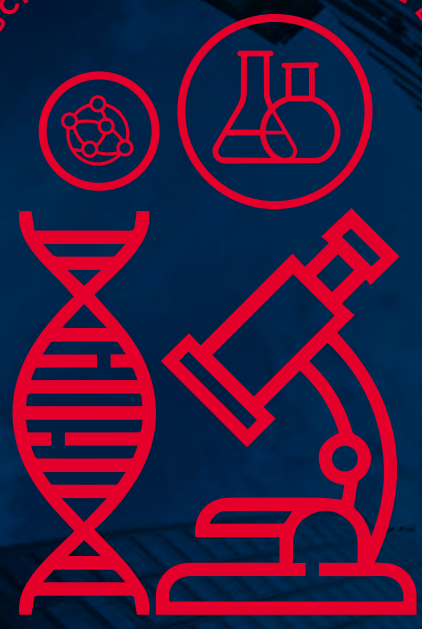


LIFE SCIENCES COMMERCIAL REAL ESTATE



EXPERIENTIAL RETAIL SHOPPING CENTRES



COLD STORAGE LOGISTICS



DATA CENTRES



SIX ALTERNATIVE PROPERTY ASSETS

WHAT TO WATCH IN CHINA

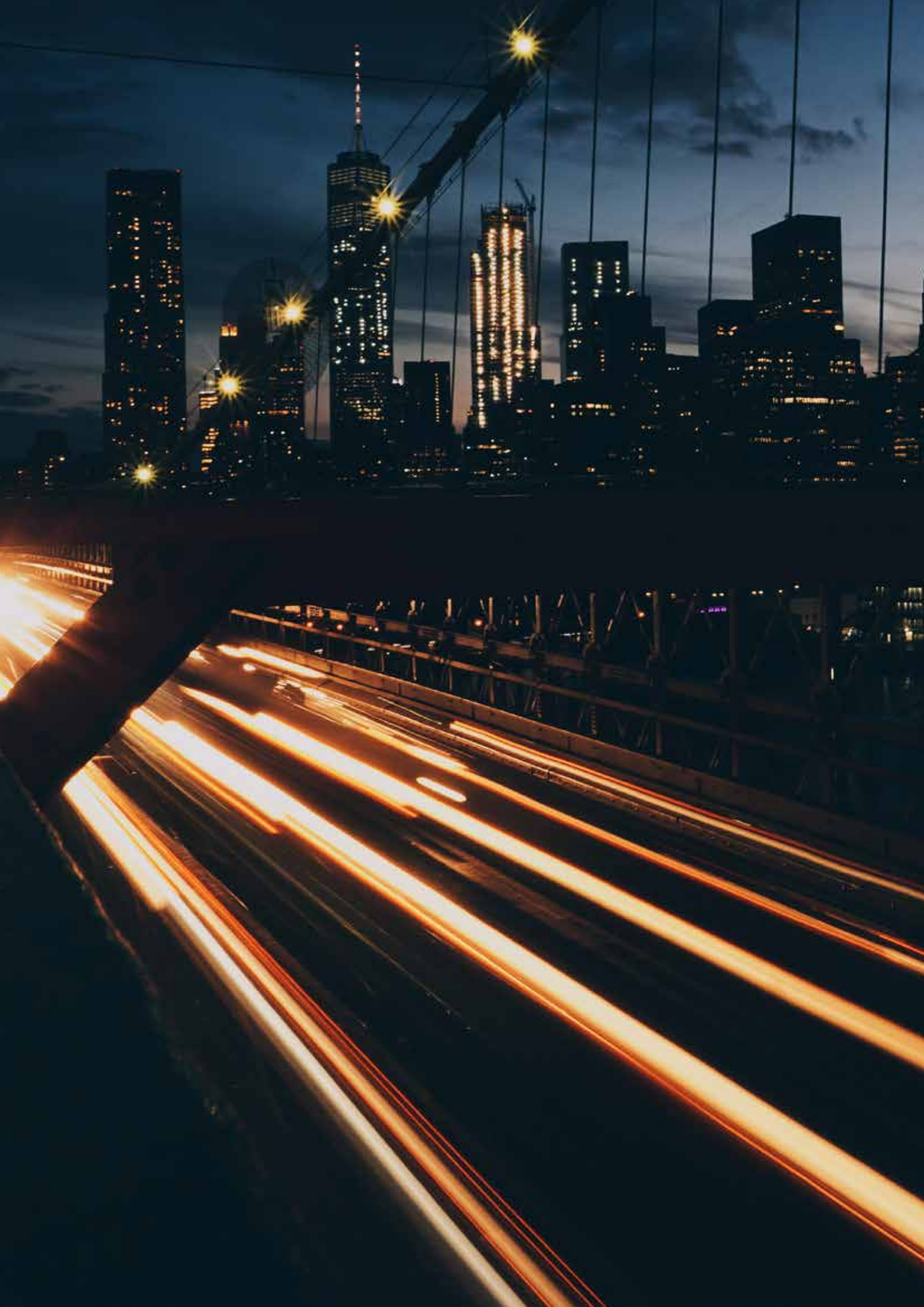
CUSHMAN & WAKEFIELD
GREATER CHINA RESEARCH

LONG-TERM RENTAL HOUSING



HOTELS





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PART 1

EXECUTIVE SUMMARY

The rise of alternative property assets in China has been shaped by a number of factors, not least by:

- o Macro-economic trends;
- o Evolving population dynamics;
- o Technology;
- o New ways of working and living;
- o A greater awareness of sustainability, and;
- o The COVID-19 epidemic.

This report considers these what-to-watch factors and more and how they have affected and stimulated a general market interest in the following six key alternative property assets:



Life sciences commercial real estate

Via encouragement and promotion policies, cities in China are changing the genetics of their real estate as they prepare to make the life sciences industry a major driver for their individual economies in the future.



Experiential retail shopping centres

These forms of shopping centres will not only be localities for consumption but will also be experience spaces with functions and features, such as culture, fashion, art exhibitions and entertainment to satisfy the spiritual consumption needs of consumers in China.



Cold storage logistics warehouses

Ahead, we expect to see more quality cold storage logistics warehouse supply to furnish the needs of domestic market storage, distribution stemming from the importation of fresh goods and products, and the need to store more perishable medicines.



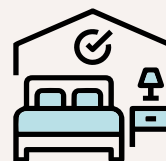
Data centres

Looking to the future, the rapid development of the digital economy in China is expected to bring about a surge in the amount of demand for cabinets. Rigid demand for these data services will only grow as large-scale data processing, storage, and transmission volume increase.



Long-term rental housing

Once a general understanding of the benefits of living in healthy residential housing, including healthy long-term rental housing, is present in more of the general public, so we expect the supply volume of certified healthy long-term rental housing in China to further grow in the years to come.



Hotels

Lastly, the transforming demographics, changing travel consumption behaviour, a greater need for convenience, an elevated grasp of the importance of health, safety and cleanliness, and a mounting desire for a unique stay experience ... are and will increasingly come to the fore within the alternative property asset hotel sector in China and hotel investors, developers and operators need to be heedful of them in order to capture any new business opportunities.

PART 2

INTRODUCTION

The emergence of alternative property assets in China has been influenced by a number of factors, not least by:

- o Macro-economic trends;
- o Evolving population dynamics;
- o Technology;
- o New ways of working and living;
- o A greater awareness of sustainability, and;
- o The COVID-19 epidemic.

This report examines these what-to-watch factors and more and how they have impacted and spurred a general market interest in six key alternative property assets, namely:

- o Life sciences commercial real estate;
- o Experiential retail shopping centres;
- o Cold storage logistics warehouses;
- o Data centres;
- o Long-term rental housing, and;
- o Hotels.



PART 3

ALTERNATIVE PROPERTY ASSETS

Life Sciences Commercial Real Estate

Experiential Retail Shopping Centres

Cold Storage Logistics Warehouses

Data Centres

Long-term Rental Housing

Hotels

Six Alternative Property Assets

What to watch in China

When considering the bigger picture, when contemplating traditional investment, often stocks and bonds generally spring to mind. When people visualise the concept of alternative investment, commodities, currency, precious metals, cryptocurrency, art and collectibles, fine wine and even real estate are some select examples many people think of. Having said this, many investors who are very familiar with real estate consider this form of investment as a traditional arrangement, with their investment going into conventional property asset types, such as Grade A commercial offices, high-end shopping centres, Grade A commercial logistics warehouse facilities and residential housing. Within real estate investment, there are

property assets which are also termed alternative. Some examples include petrol stations, hospitals, car parking areas, clubs and student accommodation. In China, alternative real estate investment and property asset types also exist. In this report, we have picked out six alternative property assets that investors should have on their radar and should be considering given the current trends and future outlook. For each examined alternative property asset, our report also provides readers with further important details on some selected key factors, aspects, elements and features associated with each alternative property asset type.

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LIFE

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01

In recent times, especially during the ongoing COVID-19 pandemic, greater awareness of the importance of healthcare by an expanding pool of educated people around the world, greater spending by governments around the world, ageing populations in many regions, and advancement in medical science and associated technology, have motivated the global life sciences sector to increasingly realise new business opportunities.

Being one of the most important life sciences markets, China is no exemption. Driven by a host of factors, including:

- o Organic industry growth;
- o Population demographics;
- o Spending power – public and private;
- o National health coverage;
- o Policy and reform, and;
- o Research and innovation ...

... China's life sciences sector has not gone unnoticed by investors in the sector, whether it's government investment, corporate investment or private individual investment.

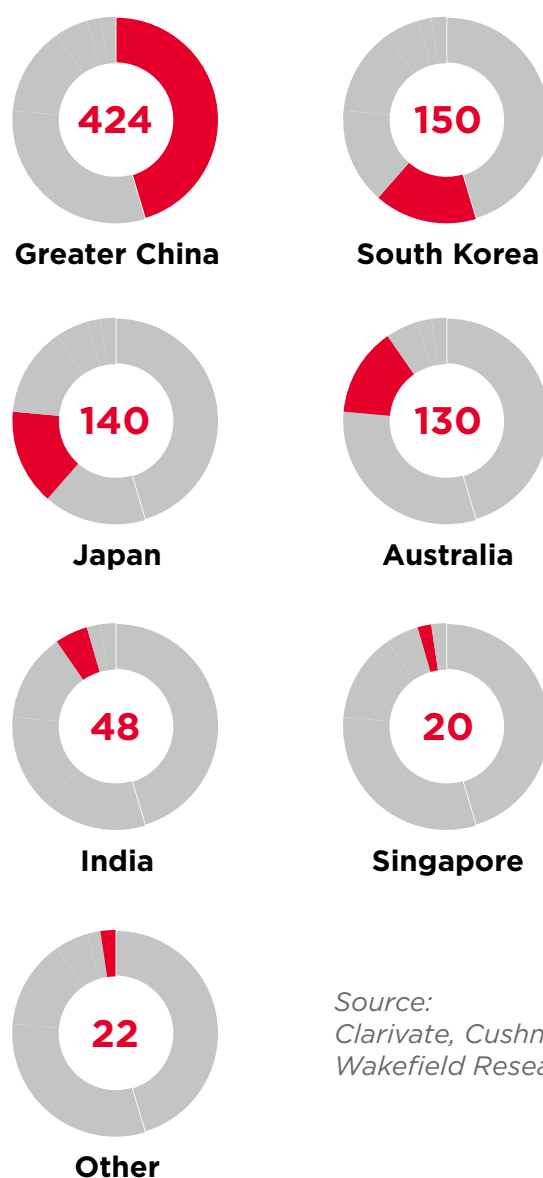
To accommodate this expanding investment, there is and will continue to be demand for associated life sciences real estate, (including related alternative property assets), whether it is large-scale biotech park space, individual lab space, office space, distribution warehouse space or pharmacy retail store space. In this section, we look at location/set up considerations with a particular what-to-watch focus on biotech parks and life sciences-related offices.

Location/Set up considerations

Real estate plays an integral role in the business success of any life sciences enterprise and making the right choice in terms of which location is best suited to establish business operations can often make or break the business.

Good choices are often derived from strategic study and analysis and via much examination, many life sciences enterprises have chosen the Greater China region to be the location for their business operations in the APAC region (Figure 1).

Figure 1:
APAC Country/region – Breakdown based on headquarters location (2019)



Source:
Clarivate, Cushman &
Wakefield Research

Thinking strategically about where to locate their businesses, life sciences enterprises also have to take into consideration the local city markets within a country and within those city markets, the sub-market dynamics as well as any present dedicated biotech parks.

There is also the specialised real estate associated with the life sciences sector to consider, whether it's an R&D lab, a manufacturing plant, an office, a warehouse, a pharmacy or even a data centre (Figure 2).

Figure 2:

Examples of specialised real estate associated with the life sciences sector



R&D Labs



Manufacturing Plants



Warehouses



Pharmacies



Offices



Data Centres

Source: Cushman & Wakefield Research

When considering R&D labs, a new phenomenon which is now evident in the life sciences real estate market in China is the co-R&D lab.

As more and more life sciences start-up enterprises emerge, so the potential for new medical field discoveries has increased over recent years. Many of these start-ups, however, do not have the capital to construct and run dedicated

labs to test and develop their life science medical products. This is where co-labs come into their own by providing much needed product testing and development leased lab facilities to enterprises, including start-up life sciences enterprises.

When built and operated in the right manner, flexible co-labs, whether they are wet, dry or damp labs,

can help attract and retain talent as well as shorten the time from product discovery and development to the realisation of a fully curative medical product.

The location of each of these specialised real estate assets also have to be considered carefully to ensure the optimisation of business success. For example, having a manufacturing plant sited in a particular location, such as a particular biotech park, might qualify the overall business for a tax break and/or might be favourably looked upon by the authorities when seeking further business expansion at a future date.

Biotech parks:

In terms of locations, biotech parks in China are a good start for those life sciences enterprises either starting up or entering China for the first time. Today, countless local governments have set up biotech parks, or more specially biopharmaceutical industrial parks (BIPs) in China. Continually ever more domestic and overseas life sciences enterprises are drawn to station a business presence in their zones. Given this situation, these parks have been one of the chief proponents of the swift growth enjoyed by the life sciences industry sector in China.

According to sina.com, at the end of 2019, China had 387 national-level industrial zones – 219 for economic and technological development and 168 for high and new technology development. Of the total, 193 parks home in on the pharmaceutical industry (Figure 3).

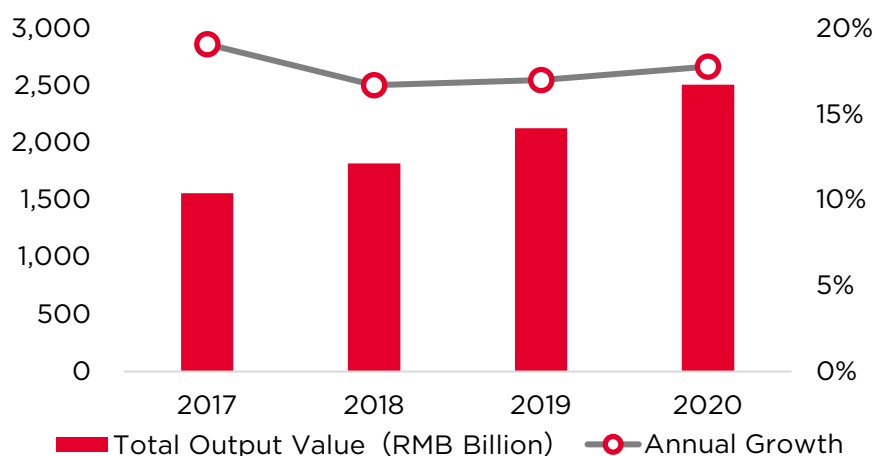
In 2020, according to AskCI.com, the output value of Chinese BIPs was more than RMB2,510 billion and by 2025 this value is expected to exceed RMB5,840 billion (Figure 4).

Figure 3:
National-level industrial parks with biopharmaceutical industry (BI) as a development focus in China (2019)



Source: sina.com, Cushman & Wakefield Research

Figure 4:
Output value of Chinese BIPs (2017-2020)



Source: AskCI.com, Cushman & Wakefield Research

In terms of geographical distribution, most BIPs in China are sited in the Bohai Rim area, the Yangtze River Delta region or the Pearl River Delta region. In terms of particular locales, according to sina.com, Jiangsu, Shandong and Guangdong provinces had the largest number of such parks in China in 2020. With investment and development in other regions, BIPs have also sprouted in Central China and in Western China (Figure 5).

Figure 5:
Distribution of the top 100 BIPs in China (2021)



Source: sina.com, Cushman & Wakefield Research

Table 1:
Representative BIPs in China

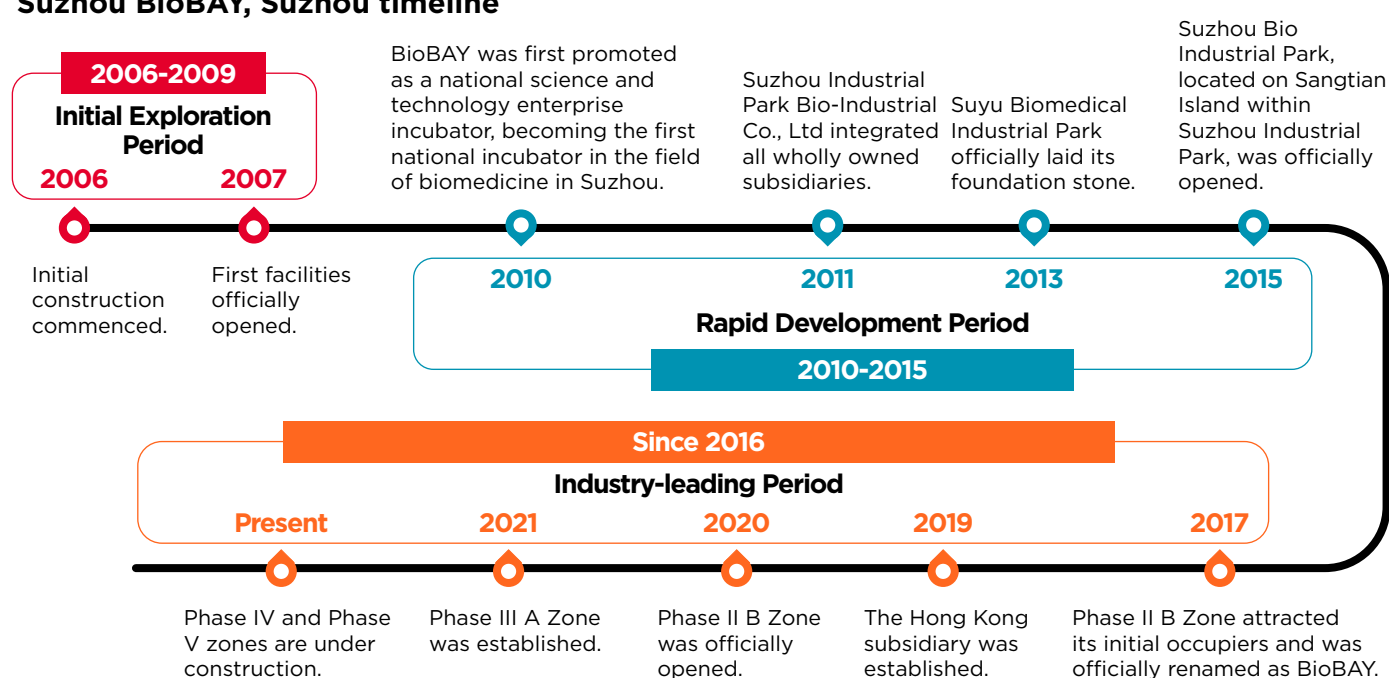
Name
Zhongguancun Life Science Park
Beijing E-Town Bio
China Bio-Medicine Park (Daxing, Beijing)
Shanghai Zhangjiang Pharma Valley
Shanghai International Medical Zone
Guangzhou Science City
Guangzhou International Bio Island
Shenzhen State Biological Industry Base
Shenzhen International Bio Valley
Chengdu Medical City
Zhejiang Yuhang Biomedical Hi-Tech Industrial Area
Hangzhou Biopharma Town
Nanjing Biotech and Pharmaceutical Valley
Nanjing Life Science Town
Suzhou BioBAY
Wuhan BioLake
Xiamen Bio Bay
National Health Technology Park (Zhongshan)
Shijiazhuang National Biological Industry Base
Lianyungang Life Health Industrial Park

Source: China Biomedical Industry Barometer 2.0, Cushman & Wakefield Research

At the present time, BIP development in China is still evolving, as they compete for enterprise investment (Table 1).

What's more, park infrastructure, systems, management, support services and related policies are constantly being advanced and tweaked. Moreover, pioneering enterprises, universities, investment institutions, public service platforms and government agencies are all being integrated into park development, with the hope that these parks can create an edge to support further investment and business growth and expansion in the future. In China, Suzhou BioBAY is a good example of a fully integrated biotech park (Figure 6 and Case study 1 in the Appendix).

Figure 6:
Suzhou BioBAY, Suzhou timeline



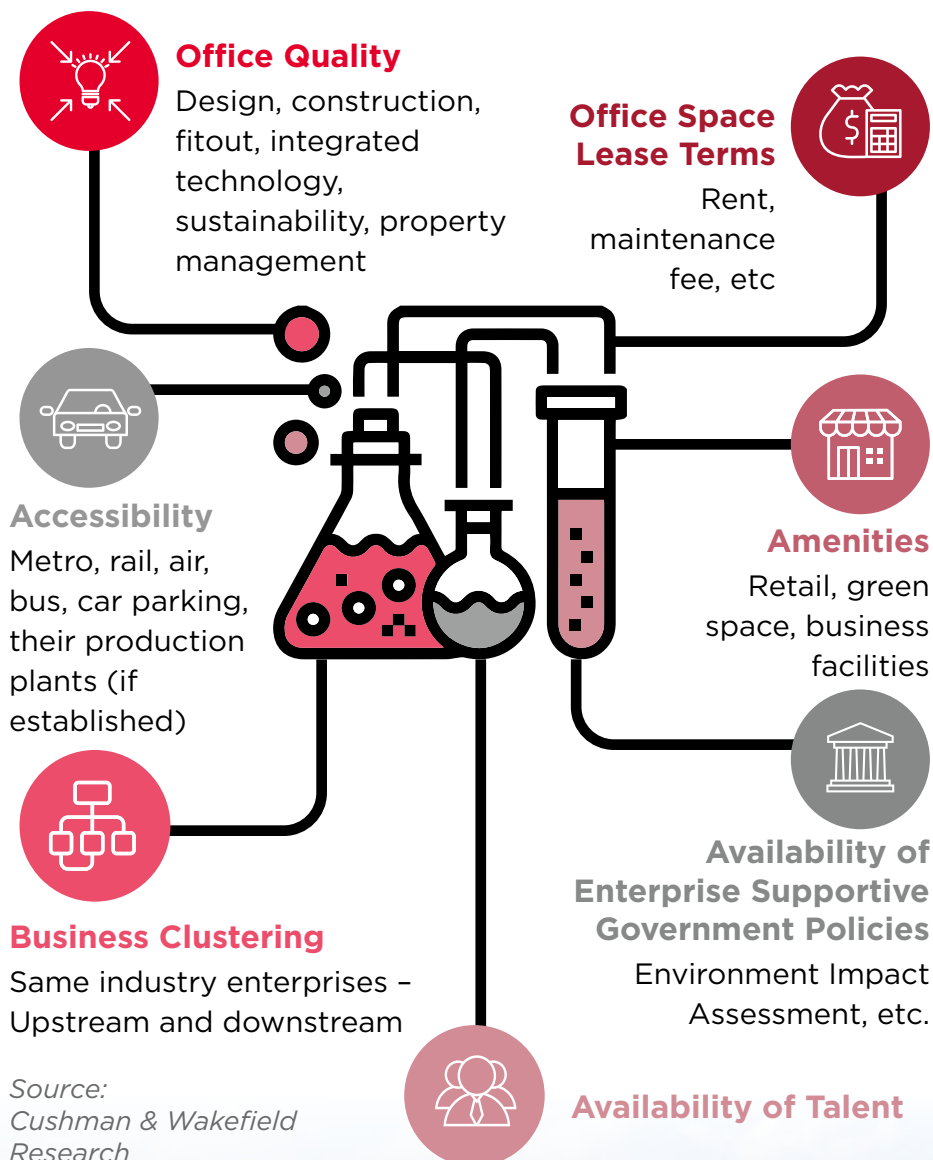
Source: Suzhou BioBAY, Cushman & Wakefield Research

Offices:

Office space, whether its location is in a biopharmaceutical industrial park, in a suburban location, or in a downtown CBD location, is a key component of a life sciences enterprise's real estate portfolio. When considering leased Grade A offices, in some city-level markets, overseas life sciences enterprises dominate. In others, it is domestic enterprises which dominate. Of late, contract research organisations (CROs), contract manufacturing organisations (CMOs) and contract sales organisations (CSOs), have surfaced as new drivers for quality office space demand in several of China's city-level markets.

