

GENERAL LOCATION DECISIONS



- ✓ Industrial Clusters
- ✓ Accessibility (Metro/Rail/Air)
- ✓ Business Environment
- ✓ Government Efficiency

SITE



- ✓ Developer
- ✓ Property Management
- ✓ Tenant Mix
- ✓ Interior Design and Fit-out
- ✓ Space Availability

QUALITY



- ✓ Car Parking Spaces
- ✓ Eco-landscape Planning
- ✓ Business Amenities
- ✓ Retail Podium(Commerce, F&B, etc.)
- ✓ Neighborhood Environment

AMENITY



- ✓ Rent
- ✓ Rent Free and Fit Out Period
- ✓ Expanding Subspace
- ✓ Handover Date
- ✓ Maintenance Fee
- ✓ Others

TERMS



- ✓ Efficiency Ratio
- ✓ Ceiling Height
- ✓ Raised Floors
- ✓ Air Conditioning
- ✓ Power System

TECH

As well as these criteria related to site, quality, amenity, terms and technology, pharmaceutical companies must consider other aspects such as location and specific industrial characteristics.

OFFICE MARKET OUTLOOK

As both domestic and foreign pharmaceutical companies accelerate their expansion, **consolidation and upgrading demand** will be the main driver of new office leases.

DEMAND

Affordable and fast-growing emerging markets that can provide good accessibility, a comfortable environment, and comprehensive amenities will be the preferred locations for pharmaceutical companies' headquarters or for large-scale consolidation. The New Bund, Hongqiao CBD and other areas in the Greater CBD will be priority areas for expansion.

SUBMARKET



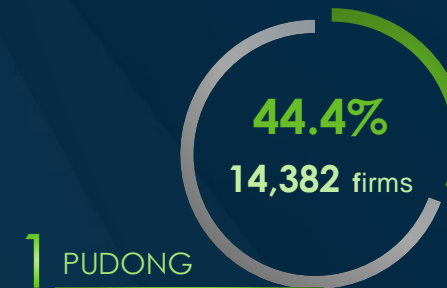
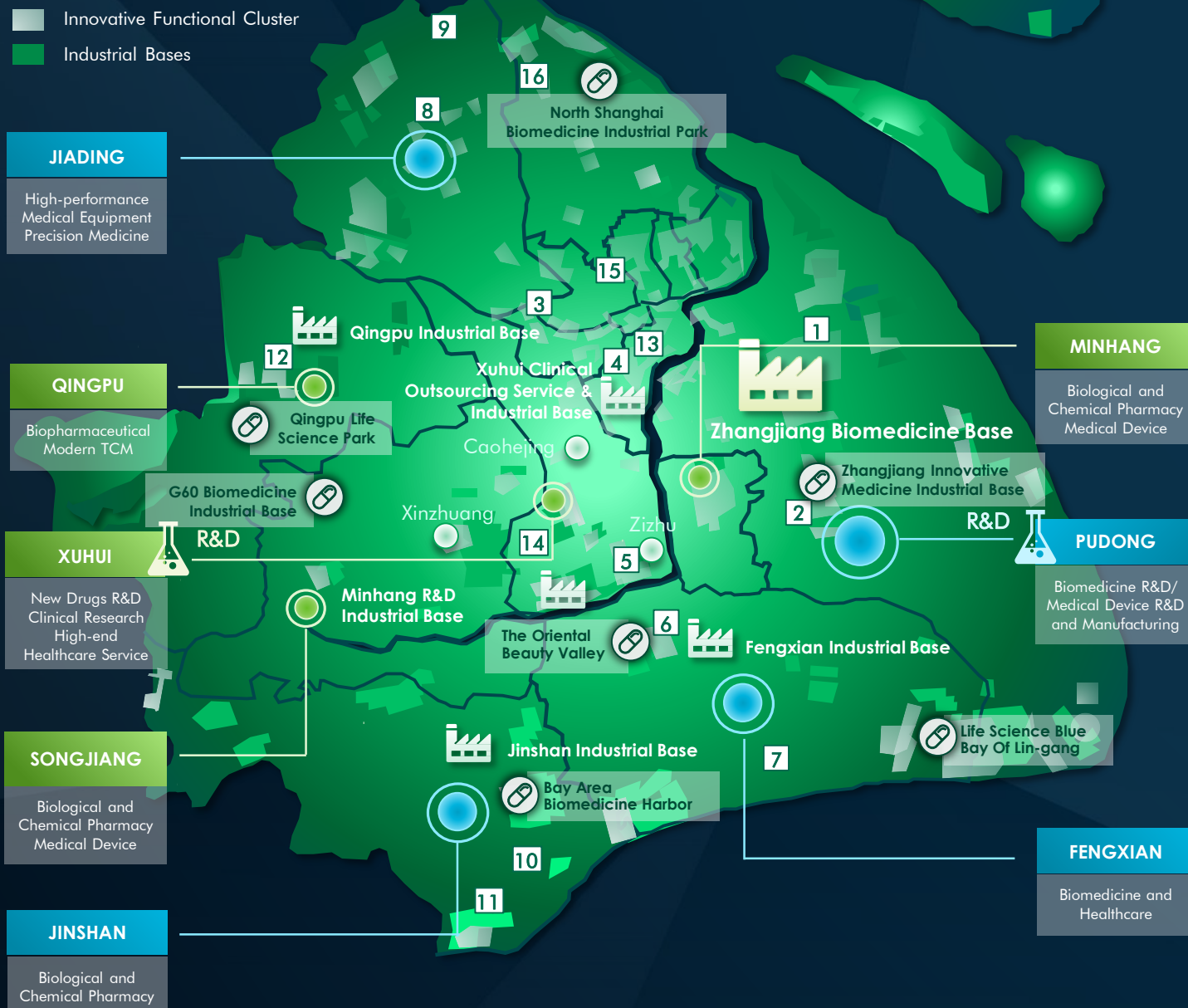
5 BUSINESS PARK

Zhangjiang as The Core Supported by Multiple Nodes

SHANGHAI'S PHARMACEUTICAL INDUSTRY PRESENCE TAKES SHAPE

In the business park sector, recent years have seen a trend for pharmaceutical companies in Shanghai to base themselves in Zhangjiang district, while also utilising supporting 'nodes' in other districts dedicated to specialised fields such as medical equipment and R&D outsourcing. Shanghai authorities have been actively promoting a "1+5+X" co-ordination pattern between Zhangjiang and other key biomedicine bases.

- Biomedicine High Industrial Output Area
- Biomedicine Industrial Area
- Characteristic Industrial Parks
- 1 Traditional Parks
- Innovative Functional Cluster
- Industrial Bases



Six Biomedicine Bases

Zhangjiang Biomedicine Base
A first-class R&D centre and innovative product manufacturing cluster in APAC

Minhang R&D Industrial Base
A biomedical high-end product manufacturing base and the largest national animal vaccine R&D and production base

Xuhui Clinical Outsourcing Service & Industrial Base
A new drug demonstration zone and innovative product manufacturing base

Fengxian Industrial Base
A high-end chemical API and modern CTM production base

Jinshan Industrial Base
A high-end chemical API and modern CTM production base

Qingpu Industrial Base
A modern CTM and health supplement production base



Shanghai authorities have been actively promoting a "1+5+X" pattern between Zhangjiang and other locations such as Lingang and Fengxian, positioning them as production spaces for R&D operations that are conducted in Zhangjiang.



Shanghai Biomedicine Cluster Distribution

Source: Shanghai Industrial Map, CBRE Research, Q2 2020.

ZHANGJIANG PHARMA VALLEY A NATIONWIDE LEADER IN R&D

Founded in 1994 and located at the core of Shanghai Sci-Tech Innovation Centre-Pudong Zhangjiang High-Tech Development Zone, Zhangjiang Pharma Valley is one of the earliest technology parks developed under the government's "focusing on Zhangjiang" policy. Thanks to its multiple advantages of location, platform, innovation and capital, the Valley has grown rapidly into a national-level biomedicine base for R&D institutions, with a particular focus on new drug development.

As of 2020, the total output value of Zhangjiang's biomedicine industry stood at approximately RMB 110 billion, accounting for 78% of Shanghai's total. Zhangjiang Pharma Valley is home to more than 600 life sciences companies; more than 150 R&D institutions; seven of the world's top 10 pharmaceutical companies; and more than 1,000 patents. As a leader in terms of R&D volume, manufacturing output and development capacity, Zhangjiang accounts for **15% of new original drugs** developed worldwide and is set to become a world-class industrial cluster for pharmaceutical innovation.

A World-class Pharmaceutical Cluster

Pharmaceutical Output Value



% Zhangjiang of Shanghai

Number of Pharma Companies



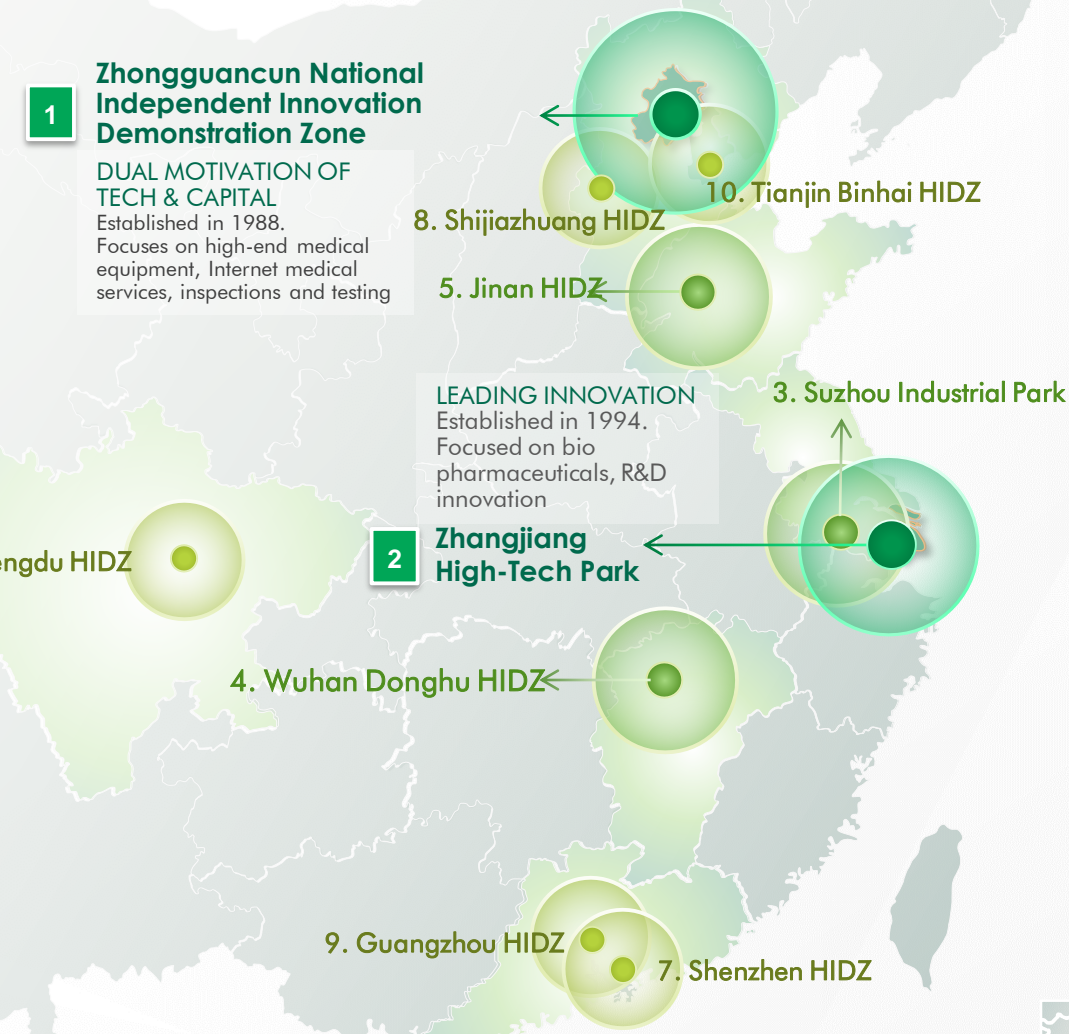
% Zhangjiang of Shanghai

Based on business parks in seven submarkets covered by CBRE Research.