When specifically considering Grade A office space options, life sciences enterprises are no different from other enterprises regarding their criteria for selecting the optimal quality office location (Figure 7).

Figure 7:
General criteria life sciences enterprises consider when locating to new Grade A office space



The impact that the life sciences sector is having is filtering down and influencing what is happening at the city level in China. Many cities in the country are now strongly emphasising the importance of the future development of the life sciences industry. Through support policies, these cities are changing the genetics of their real estate as they prepare to make the life sciences industry a key driver for their individual economies in the future.

EXPERIENTIAL

RETAIL

SHOPPING

CENTRES

ALTERNATIVE

PROPERTY

ASSETS

02

In recent years, with population change, the continuous expansion of the consumer market, the advance of technology, the impact of the COVID-19 epidemic, the intensive introduction of favourable policies and strong capital investment, retailers and landlords of retail properties in China have actively seized the new consumer opportunities that have arisen. Subsequently, China's retail market continues to introduce new business models, new type of services and innovative retail formats to adapt to the ever-changing consumer groups and consumption patterns. This report considers five major what-to-watch trends which have occurred in China's retail market, which alternative

experiential retail shopping centre property asset owners and operators in the country need to be aware of, and they are:

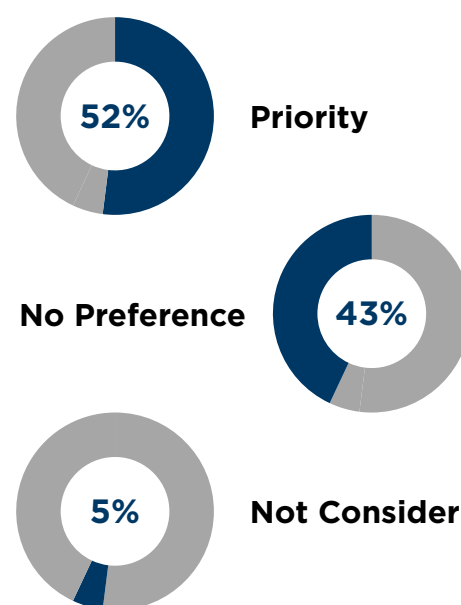
- Online 'guochao' (or national trend) brands are now opening brick and mortar stores;
- Lifestyle brands are in the ascendancy;
- The Metaverse will lead a new wave in retail and social experience;
- The 'socialising +' scenario is now empowering brands and shopping centres, and lastly;
- Tourist attraction-type shopping centres are on the rise.

Online 'guochao' brands open brick and mortar stores

With the development of the economy and the improvement of Chinese cultural self-confidence, nearly 0.7 billion new middle class and Generation Z groups are more and more willing to spend on Chinese brands, so as to find their cultural identity and sense of belonging. According to Cushman & Wakefield Research's survey, 52.2% of Chinese consumers will prioritise domestic goods and products when purchasing (Figure 8).

Meanwhile, China's manufacturing and retail companies have actively innovated, so as to obtain market competitiveness in product quality, aesthetic design, marketing model and patented technology. According to Cushman & Wakefield Research's survey, the top six factors for consumers to buy Chinese branded goods, products and/or services are aesthetic design, price advantage, consumption experience, improvement of product quality, brand influence and patented technology (Figure 9).

Figure 8:
Chinese consumers' attitude towards domestic products (2021)

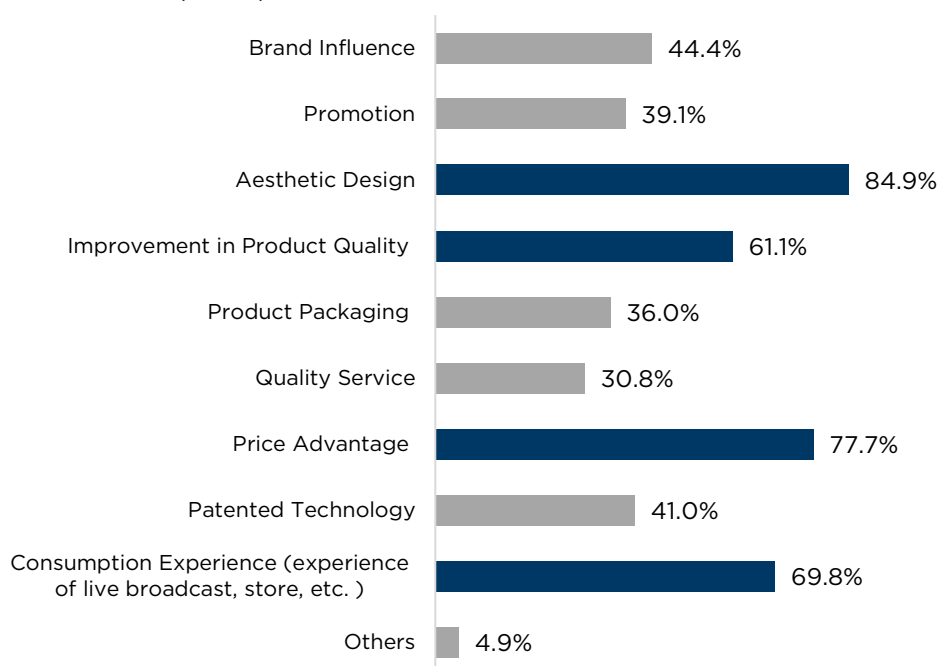


Source: Cushman & Wakefield Research

Therefore, compared with 20 years ago, consumers in China buy Chinese brand products for a variety of reasons, not just for the price advantage.

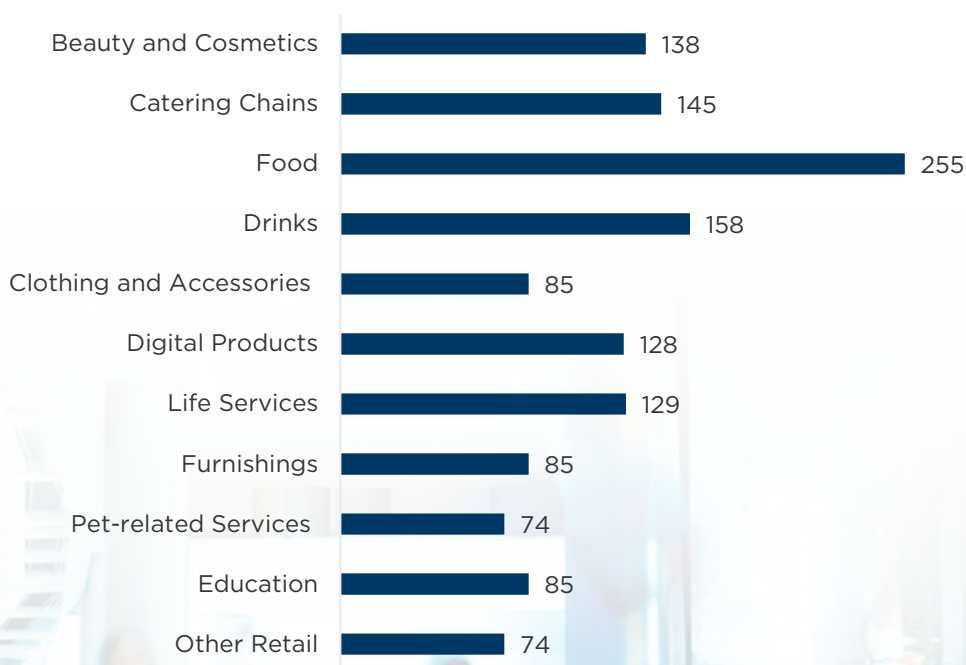
Moreover, ‘guochao’ brands continue to explore opportunities in subdivided and emerging markets, overtaking and rapidly seizing local market share. Chinese brands have been supported by capital, allowing these companies to compete with international brands in terms of scale. 1,356 financing deals have been associated with Chinese or ‘guochao’ brand companies in 2021. According to Rhino Data, food and beverage, catering chains, beauty and cosmetics, clothing and accessories, life services and digital products have become popular retail segments in the capital markets in China recently (Figure 10).

Figure 9:
The major factors for consumers to buy Chinese brand products or services (2021)



Source: Cushman & Wakefield Research

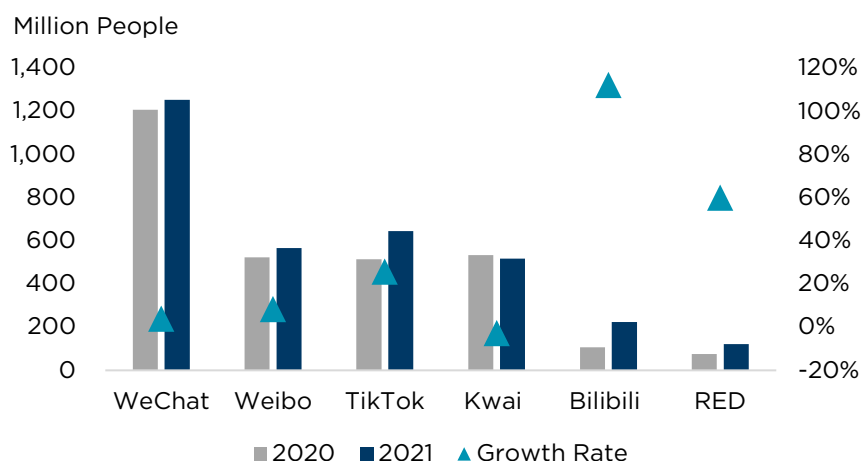
Figure 10:
The number of financing deals related to Chinese or ‘guochao’ brand companies in China (2021)



Source: Rhino Data, Cushman & Wakefield Research

With the popularity of smart phones and the construction of 5G in China, new media platforms, such as online videos, live streaming and short videos are popular because of their social media attributes, three-dimensional visual experience, real-time interaction and distinctive subjects and topics. According to QuestMobile, in 2021, the user scale of TikTok, Bilibili and RED grew by 25.6%, 112.1% and 59.9%, respectively (Figure 11).

Figure 11:
Monthly active user scale and growth rate of major social media platforms in China (2020 and 2021)



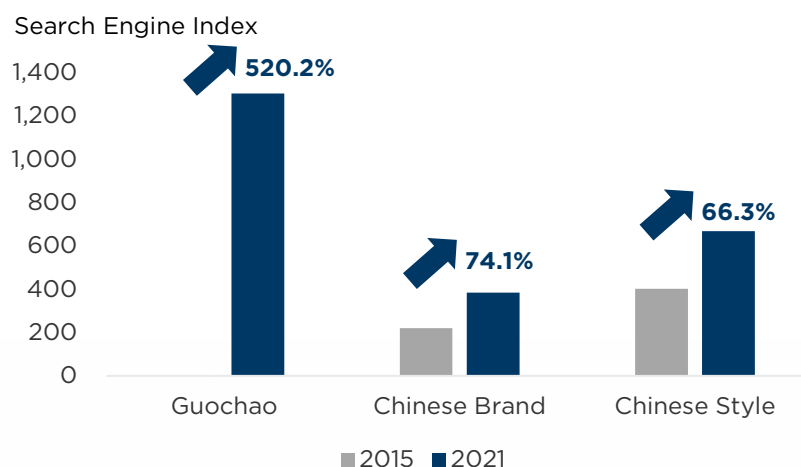
Source: QuestMobile, Cushman & Wakefield Research

Moreover, live streaming sales enhance the interaction between retailers and consumers, making the relationship between them more intimate. Web celebrities not only introduce product functions and features, but also try out the product on site and describe the experience of using the product during the live streaming session.

Compared with traditional media advertising, consumers can obtain a more comprehensive idea of what a product is all about, its quality and what it can offer. Retailers are more likely to gain the trust of consumers and achieve better effects regarding product promotion. Meanwhile, retailers can offer real-time sales promotions during the live streaming session. Consumers can communicate with web celebrities online in real-time and provide tips and gifts for the web celebrities' performance. What's more, retailers can receive feedback from consumers in real-time to improve their goods, products and services.

'Guochao' brands have seized on this trend, expanded their brand influence and improved their sales performance by virtue of new media platforms. According to the Baidu Index, compared with 2016, the key hot search words of - 'guochao', Chinese brands or Chinese style - (regarding Baidu's search engine and words used to search on the search engine), have increased by 520.2%, 74.1% and 66.3% respectively in the recent six years (Figure 12).

Figure 12:
Key hot search words - 'Guochao', Chinese brand and Chinese style - Search engine index search results on Baidu (2015 and 2021)



Source: Baidu Index, Cushman & Wakefield Research

Furthermore, during the 'Double 11' shopping festival in 2021, among brands with sales of over RMB100 million on Taobao (according to Taobao), 'guochao' brands accounted for 45%, up 17% y-o-y. The top five brands in the mobile phone sector, jewellery sector and snacks sector were all 'guochao' brands (Figure 13).

Figure 13:
The proportion of 'guochao' brands with more than 100 million sales during the 'Double 11' shopping festival in China (2020 and 2021)



Source: Taobao, Cushman & Wakefield Research

After the era of mass consumption and Internet marketing, 'guochao' brands have reached a turning point in China. The impression that many consumers have of 'guochao' brands is often associated with the recommendation of celebrities and the WeChat Moments social media platform. Many consumers also buy on impulse, so Consumer loyalty and stickiness is relatively low. Meanwhile, the growth of live streaming sales has slowed and the cost of attracting consumers through Internet marketing has increased.

Therefore, opening brick and mortar stores has become a new way for Chinese fashion brands to improve brand value and attract

new consumer groups in China. The diverse experiential spaces of existing and newly launched 'guochao' brand stores have created a visible and tangible sense of trust and emotional bond with consumers. According to Cushman & Wakefield estimates, since 2017, 'guochao' brand beauty and clothing stores have expanded rapidly in first- and second-tier cities in China. The annual estimated store number growth rates are 27% and 8%, respectively. Moreover, the market expansion trend for 'guochao' brand stores in China has been to expand in first-tier cities, and then gradually enter into second-tier cities, small-town and rural markets. Annual store number growth rates have been as high as 67% (Figure 14).

Figure 14:
Number of 'guochao' brand stores in China's first- and second-tier cities (2017 and 2021)



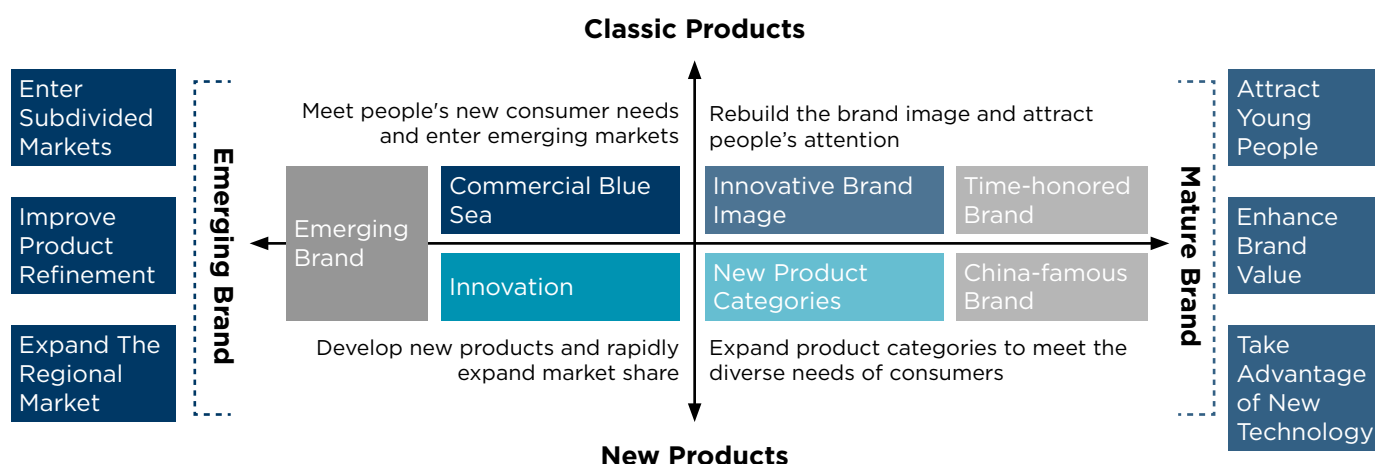
Note: The number of stores including collection store.

Source: Cushman & Wakefield Retail Services, Cushman & Wakefield Research

Looking forward, consumers will be the focal point for the entire retail industry in China. 'Guochao' brands will integrate online and offline data, products, prices and services to provide consumers with a comprehensive shopping experience. Some time-honoured and China-famous 'guochao' brands will improve

their brand value, attract young consumers and adopt new technologies to reshape their brand image. Meanwhile, emerging 'guochao' brands will expand their market share by looking for commercial blue oceans by developing new products to meet consumers' consumption demands (Figure 15).

Figure 15:
'Guochao' brand development path



Source: MMA, Cushman & Wakefield Research

Lifestyle brands are in the ascendency

With the expansion of China's middle class, the middle class has formed the backbone of China's consumer market. The consumption upgrade of the new middle class has led to the development and innovation of brands and shopping centres. Most Chinese citizens are now relatively materially well off. Thus, China's middle class is no longer satisfied with material pursuits, but more concerned with the quality of spiritual life. In the consumer market today, products with high quality and trendy designs are only the basis to impress Chinese consumers, while satisfying

consumers' needs on the spiritual level now lies at the core of competition between brands in China.

Lifestyle brands do not aim to provide the 'product', but rather paint a picture of a lifestyle and all the products associated with it. Through the interaction between the brand and consumers, consumers are not only satisfied with having products, but constantly look to realise their life dreams through the brand. Thus, lifestyle brands mainly have the following three core elements:

The real-life perspective:

A brand needs to express what it is and what lifestyle it represents. 'Real-life perspective' determines what kind of consumers the brand aims at and what kind of brand value it builds.

The concrete, practical experience:

In the mind of consumers, a lifestyle brand is not an ethereal image, but a 'concrete, practical experience', which allows consumers to form a stronger brand image, and;

The desirable good life:

Lifestyle brands represent a target consumer's image of a 'desirable good life'. Lifestyle brands should not be a copy of the current life of target consumers.



Consumers buy products not only because 'I need it', but also because 'I want it'. I want to show my life attitude and way through this brand and product. Therefore, lifestyle brands not only serve to let consumers remember their brands and products, but they create brand experiences based on the characteristics of consumers, so that consumers can have a sense of resonance and take the initiative to choose their products and services.

Therefore, many lifestyle brand physical stores in China now encapsulate experience spaces for art, exhibitions and so on as well as retail. These stores better interpret the brand connotation, they guide consumers to explore their emotions and identity and

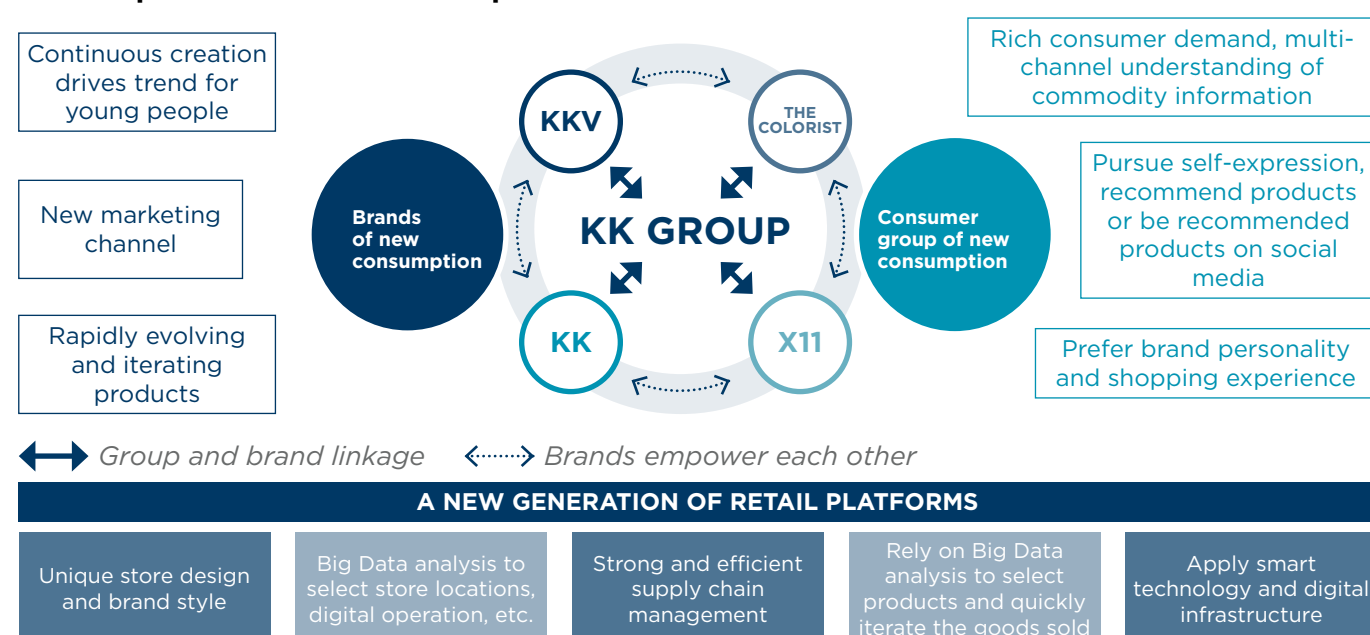
they arouse the consumer resonance with the brand and the brand's products. This not only expresses the brand, but also strengthens the identity of its consumers.

The Internet has become an integral part of consumers' daily lives in China. Mobile payment is the norm now and online purchasing is frequent. Under this new retail modus operandi, the traditional distinction between online and offline retail is steadily blurring. Moving forward, only by complementing the advantages of online and offline can a comprehensive shopping experience be provided to consumers in China. This has not been lost on many traditional retailers and Internet enterprises, and many have joined forces to provide a seamless

online/offline retail service demanded by consumers in the country.

Taking KK Group as an example, the company's retail operation is data centred. It has established a selection strategy mainly supported by Big Data analysis, so as to timely grasp the most popular products associated with local consumers, flexibly adjust the product mix of each store, and achieve the effect of different goods in different stores. In addition, a large amount of transaction data can be accumulated through the interaction with target consumers. Based on a deep understanding of its consumers, KK Group can provide a differentiated experience through its innovative approach to retailing (Figure 16).

Figure 16:
KK Group's data centred retail operation model



Source: Prospectus of KK Group, Cushman & Wakefield Research



In the post-COVID-19 era, people are paying more attention to their own lives and experiences in China. The lifestyle brand is not only a breakthrough point in the new consumption field but is also a new business track for retailers in the country to take.

The Metaverse leads a new wave in retail and social experience

Nowadays, Generation Z has gradually become the mainstream consumer group in the market and leads the new trend in consumption in China. In terms of consumption, Generation Z cares more about trendy and avant-garde experiences and is willing to pay for them. Today, the Metaverse concept coincides with the current consumer demand of Generation Z. The Metaverse craze, with elements such as immersion and socialisation, is rapidly sweeping the world, including China.

The term 'Metaverse' first appeared in the science fiction novel "Avalanche" published in 1992. In this work, the

author depicts an online world parallel to the real world, where people use digital avatars to control everything and compete to improve their status in the virtual world. The Oasis in the film "Ready Player One" is also a Metaverse.

Returning to the essence, the Metaverse uses cutting-edge technologies, such as artificial reality (AR), virtual reality (VR), 5G, cloud computing, and blockchain to build a channel between the real world and virtual application scenarios under the support of shared infrastructure, standards and protocols – giving users a high sense of immersion and participation (Table 2).

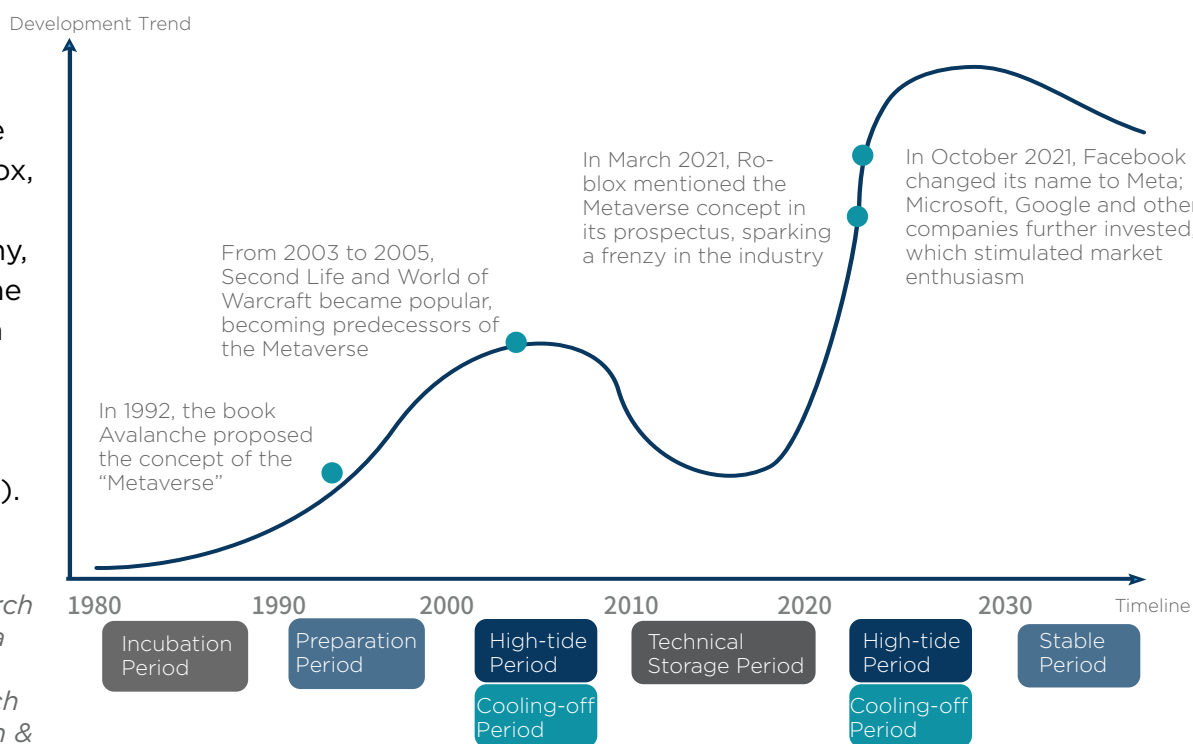
Table 2:
Metaverse related technologies and applications

Metaverse Technology Base	Corresponding Technology	Application Scenario
Virtual-real Interface	Extended Reality (XR) (collectively referred to as VR, AR, mixed reality (MR))	VR provides an immersive experience and realises the input and output of information in the Metaverse by fully taking over human sight, hearing, touch and motion capture. AR superimposes a layer of virtual information based on retaining the real world. MR projects a light field to the retina, achieving partial retention and free switching between the virtual and the real.
	Robots	The physical simulation of the body becomes another channel to connect the Metaverse.
	Brain-Computer Interface	It is becoming the focus of competition among technology giants, and it is currently mainly used in the medical field.
Web Environment	5G	5G's high speed, low latency, low energy consumption, and large-scale device connections can support many application innovations required by the Metaverse.
Data Processing	Cloud Computing	A cloud computing system with a dynamic computation allocation framework will be an infrastructure associated with the Metaverse.
Content Production	Artificial Intelligence (AI)	AI can greatly improve computing performance. Content production: AI can intelligently generate a massive amount of content that is not repeated, and it can realise the spontaneous and organic growth of the Metaverse. Content presentation: AI-driven virtual digital humans present the content of the Metaverse to users in an organised manner. Content review: Censorship of massive amounts of content in the Metaverse that cannot be done manually to ensure the safety and legitimacy of the Metaverse.
	Digital Twin	Originally used in industrial manufacturing, the Metaverse needs a digital twin to build an extremely detailed immersive environment, thus creating an immersive presence experience.
Authentication Mechanism	Blockchain	It is a virtual currency based on a decentralised network. It makes value attribution, circulation, realisation and authentication of virtual identity possible in the Metaverse, and has the advantages of stability, efficiency, transparent rules and certainty. Non-Fungible Tokens (NFTs). Its unique, non-reproducible, and non-removable characteristics naturally have collectible properties, so it can be used to record and trade some digital assets, such as artworks.

Source: New Media Research Centre in Tsinghua University, Huaan Securities Research Institute, Cushman & Wakefield Research

In some respects, 2021 could be called the first year along the path to the realisation of the Metaverse. Roblox, a Metaverse concept company, went public in the United States on March 10, 2021, with a market value of \$38.3 billion (Figure 17).

Figure 17:
The Metaverse's global development trend (1980-2030)



Source:
New Media Research
Centre in Tsinghua
University, Huaan
Securities Research
Institute, Cushman &
Wakefield Research

The Metaverse has begun to enter people's field of vision, and has quickly spread to various social and economic domains, such as social media, retail, etc. It has also recently become an outlet for capital to chase, and major companies have entered the arena one after another.

With the improvement in technology, the Metaverse is gradually changing our life and consumption patterns, affecting the innovation and development of the retail industry. In the world of the Metaverse, the 3D visualisation of the retail products is closer to reality, and functions, such as product 'try-on', 'trial-on', and 'on-site placement' can also be realised. At the same time, the birth of the virtual digital human has aroused the curiosity of consumers, empowered brand marketing, and made the brand image more vivid and three-dimensional.

Many retailers who do not want to miss any opportunities in the virtual world are starting to deploy and build their Metaverse systems. Some of these retailers/systems include:

Walmart	Nike	Metahuman AYAYI	Floris
announced its entry into the Metaverse, with plans to produce and sell via the virtual world, including electronics, home furnishings, toys, sporting goods and personal care products.	announced that it has cooperated with Roblox to create an online world called Nikeland, and announced the official acquisition of RTFKT Studios, a virtual fashion luxury design company, to accelerate the pace of digital transformation.	joined Ali as a digital employee and became the digital manager of Tmall Super Brand Day. In the future, AYAYI will also unlock multiple identities, such as NFT artists and fashion brand managers.	released the first hyper-realistic image of domestic makeup brands, showing Chinese makeup and oriental beauty brands to the world.

Some brands that attach importance to the whole lifestyle of young consumers may go on to promote a full digitalisation system. Retailers that are pushing the technology boundaries are now beginning to manufacture and sell all kinds of goods and products via the virtual world, and the Metaverse is the next step that is fast taking shape.

In addition, the offline commercial retail space has also firmly grasped the new opportunities for consumption transformation and upgrading brought by the Metaverse. The Metaverse repositions the relationship between people and commercial space, so that retail is no longer limited to the physical

space but combines the physical space and the virtual world to bring infinite scalability to commercial real estate. Commercial real estate retail space is able to build a Metaverse channel through AR, VR, 5G, cloud computing, blockchain and other technologies to:

- o **Create a space for virtual and real integration;**
- o **Arouse the curiosity for consumer groups, and;**
- o **Strengthen scene-based consumption, precision marketing, personalised services, etc., to increase the stickiness of existing consumer groups and expand the scope of consumer groups.**



In recent years, many shopping centres in China have been scrambling to explore 'Metaverse + retail space' and have entered the blue ocean domain of the Metaverse:

Huawei launched its Cyberverspace platform in 2019. Dedicated to creating a new digital world that seamlessly integrates with reality. In 2021, Cyberverspace is becoming 'meta-universal', helping shopping centres, such as Beijing Fun, Xidan Joy City, Shenzhen Mixc to provide surreal large-space AR landscapes, convenient immersive AR navigation, virtual IP interactive games and other services;

In 2019

In April 2021

Chengdu IFS International Financial Square officially launched ARgo AR navigation, with SenseTime AI+AR technology as the core, to firstly, realise the country's first full-scene urban complex AR navigation and, to secondly, connect navigation with brand marketing activities, such as AR gift coupons, new product recommendations and theme event promotion;

"The first futuristic technologies experience-based shopping centre in China", Shenzhen CATIC-CITY Dreams-on, was upgraded and unveiled. Labelled "Futuristic Technologies + Art", CATIC-CITY Dreams-on, together with the top production team d'strict in South Korea and Shanghai Mark created Shenzhen's first naked-eye 3D vertical large-screen and integrated other futuristic technologies, experience art installations in its renewal of 200,000 sq m of commercial space. In addition, the centre has built a "futuristic technologies + first store" matrix with brands, such as McDonald's, Ye Cui Shan, Nayuki PRO, Peachful, LOLY POPING, and BIEM. L.FDLKK, which are very popular with the centre's young consumers today;

In August 2021

In September 2021

Shenzhen Longgang Wanda Plaza, the Wanda Plaza chain's first fourth-generation project, officially opened, introducing its Metaverse World. Here, digital twins are constructed through scan-to-BIM technology to form a "parallel world" that allows consumers to travel and interact in the virtual world and in reality;

The country's first 5G smart business 2.0 complex jointly built by China Telecom and China Resources Mixc Lifestyle will land in Hefei Mixc. Relying on its "Ecoverse" platform, Hefei Mixc has realised AR real-time navigation, VR immersive game interaction, and a customised version of the Metaverse called "Cloud Mixc" which allows for VR shopping and other full-scene applications, as well as further upgraded intelligent parking services, and;

In September 2021

The first AR world reality application in South China, an AR show called "Ice and Snow Wonderland", was launched on the first anniversary of the opening of Guangzhou Yue City. Here, SenseMARS has created a Metaverse consumption experience for Yue City, which includes a huge ice dragon hovering in the sky, dreamy and realistic ice and snow castles and other scenes, AR red envelope rain, AR photo collection to check-in, etc. Since the introduction of this technology, market sales have increased by 196% year-on-year, and the growth in passenger flow exceeded that of the centre's initial opening period.

In September 2021

The Metaverse is infiltrating the offline commercial space in a diversified form by:

- o Realising more possibilities of space extension;
- o Breaking through the limitations of scenarios;
- o Building an immersive experience combining the virtual and the real;
- o Satisfying the consumer group's "experience" shopping appeal, and;
- o Improving the interaction between space and consumption.

At the same time, the Metaverse-inspired consumer experience with a sense of story, substitution, interaction, difference, and immersion, coupled with the effective combination of the online and the offline, allows for:

- o The promotion of consumer activity;
- o The generation of a large amount of consumer consumption activity information and data;
- o The enhancement of user stickiness, and;
- o The augmentation of the soft value of commercial retail real estate.

The rise of the Metaverse has opened up innovative paths for commercial real estate, bringing consumers a more comfortable and attractive consumption experience. It allows developers, investors and the public to think in new directions about future business models. Meanwhile, to steer the business growth of the Metaverse along the right development track, relevant ministries and local governments in China have successively issued Metaverse growth support policies (Table 3).

Table 3:
Recent policies related to the development of the Metaverse in China

December 2021	The 14th Five-Year Plan for the Development of Shanghai's Electronic Information Industry
Shanghai	Strengthen the forward-looking research and development of the underlying core technology and basic capabilities of the Metaverse, promote the development of new terminals (that deepen perception and interaction) and the construction of systematic virtual content. Additionally, explore industry applications, such as a new generation of information technology integration applications that focus on AI + Big Data, cloud computing + edge computing, 5G + XR, blockchain + quantum technology, cloud-edge-device collaboration, digital twin + data middle platform, etc. Lastly, promote technical collaborative research, standard formulation and platform construction, innovating applications, etc.
January 2022	The 14th Five-Year Plan for the Development of the Digital Economy
China	Innovate and develop "cloud life" services, deepen the integration of AI, VR, 8K high-definition video and other technologies, expand applications related to social networking, shopping, entertainment, exhibitions and other fields, and promote the upgrading of quality-of-life consumption.

January 2022

China

Fintech Development Plan (2022-2025)

Build diversified service channels. On the offline retail front, relying on the high bandwidth and low latency of 5G, integrate visual technologies, such as AR and MR with the banking scene, and promote the upgrading of physical outlets to multimodal, immersive and interactive smart outlets.

January 2022

Zhejiang

Guiding Opinions on the Construction of Future Industry Pilot Zones in Zhejiang Province

With AI, blockchain, and third-generation semiconductors, the Metaverse will be one of the key future economic domain pilot areas for Zhejiang by 2023. In the key construction tasks for this pilot area, Zhejiang will speed up the establishment of an open innovation platform in the fields of brain-computer collaboration, VR, blockchain, etc., to promote industrial technology empowerment and integrated innovation.

January 2022

Beijing

Eight Measures for Accelerating the Innovation-led Development of Beijing's Sub-centre Metaverse

Key enterprises which are newly registered in the Metaverse Application Innovation Centre and renting their own office space can apply for one of three levels of business subsidies – a 50% level subsidy, a 70% level subsidy, and a 100% level subsidy. In content design, highlight the characteristics of the integrated development of the Metaverse and cultural tourism. In terms of industrial space, plan the Metaverse industrial space layout to be in line with “1 innovation centre + N characteristic theme parks”. In terms of application scenarios, aim development so as to provide digital empowerment and cultural and technological integration, thus “creating a new cultural and tourism scene of the real economy and digital economy integration”. Provide enterprises with technology display and creation space.

January 2022

Hefei

2022 Hefei Municipal Government Work Report

Deploy future industries, aiming at frontier fields, such as quantum information, nuclear energy technology, Metaverse, superconducting technology, precision medicine, etc., to create a group of leading enterprises, cutting-edge technologies, high-end products. Use related future industries to grasp the city's future.

January 2022

Wuhan

2022 Wuhan Municipal Government Work Report

Promote the integration of the Metaverse, Big Data, cloud computing, blockchain, geospatial information and quantum technology with the real economy. Build a new generation national AI innovative development pilot zone and build five digital economy industrial parks, including the Xiaomi Science Park.

January 2022

Chengdu

2022 Chengdu Municipal Government Work Report

Vigorously develop the digital economy, actively seize future development tracks, such as quantum communication and the Metaverse, and build a “lighthouse factory” for digital manufacturing.

Source: Data from the various government official websites, Cushman & Wakefield Research

Ahead, according to a Bloomberg Industry Research report, the Metaverse will be an \$800 billion market by 2024. Moreover, Gartner, a third-party research organisation, stated that by 2026, 25% of people in the world will work, shop, study, socialise or play in the Metaverse for at least an hour every day, and 30% of enterprises will have products and services for the Metaverse.

In this digital economy era, the development of this industry in China requires the joint promotion of the market and the government. To seize the development opportunities of the Metaverse and make forward-looking plans, the retail industry should pay close attention to policy guidance and formulate timely strategies.

The 'socialising +' scenario empowers brands and shopping centres

The social habits of the Internet's native Generation Z and new middle-class families have shifted. They are no longer satisfied with the virtual way of making friends on the Internet but want to have a high-quality social circle and communicate with like-minded friends and family members face-to-face. Based on the strong social needs of Generation Z and the new middle class, retailers and landlords of shopping centres have actively created 'socialising +' retail spaces to attract young consumers. There are four main types of 'socialising +' retail spaces now active in China:

1. 'Competitive socialising' is a leisure concept which brings people together to play a game, for example, live action role-playing, escape rooms, indoor sports, etc. Different from traditional KTV and board games, 'competitive socialising' activity

adopts tech and auto control, handheld PDAs, VR/AR and other software, sensors and devices to enhance players' sense of immersion and participation and weaken the awkward feeling of face-to-face interpersonal communication. At the same time, the activity allows players to be faced with a dilemma and they need to help each other in order to achieve the same game goals, which binds players together.

After nearly 10 years of development, the market size of 'competitive socialising' in China has reached more than RMB10 billion. According to Meituan's forecast, the market size of Chinese offline live action role-playing will reach RMB15.42 billion in 2021, with 9.41 million consumers. In 2021, the number of registered enterprises related to 'competitive socialising' reached 5,361, up 167% y-o-y (Figure 18).

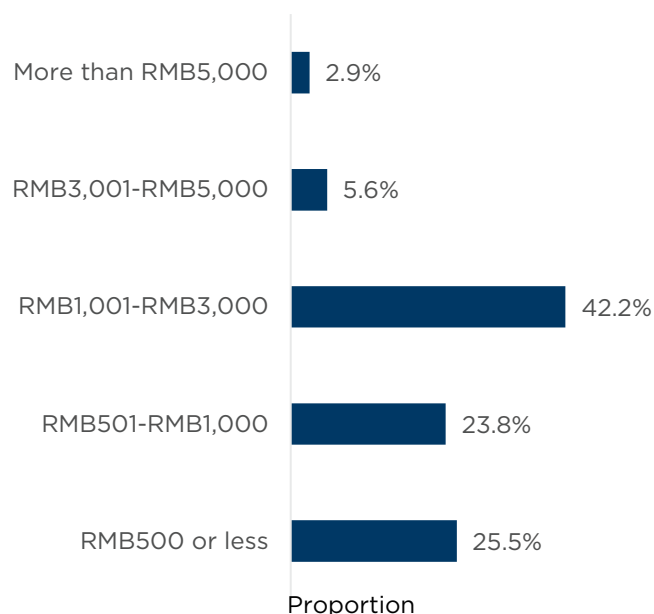
Figure 18:
The number of registered enterprises related to 'competitive socialising' (2016-2021)



Source: Qcc.com, Cushman & Wakefield Research

2. ‘Trendy’ toys have grown from a niche product to a popular trend among young players. Their essence is the integration of IP, offline experience and the social circle. Different from ordinary toys, ‘trendy’ toys have social attributes in their design, production, sale, secondary sale and collection. During the design and production process, designers post every step of the design on social media so that players can witness the process of a toy from design draft to real toy. Players feel like they are involved in the design and production of the toy. During the sales, secondary sales and collection process, the online social platform and the activities held by ‘trendy’ toy stores allow like-minded young people to gather together to share and communicate their collections and life.

Figure 19:
The annual spending of Generation Z in China on ‘trendy’ toys (2021)



Source: Cushman & Wakefield Research

China’s ‘trendy’ toy market has exploded in recent years. According to iMedia Research, the size of China’s ‘trendy’ toy market increased from RMB6.3 billion in 2015 to RMB20.7 billion in 2019, with a compound annual growth rate of 34.6%, higher than the global growth rate. According to the research by Cushman & Wakefield Research, 51% of Generation Z in China spend more than RMB1,000 per year on ‘trendy’ toys (Figure 19).



3. In order to cater to Generation Z's needs of socialising and evening consumption, many chain restaurant brands have entered the pub and bar market. The combination of 'restaurant + pub/bar + show' not only meets the needs of consumers for lunch and dinner, but also provides a place to socialise and for afternoon and evening entertainment.

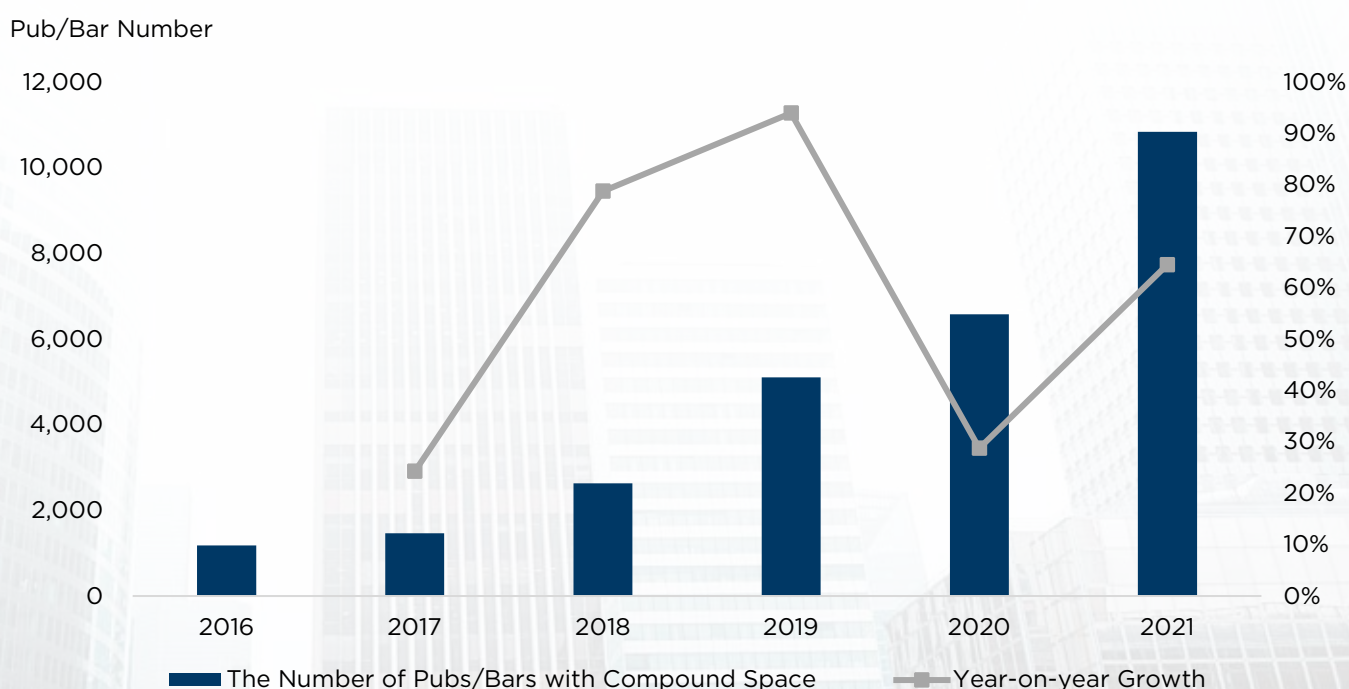
In addition to chain restaurant brands, some well-known brands related to talk shows, crosstalk, musicals and theatres have also entered this market. Performing arts companies are actively developing performance venues in retail spaces, such as restaurants, bars, cafes, teahouses and bookstores, to promote comprehensive consumption, such as dining and shopping through performing arts activities.

According to estimated statistics from Cushman & Wakefield Research, the number of pubs/bars with compound space in China's first- and second-tier cities reached 10,836 in 2021, up 64.5% y-o-y (Figure 20).

4. The 2008 and 2022 Olympic Games boosted the popularity of summer and winter sports in China. Fitness and sports have become the way of life for Generation Z and the new middle class in China. Affected by this, shopping centres have paid more attention to the sports sector in recent years. The sports sector has become a new bright spot for shopping centres to attract consumers. Its outlets are not limited to gyms and fitness studios, but integrate F&B, arts, entertainment, exhibition, education, tourism and other functions, becoming a new venue for family and friends to entertain.