A national-level pharmaceutical park with strengths in **New Drug R&D** and manufacturing.

Rankings are from the **2019 China Biomedical Parks Competitiveness Evaluation and Analysis** published by the China National Centre for Biotechnology Development



Zhangjiang Pharma Valley's Achievements in Innovation Lead the Rest of the Nation, Particularly in New Drug R&D

Recent years have seen Zhangjiang Pharma Valley make rapid progress in new drug creation. A total of 64 Class 1 new drugs have been developed in the Valley, accounting for one-fifth of those developed in China's top 10 domestic biomedical parks. The Valley also has 400+ new drugs under study and 130+ at the clinical research stage.

Number of New Drug Applications



Comprehensive Innovation



25

PHARMACEUTICAL INDUSTRY PARK DEVELOPMENT: UPGRADING AND REVITALISATION OF EXISTING STOCK

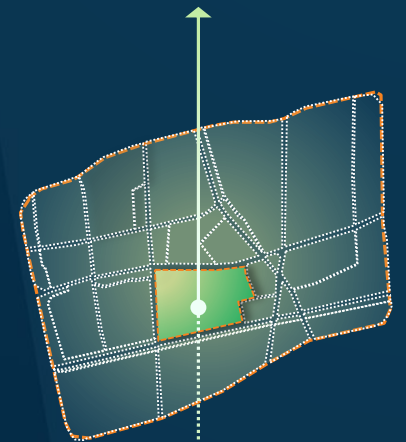
Owing to its reputation for innovation, Zhangjiang Pharma Valley has attracted numerous pharmaceutical companies and R&D centres to establish a presence in the area. Supported by the creation of a national incubation platform, the Valley is a leader in new drug development and has made a name for itself in the field of outsourcing services. Owing to its integrated industrial chain and agglomeration of industry, an increasing number of startups are choosing to move to the Valley. Strong demand for suitable real estate has led to shortage of supply, prompting some landlords to commence upgrading and revitalisation of exiting stock.

CBRE's analysis of more than 300 tenants in Zhangjiang Pharma Valley has uncovered several key trends. The Medical R&D service industry accounts for the bulk (69%) of occupiers, while 81% of companies in the area are CRO and CMO enterprises. Around 200 firms in the Valley offer outsourcing services and outsourcing services, a number expected to increase. 90% of tenants are classified as startups, reflecting the appeal of the area as a hub for innovation.

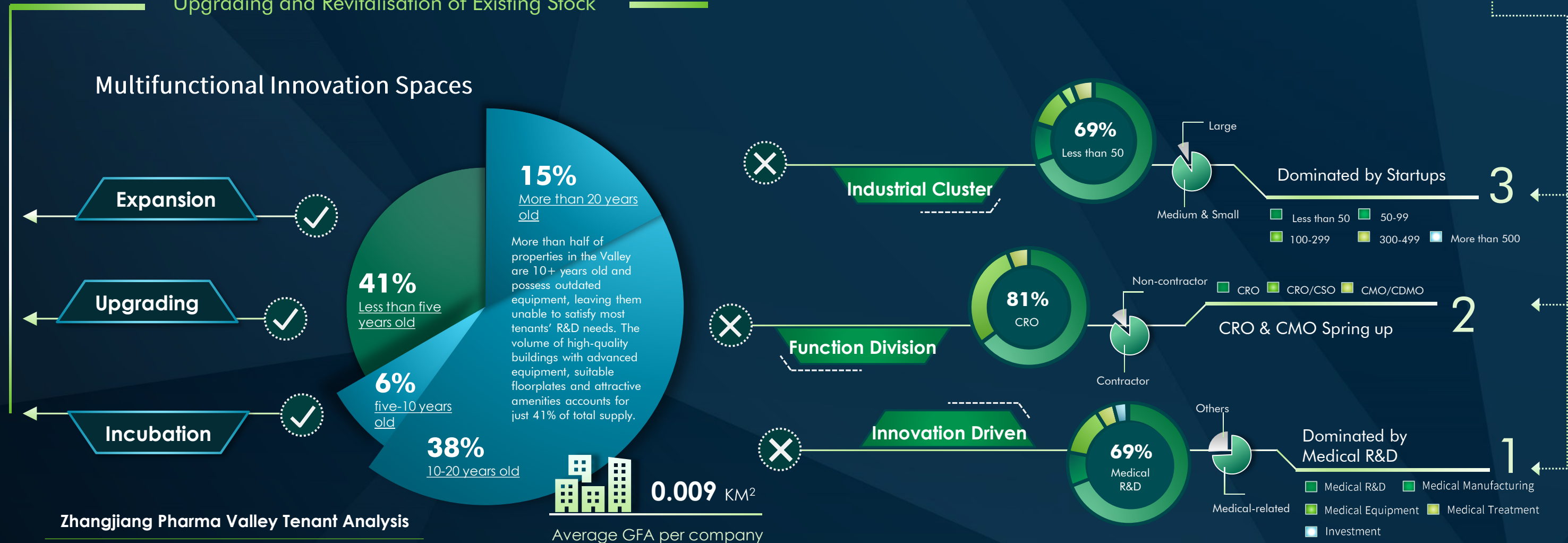
While high quality properties account for 41% of total supply in the Valley, 53% of buildings are more than 10 years old. This means there is a shortage of space with both modern life sciences R&D facilities and Environmental Impact Assessment qualifications. Many landlords of pharmaceutical parks are therefore renovating or redeveloping older properties.

With the average GFA per company in Zhangjiang Pharma Valley just 0.009 sq. km. compared to 3 sq. km. in other national level pharma parks, potential for extension is limited. This has led to expansion shifting away from the core of the Valley to the four radially distributed bases of Zhangjiang Headquarter Park, Zhangjiang Innovative Medicine Industrial Base, Zhangjiang Medical Devices Industrial Base and Desano Old Port Base. This trend will eventually result in the formation of a Zhangjiang Pharma Village.

CBRE sample collected from Pharma Valley Phase II



Pharmaceutical Park Development Trends - Upgrading and Revitalisation of Existing Stock



Source: 2021 Shanghai Business Park Tenant Profile, CBRE Research, Q2 2021.

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UPGRADING TRENDS: SHARED R&D SPACE

Many of China's early pharmaceutical parks such as Zhangjiang Pharma Valley struggle to meet tenant demand for multifunctional properties possessing high-quality office, laboratory and leisure space. Some parks also lack cost efficient facilities and incubators that can appeal to startups.

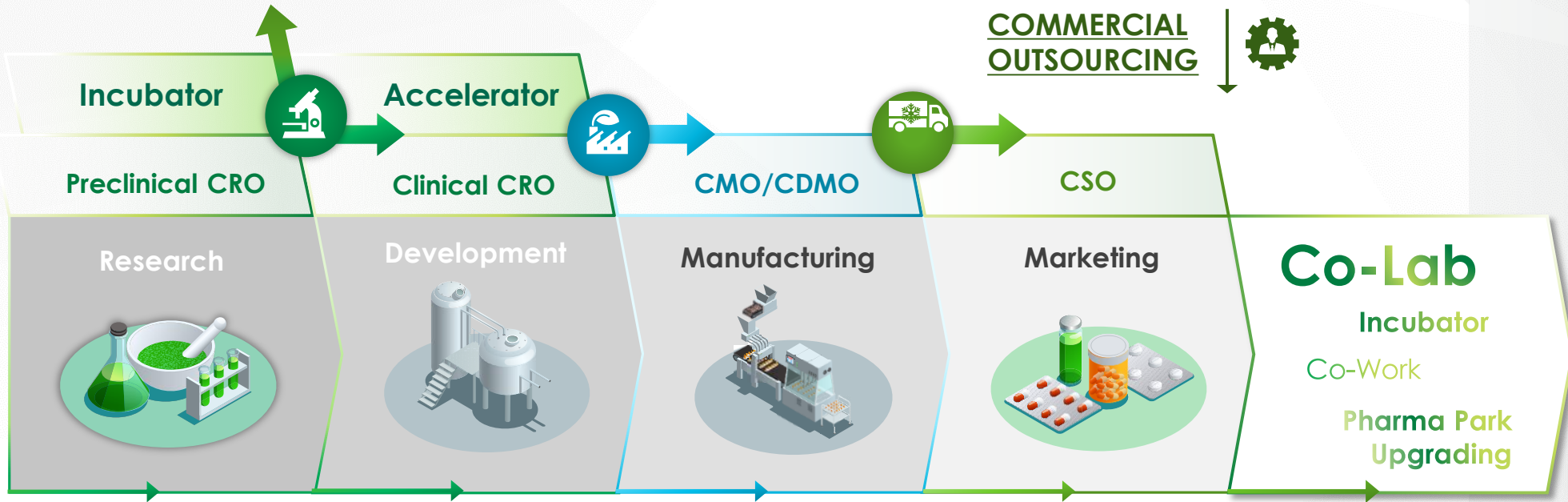
However, recent years have seen the advent of incubators and co-labs in Zhangjiang, which cover the entire industrial chain and outsourcing services to accelerate the industrialisation of new drugs. In 2019, Johnson & Johnson established its JLABS facility in Zhangjiang. The facility is the first incubator of its type in Asia Pacific and mixes R&D with art space to enhance creativity and innovation. Several local platforms such as ATLATL have also emerged in Phase II of the Valley.



REAL ESTATE INNOVATION

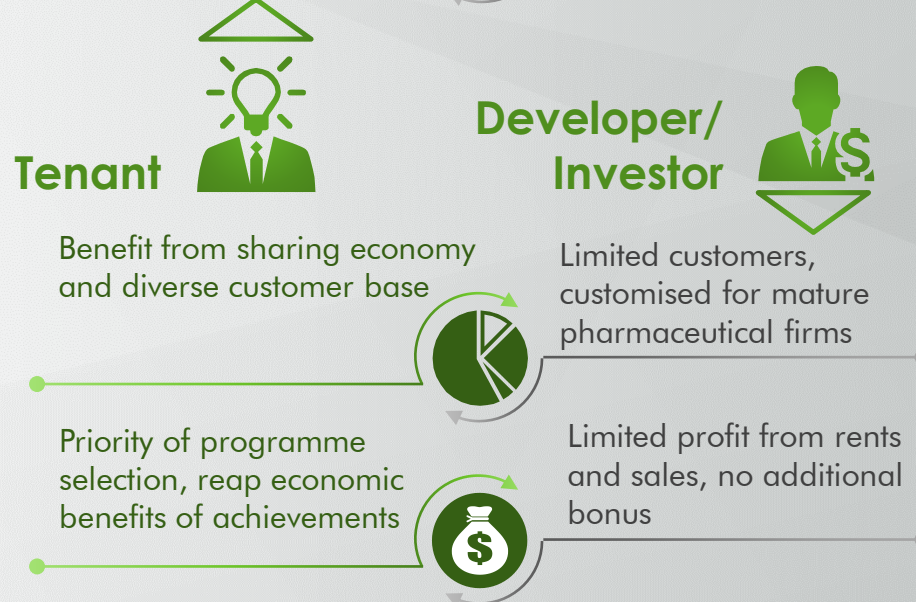
Biomedical firms are clustering in Zhangjiang due to its one-stop R&D and production service model. This influx of companies will prompt landlords to upgrade existing facilities to support industry growth, with CBRE expecting this to lead to an increase in new R&D incubators and co-labs.