Moreover, in the post-early-2020-COVID19 epidemic era, the 'trendy' indoor sports centre concept has evolved to cater to the hottest business trends. On the one hand, as a leisure business related to the physical and mental health of consumers, indoor sports have ushered in a new course for development to take after the epidemic. More and more consumers in China are now paying more attention to their health, so indoor

Figure 20:
The number of pubs/bars with compound space in China's first- and second-tier cities (2016-2021)

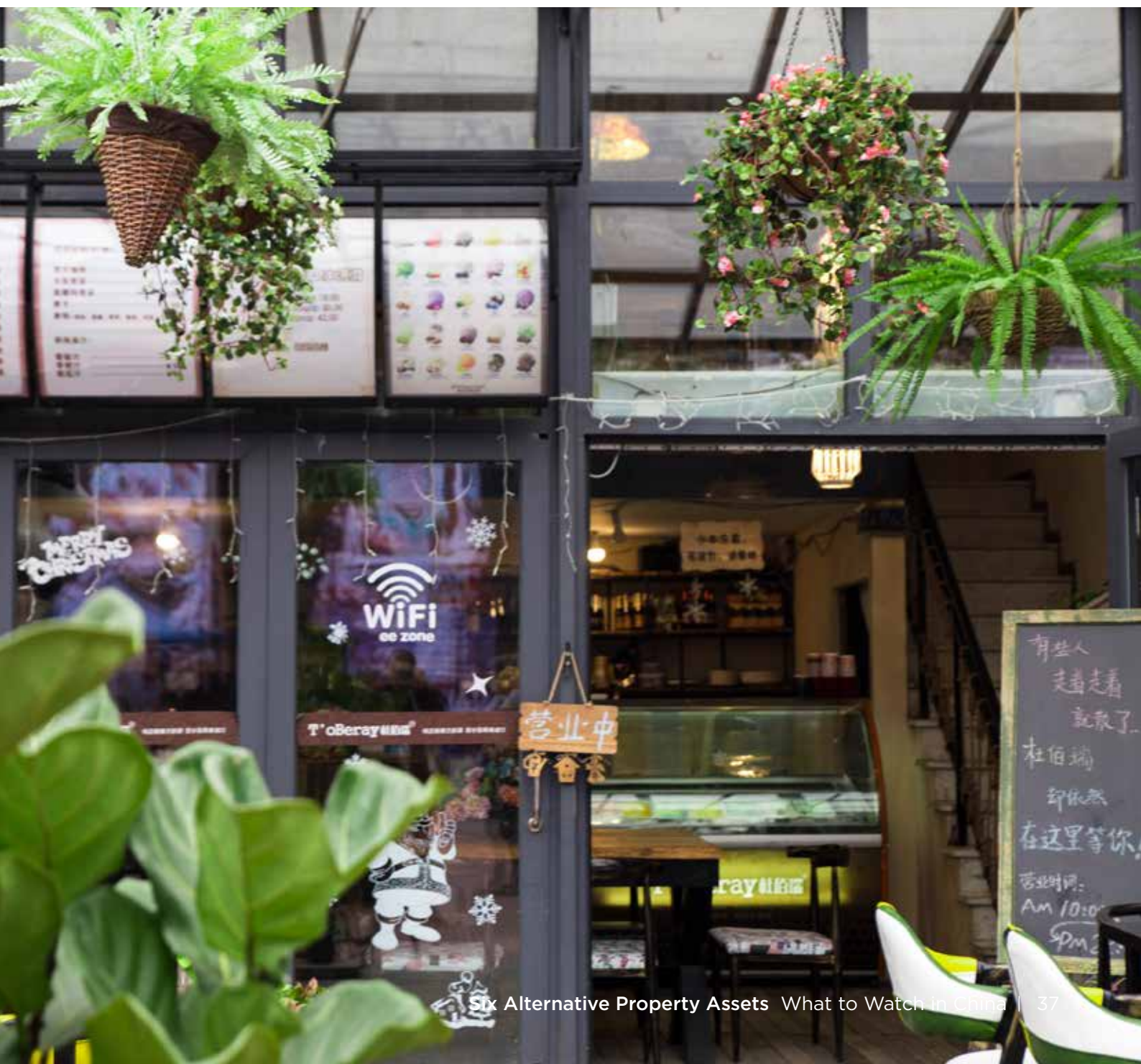


Source: Cushman & Wakefield Retail Services, Cushman & Wakefield Research

sports have gradually become a new way for family and friends to gather for entertainment since people have not been fully able to travel extensively. On the other hand, people in China are paying more attention to family companionship and parent-child time in the post-epidemic era, and an indoor stadium with immersive experiences and good safety and hygiene standards has become a new engine for shopping centre consumer footfall traffic generation.

In this context, the advantages of 'trendy' indoor sports centres in China have been gradually revealed recently. Today, they are able to attract a large number of not only general consumers but also young parents and their new generation children.

Looking ahead, Chinese brands and shopping centres will continue to adopt new technologies and innovative business models to create more diverse 'socialising +' retail spaces to meet the new needs of consumers in the country.

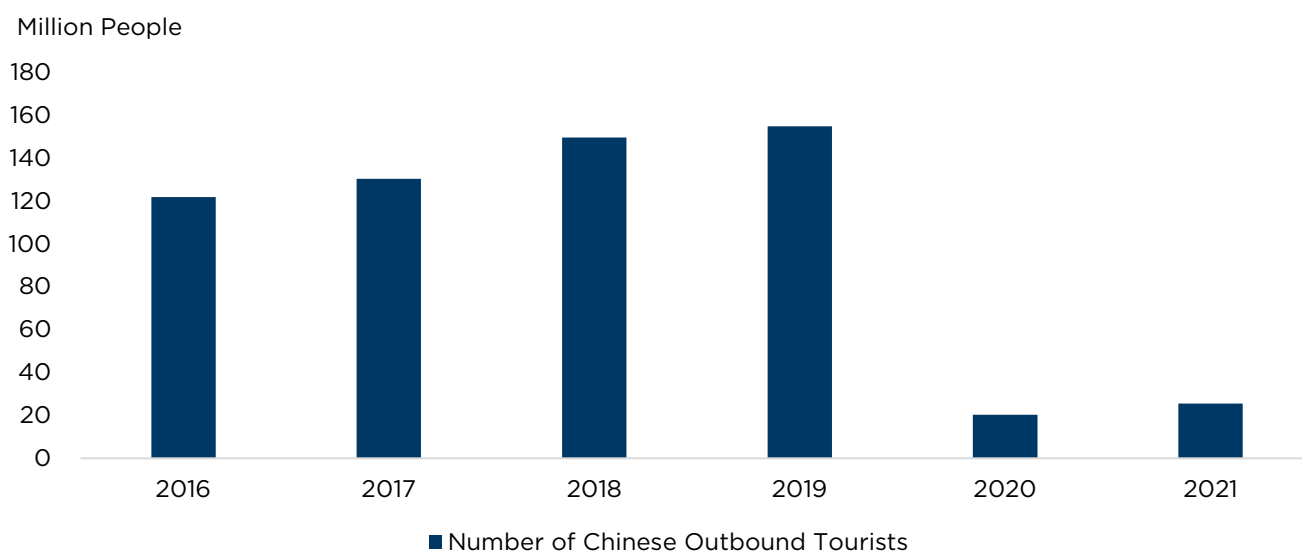


Tourist attraction-type shopping centres are on the rise

With the improvement of people's living standards in China, the consumption of culture and tourism has been continuously upgraded. However, due to the ravages of COVID-19 worldwide, the number of outbound trips by Chinese nationals has plummeted. According to relevant statistics from Qianzhan, under the impact of the epidemic, the number of outbound tourists in 2020 was 20.334 million, which decreased 86.9% from the year before. Compared with the scale of over 100 million trips before the epidemic, outbound tourism in 2021 is still basically at a standstill (Figure 21).

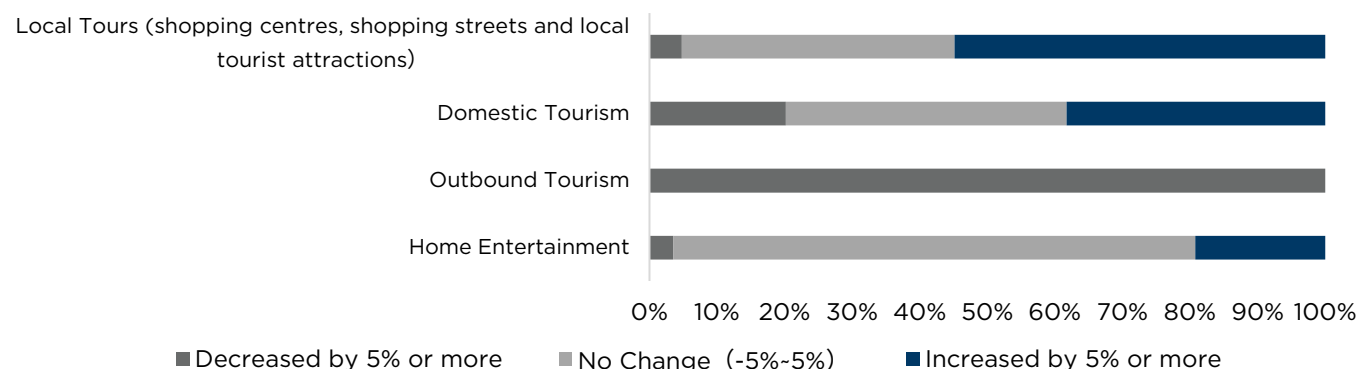
On the other hand, under the regular epidemic prevention and control and dynamic zero COVID-19 strategy, the epidemic was basically controlled between early 2020 and early 2022. During this time, domestic consumption maintained a steady and positive momentum in China. According to Cushman & Wakefield statistics, compared with 2019, during weekends and holidays in 2021, nearly 56% of consumers in China increased their spending in local shopping centres and shopping streets and at tourist attractions (Figure 22).

Figure 21:
The number of Chinese outbound tourists (2016-2021)



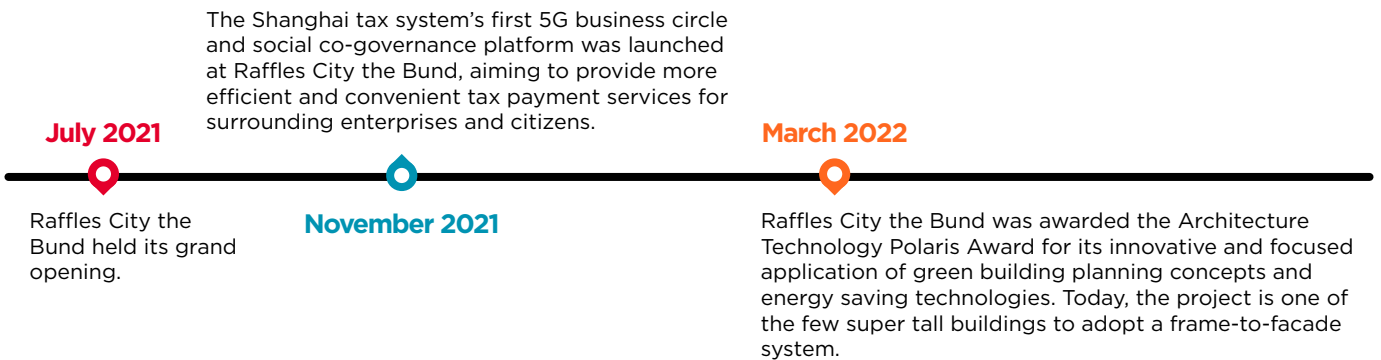
Source: Qianzhan, Cushman & Wakefield Research

Figure 22:
Changes in consumption patterns on weekends and holidays in China (2019 and 2021)



Source: Cushman & Wakefield Research

Figure 23:
Raffles City the Bund, Shanghai timeline



Source: Cushman & Wakefield Research

Under these circumstances, tourist attraction-type shopping centres in China that combine new forms of culture and tourism on their doorsteps have become attractive focus consumption points for consumers in the country.

Following on from this, the implantation of cultural and tourism elements can enrich commercial retail spaces in terms of the content and transform the original business model from being just a model driven by purchasing to a model driven by immersive experience. The era of the tourist attraction-type shopping centre in China is now here already, and one example is Raffles City the Bund in Shanghai. (Figure 23 and Case study 2 in the Appendix).

Looking forward to the future, alternative experiential retail shopping centre property asset development will continue to gain momentum in China. These types of shopping centres will not only be places for consumption but will also be experience spaces with functions and features, such as culture, fashion, art exhibitions and entertainment to meet the spiritual consumption needs of consumers in China.

COLD

STORAGE

LOGISTICS

WAREHOUSES

ALTERNATIVE

PROPERTY

ASSETS

03



As China's society has become more affluent over recent years, so consumer demand for a greater variety of food, greater quality food, food with a greater amount of nutrition, and food with a greater variety of taste has also increased significantly. Much of this food is fresh and needs to be transported, processed, stored and distributed in a cold or frozen state and this has led to a continually burgeoning cold chain industry in China, including growth in the number of quality alternative cold storage logistics warehouse property assets in the country.

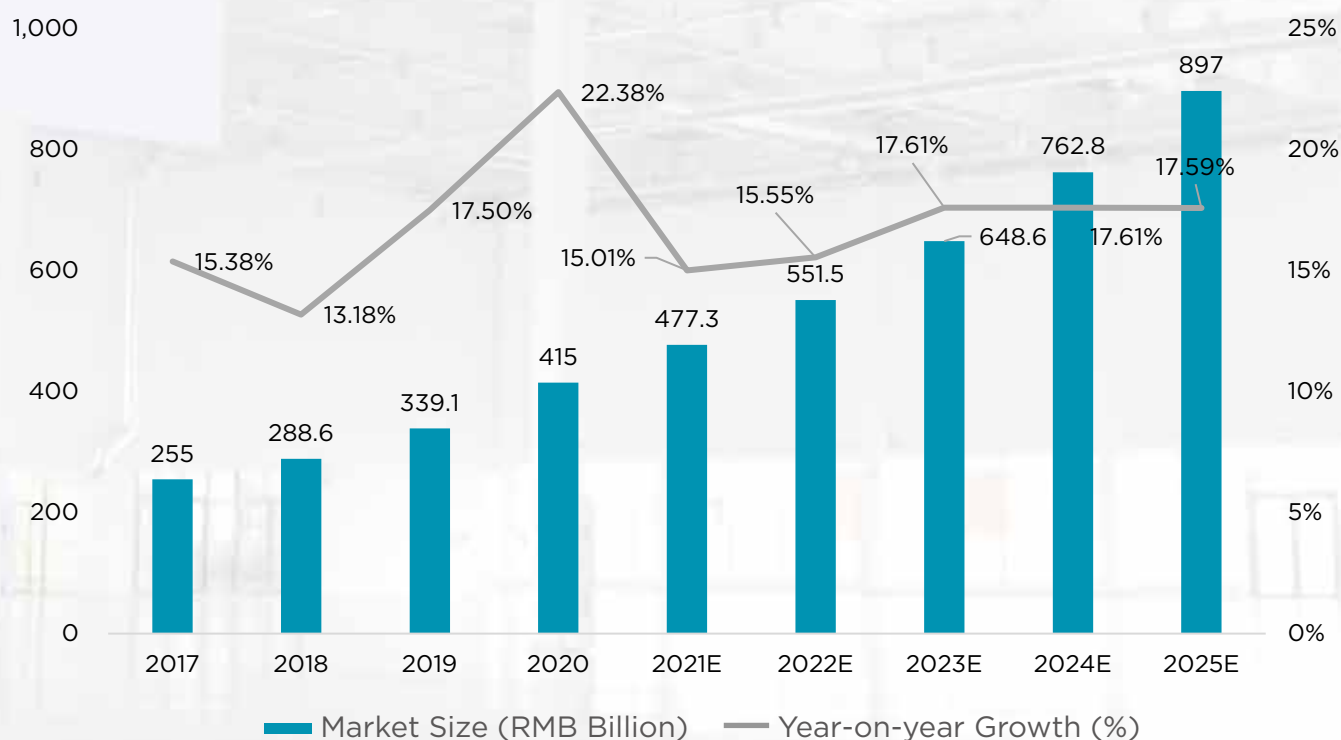
According to the Cold Chain Logistics Committee (CFLP) and the Intelligence Research Group, the cold chain industry sector in China has enjoyed double digit growth. In 2020, the market size reached RMB415 billion, a year-on-year growth of 22.38%. Considering the future growth momentum, China's cold chain logistics

market is expected to further increase to about RMB897 billion by 2025 (Figure 24).

The underlying factors which are having an influence on the growth of the cold chain industry sector in China are many, but some of the more important what-to-watch industry elements which we consider in this report include:

- o Greater consumer spending power;
- o A further emphasis on food safety;
- o Continued importance placed on food security;
- o More value being added to goods during the time between when they enter and exit the cold chain system, and;
- o Even though playing a small role in cold chain services demand, an increasing need to transport, store and distribute medicines.

Figure 24:
China's cold chain logistics industry growth (2017-2025)



Source: Cold Chain Logistics Committee (CFLP), The Intelligence Research Group, Cushman & Wakefield Research

Industry drivers

The underlying factors which are having an influence on the growth of the cold chain industry sector in China are many, but some of the more important reasons include:

- o Greater consumer spending power;
- o A further emphasis on food safety;
- o Continued importance placed on food security;
- o More value being added to goods during the time between when they enter and exit the cold chain system, and;
- o Even though playing a small role in cold chain services demand, an increasing need to transport, store and distribute medicines.

Consumer spending power

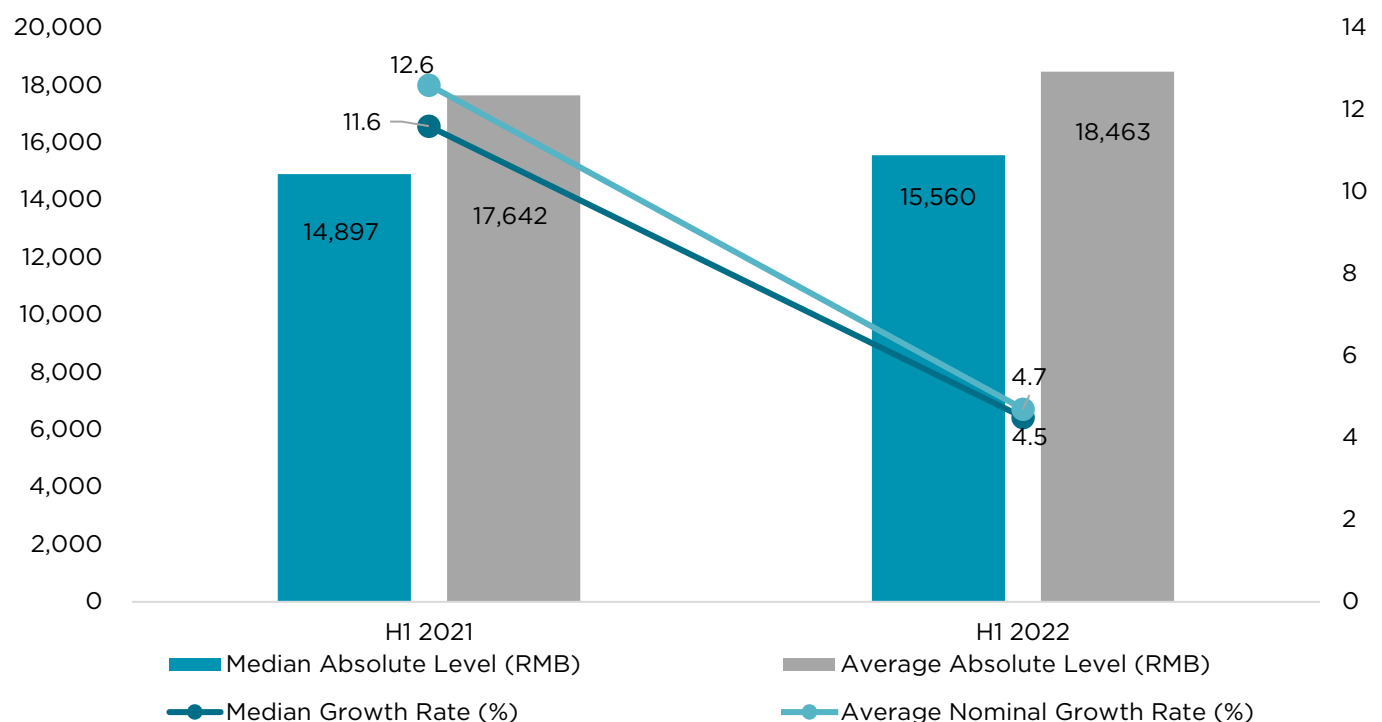
On a household basis, we have seen disposable income in China continue to rise. As disposable income has risen, so individual citizens have spent more on better quality food and food with a variety of taste.

In the first half year of 2022, the per capita disposable income of households in China was RMB18,463, an increase of 4.7% since a year ago (Figure 25).

From the standpoint of urban and rural areas, the per capita household disposable income of urban residents was RMB25,003, a rise of 3.6%. The per capita household disposable income of rural residents was RMB9,787, a rise of 5.8%.

Figure 25:

Average and median per capita disposable household income in China (H1 2021 and H1 2022)



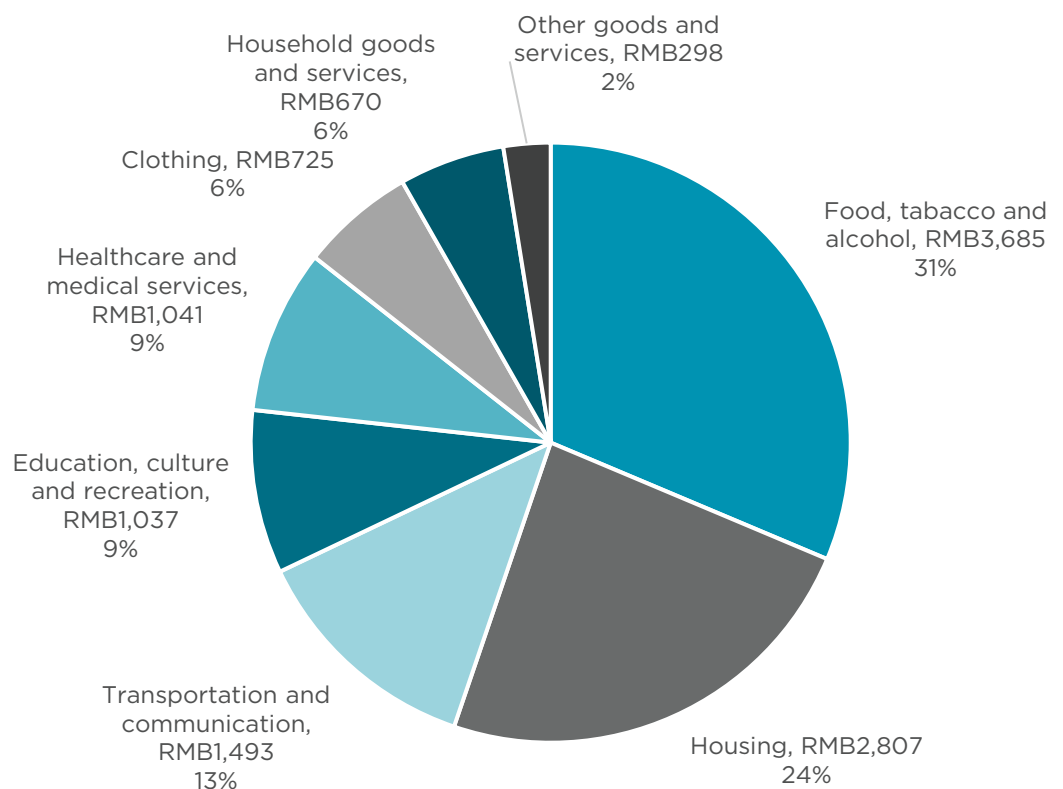
Source: National Bureau of Statistics, China, Cushman & Wakefield Research



When examining a breakdown of average per capita household consumption expenditure in China, in the first half year of 2022, the per capita consumption expenditure on food, tobacco and alcohol was RMB3,685, an increase of 4.2%, accounting for the highest share of the total per capita consumption expenditure, at 31.3% (Figure 26).

In the future, food will continue to be a sizeable element of household consumption in China.

Figure 26:
Median per capita household consumption expenditure breakdown in China (H1 2022)



Source: National Bureau of Statistics, China, Cushman & Wakefield Research

Food safety

Food preservation and safety is now at the top of the cold chain industry agenda in China, especially given the experience of the COVID-19 epidemic and the heightened level of general health and safety across the country.

To ensure food remains frozen and/or fresh, the cold chain industry will resort to relying on the use of the latest technology available,

such as:

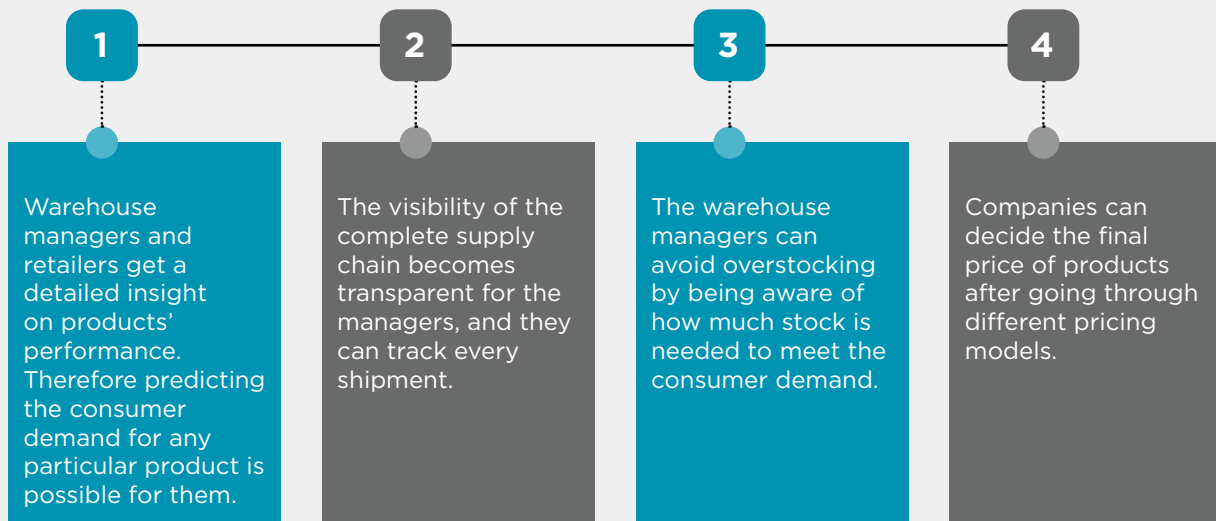
- o Big Data;
- o The Internet of Things (IoT);
- o Artificial intelligence (AI) and machine learning;
- o Autonomous vehicles;
- o Smart cold chain shelving, and;
- o Cold chain robots.

Big Data:

Data is key. It is the lifeblood of the cold chain system that when generated, analysed, processed and effected in the best manner, will lead to a more efficient overall cold chain system (Figure 27).

Figure 27:

Big Data - Four approaches to improve cold chain inventory management



Source: Mobisoft, Cushman & Wakefield Research

The IoT:

The IoT encompasses software and connected devices that recurrently gather, process and convey related data, and in this case enterprise cold chain data. In the industry, this data can be utilised to track goods, optimise routes, avert product counterfeiting, check processes and situations, uncover bottlenecks, produce system reports and more (Figure 28).

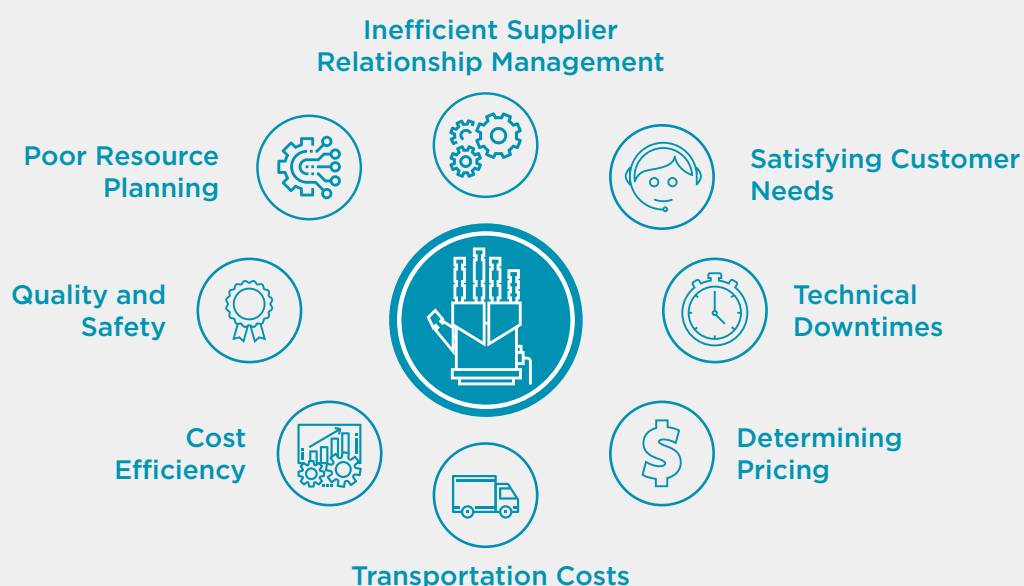
Figure 28:
IoT - Value add to cold chain



AI and machine learning:

AI and machine learning can be employed to digest and analyse at speed, huge amounts of data. Moreover, this technology can allow automated systems to act in certain ways given the underlying algorithmic ruleset at any given time (Figure 29).

Figure 29:
Machine learning and AI - Cold chain challenges which can be solved



Autonomous vehicles:

Fully autonomous vehicles within the cold chain industry sector will substantially improve cold chain transportation, including safety, delivery punctuality, more stop-free trips, augmented fuel-use efficiency, and more (Figure 30).

Figure 30:

Autonomous vehicles – Selected examples of cold chain service improvement



Will lead to:

- o Improved safety;
- o Better delivery punctuality;
- o More stop-free trips;
- o Augmented fuel-use efficiency.

Source: Cushman & Wakefield Research

Smart cold chain shelving

Smart cold chain shelving improves inventory management, order picking, and warehouse shelf space planning and utilisation, to name three improvements (Figure 31).

Figure 31:

Smart cold chain shelving – Selected instances where cold chain can be augmented



**Inventory
Management**



**Order
Picking**



**Warehouse Shelf
Space Planning and
Utilisation**

Source: Cushman & Wakefield Research

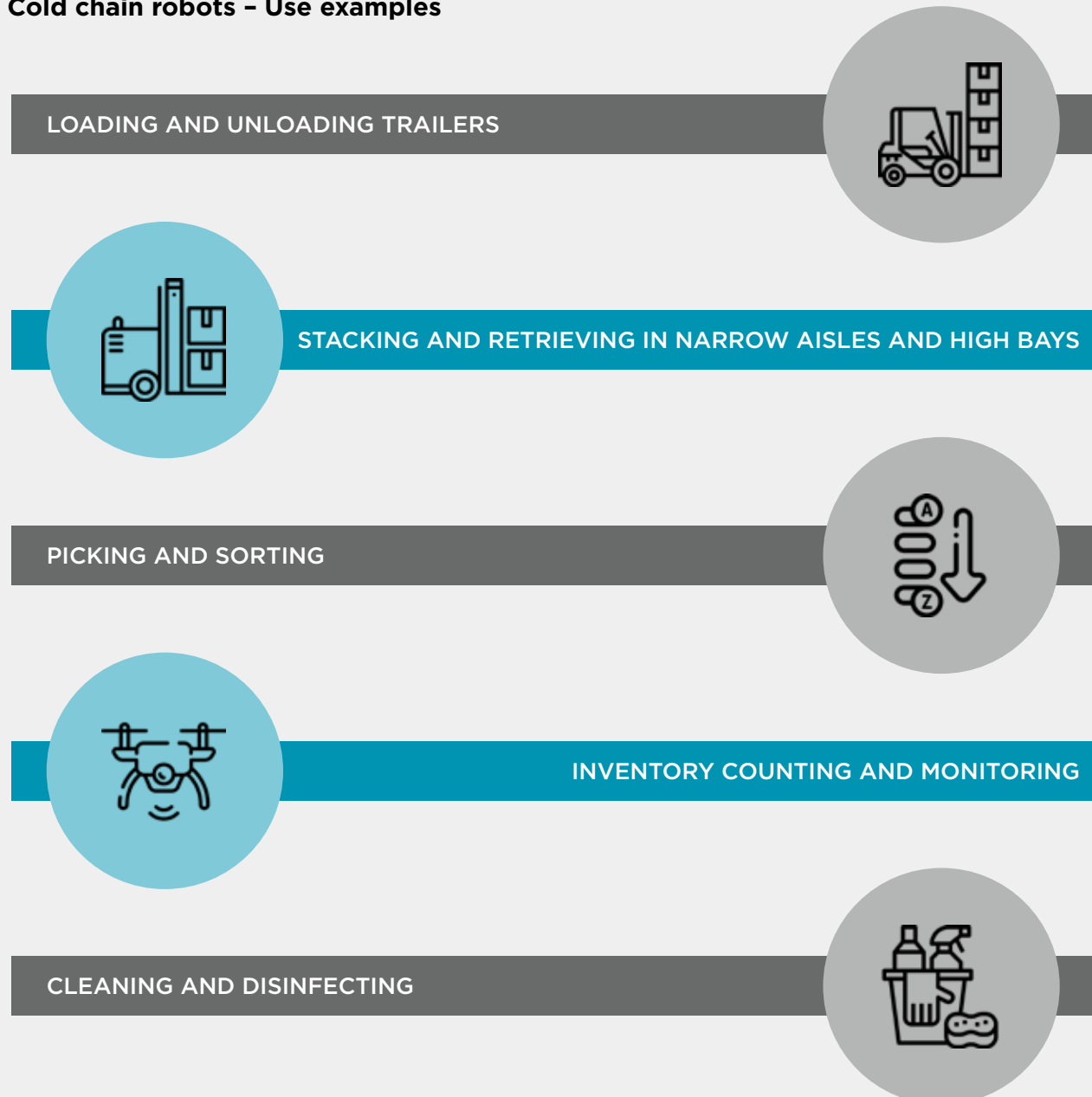
Cold chain robots:

When and where used, cold chain robots can perform a multitude of functions, which can improve work speed and efficiency within the industry. Four examples of where these improvements can be made are:

- The loading and unloading of trailers;
- Working in confined spaces;
- Picking and sorting, and;
- Cleaning and disinfection (Figure 32).

Figure 32:

Cold chain robots – Use examples



Source: AGV Network, Cushman & Wakefield Research

Food security

With 1.4 billion people, China has a large population, by country, the largest in the world. On the other hand, China also has many mountains, with mountainous areas taking up two-thirds of its total land area. The country has also experienced much urbanisation and is subject to intermittent natural disasters, such as typhoons. Thus, agricultural production and food security in the region are continually prioritised.

The cold chain industry can offer a number of solutions to food security. Two include: the storage of agricultural produce during peak production periods and made ready for distribution during lean periods, and the mitigation of food loss.

Food loss is an important issue. Globally, the European Food Information Council (EUFIC) estimates that one third of all food produced for human consumption is either lost or wasted (Figure 33).

Figure 33:
Food loss vs. food waste



Source: onethird, Cushman & Wakefield Research



What's more, there are environmental costs. By some estimates, up to 10% of all greenhouse gas emissions can be attributed to food loss and waste.

According to the United Nations Environment Programme around 50% of food losses happen during the initial stages of the supply chain owing to absence of appropriate refrigeration and cold chain tailbacks. Additionally, often if food production exceeds local cold chain capacity at any given time, food is lost.

Once food is harvested, it starts to decay. The decay process and speed of decay are influenced by temperature and humidity. Even minor variations in temperature affect the levels of nutrition and the shelf life of food. Picked bananas, for example, are best preserved in conditions where the temperature falls between

13 to 14 degrees centigrade. Apples on the other hand do well when the storage temperature is between 5 and 7.5 degrees centigrade. Therefore, crucial to food safety are cold chain refrigerated vehicles, cold storage rooms, and ripening chambers. Appropriate freezing, chilling or cooling is indispensable for upholding food safety and quality, and the temperature control must be very precise to prevent faster-than-normal-speed decay or chilling damage.

Two modern temperature-related food preservation techniques which can be employed by cold chain service providers, which can go some way to improving food preservation, and at the same time, mitigating food loss, are:

- o High pressure processing (HPP) and high-temperature short-time heating (HTST), and;
- o Blast freezing.

HPP and HTST:

Retort packaging, which is usually applied to juices, milk and meat products, can allow for cost-effective sterilisation done in a short time with minimal damage to the product. The product is then palletised and transferred to a cold storage logistics warehouse space for distribution at a later date.

Blast freezing:

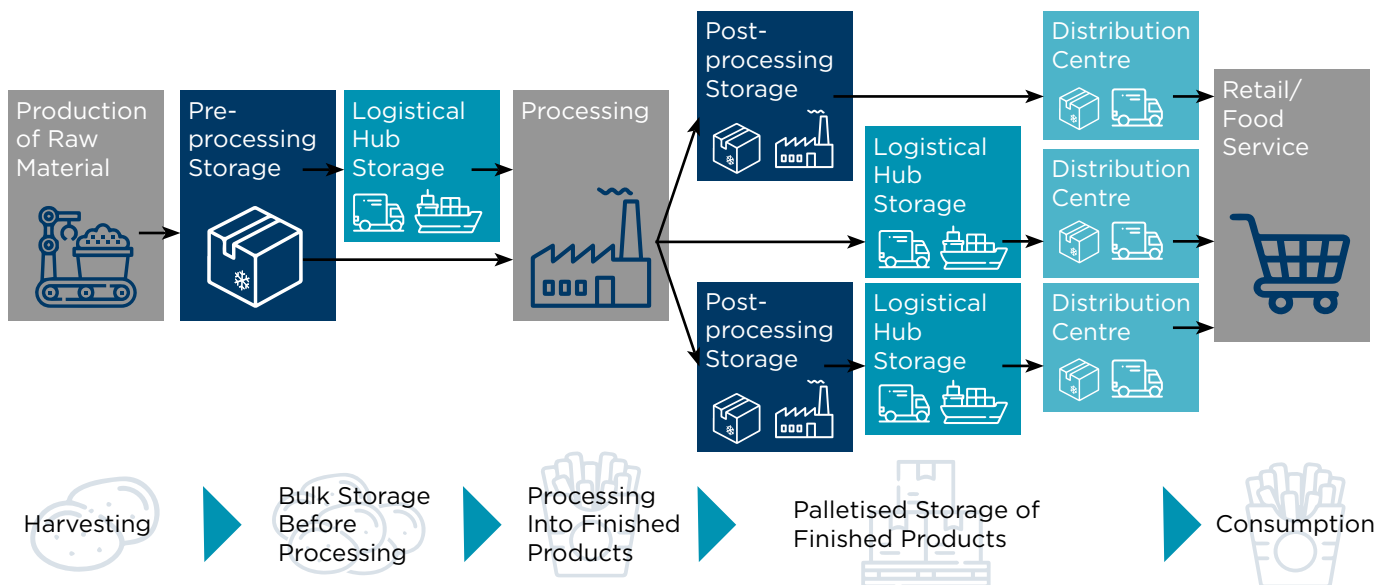
Blast freezing, like retort packaging, extends the shelf life of a product. This procedure involves deep freezing a food product in a blast cell utilising time and mechanical means of low-temperature refrigeration in combination with amplified air velocity.

Added value

A key development in the cold chain industry at present is a move towards value-added services and two examples of these services are:

- o Food processing and portion packaging, and;
- o Custom pallet building (Figure 34).

Figure 34:
Simplified cold chain added value



Source: Consultancy.eu, Cushman & Wakefield Research

Food processing and portion packaging:

In terms of cold chain cold storage warehouse facilities located near agricultural areas in China, often food produce arrives at the facility in bulk – whether it is grain, vegetables, fruit, dairy products or meat. To add value to this produce, they can be initially processed and then repackaged into smaller containers. For example, some fruit could be cleaned, peeled, sliced, mixed (with other fruit in some cases) and portion packaged in customised packs ready to be distributed to an individual retailer or supermarket chains at a higher price.

Custom pallet building:

This is an additional value-added service cold chain cold storage warehouse facilities operating in the initial stages of the cold chain could offer to save their onward distribution clients time and money. Usually, full pallets of the same food product arrive at warehouses which store products at the initial stages in the cold chain. Rather than forwarding on the produce in the same homogenous bulk format, initial stage warehouse operators can reorganise and customise the pallets to send on with a mix of products that an onward client prefers. The onward client would then be in a position to distribute the pallets directly to their own outlets, be they shops, restaurants, supermarkets, etc.

Medicines

The amount and number of medicines requiring cold chain handling in China has been increasing recently given:

- o The push to further improve public healthcare;
- o People's greater awareness of the importance of healthcare;
- o People's capability and willingness to spend more on healthcare, and;
- o The impact of the COVID-19 epidemic.

In response, the cold chain sector in China has had to learn, adapt and invest in specialised processing techniques, transportation and warehouse spaces and facilities to accommodate burgeoning demand.

Given the specialised nature of handling medicine products within the cold chain, cold chain operators in China have to follow a number of exacting guidelines, including:

- o Packing (if part of the service) and shipping consistent with suggested procedures, and;
- o Storing medicine products within the recommended temperature range during warehouse storage and transportation.

As to the last point, storage and temperature, certain medicines need to be stored and kept within a precise temperature range. These medicines are many and include vaccines, biologics, oncology treatments and some types of insulin.

Storage temperature ranges vary. Some medicines need to be stored at temperatures that range between 2 and 8 degrees

Celsius. For others, they need to be stored in a deep-frozen state – say below minus 10 degrees Celsius. In the case of some COVID-19 vaccines, they need to be stored at temperatures below minus 80 degrees Celsius (Figure 35).

Figure 35:
Cold chain and ultra-cold chain

Cold Chain

Most cold chain products require storage and transportation at **2 to 8 degrees Celsius**, while frozen products need to be kept below minus 10 degrees Celsius.

Ultra-cold Chain

Some of the leading COVID-19 vaccine candidates are classified as “ultra-cold chain” and need to be held at temperatures **below minus 80 degrees Celsius**.

Source: Healthcare Distribution Alliance, Cushman & Wakefield Research

Looking to the future, even though the handling of medicine products plays a small part in cold chain service demand when compared to other products like food, we do expect the service demand in China from medicine products will continue to increase as healthcare is further prioritised across the country.

Property trends

Apart from the industry drivers, there are a number of underlying trends influencing the cold storage logistics warehouse market in China and three major developments are:

- o Sustainability;
- o Technology, and;
- o Advances in warehouse design.

Sustainability

In order to reduce the amount of energy used by, and carbon emissions from, cold storage logistics warehouses in China, it will be important to take the next step and go carbon neutral.

Looking at whole building lifecycle carbon, the amount of energy and water used during a cold storage logistics warehouse's lifespan need to be considered. When ruminating on this, many aspects about a building project have to be assessed, including:

- o The proposed use of the facility;
- o The proposed design of the facility;
- o The proposed building systems, plant and machinery used in the facility;
- o The extraction of the building materials;
- o The processing and manufacturing of the building materials;
- o The transportation of the new building materials;
- o The construction of the facility;
- o The operation, management and maintenance of the facility;
- o The re-use/disassembly of the facility (if known);
- o The transportation of the old building materials;
- o The recycling of the old building materials, and;

- o The landsite where the rest of the old building materials will be deposited.

Before building, operating and re-using/ dismantling a cold storage logistics warehouse, it will be important to execute on the right whole-building lifecycle approach and to do this, the following elements will also need to be taken into consideration:

- o Carbon offsetting;
- o Carbon avoidance;
- o Embodied carbon, and;
- o Operational carbon.

Continuing on, one big move towards the creation of zero carbon cold storage logistics warehouses is the move towards the usage of renewable energy. There are a number of sources of renewable energy, but the main ones include:

- o Solar power;
- o Wind power;
- o Hydropower;
- o Geothermal power;
- o Tidal power, and;
- o Biomass power.

Much of the attention has also been brought about by a further push by authorities and by investment capital for

development that is environmental, social and governance (ESG) principals driven. Given the ESG development momentum of late, this driver is increasingly going to become a key influencer in the development and operation decision making of and for cold storage logistics warehouse investors, developers and landlords in China.

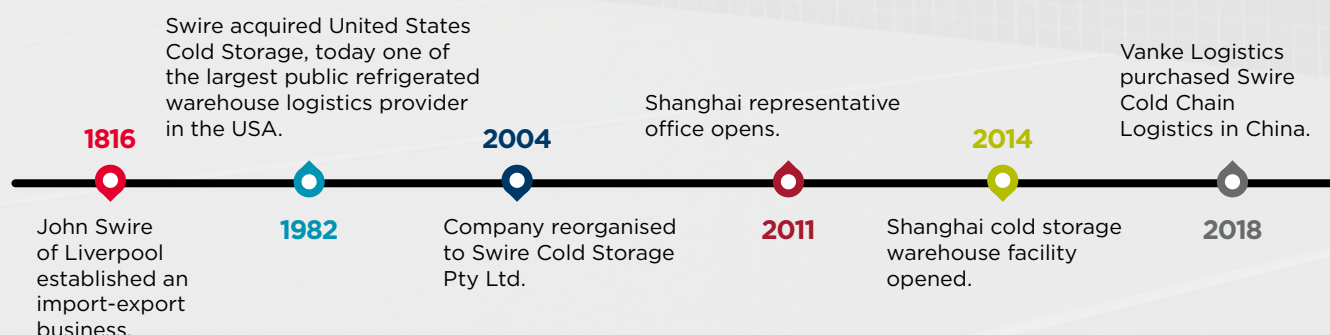
In addition, more and more real estate developers and real estate fund companies have joined the Global Real Estate Sustainability Benchmark (GRESB). Some companies operating in China have been participating in the assessment for many years. Green building in China is still continually developing and growing and alongside this development and growth, GRESB will be used more in the country for measuring the sustainability performance of real estate companies and real estate funds, including those that are actively involved in the country's cold storage logistics warehouse market because:

- o It incorporates a rounded methodology;
- o It has a clear assessment goal;
- o It is an international like-for-like standard that can be used in different jurisdictions across the globe, and;
- o It is a standard that is continually evolving.

What's more, when considering optimal carbon neutrality solutions for cold storage logistics warehouse facilities, collective and early involvement of all professionals within the design team is essential.

Lastly, one cold storage logistics warehouse project in China which currently incorporates a number of sustainable features is the former Swire Cold Chain Logistics Facility in Shanghai (now owned by Vanke Logistics), which among other features, includes a rainwater recycling system, LED lighting and a geo-thermal heat exchange system (Figure 36 and Case study 3 in the Appendix).

Figure 36:
Former Swire Cold Chain Logistics Facility (now owned by Vanke Logistics), Shanghai timeline



Source: Cushman & Wakefield Research

In addition to the emission reductions earned by preventing food losses, energy efficiency can bring further gains. Cold storage is a very energy-intensive process. 60-70% of the electricity used in cold storage facilities goes towards refrigeration. This means while expanding the cold chain, we must utilise the most energy efficient technologies available, as well as low global warming potential refrigerants to keep the climate impact as low as possible and technology will be key for delivering these solutions.

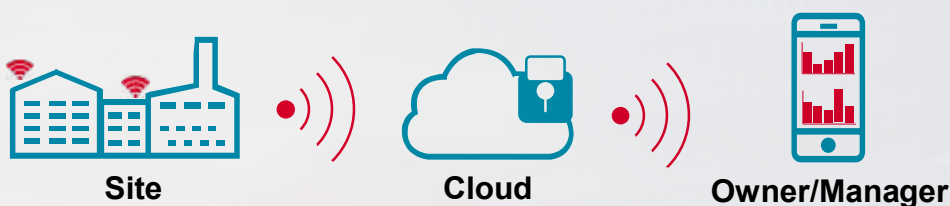
When considering cold storage logistics warehouses and the cost incurred in

running these types of facilities, the amount of energy consumption is significant and one of the biggest total occupancy cost drags. This is changing for smart cold storage warehouses, however, with the onset of the Internet of Things (IoT).

The IoT is shepherding in a new period where linked devices stream real-time information and data, via IEEE 802.15.4 wireless mesh technology, cloud and an app, from a smart cold storage logistics warehouse property to a property owner or manager, anytime and anywhere (Figure 37).