Renovation strategies likely to focus on R&D Incubators and Co-labs



ATLATL model VS Traditional model

Shared R&D Space Professional Operation Support	Limited Leasing
Quicker launch	Slower launch
Flexible space, terms and operation	Rigid Solutions
3rd party professional operation support	Focus more on operations
Integrated operations and infrastructure	Challenging to focus on research
Low upfront CAPEX and operation costs	High costs
Lower risk	Higher risk



CO-LAB - ATLATL INNOVATION CENTRE

“ATLATL INNOVATION CENTRE PROVIDES SHARABLE AND FLEXIBLE SOLUTIONS FOR R&D COMPANIES AT VARIOUS STAGES OF DEVELOPMENT AND WILL BE A KEY INCUBATOR FOR LIFE SCIENCES INDUSTRY TRANSFORMATION”

PC ZHU, PH.D

ATLATL FOUNDER



BSL-1 Level 1 biological safety: not pathogenic to healthy adults, animals and plants.

BSL-2 Level 2 biological safety: suitable for pathogens that have moderate hazards or potential dangers to humans, animals, plants or the environment.

MBL Molecular Biology Laboratory: suitable for genetics, immunology and other research.

QCL Quality Control Laboratory: used to ensure the quality of drug R&D inspection, reduce the probability of sample cross-contamination, and improve environmental quality.

AR Animal Room: suitable for breeding and experimenting on animals.

Laboratory construction should comply with the 2008 *General Requirements for Laboratory Biosafety* and 2011 *Technical Specifications for Biosafety Laboratory Buildings*.

BUSINESS PARK SITE SELECTION STRATEGY

Industrial Clusters for Small and Medium Sized R&D Startups

Recent years have seen leading pharmaceutical enterprises in Shanghai move to pharma parks that can meet both their office and R&D needs. Startups are opting to locate themselves at parks with a clear industrial positioning and abundant R&D resources. As one of the largest national biomedical clusters, Zhangjiang Pharma Valley possesses an integrated industrial chain covering R&D, clinical service and manufacturing, and is emerging as a world-class pharmaceutical innovation centre.

AGGLOMERATION

- ✓ Ample land able to meet firms' office and R&D needs;
- ✓ Clustered integrated industrial chain, maximize synergy Incubator resources and CRO/CMO service platforms;
- ✓ Industrial supporting policies and preferential taxation.

56.8%

ZHANGJIANG

16.6%

PUJIANG

11.1%

CAOHEJING

CBRE's 2021 Shanghai Business Park Tenant Profile found that most pharma tenants are in Zhangjiang, followed by Pujiang and Caohejing

RESEARCH RESOURCES

- ✓ Abundant medical instructions and universities
- ✓ Various experimental and clinical facilities such as National-level laboratories and 3A-Grade hospitals
- ✓ Incentive policies for R&D talent

Talent Attraction

Zhangjiang Science City's proximity to major universities, collaborative environment and wealth of long-term accumulated industrial advantages are helping the area attract R&D talent. A new talent policy due to be released this year is also set to attract more technical personnel to Zhangjiang.

ADVANTAGES

SITE SELECTION

LOCATION		<ul style="list-style-type: none"> ✓ High industry concentration, dense distribution of upstream and downstream industries ✓ High-quality clinical resources and laboratories
POLICY		<ul style="list-style-type: none"> ✓ Industrial supporting policies, preferential taxation, etc. ✓ Talent incentive policy: settlement, housing subsidies, etc.
AMENITY		<ul style="list-style-type: none"> ✓ Corporate branding : naming, logo, advertisements ✓ Transportation: metro, shuttle, parking spaces ✓ Surrounding environment: commercial facilities, green space ✓ Function
FUNCTION		<ul style="list-style-type: none"> ✓ Core: office + R&D lab ✓ Others: Exhibition, conference room, leisure space
LAND-TITLE		<ul style="list-style-type: none"> ✓ Property with biomedical R&D EIA ✓ Industrial land-titled property with biomedical pilot test EIA ✓ Comply with General Requirements & Building Technical Codes for biosafe laboratories
PROPERTY TYPE		<ul style="list-style-type: none"> ✓ Independent space for biohazard disposal solution ✓ Single-storey factory with cleanroom ✓ Strict security to prevent theft or leakage of R&D data
TECH-INDICATOR		<ul style="list-style-type: none"> ✓ 4.5 m. + floor height for R&D equipment installation ✓ Electrical & floor loading requirement Electrical Supply: 50W-500W/sq. m. Floor Loading: up to 500 kg-1000 kg/ sq. m. Ceiling Bearing: able to accommodate A/C units

Compared to other industries, pharmaceutical firms have more complex requirements for R&D space. Most companies require space that can facilitate collaboration and teamwork between employees, while also being capable of housing advanced equipment and safety features to handle hazardous materials.

BUSINESS PARK OUTLOOK

As Shanghai's pharmaceutical industry reaches a mature stage of clustering, agglomeration and integration, space availability is tightening. Measures such as **upgrading** and **revitalisation** existing stock are needed to meet emerging demand.

TRENDS

Landlords renovating business parks will look to create a diversified offering featuring **Incubators, Coworking, Co-labs and Leisure Facilities**, providing an ideal accelerator environment for startups.

FORMATION

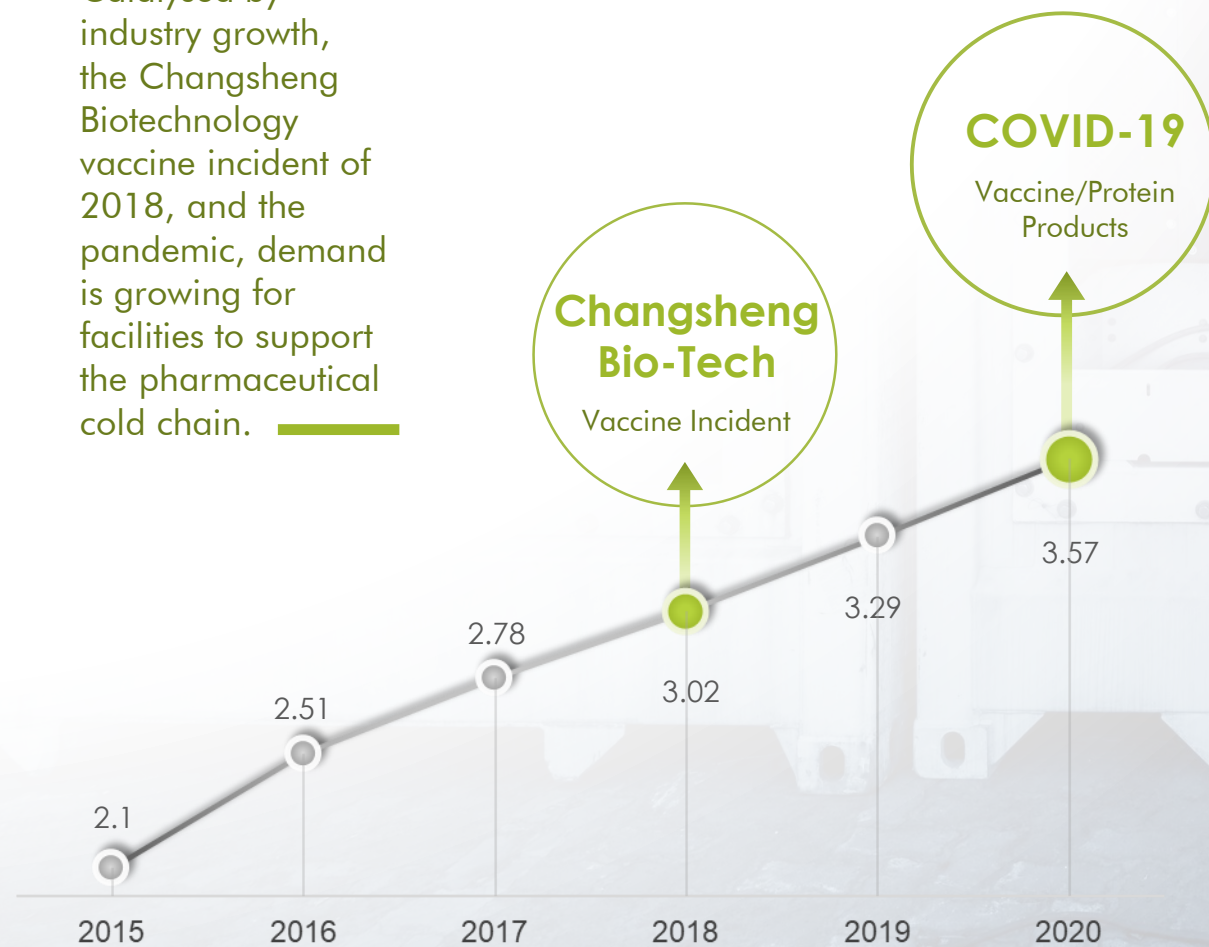


6 COLD CHAIN

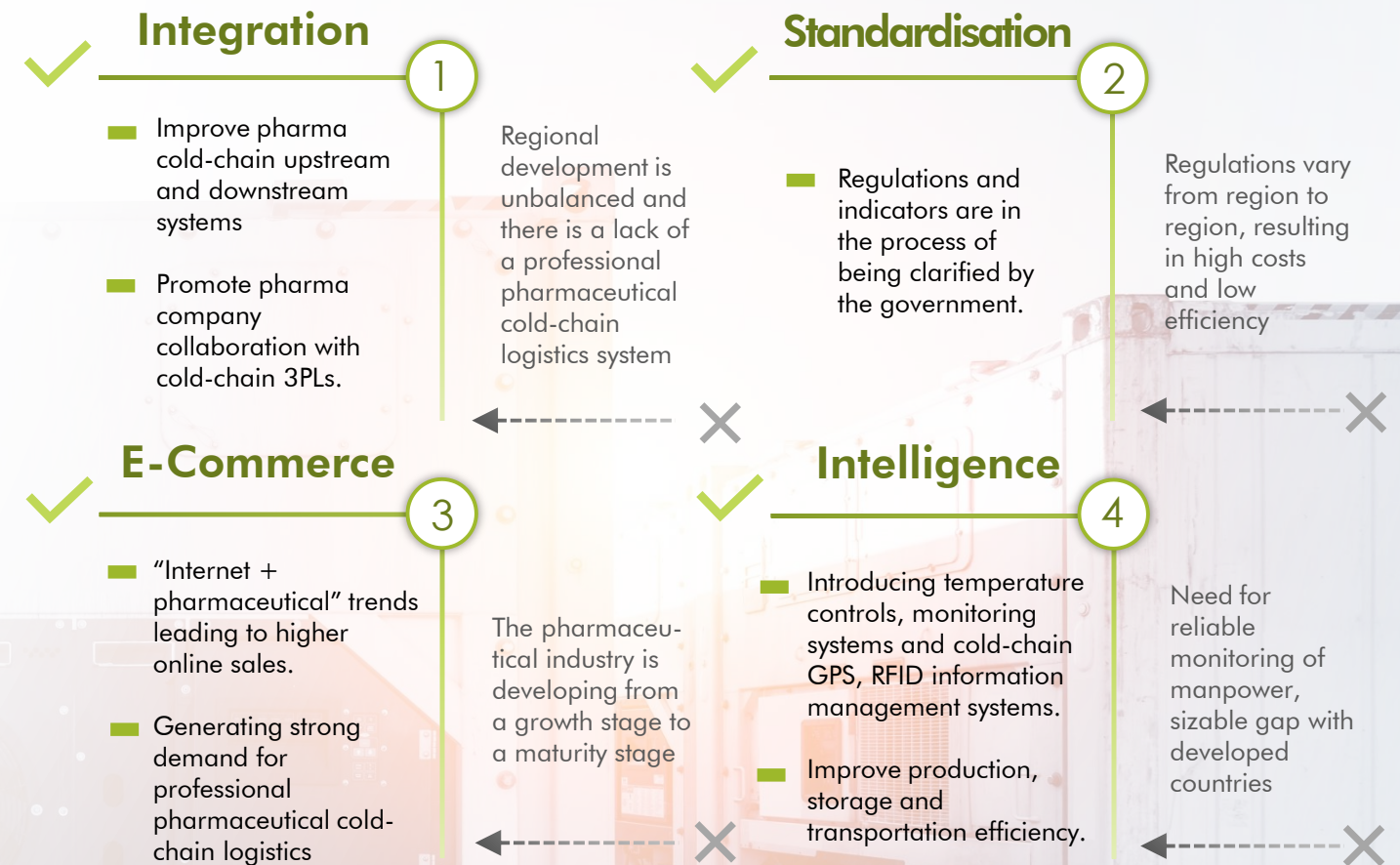
THE RISE OF PHARMACEUTICAL COLD-CHAIN

Recent years have seen growing demand for pharmaceutical cold storage in China as part of the development of medical transportation systems. While the COVID-19 pandemic has generated additional demand for facilities to store refrigerated medicine such as vaccines, serums, and protein products, the country's existing supply of medical cold chain facilities is limited. However, new policies such as those related to medical reform and the two-invoice system are set to underpin significant growth in the pharmaceutical cold chain in the years ahead.

Catalysed by industry growth, the Changsheng Biotechnology vaccine incident of 2018, and the pandemic, demand is growing for facilities to support the pharmaceutical cold chain.

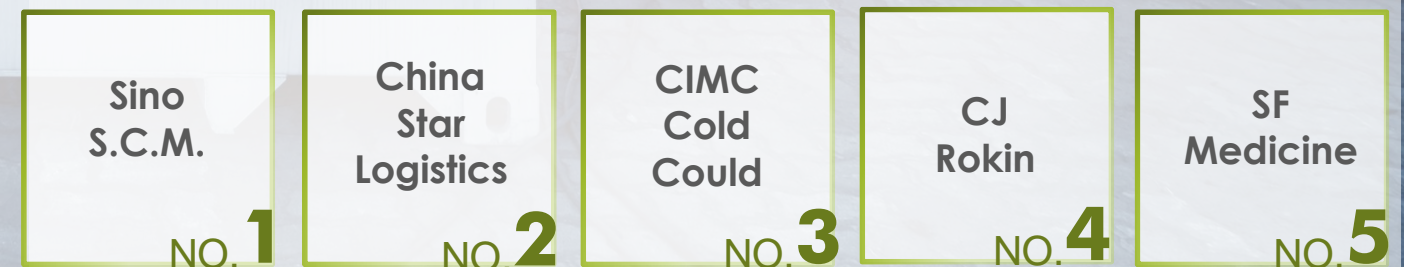


China's Bio-pharmaceutical Output is Increasing YoY/ RMB 100 mn



CBRE has identified these four key trends in Shanghai's pharma cold chain.

There are three modes of cold-chain operation: **Self-operated, Self-operated + 3PLs, and 3PLs**. Thanks to their extensive experience, **3PLs** are playing a prominent and dual role in the supply chain as logistics operators and cold storage providers, with this integration bringing numerous efficiency improvements.

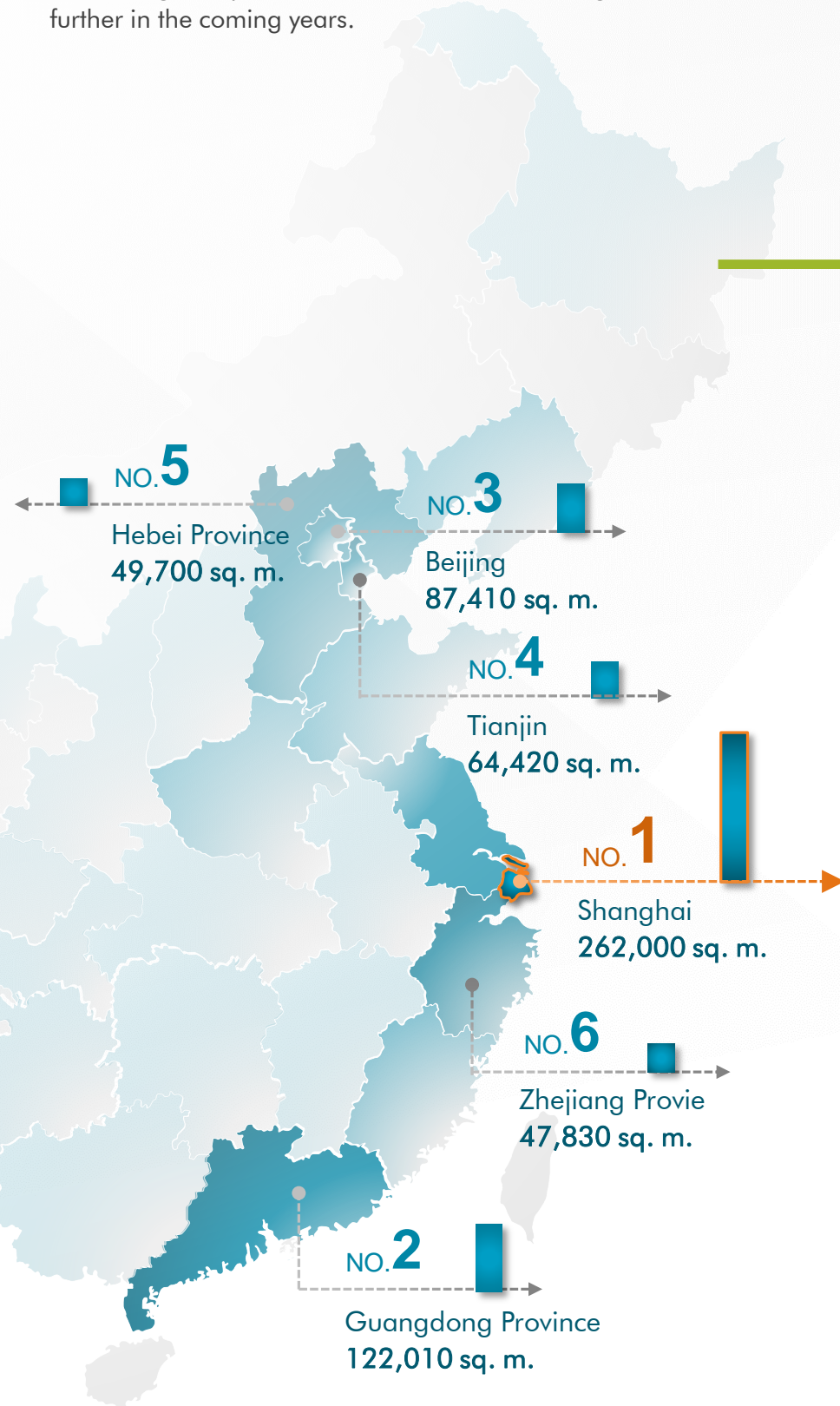


Top Five in China Pharmaceutical Cold-Chain Logistics Top 20 Ranking/By CFLP

26

DEMAND STIMULATES COLD CHAIN INFRASTRUCTURE DEVELOPMENT

With demand for vaccines, blood, protein and other products used in epidemic prevention set to remain high, requirements for medical cold storage and cold chain facilities are expected to rise further in the coming years.



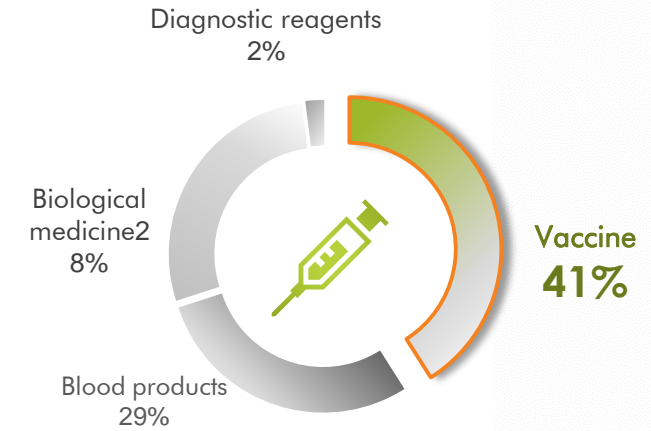
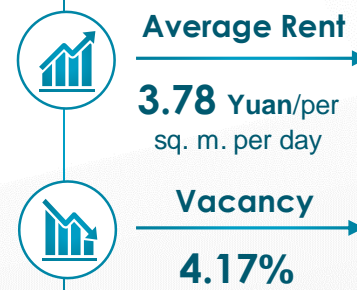
The professional and specialist management of cold storage means these assets command **higher rental premiums** compared to general warehouses.

China Cold Chain Logistics Committee (CCLC) data show that total nationwide demand for pharmaceutical cold storage exceeded 612,200 sq. m. in H1 2020, led by demand for freezer facilities, which accounted for just over half of the total. In terms of location, just over half of demand is concentrated in the economically well-developed East China region, in which 262,000 sq. m. of requirements were in Shanghai. Among enterprise type, cold chain enterprises (53.5%) displayed the highest demand.

Pharma Cold Storage Demand

The 2nd highest Average Rent

The average rent for cold storage facilities in Shanghai is RMB 3.78 per sq. m. per day, just behind that of Beijing, but well above the national average of RMB 3.0 sq. m. per day. Vacancy in Shanghai stands at 4.17%, far lower than the national average of 10.87%.



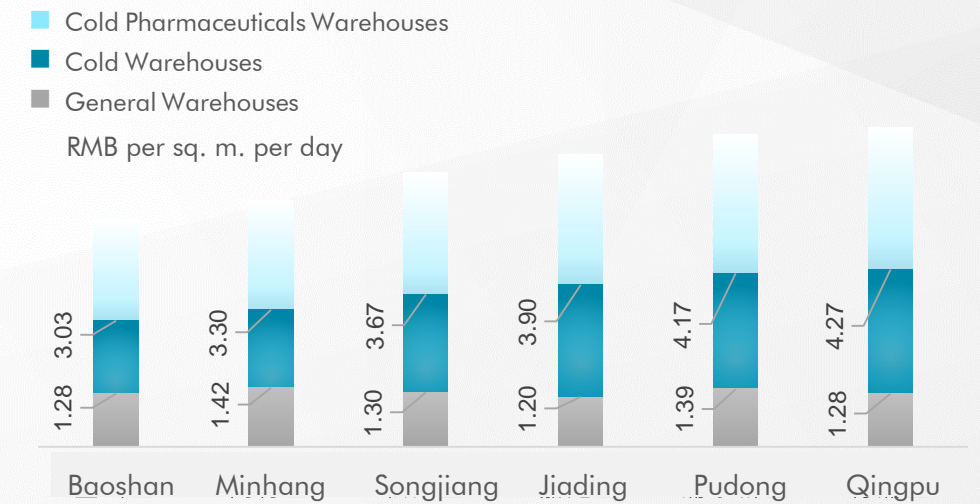
Major drivers of pharmaceutical cold chain demand are vaccines and blood products.



3PLs account for more than half of the number of cold storage tenants

Rents for cold storage are higher than those for general warehouses in Shanghai. Rents in Qingpu and Pudong districts are relatively higher.