Figure 37:

The IoT - Streaming information and data via linked devices



Source: Cushman & Wakefield Research

What's more, once a decision is made, by using the same linked system and building control technology, owners and property managers can issue turn up, turn down, and on or off control signals remotely to plant and machinery embedded in a smart cold storage logistics warehouse property, in a timely manner. In turn, as efficient plant and machinery control is properly used

by smart cold storage logistics warehouse owners and property managers, energy consumption is reduced, and costs are lowered. Areas where energy consumption and costs can be lowered using a wireless building control system include:

- o **Air conditioning and fan control -**

The wireless building control system

can facilitate advanced schedule and occupancy control for air conditioning and fans. A whole smart cold storage logistics warehouse does not necessarily need cooling or heating at all times. The wireless building control system (combined with motion sensors) can allow the cooling or heating of a specific area to be only activated when occupied. Moreover, exhaust fans and thermal destratification fans can also be remotely turned on or off based on use demand;

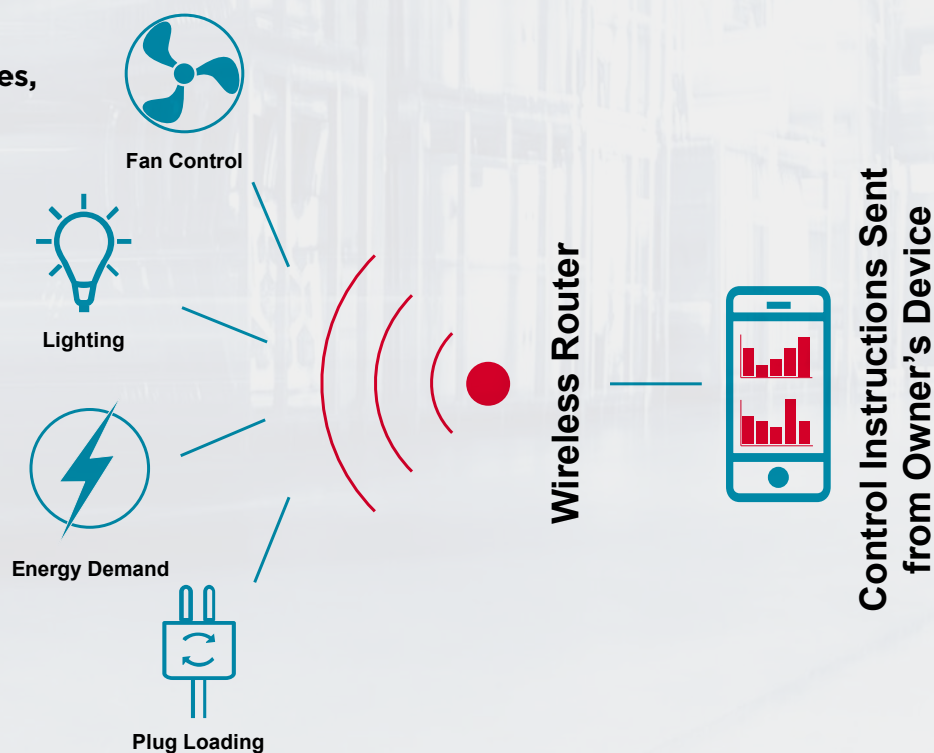
- o **Energy demand** - Owners and property managers can use the wireless building control system to automate demand response, so that non-priority plant and machinery can be turned down or off during periods of high energy demand;

- o **Lighting** - The wireless building control system (again, combined with motion sensors) can also lead to smart lighting, which combines with tuning, daylight harvesting and scheduling to provide demand-based lighting optimised for each area of the smart cold storage logistics warehouse. In some cases, this has led to 90% savings in energy consumption costs, and;

- o **Plug loading** - It has been estimated that around 25% of total electricity consumed by offices is down to plug loads. With this in mind, smart cold storage logistics warehouses also have numerous plugs in sockets which can be turned off when not in use. This can be done remotely and in a timely manner via a wireless building control system (Figure 38).

Figure 38:
The IoT - Linking devices, conveying control instructions

Source:
Cushman & Wakefield
Research



Smart cold storage logistics warehouses today, generate a tremendous amount of data. By encapsulating and analysing this data using the latest IoT facilities management software, smart cold storage logistics warehouse operators and lessees alike can be furnished with an improved understanding of the operational effectiveness of their space, including its energy consumption performance.

By using the right smart IoT building energy management software in particular,

smart cold storage logistics warehouse operators and lessees can now also spot operating variances within energy-consuming equipment, such as HVAC units, and systematise corrective action (Figure 39).

Additionally, this smart IoT software can offer integrated tools that examine and compare potential efficiency measures to augment the financial and environmental returns from energy reduction investments (Figure 40).

Figure 39:
IoT software systematising corrective action

Source:
Cushman & Wakefield
Research

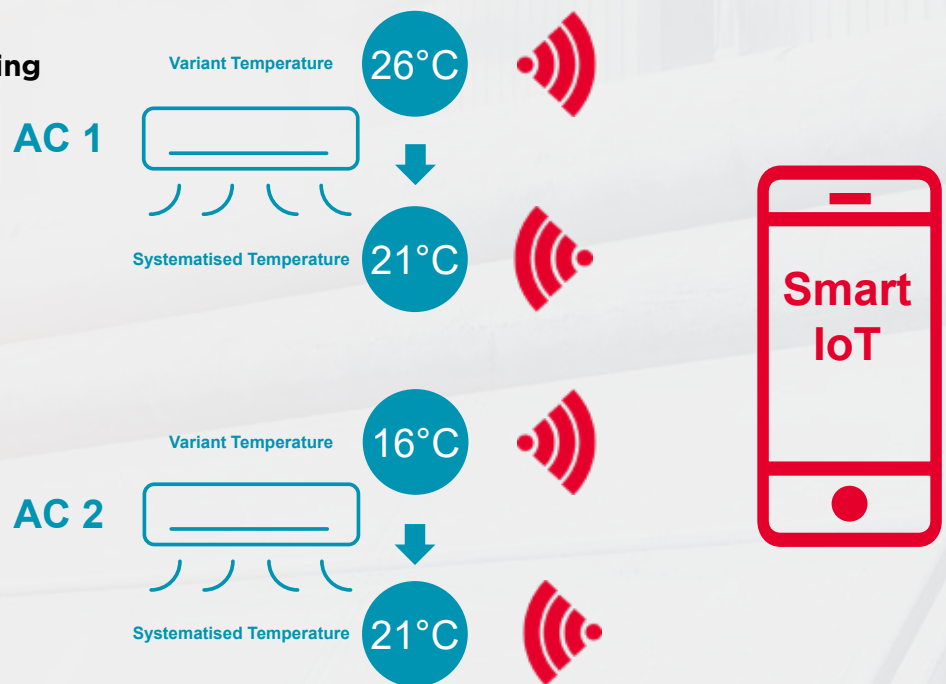
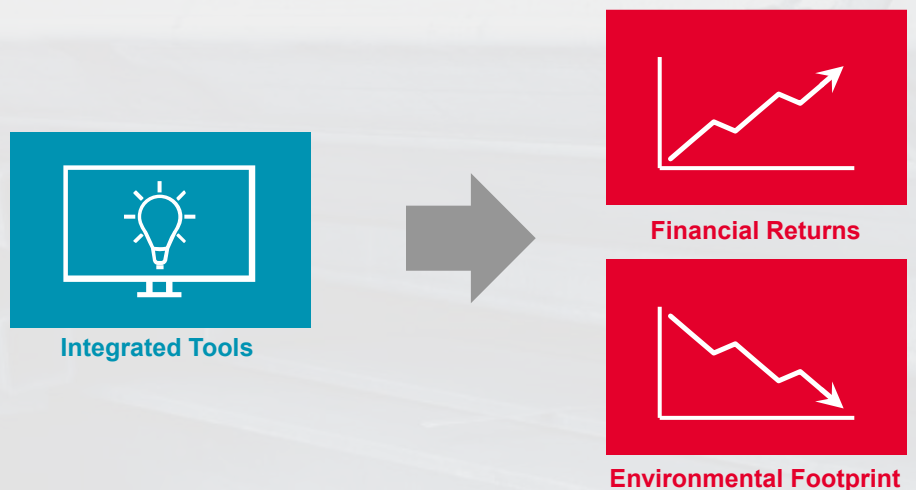


Figure 40:
IoT software augmenting financial and environmental returns

Source:
Cushman & Wakefield
Research



Moreover, the right smart IoT building energy management software delivers a platform for constant monitoring and management across a smart cold storage logistics warehouse facility. This ensures that environmental and energy improvements to a warehouse result in long-term sustainable gains, rather than short-term wins.

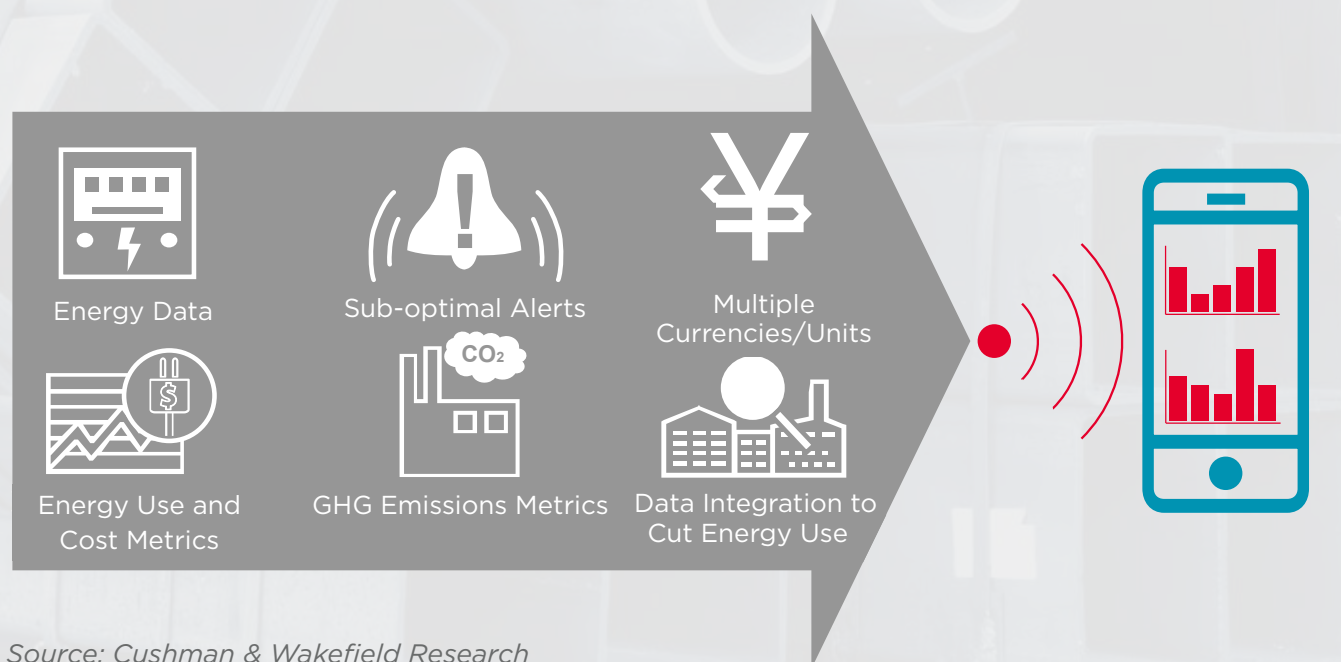
Smart IoT building energy management software is continually improving; some of the value-add functions such software can perform today are:

- o Automatically obtaining building energy data from energy monitors and building management systems;
- o Providing real-time alerts to sub-optimal conditions occurring in a building, such

as concurrent heating and cooling, system leaks, etc;

- o Displaying multiple currencies and units of measurement for energy and area for global reporting purposes;
- o Offering performance metrics to examine and predict energy use and costs against internal and external energy benchmarks;
- o Offering performance metrics to examine greenhouse gas emissions against internal and external benchmarks, and;
- o Integrating environmental and energy management with facilities management and capital projects to streamline energy and environmental impact reduction stratagems (Figure 41).

Figure 41:
Smart building energy management software output deliveries



Source: Cushman & Wakefield Research

The IoT hardware and software set to proliferate within the built environment

Lastly, all these hardware and software applications clearly show that wireless building control solutions can make cold storage logistics warehouses smarter, leading to efficiency in terms of energy consumption and lowered costs. Undoubtedly, the combination of mobile devices, cloud technology, software, building sensors and a wireless network will ensure the propagation of the IoT in smart cold storage logistics warehouses, for the foreseeable future (Figure 42).

Figure 42:
IoT proliferation to lead to ever lower costs



Source: Cushman & Wakefield Research

When considering a cold storage logistics warehouse, there are a number of factors which need to be taken into account in order to design and build a facility that can be best optimised when it is operationalised. Two fundamental factors include:

- o The proposed automation system, and;
- o The height of the facility.

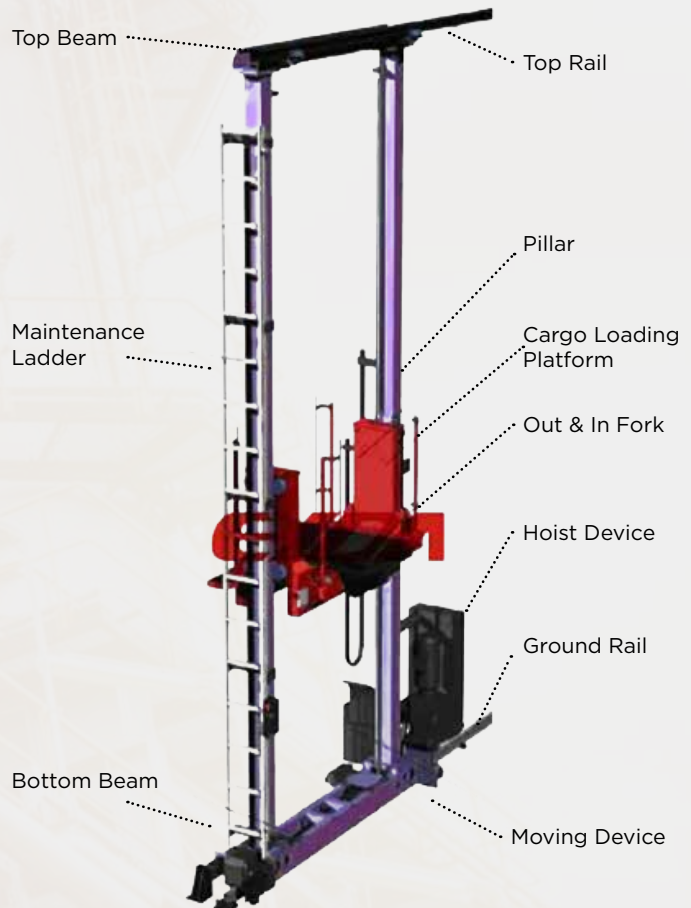
The automation system:

Before design commences, it's best to firstly understand the automation system to be installed in the cold storage logistics warehouse so that the designer can fully leverage the potential of the system to realise greater operational efficiency.

Cold storage automation systems include a number of features, including stacker cranes, robotic pallet shuttles and carton handling to name but three (Figure 43).

Automation systems also necessitate some specific modifications to operate dependably in low-temperature conditions and these modifications, including, remote visibility into the system to reduce technician time in the deep-freeze environment, cold-resistant lubrication, quick disconnect couplings, and other features that enable technicians working on the system to get in and out rapidly, will have to also be designed in.

Figure 43:
A typical stacker crane



Source: EYDA, Cushman & Wakefield Research

Facility height:

Conventional cold storage logistics warehouses with 40-foot ceiling heights are not conducive to efficient refrigeration because the area of the roof attracts heat from solar energy, adding to the load on the refrigeration system. If the facility is a deep-freeze warehouse it will also have a heated floor, which further adds to the heat load.

These concerns can be lessened by a building design that cuts roof and floor area without doing away with storage capacity. That entails building taller cold storage logistics warehouses, which are supported by automation systems that permit vertical storage, such as those mentioned above (Figure 44).

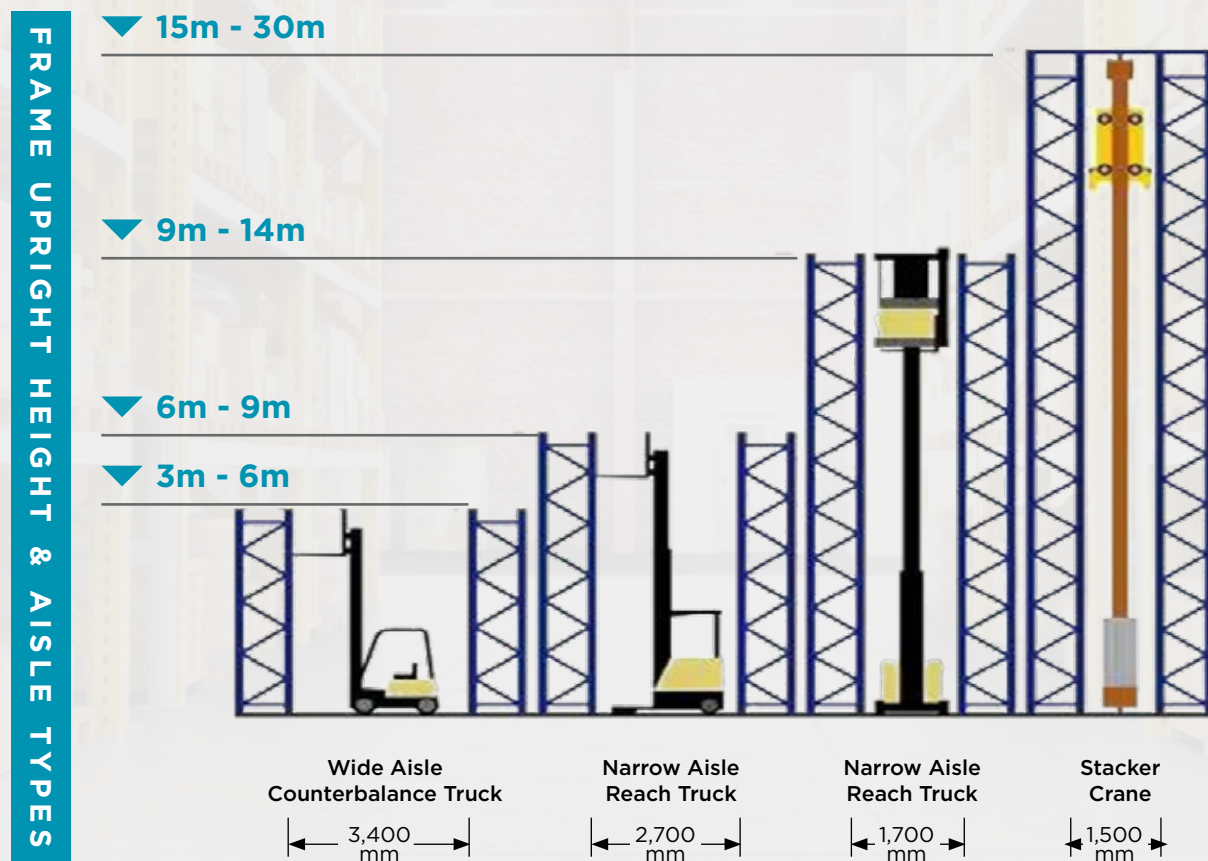
Raising the building height can allow the cold storage logistics warehouse to achieve

a footprint that is more or less one-third that of a traditional cold storage logistics warehouse facility, thus generating substantial operational expense savings over the facility's lifetime.

Given the industry drivers outlined above, the cold chain industry in China is set to grow and this growth will heavily influence the growth and business performance of the alternative cold storage logistics warehouse property asset market in the region.

In the coming years, we expect to see more quality cold storage logistics warehouse supply. This supply is expected to cater to the needs of domestic market storage and distribution derived from the importation of fresh goods and products. We also expect more quality cold storage logistics warehouse development space to cater to the need to store more perishable medicines. All said, these factors should continue to pique investor interest for the foreseeable future.

Figure 44:
Cold storage warehouse heights, aisle widths and stacking systems



Source: S&P, Cushman & Wakefield Research

DATA

CENTRES

ALTERNATIVE

PROPERTY

ASSETS

04



China's data centre market is evolving rapidly. As investors and developers invest/further invest in this alternative property asset in the country, there are many themes, topics, and issues to consider. Four important what-to-watch ones to investigate are:

- o **The market;**
- o **Government policy;**
- o **Investment, and;**
- o **Environmental sustainability.**

The market

At the beginning of 2021, cabinet stock in China touched 3.6 million, with the anticipation that this number will surpass 4 million by the end of the year/beginning of 2022.

The Beijing-Tianjin-Hebei region, the Yangtze River Delta region and the Pearl River Delta region continue to maintain strong data centre construction impetus, both in terms of the number of new cabinets and aggregate inventory.

Government policy

One of the most important data centre industry-related policies released recently in China is “The Three-year Action Plan for New Data Centre Development (2021-2023)”. The basic actions of the plan are:

- o **The optimisation of construction layout;**
- o **The upgrading of network quality;**
- o **The enhancement of computing power;**
- o **The strengthening of the industrial chain;**
- o **‘Green’ and low-carbon development, and;**
- o **Safety and reliability.**

Investment

Domestic data centre financing conduits in China are varied. They are largely split into equity financing and debt financing, including public offering, rights issue, private placement, bond financing, bank loans and other instruments.

These investors have executed on investment deals via a number of methods, such as directly purchasing data centre property assets, forming a joint venture company, or utilising financing channels. The following are recent investment deal examples:

Given the attractive cap rate that data centre projects can provide, many investors of late have shown much interest in data centre properties in China. Example investors include Actis, Blackstone, Hill House, and CapitaLand.

1. **Direct property asset purchase: In April of 2021, CapitaLand directly acquired its first hyperscale data centre property in China in Shanghai’s Minhang district.**
2. **Joint venture: In 2019, Gaw Capital**



Partners formed a joint venture partnership with Centrin Data to acquire, develop and operate a portfolio of hyperscale IDC projects in China. In the same year, Global Data Solutions and GIC also formed unique strategic partnership to develop and operate hyperscale domestic build-to-suit data centres.

3. Financing channels: In June 2021, Princeton Digital Group (PDG), backed by private equity firm Warburg Pincus, secured US\$230 million debt refinancing from China Merchants Bank as part of a US\$1 billion data centre investment expansion plan in China.

Cloud computing vendors are an important driving factor for the development of data centres in China. Companies involved in cloud computing are expected to continue to increase investment, including investment in

large data centres in the country. Alibaba and Tencent are two representative companies in China that will drive data centre investment over the next few years:

- o **Alibaba:** According to a Sina News report in 2019, Alibaba plans to invest around RMB200 billion in data centres over the next three years, and;
- o **Tencent:** According to a recent article by Xinhuanet, Tang Daosheng, President of Tencent Cloud and Intelligence Industry Group, announced that Tencent will invest RMB500 billion over the next five years.

As can be seen from both Alibaba's and Tencent's investments, data centres need large capital investment, and the trial of a domestic REITs market will bring new financing channels to listed companies (Figure 45).

Figure 45:
REIT investment mechanism



Source: Listen Money Matters, Cushman & Wakefield Research

The recent REITs documents jointly issued by the China Securities Regulatory Commission and the National Development and Reform Commission (NDRC) pointed out that the ownership of REITs projects should be clear, and relevant procedures, such as acceptance, land use, environmental assessment, planning, project investment management, operation, cash flow and investment returns, should be fulfilled as required.

Internationally, Equinix is a good example of a data centre operator which has converted to a REIT (Figure 46 and Case study 4 in the Appendix).

By converting to a REIT, Equinix has been able to acquire a number of business advantages:

- o **Firstly, Equinix had to and has to continue to ensure high yield, low risk characteristics to meet the needs of investors — which in turn has resulted in a high stock price.**
- o **Secondly, there is the advantage of a lower tax burden. Equinix is able to avoid double taxation by exempting REITs from income tax on rental income and dividends from property sales.**
- o **Thirdly, Equinix enjoys an enhanced financing capacity. Since 2015, Equinix's capital expenditure has grown rapidly, and its operating income has improved significantly.**

- o **Lastly, Equinix's asset structure has been optimised. Financing has been easier since transforming to a REIT, and the gearing ratio has steadily declined while the company has maintained rapid business expansion.**

Ahead, as with any asset, all assets under a REIT, including data centre REIT assets, will increasingly be subject to scrutiny from an environmental sustainability perspective. Understanding how data centre development and operation impact environmental sustainability and finding impact mitigating solutions will be key to the industry in China, and these issues are discussed in the next chapter.

Figure 46:
Equinix, Redwood City timeline



Source: Cushman & Wakefield Research

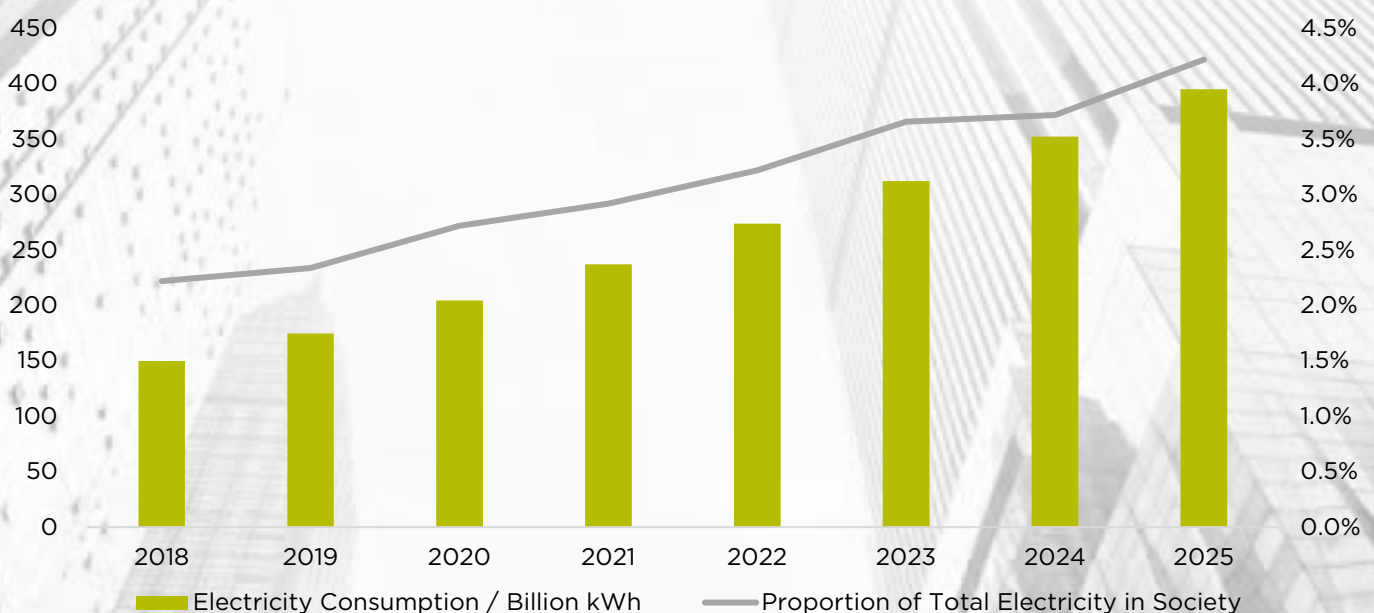
In the face of global warming, China has proposed the strategic goal of “reaching a carbon peak by 2030 and going carbon neutral by 2060.” Data centres, on the other hand, convert electricity into computing power, and so with the rapid growth of digital demand, data centres are increasingly demanding a greater amount of electricity for centre operational purposes.

When considering China specifically, according to statistics, the total power consumption of China’s data centres in 2020 exceeded 200 billion kilowatt hours, accounting for 2.7% of the total power consumption. Meanwhile, the total power consumption of China’s data centres will be 2.5 to 3 times that of 2020 by

2035, accounting for 5 to 7% of China’s total power consumption (Figure 47).

The spectacular acceleration of global data centre markets has elevated trepidations around the impact the sector has on the environment. With the exceedingly high consumption of power by data centres and the substantial carbon footprint the sector produces, there is a need to fortify sector-wide standards and commitments for sustainable data centre operations. Governments around the world are pushing the data centre sector towards ‘greener’ operations with new regulations, and even moratoriums.

Figure 47:
China data centre power consumption (2018-2025)



Source: IDC Qian, Cushman & Wakefield Research

In light of this, as previously mentioned, the National Development and Reform Commission, the Cyberspace Administration of China, the Ministry of Industry and Information Technology and the Energy Administration have jointly issued the "Guidance on Accelerating the Construction of the Collaborative Innovation System of Integrated Big Data Centres" and other documents. These policies aim to steer future data centre development in China along a sustainable 'green' path, whereby, among other factors, new development:

- o Is systematic, coordinated, and orderly;
- o Ensures energy-use efficiency, and;
- o Utilises energy from renewable energy sources where possible.

In addition, demand pressure for data centre carbon neutrality is also arising from user enterprises, as they try to fulfil their annual environment, social and governance (ESG) rating targets (Figure 48).

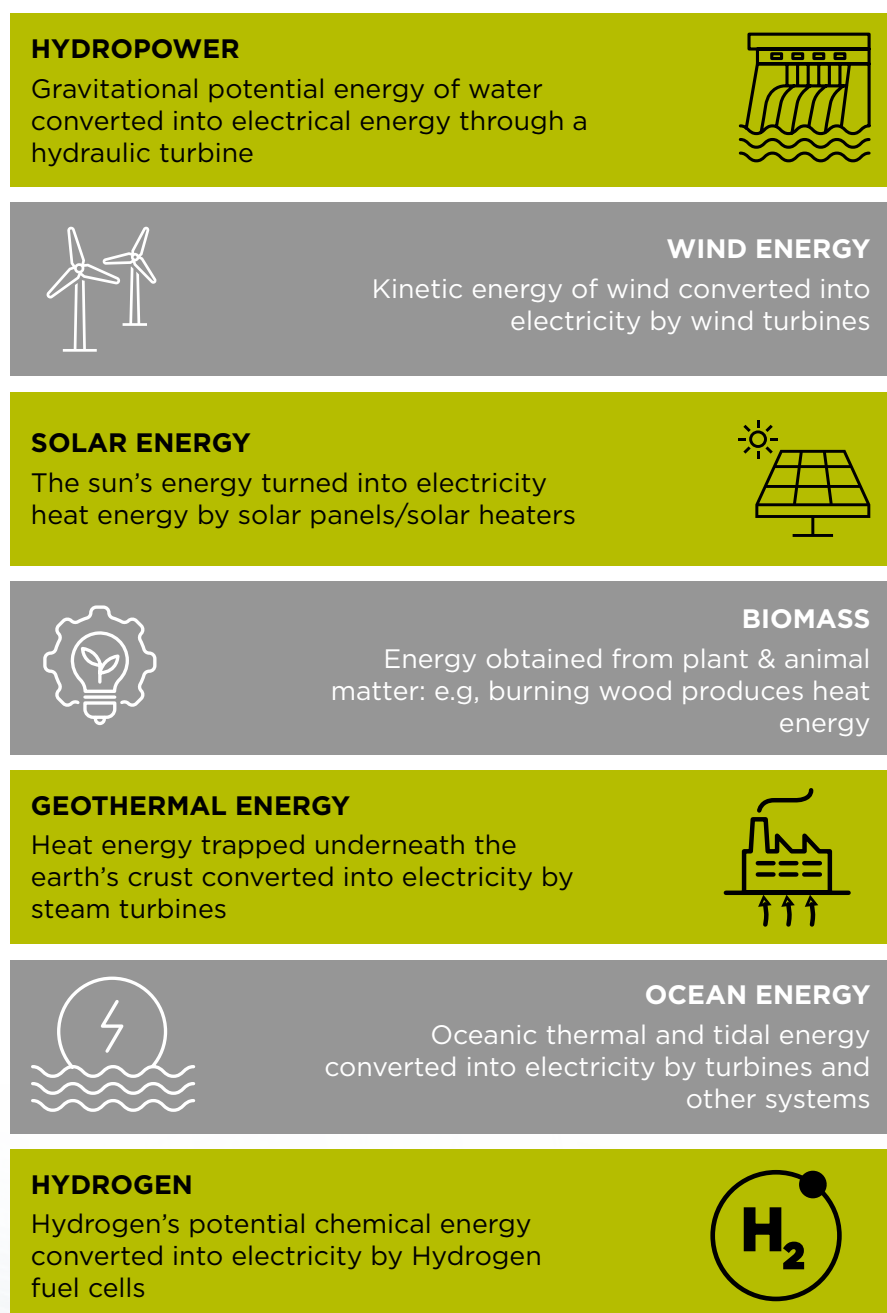
Figure 48:
An ESG rating example

Source: medium.com,
Cushman & Wakefield
Research



Over the years, the data centre industry in China has explored various energy-saving and 'green' technology initiatives. Some data centres in the country have been able to lessen their PUE value to 1.1 or below. In the long term, regarding the goal of going carbon neutral, energy efficiency and energy saving are just small steps in the overall journey to find a true solution. Additionally, carbon offsetting, carbon trading, carbon capture and other similar initiatives are also somewhat limited when considering the overall goal. For a long-term total solution, the generation and use of renewable energy are the keys to unlocking and revealing the real 'green' solution (Figure 49).

Figure 49:
Sources of renewable energy



Source: Science Facts, Cushman & Wakefield Research

Having said this, however, with data centres in China, there is a bit of a dilemma when it comes to optimising workloads. On the one hand, China has a vast territory with many areas, particularly in its western regions, such as Sichuan, Xinjiang, Guizhou and Inner Mongolia, having the potential to provide sufficient power from wind, solar, water, heat, and other renewable energy sources. However, on the other hand, China has a densely populated and developed economy, which requires a large amount of energy in its eastern and coastal areas.

In the case of data centre development, demand and data transmission speed is important. Understanding this, it is natural for data centres to prefer to locate to a site close to a populated developed centre. Data centres, however, require a considerable amount of electricity and China's developed populated centres in its eastern and coastal regions lack many of the renewable energy resources, (found in its western regions), which will be increasingly needed in the future to power the data centres located in their jurisdictions.

To solve this energy generation/energy consumption sustainability issue, the development of data centres in China will have to take a two-pronged approach in the future:

1. Data Centres Built in Renewable Energy-rich Areas:

Given these data centres will be located in China's western region, far from the large pool of users in the country's eastern and coastal regions, these particular data centres could be largely used for the storage of data, disaster recovery and other data uses which aren't subject to low-latency requirements. What's more, China's western regions are often cooler and, therefore, the amount of energy (in this case, renewable energy) required to cool data centres in this region, will largely be less than for an equivalent data centre located in China's eastern and coastal regions.

To further augment the environmental sustainability aspect of these particular data centres, energy efficiency and PUE reduction strategies can be employed.

2. Data Centres Built Close to Populated Developed Centres:

For data centres built close to populated developed centres in China, the main environmental sustainability priorities will be energy efficiency and PUE reduction.

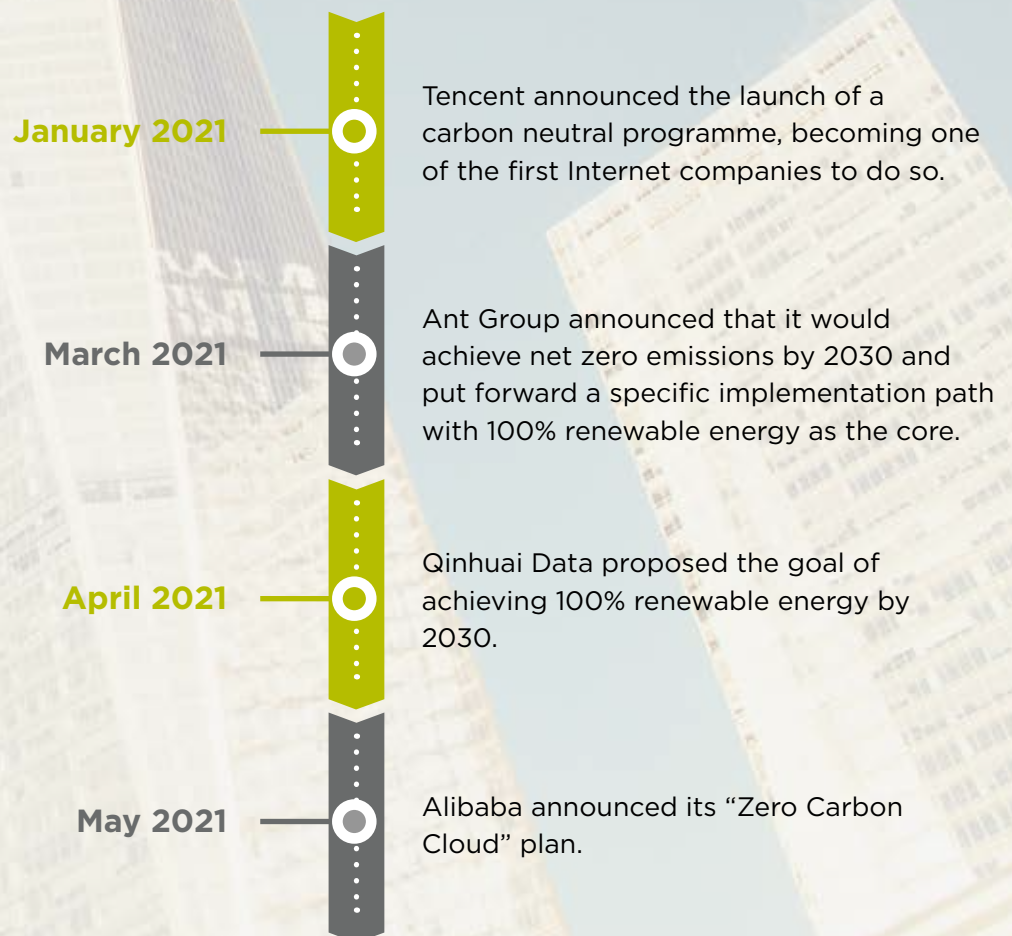
On this note, the Action Plan, as mentioned previously in our report, has laid out specific measures to implement to achieve 'green' and low-carbon data centre development in China. Explicitly, the plan also provides advice on a number of aspects related to the planning, design, operation, and management of data centres to realise energy efficiency and PUE reduction.

Generally, when considering energy efficiency for data centres, strategy measures usually target five aspects:

Information technology (IT)	Power infrastructure	Air flow management	Heating, ventilation, and air conditioning (HVAC)	Operational management
A reduction of energy consumed by information technology (IT) equipment;	Reducing energy loss from power distribution;	Augmenting cooling by preventing the intermingling of hot and cold air;	Enhancing humidity and cooling systems, and;	Optimising systems monitoring and centre management training.

Industry Moves:

In China, well-known enterprises, including hyperscalers, have also been actively exploring 'green' energy efficient low carbon-emitting data centres. In this context, both upstream and downstream data centre enterprises have begun to take action and put forward their commitment to or goals for 'green' transformation.



May 2021

The goal of the plan is “to ensure that the overall efficiency is the highest it can be and PUE is the lowest it can be.”

Currently, Ali Cloud has established five super data centres in Zhangbei in Hebei, Ulanqab in Inner Mongolia, Heyuan in Guangdong, Nantong in Jiangsu and Hangzhou in Zhejiang. Of note, Ali Cloud’s:

- o **Zhangbei Data Centre** — has a PUE of 1.25;
- o **Ulanqab Data Centre** — utilises renewable energy which is generated from both wind and solar sources;
- o **Heyuan Data Centre** — is the first ‘green’ data centre in China to harness lake water for cooling;
- o **Nantong Data Centre** — is actively promoting new energy consumption, and lastly;
- o **Hangzhou Data Centre** — is continually striving to achieve one of the lowest PUE scores in China.

May 2021

Dataport proposed the goal of achieving 100% renewable energy for all new generation hyperscale data centres within its operational scope by 2030.

June 2021

Baidu announced a carbon neutral plan to “achieve carbon neutrality in group operations by 2030.”

July 2021

Aofei Data announced that the company received the carbon neutrality certificate issued by the China National Accreditation Service for Conformity Assessment (CNAS). The company’s Guangzhou Jinfa Data Centre, Langfang Cloud Data Centre and the company’s other self-built data centres obtained carbon neutrality certification.

September 2021

GDS’s Chengdu No.1 and Shanghai No.3 data centre projects passed the first DC-Tech “Zero Carbon” data centre grade evaluation.

In summary, China’s data centre market is rapidly transforming. By thoroughly accessing the market, government policy, the investment dynamics, and factors associated with sustainability, both investors and developers will be in a stronger position to make the right decisions when it comes to their data centre alternative asset property investment in the region.

LONG-TERM

RENTAL

HOUSING

ALTERNATIVE

PROPERTY

ASSETS

05



Given affordability matters related to housing in many large urban areas in China, the case for another alternative property asset – long-term rental housing – and its investment and development continues to grow stronger. When considering this, however, investors and developers in China’s long-term rental housing market have to increasingly take into account an essential what-to-watch factor and that is the desire (or desires) of residents regarding their property and its living environment.

Generally, as much as 60% of our time is expended at home during the day and that’s not even making an allowance for the one-third of our time devoted to sleeping

at night. With this amount of time spent residing at home, it is not surprising that people are progressively becoming concerned about how healthy their living accommodation is.

Levels of pollution within buildings in many locations globally, including in some residential buildings, are frequently greater than levels recorded outside. In many situations, evaluations done to assess indoor levels of radon, environmental tobacco smoke (ETS), and lead have substantiated that health and safety risks are significant. Not only this, thousands of chemical and biological pollutants can be found to be present indoors, many of which are known to have a considerable health

impact on people.

When looking to improve residential building health, including long-term rental housing health, there are many ways this can be accomplished, but nine principal areas that can be observed, addressed and improved upon are:

- Air conditioning and ventilation;
- Air quality;
- Temperature and humidity;
- Damp and fungus;
- Dust, grime and pests;
- Water quality;
- Noise pollution;
- Lighting and views, and;
- Safety and security (Figure 50).

Figure 50:
Nine foundations for a healthy residential building

Source:
archdaily.com,
Cushman & Wakefield
Research



For the purposes of this report, to be classified as a certified healthy residential building, a property has to satisfy certain conditions:

1. Evidence of a healthy building certification, and/or;
2. Has integrated a healthy building-related standard/scheme/technology.

As for fulfilling the first condition, investors, developers and owners in China have a number of healthy building certification choices open to them. One example, however, is the International WELL Building Institute (IWBI) and their WELL Building Standard version 2 (WELL v2) certification (Figure 51).

Figure 51:
WELL v2 – The 10 concepts

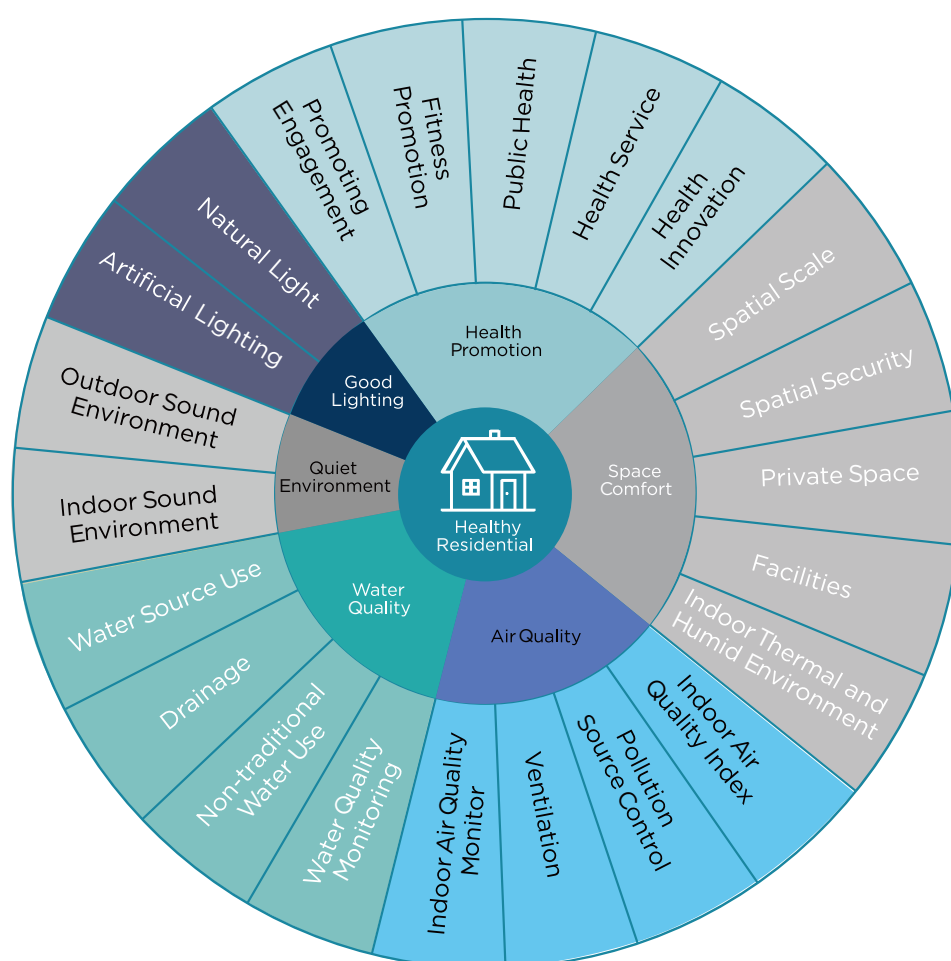


Source: IWBI, Cushman & Wakefield Research

As for fulfilling the second condition, again, there are a number of healthy building-related standards, schemes and/or technology which can be integrated in China by investors, developers and owners. Regarding standards, one example is the domestically generated Evaluation Standard for Healthy Housing (T/CECS 462-2017) (Figure 52).

Figure 52:
Components to the Evaluation Standard for Healthy Housing (T/CECS 462-2017)

Source:
Evaluation Standard for Healthy Housing T/CECS 462-2017, China National Engineering Research Centre for Human Settlements, Cushman & Wakefield Research

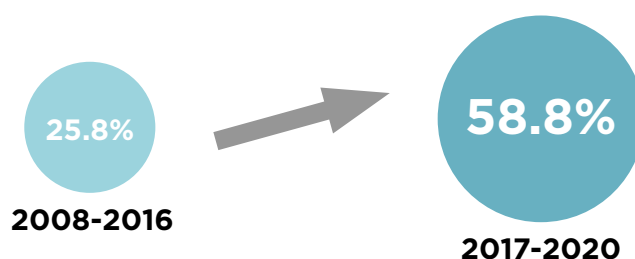


In brief, both WELL v2 and the Evaluation Standard for Healthy Housing (T/CECS 462-2017) provide comprehensive building appraisal schemes that can augment human health and wellbeing throughout the residential built environment.

When clearly centring on general healthy residential projects, and in particular, certified residential projects built by a representative group of 10 selected major developers, some years prior to 2017, healthy residential housing building volume in China was comparatively small. Over the eight-year period between 2008 and 2016, the average accumulated supply growth rate for this asset class was 25.8%. On the other hand, over recent years, the accumulated residential supply with “health” as a major theme has grown significantly. Over the four-year period, between 2017 and 2020, the average growth rate for accumulated healthy residential project supply, built by this group of selected developers, grew by a considerable 58.8% (Figure 53).

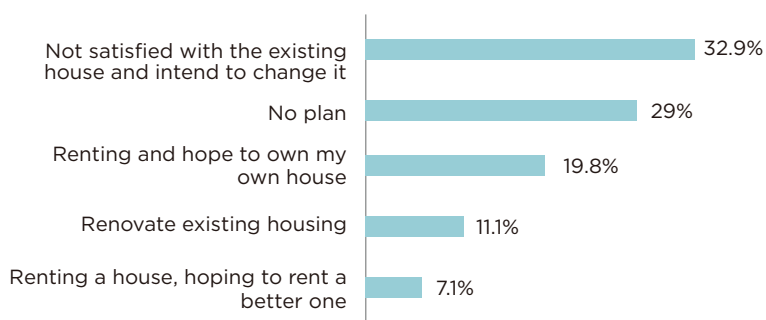
Knowledge of the importance of living in a healthy residential dwelling is also increasing in China. Nearly a decade back, as affirmed by a market survey by Fang.com on the awareness of healthy housing, it can be seen that only about 24% of consumer respondents were acquainted with the notion of healthy housing. Moreover, as per a recent survey by Baixing Finance & Economics, over 70% of respondents plan to improve their living environment and the health level of their home by either modifying their existing home, buying a new house or renting a better one (Figure 54).