2.8x



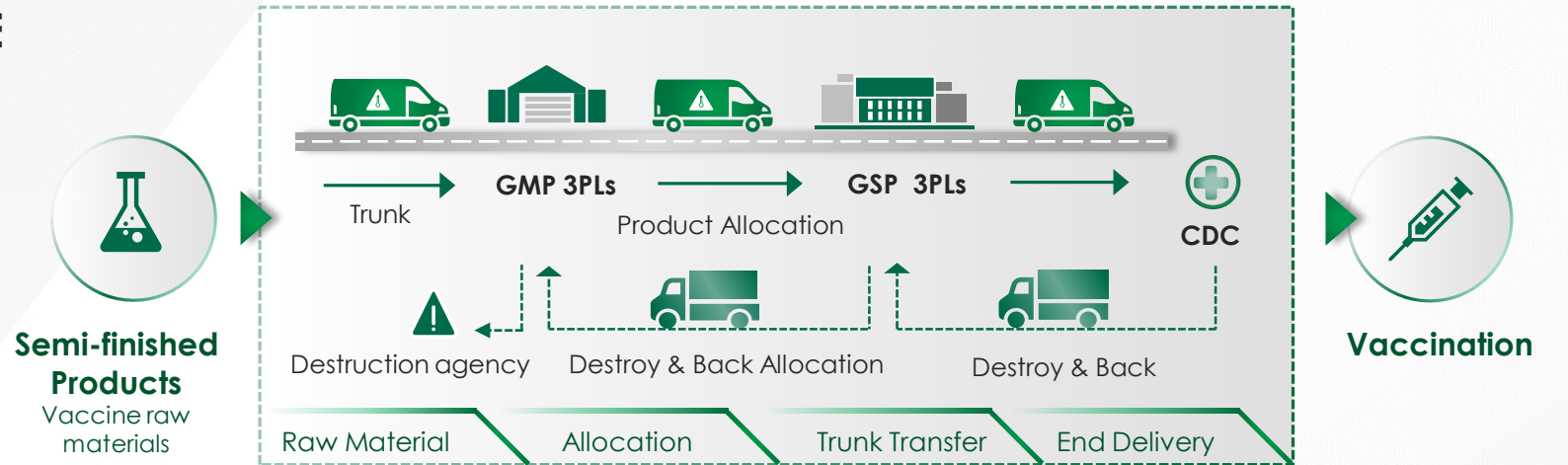
Information Source: Liankui, Warehouse Incoold, PDB, CBRE Research, Q2 2021.

MEDICAL COLD STORAGE: PRECISION AND INTELLIGENCE

The pharmaceutical cold-chain is designed to ensure products are kept at a constant temperature. To ensure safety, perishable drugs such as vaccines, blood products and diagnostic reagents must be kept at a low and constant temperature during production, storage, transportation and to medical institutions and other consumers. Any deviation in temperature can lead to serious and lasting damage.

Pharmaceutical production, storage and circulation must strictly comply with **GSP** and **GMP** guidelines which refers to transportation precautions and facility standards.

Vaccine Cold Chain and Recycle Supply Chain



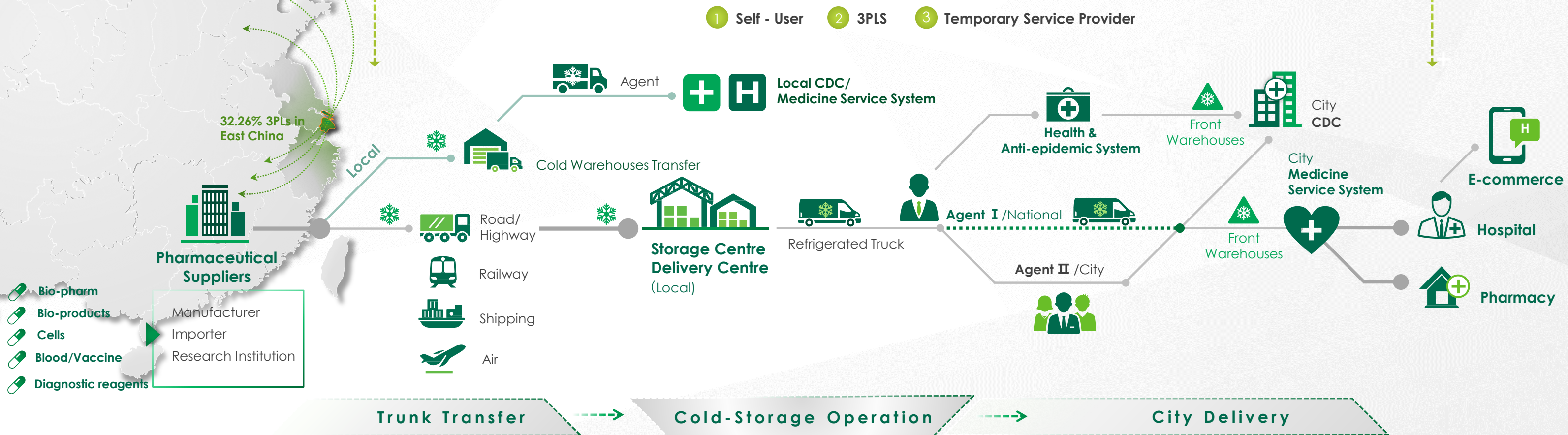
GSP

Good Supply Practice, regulations mainly guaranteeing drug quality in the process of purchasing, detection and storage, and sales.

GMP

Good Manufacturing Practices, regulations stipulating that pharmaceutical, food and other companies should establish a complete production chain to ensure that product quality meets the required standards.

Circulation process: From place of production, storage centre transfer, delivery centre storage, city delivery to end user



- Bio-pharm
- Bio-products
- Cells
- Blood/Vaccine
- Diagnostic reagents

DEDICATED FACILITIES REQUIRE PRECISE AUTOMATION

1 GSP/GMP Regulations

Medicine Type	Temperature	Example	Warehouses	
Chemical Medicine	20°C < (Cool, shady)	Sevochlorane Acetylsparmycin	Constant Temperature	Shady Constant Temperature
	2°C~10°C (low temperature)	Asparaginase	Refrigeration & Constant Temperature	
Chinese Medicine	Special	Ulinastatin	Refrigeration	Cold
	20°C < (Cool, shady)	Chinese herbal medicine	Temperature - control	
Bio-Products	0°C~8°C	Typhoid vaccine	Vaccine storage	Cold
	2°C~8°C	Antibiotic	Medicine storage	
	1°C~ 5°C	Blood	Blood storage	
	-20°C~ -30°C	Reagent	Low-temperature	
	-30°C~ -80°C (No light\dry)	Cells	Ultra-low temperature	

Pharmaceutical cold storage is designed to guarantee the quality of medicines and other related products to prevent their deterioration and other potentially dangerous consequences. National Medical Products Administration (NMPA) regulations state that medical cold storage facilities must have dual circuit controls to ensure that temperatures can be maintained at between +2°C ~ +8°C and humidity kept at between 45% ~ 75%. Facilities should also be capable of maintaining different temperature zones such as deep cold, freezing, cold, constant and normal for various kinds of products. For example, vaccines and (In Vitro Diagnostic) IVD device reagents require independent freezers or freezers.

2 Division by Colour

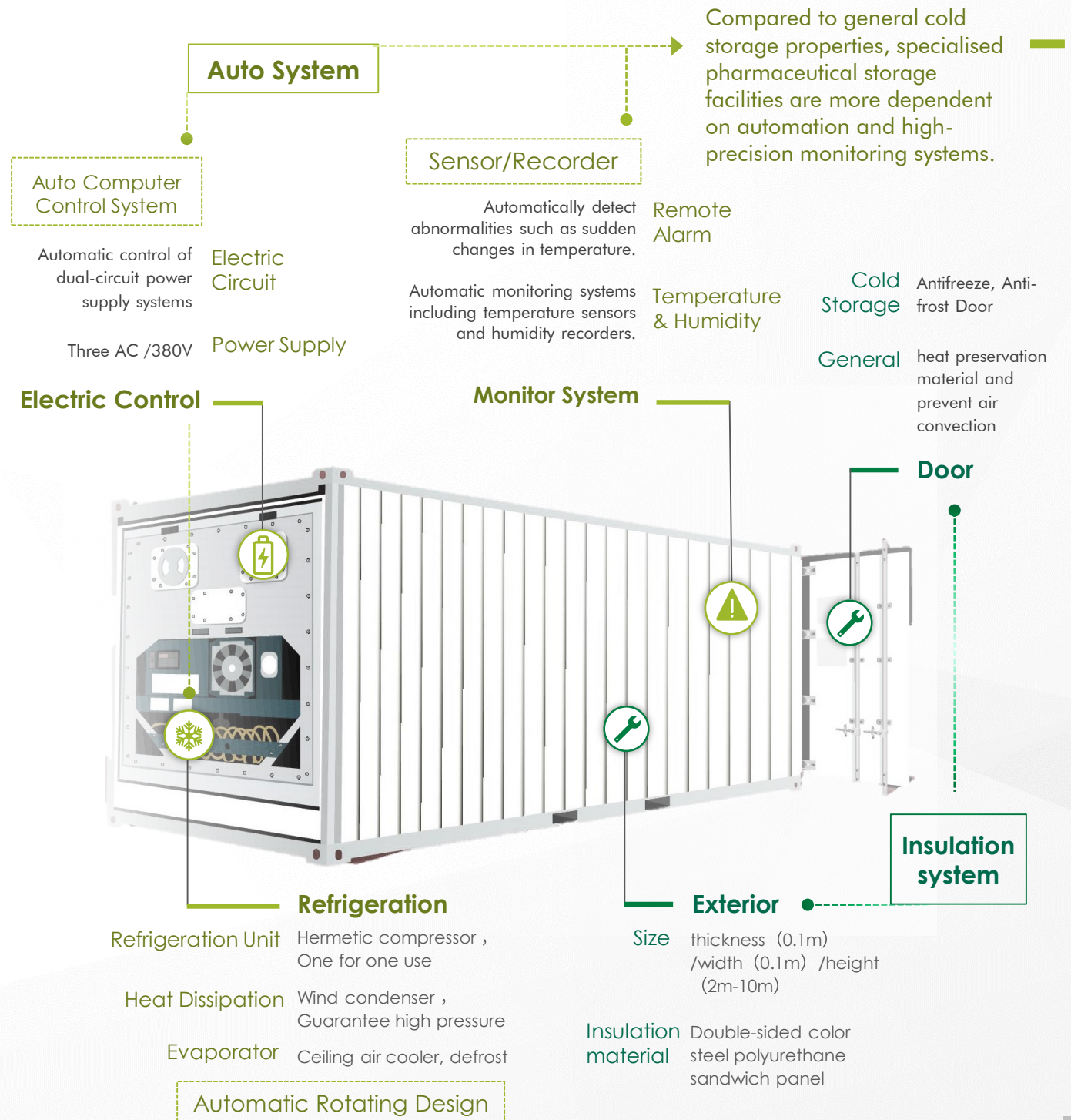
Green	Yellow	Red
Qualified Area	Pending Area	Unqualified Area
Qualified Storage	To be tested Storage	Unqualified Storage
Herbal Medicine	Return Storage	
To be delivered		

3

Pharmaceutical storage facilities typically have higher specifications than ordinary cold storage due to certain requirements related to temperature, humidity, and visibility. With the strengthening of safety supervision, standards related to supporting cold chain facilities have also increased. This has led to the entry of more 3PLs to the market and the emergence of professional pharmaceutical cold storage facilities with high profit margins.

Key items of equipment in small medical cold storage -
Refrigerators, electrical controls, automatic temperature and humidity monitoring systems

Supporting Facilities Specifications



Temperature & Humidity Control

Quality Guarantees

POTENTIAL FOR GENERAL WAREHOUSE TRANSFORMATION

Overlay Map of R&D Centres, Pharmaceutical Factories and General Warehouses

CBRE's analysis of the distribution of 70 high-standard warehouses and the locations of Shanghai's large pharmaceutical factories and R&D institutions shows that most are situated in the Zhangjiang HTZ, Fengxian EDZ, Jiading and Lingang Industrial Zone. This clustering strategy enables pharmaceutical companies to reduce the cost of drug distribution and access to customised cold storage services.

Industrial agglomeration provides two-way convenience for both pharmaceutical companies and 3PLs.

Pharmaceutical Cold Storage Location Criteria

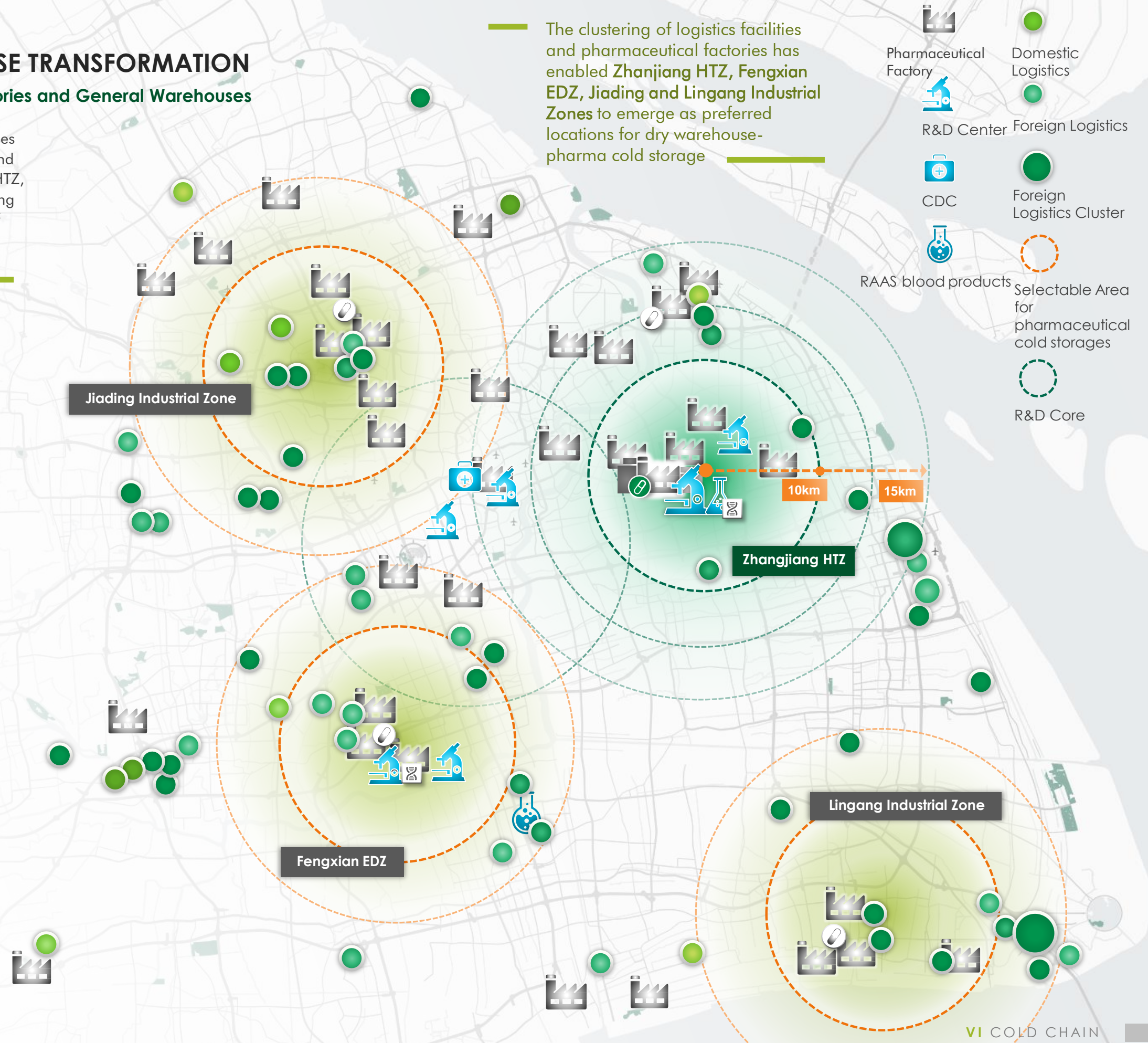
General Dry Warehouses

- 1 Distance**
 - ✓ Near transportation hubs such as ports, expressways and airports
 - ✓ Near end-user markets such as major residential areas
- 2 Land**
 - ✓ Land/property rights
 - ✓ Groundwater resources
- 3 Equipment**
 - ✓ Sufficient ceiling height and unloading platforms
- 4 Environment**
 - ✓ Meet health and safety requirements such as contaminant detection and environmental monitoring

Special Requirements for Medical Cold Storage

- 1 Min Distance**
 - ✓ Near service companies such as factories and R&D centres
- 2 Max Radiation**
 - ✓ Good access to supply and demand sides
- 3 Environment**
 - ✓ Located along the upper sections of rivers and in upwind zones
- 4 Water & Electric**
 - ✓ Adequate water supply and electricity stability

The clustering of logistics facilities and pharmaceutical factories has enabled Zhangjiang HTZ, Fengxian EDZ, Jiading and Lingang Industrial Zones to emerge as preferred locations for dry warehouse-pharma cold storage



Rapid industrial growth, supportive policies, a stronger emphasis on quality control and the onset of the COVID-19 pandemic have led to the pharmaceutical cold chain system taking on a more prominent role in the national logistics industry. CBRE expects the coming years to see a greater focus on **integration, e-commerce, standardisation, and intelligence.**

TRENDS

Owing to their high specifications, pharmaceutical cold storage facilities command rents **two to three times** higher than those for general cold storage. Surging demand for biological products will lead to an **uptick in new construction or upgrading of medical cold storage** facilities in future.

HIGHLIGHTS

COLD-CHAIN OUTLOOK



7 INVESTMENT

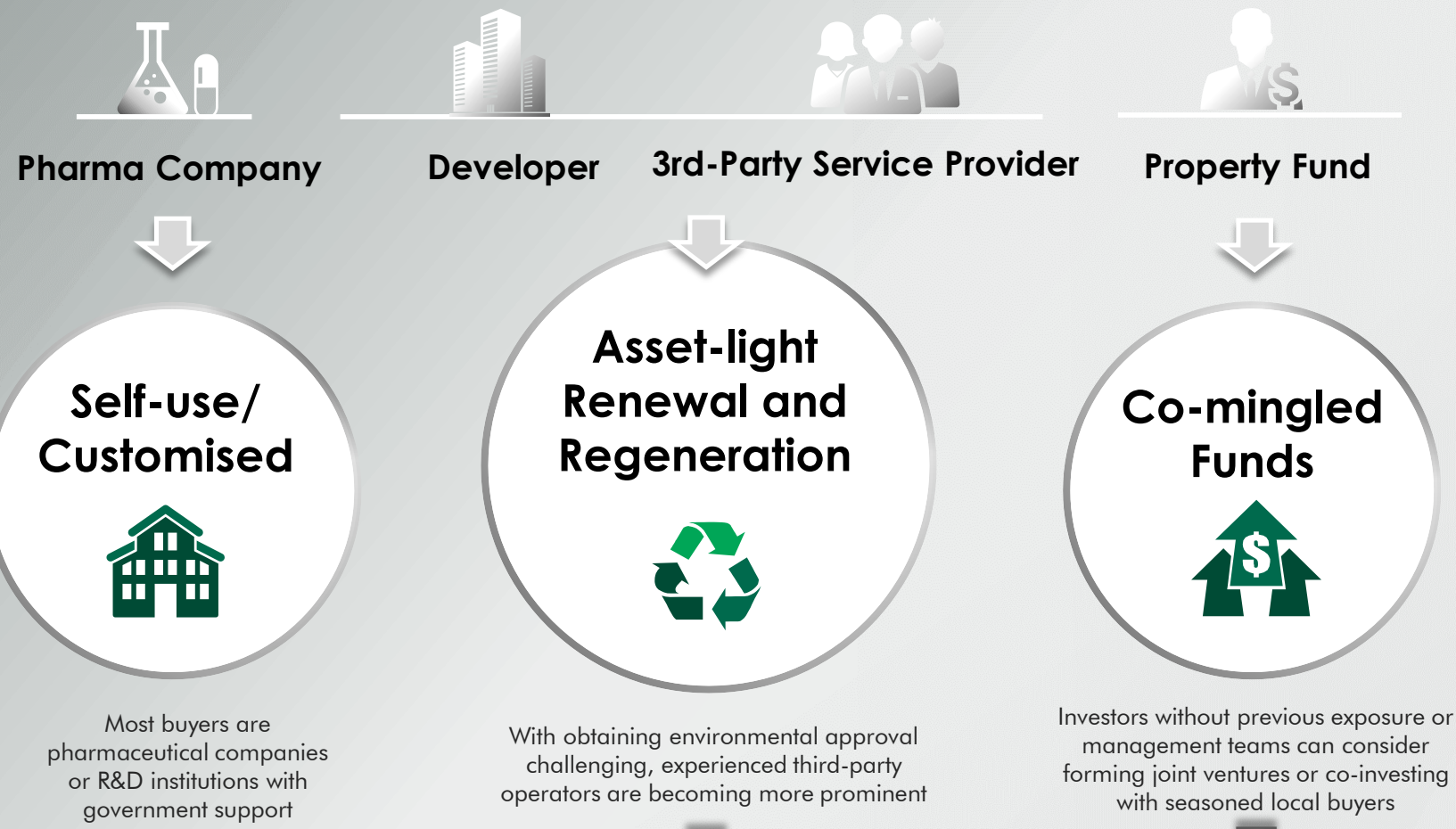
Business parks are an increasingly popular asset class among property investors, with total business park investment volume in China exceeding **RMB 10 billion** in 2020. The rapid growth of pharmaceutical and life science companies will spur additional demand for business parks capable of accommodating these industries' specialised and diversified requirements. Due to the scarcity of suitable facilities and need for EIA (Environmental Impact Assessments), buildings in Zhangjiang Pharma Valley can command rents **1.5x – 1.8x** higher than comparable properties elsewhere.

Since 2020, the COVID-19 pandemic has accelerated investment demand for pharmaceutical related business park assets, especially from pharmaceutical companies, industrial park developers, operators and overseas real estate funds. **Regeneration and Professional Operations** is an increasingly popular investment model for investors seeking to access the business park sector. The forthcoming establishment of China's REIT market will spur additional demand for incoming producing and professionally managed business park assets.

CBRE recommends core-plus investors consider **Sale Leaseback** deals or target core assets in mature business parks. Value-added investors are advised to seek opportunities in emerging pharmaceutical clusters with environmental certification and upside potential. With the pharmaceutical industry having been identified as one of Shanghai's key strategic industries, investors are advised to closely follow changes to industrial policy, land tenure and tax incentives, engage experienced local consultants, and adjust strategies based on risk tolerance when challenges arise.

Business Park En-bloc Transactions (with EIA)

Project	Location	Transaction Date	Buyer	Deal Size (mln RMB)	Deal Type
Pharma Valley Building	Zhangjiang	2018	Property Fund	730	Onshore equity
NEXXUS (Meien Building)	Zhangjiang	2020	Investment Fund	437	Offshore equity
Faladi Rd Project	Zhangjiang	2020	End-user	120	Onshore equity
Ziping Rd 735 Project	Nanhui	2020	End-user	392	Asset Deal
Creation Garden	Zhangjiang	2021	End-user	290	Asset Deal
Pujiang high-tech Plaza#9	Pujiang	2021	End-user	460	Asset Deal



Strategy X Return

>7%
Three-Year Return Rate
 3.5 pps higher than risk-free interest rate.

22.5%
Three-Year CAGR
 Outstanding rental growth, comparing to standard Grade A office development

Platform
 With R&D equipment
 Office facility
 Experienced management team

Investment and Renovation
 Purchase and lease or appoint local agency to do leasing to pharma occupiers

Case study of business park project with EIA

EIA CHALLENGES DRIVE SHIFT TO RENOVATION AND UPGRADING

Investor

2 HIGH RETURNS ATTRACT INVESTORS TO COLD STORAGE

Despite elevated CapEx and OpEx, cold storage facilities command higher rental premiums than general dry warehouses. Rents for pharmaceutical cold storage facilities in Shanghai can be 1.5x to 2.0x of those for standard cold storage, and 2.0x to 3.0x those for dry warehouses.

High returns are attracting a broad range of buyers including pharmaceutical companies, 3PLs, experienced logistics developers and institutional investors to the pharmaceutical cold storage sector. In the longer-term, there will be more opportunities for investors to participate in cold storage-focused real estate funds, providing yet another conduit into this rapidly emerging and lucrative sector.

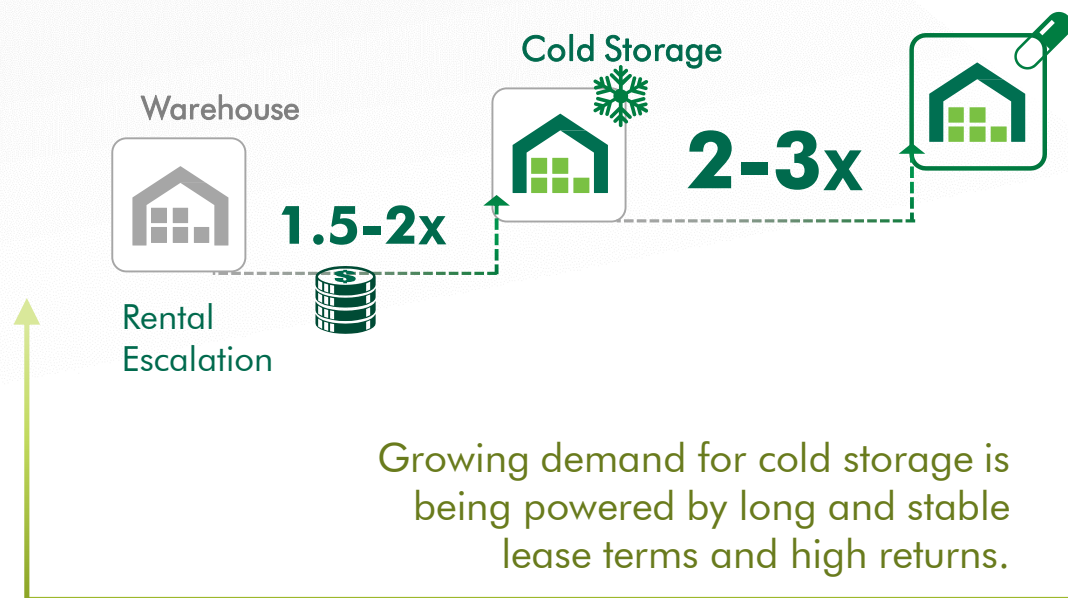
1 Cold storage has long and stable lease terms



2 Cold storage involves higher construction and maintenance costs



3 Pharma cold storage facilities command higher rents



Strategy

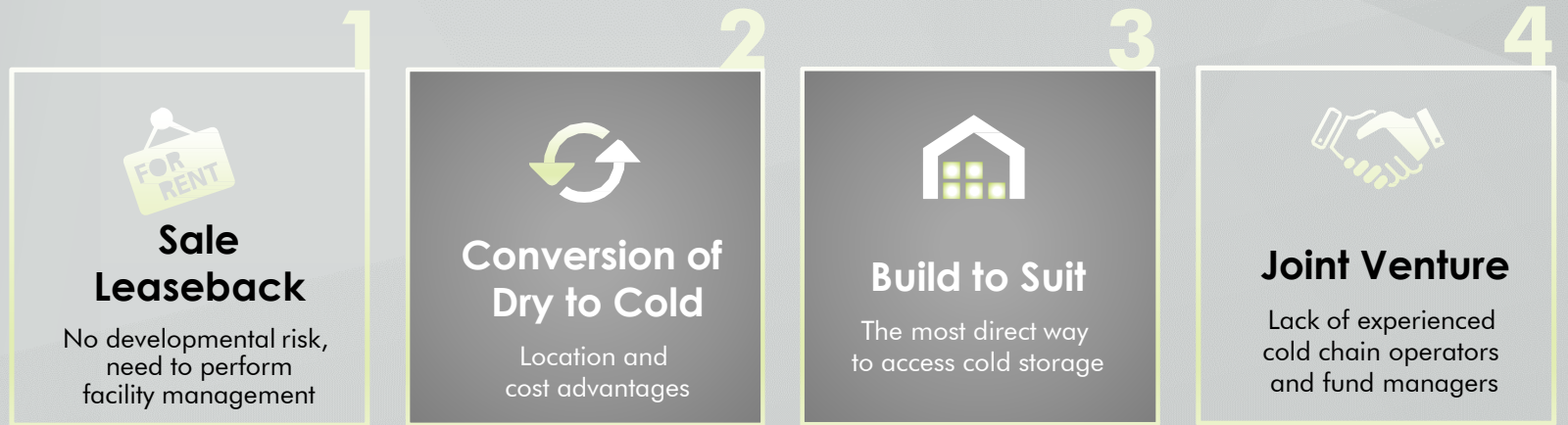
Return



COLD STORAGE INVESTMENT CHANNELS

Lease	Method	Lease + Service
<ul style="list-style-type: none"> Asset Owner Provide building and compatible interior structure for cold storage installation 	Role of Investor	<ul style="list-style-type: none"> Logistics service provider Provide buildings, machinery and logistics service
<ul style="list-style-type: none"> Tenant / Operator Rents (Asset leasing) None (Triple net lease) Build / maintain the property 	Ownership of Machinery and Equipment	<ul style="list-style-type: none"> Landlord Rent (Asset + Service charge) Comprehensive facilities management, security, sales & marketing Building and maintain the property and machinery
	Revenue Stream	
	OPEX	
	CAPEX	

Investment Strategy



Source: Liankur.com, CBRE Research, Q2 2021.

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CBRE RESEARCH

This report was prepared by the CBRE China Research Team, which forms part of CBRE Global Research – a network of preeminent researchers who collaborate to provide real estate market research, econometric forecasting and consulting solutions to real estate investors and occupiers around the globe.

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HEAT MAP & APPENDIX



PHARMA OFFICE TENANTS

- Multinational Pharma
- Domestic Pharma
- Self-Use
- China Headquarters

Johnson & Johnson
FAR GLORY
Bristol Myers Squibb
TAKEDA
BEIGENE
SANOFI
WYETH
PFIZER
ELI LILLY
ABBOTT
ABBVIE

Glaxo Smith Kline

YANGZI-JIANG

National Pharma

Harbin Pharma

Shanghai Pharma

AMGEN






ROCHE

FRESENIUS

SIEMENS

BAYER

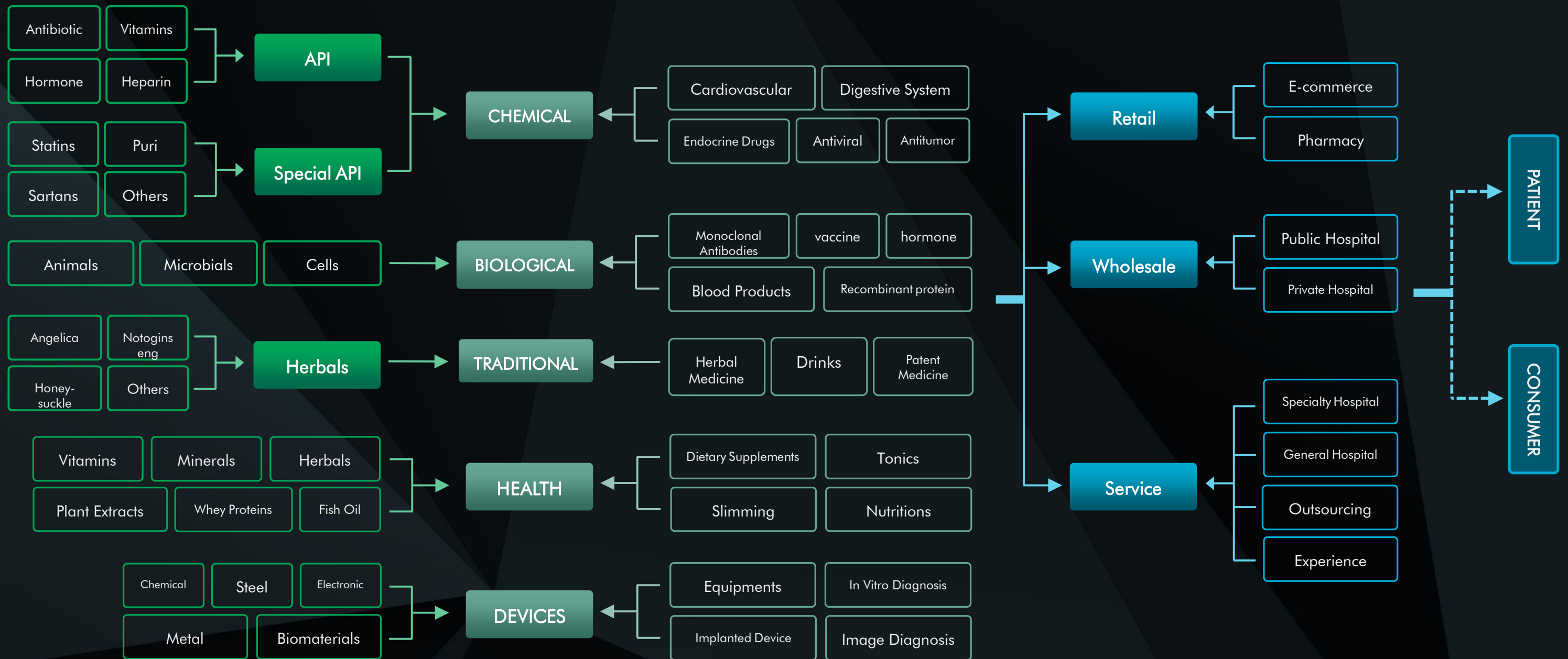
PHARMA BUSINESS PARK TENANTS

-  Multinational Pharma
-  Domestic Pharma
-  Self-Use
-  R&D Centre
-  China Headquarters

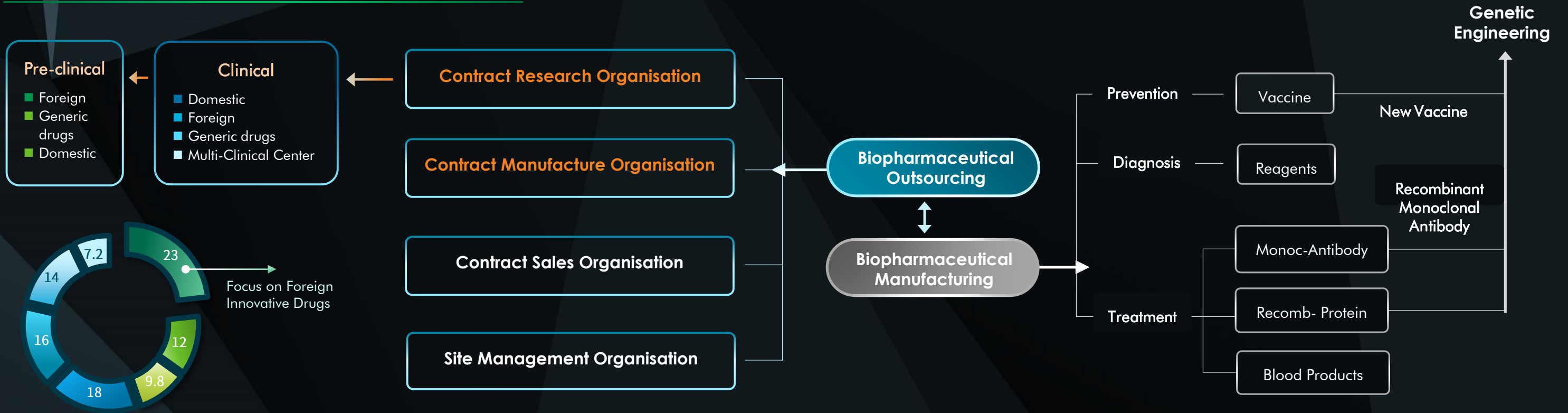


PHARMACEUTICAL INDUSTRY CHAIN

With the rapid development of new life sciences technology and increasing demand for health-related products and services, China's pharmaceutical industry is set to evolve from upstream raw material supply and processing, to midstream pharmaceutical R&D and production, and downstream industrial chain coverage of product circulation. The biopharmaceutical industry, which is a key field of innovation in China, will take on a role at the core of the pharmaceutical manufacturing industry together with chemical medicines, traditional Chinese medicines and healthcare products.



OUTSOURCING SERVICE CHAIN



CRO Sub-industry Distribution In China/%

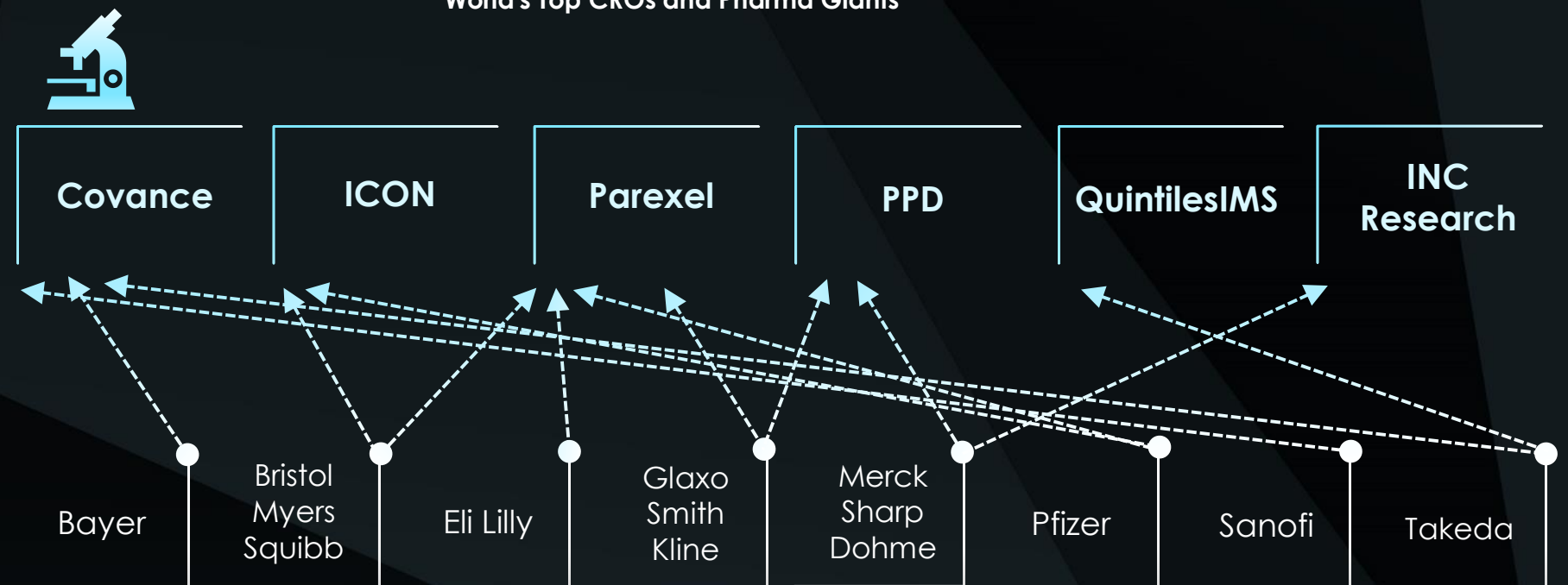
In response to biopharmaceutical innovation, the outsourcing industry has seen substantial growth, with numerous third-party professional companies now bound to pharmaceutical companies through contracts in R&D, production, customised production, sales and clinical management. This enables pharmaceutical giants to reduce their R&D costs while achieving more efficient results.

Using CROs as an example, China's huge population, diversified disease spectrum, relatively low R&D costs, and rapidly growing pharmaceutical demand provide optimal conditions for the development of the outsourcing service industry. The domestic CRO market has grown rapidly over the past decade, reaching a size of RMB 100 billion in 2020. With the accelerated transfer of global pharmaceutical outsourcing businesses to emerging markets such as China and India, and the gradual maturing of China's R&D capacity, generic drug development and other industries, the country's rapidly growing outsourcing market centered on CROs and CMOs will cement China's status as a strategic location for global pharmaceutical giants.

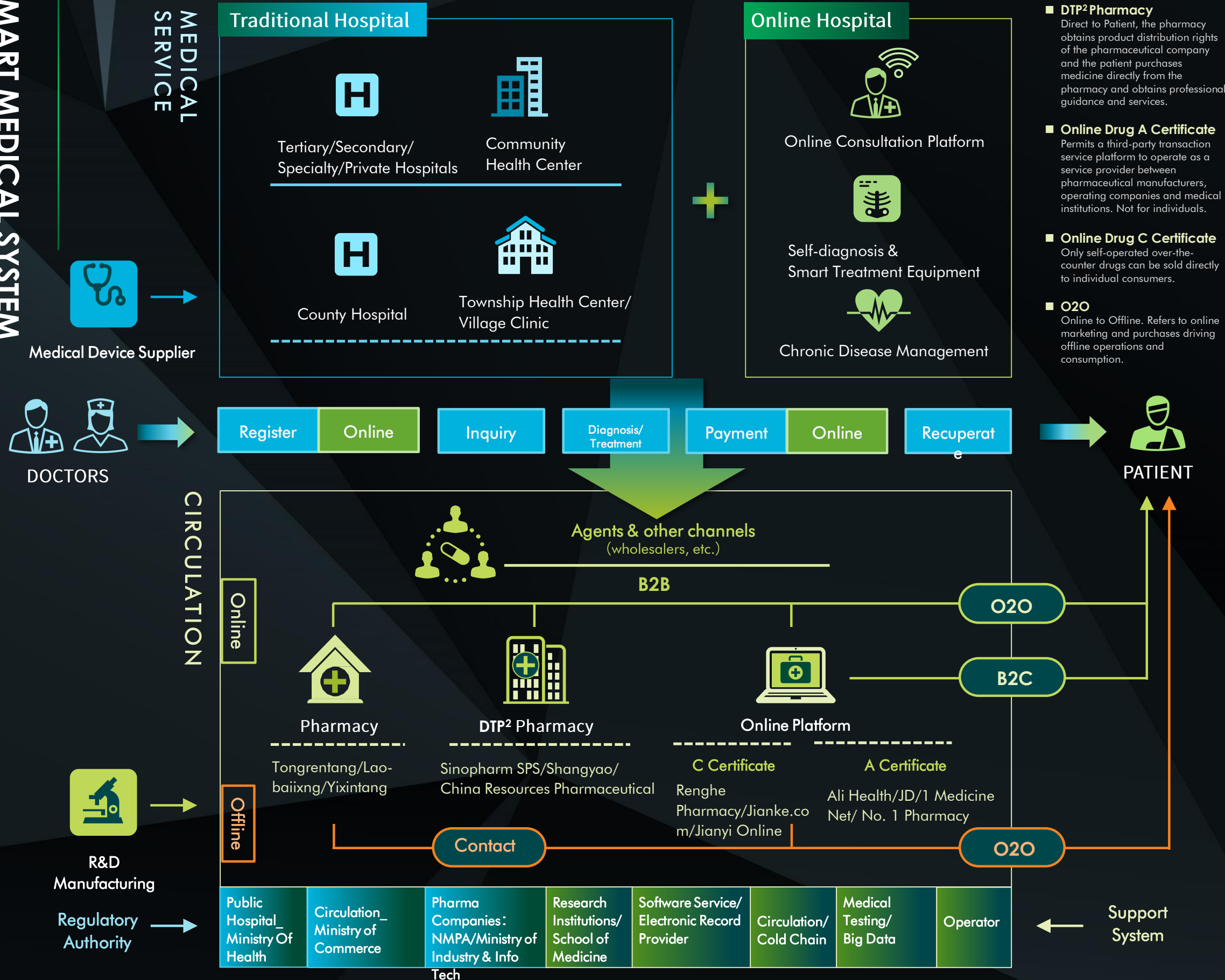
SOURCE
Informa, ARCHINA, CBRE Research, Q2 2021.

Biopharmaceutical Industry Promotes Rise Of Outsourcing Industry

Strategic Cooperation Between The World's Top CROs and Pharma Giants



SMART MEDICAL SYSTEM



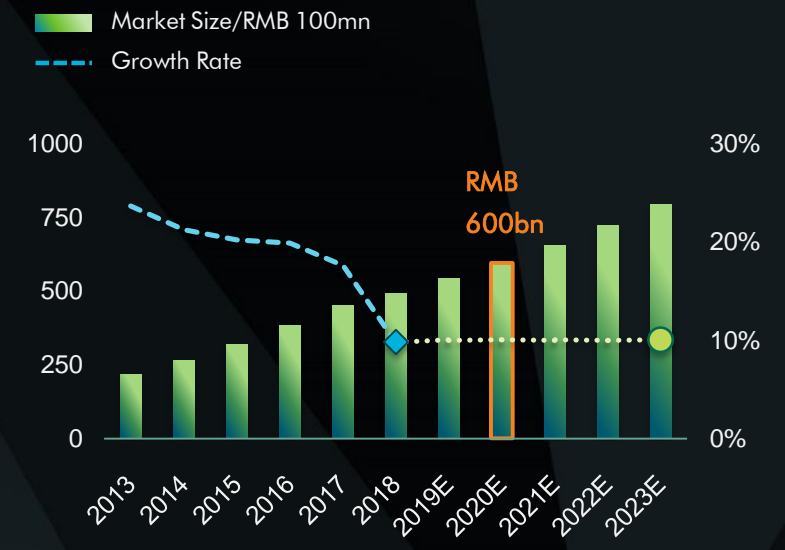
- DTP² Pharmacy**
 Direct to Patient, the pharmacy obtains product distribution rights of the pharmaceutical company and the patient purchases medicine directly from the pharmacy and obtains professional guidance and services.
- Online Drug A Certificate**
 Permits a third-party transaction service platform to operate as a service provider between pharmaceutical manufacturers, operating companies and medical institutions. Not for individuals.
- Online Drug C Certificate**
 Only self-operated over-the-counter drugs can be sold directly to individual consumers.
- O2O**
 Online to Offline. Refers to online marketing and purchases driving offline operations and consumption.

SMART PLATFORMS: CORE TO THE HEALTH INDUSTRY OF THE FUTURE

China's medical informatisation sector, which refers to the field of expertise combining digital technology and medical care, is growing rapidly, registering a CAGR of about 20% over the past decade. IDC Health Insights expects the industry's market size to exceed RMB 60 billion in 2020, with the online medical chain estimated to eclipse RMB 100 billion value in the short-term.

Smart medical applications are focused on delivering mobile medical systems and telemedicine and aim to innovate new health concepts and diagnosis and treatment systems through medical informatisation.

China's Medical Information Market is Poised for Rapid Growth



SOURCE: International Data Corporation, CBRE Research, Q2 2021.