Figure 53:
Healthy residential housing project supply in China - Average accumulated growth rate (Built by a representative group of selected developers) (2008-2020)



Source: Cushman & Wakefield Project & Occupier Services, Cushman & Wakefield Research

Figure 54:
China housing owner/user sentiment survey - Since the epidemic, what are your intentions regarding the health levels of your home? (2020)



Source: Baixing Finance & Economics, Cushman & Wakefield Research



As the health of residential buildings in China is further enhanced, a healthy residential housing system can also be created and employed by developers and asset owners.

From the adoption of such a healthy residential housing system, a greater amount of certified healthy residential homes, including certified long-term rental housing homes, which integrate healthy design, materials, products and technology, can be realised in China.

Creating healthy residential projects, including long-term rental housing projects, is more than just building quality houses. It also requires the provision of health and well-being features and facilities, such as open green space, community gathering places, games rooms, sports facilities, exercise equipment, etc, and good property management that adds value to the community's social framework. The Landsea Yue Mansion project in Hangzhou is a perfect illustration of a well-planning residential

community which enhances the health and social well-being of its residents through good design and property management (Figure 55 and Case study 5 in the Appendix).

Lastly, once mindfulness of the advantages of living in healthy residential housing, including healthy long-term rental housing, is present in more of the general public, so we anticipate the supply volume of certified healthy residential housing in China to further grow in the years to come.

Figure 55:
Landsea Yue Mansion, Hangzhou timeline



Source: Cushman & Wakefield Research

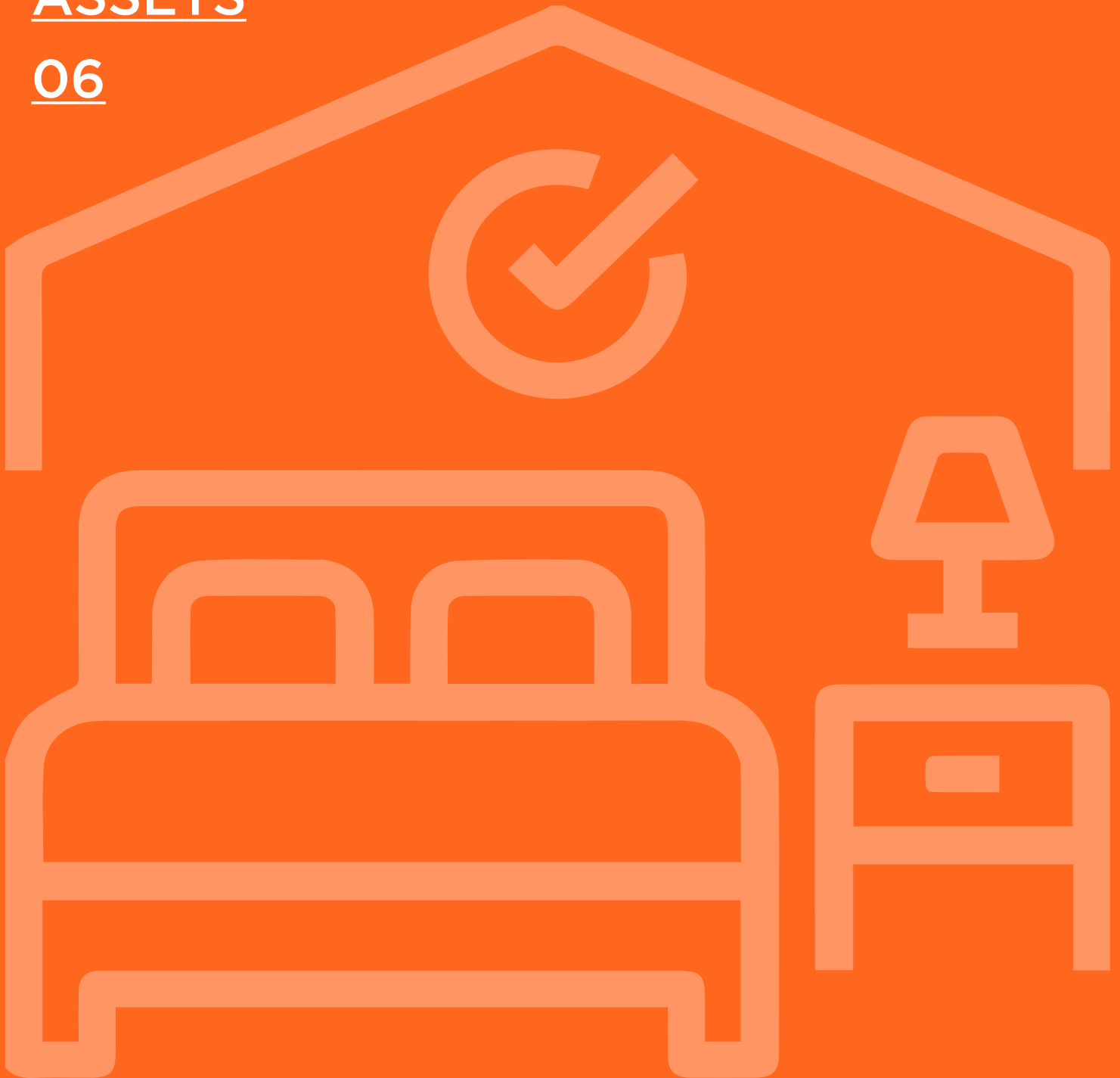
HOTELS

ALTERNATIVE

PROPERTY

ASSETS

06



Finally, several what-to-watch factors, including:

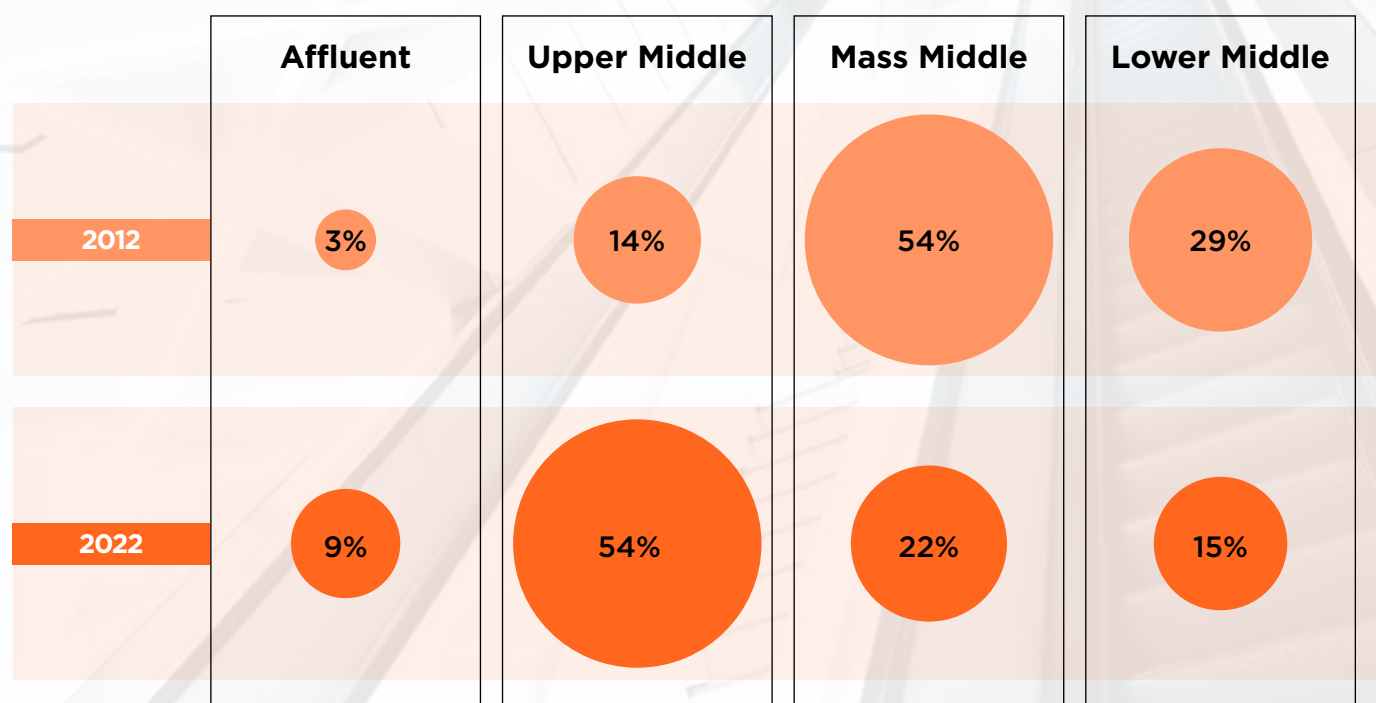
- o The changing demographics;
- o Changing travel consumption behaviour;
- o A greater want for convenience;
- o A heightened awareness of health, safety and cleanliness, and;
- o A growing desire for a unique stay experience ...

... are and will increasingly come into play within another alternative property asset sector in China; the hotel sector, and hotel investors, developers and operators need to be aware of them in order to capture any new business opportunities.

The changing demographics:

As China becomes the world's second largest economy, the number of middle-class families is growing in China. Today, the middle-income group in China stands at over 300 million people (Figure 56).

Figure 56:
The middle-class population in China as a percentage of urban households (2012 and 2022)



Note: Urban household incomes are calculated as:

A. Affluent households earning above US\$34,000;

B. Upper middle-class households earning between US\$16,000 to US\$34,000;

C. The mass middle class earning between US\$9,000 and US\$16,000, and;

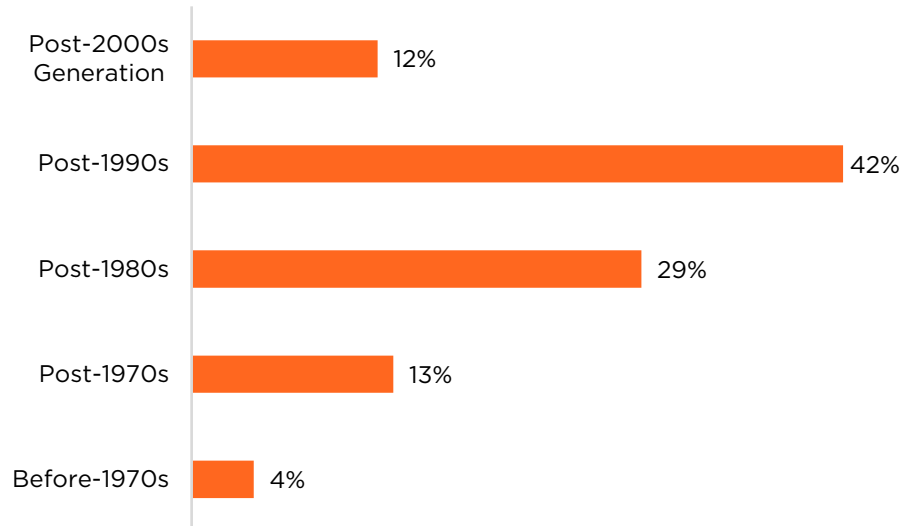
D. The lower middle class earning less than US\$9,000.

Source: McKinsey & Company, China Briefing, Cushman & Wakefield Research

Changing travel consumption behaviour:

The hotel stay consumption behaviour of travellers in China has undergone tremendous changes, and new segmented groups, such as girlfriends, online gamers, and couples cannot be ignored (Figure 57).

Figure 57:
Female traveller age distribution in China (2021)



Source: Nextdoor, Ctrip, TravelGo, Cushman & Wakefield Research

A greater want for convenience:

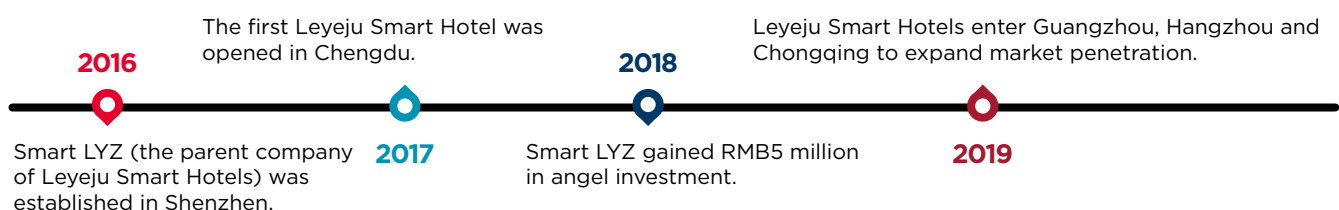
In recent years, with the rapid development of technology, hotel guests in China have increasingly demanded new types of efficient and convenient hotel services which feature high-tech solutions. Three important areas where technology is and will play an important role in enhancing convenience are:

- o Front desk and housekeeping services;
- o Room services, and;

o Dining services.

This type of smart, comfortable hotel stay experience is not a futuristic dream. It is something we can experience now. One domestic smart hotel chain which has incorporated some of these features is Leyeju Smart Hotel in Shenzhen (Figure 58 and Case study 6 in the Appendix).

Figure 58:
Leyeju Smart Hotel, Shenzhen timeline



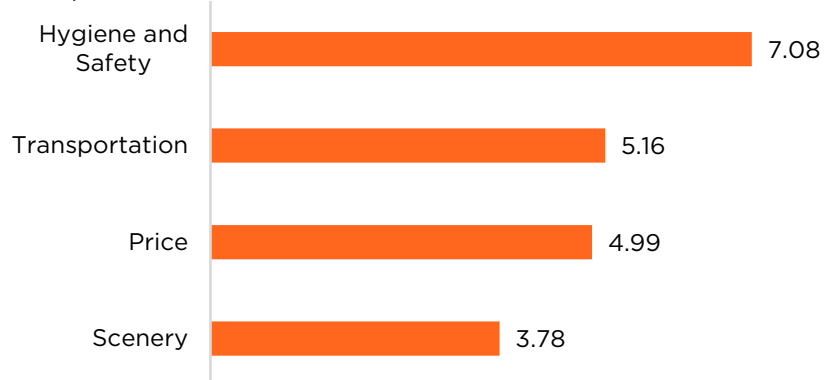
Source: Cushman & Wakefield Research

A heightened awareness of health, safety and cleanliness:

As COVID-19 first began to gain a footing in China in early 2020, many hotel operators in the region quickly took steps to ensure hotel building health and safety levels were strengthened, in an effort to combat the spread of the virus. Much mitigation work was carried out at the time and is still being carried out, including the establishment of hotel entrance

health and safety measures, and entrance registration procedures and protocols for all guests, visitors and staff entering the hotel (Figure 59).

Figure 59:
Generation Z in China – Factors to consider when choosing a hotel (2021)



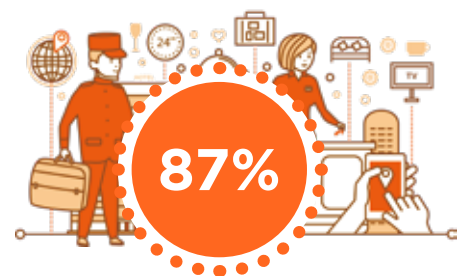
*Note: Scoring is on a 1 to 10 basis, with 10 being of the most importance
Source: Nextdoor, Ctrip, TravelGo, Cushman & Wakefield Research*

A growing desire for a unique stay experience:

Millennials and Generation Z in China crave the joy of adventure and new discoveries. They are no longer content with merely visiting a destination and having the same experience as everyone else. They increasingly yearn for a unique experience, which they can share via social media. For these two generations of travellers in China, 'daka' is now a big overall travel trend. 'Daka' or 'punch card', is a type of check-in style travel that is linked to online sharing. Must-visit places are visited, and the event is

then posted via photos or a video online to illustrate and confirm that the destination has been viewed and experienced (Figure 60).

Figure 60:
How many Generation Z travellers in China have a 'daka' list? (2021)



Source: Mafengwo, Cushman & Wakefield Research

Lastly and looking to the future, the factors discussed above and more, are and will progressively come to the fore within the alternative property asset hotel sector in China and hotel investors, developers and operators need to be mindful of them in order to secure any new business opportunities.

PART 4

KEY TAKEAWAYS

The emergence of alternative property assets in China has been influenced by a number of factors, not least by:

- **Macro-economic trends;**
- **Evolving population dynamics;**
- **Technology;**
- **New ways of working and living;**
- **A greater awareness of sustainability, and;**
- **The COVID-19 epidemic.**

Life sciences commercial real estate

Through support policies, cities in China are changing the genetics of their real estate as they prepare to make the life sciences industry a key driver for their individual economies in the future.

Experiential retail shopping centres

These types of shopping centres will not only be places for consumption but will also be experience spaces with functions and features, such as culture, fashion, art exhibitions and entertainment to meet the spiritual consumption needs of consumers in China.



Cold storage logistics warehouses

In the coming years, we expect to see more quality cold storage logistics warehouse supply to cater to the needs of domestic market storage, distribution derived from the importation of fresh goods and products, and the need to store more perishable medicines.

Data centres

By thoroughly accessing the market, government policy, the investment dynamics, and factors associated with sustainability, both investors and developers will be in a stronger position to make the right decisions when it comes to their data centre alternative asset property investment in the region.

Long-term rental housing

Once mindfulness of the advantages of living in healthy residential housing, including healthy long-term rental housing, is present in more of the general public, so we anticipate the supply volume of certified healthy residential housing in China to further grow in the years to come.

Hotels

Lastly, the transforming demographics, changing travel consumption behaviour, a greater want for convenience, a heightened awareness of health, safety and cleanliness, and a growing desire for a unique stay experience ... are and will progressively come to the fore within the alternative property asset hotel sector in China and hotel investors, developers and operators need to be mindful of them in order to secure any new business opportunities.

PART 5

APPENDIX

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BIOBAY, SUZHOU

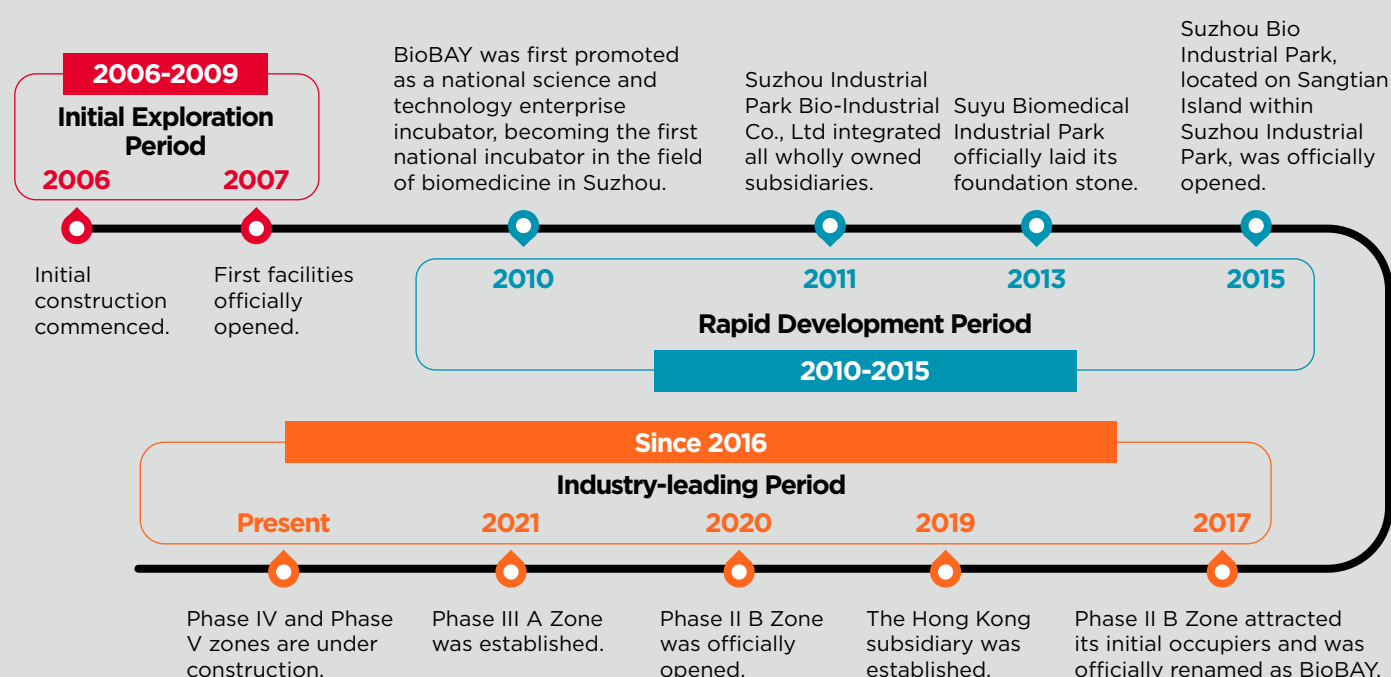
A world-class bio-industry ecosystem

2006 – Present

Summary

Suzhou is an important life sciences industry development centre in China. Located and well-established in the city, Suzhou BioBAY is at the very heart of cutting-edge industry innovation. Currently, the park is not only driving industry progression in Suzhou and in China but is also pushing sector advancement beyond.

Timeline of major events/milestones reached:



Overview:

- Located in Suzhou, Suzhou BioBAY is the innovation base within Suzhou Industrial Park. Its purpose is to foster the development of the life sciences industry.
- BioBAY has gathered more than 550 high-tech R&D enterprises and has formed an industrial clustering of enterprises involved in new medicine creation, medical equipment production and biotechnology.
- 23 enterprises established in BioBAY are listed in and outside China.
- BioBAY has attracted over RMB50 billion in capital investment thus far.

How it was done:

- BioBAY commenced construction in 2006.
- BioBAY targets biotech start-up or fledgling enterprises and focuses on incubating innovative start-ups in three main areas: medicine development, medical devices and biotechnology.
- The success of Cold Spring Harbour Asia in 2010 marked a turning point for Suzhou BioBAY in its quest for commercial development and expansion.
- In 2013, YuanBio Venture Capital established a biological industry fund of RMB500 million under management.
- In BioBAY, Innovent reached a strategic cooperation with Lilly to build the largest biotechnology industrialisation technology platform and production base in China in line with international standards. In 2019, the launch of “TYVYT” developed by Innovent marks a significant achievement in the pursuit of anti-tumour immunotherapy in China.
- BioBAY cooperated with Changshu to build BioBAY-Changshu, which is a new highlight of Suzhou Industrial Park’s ‘going out’ strategy. At present, industrial clustering is taking shape and is expected to form a RMB10 billion-level biomedical industrialisation base in the next five years.
- Four domestic new PD-1 medicines developed by Junshi Biosciences, Innovent, Hengrui Shengdiya and BeiGene have been approved for marketing one after another successively. Three of these four medicines are developed or produced in BioBAY.

Key takeaways:

- BioBAY provides a high-quality service platform for innovative start-ups. It encompasses many research institutes, R&D institutions and national innovation bases, including the Suzhou Institute for Drug Innovation, the Suzhou Institute for Systems Medicine, the Suzhou Institute’s Centre for Excellence in Molecular Cell Science, etc. It has also gathered entrepreneurial projects led by 72 top national experts as well as Chinese and overseas academicians.
- BioBAY is located in Dushu Lake Higher Education Town, which is home to many universities. Preferential policies are given in terms of taxation, capital investment, and talent employment.
- Since 2012, BioBAY, as a limited partner, has collaborated with well-known industry venture capital institutions, such as 6 Dimensions Capital, TF Capital, Lilly Asia Ventures, and Medtronic-Sequoia Innovation Venture Fund.
- Along with YuanBio Venture Capital and Ming Bioventures, BioBAY has also participated in the launch of industrial funds focusing on early and mid-stage venture projects. Moreover, the abundance of industrial capital has become another factor in enhancing the park’s push and achievement in terms of innovation.
- In 2020, Suzhou proposed to benchmark and learn from the experience of Boston in the United States and turn Suzhou into ‘China’s Pharmaceutical Valley’. The new positioning of the city is and will be of great significance to BioBAY.

Results:

- Projects such as the Cold Spring Harbour Conferences Asia have helped Suzhou BioBAY become a global hub for academic and industrial exchanges in the field of life sciences.
- In 2014, GenePharma was listed on the National Equities Exchange and Quotations (NEEQ); in 2016, BeiGene was listed on the NASDAQ; Innovent was listed on the HKEX (Hong Kong Stock Exchange) in 2018; in 2019, Cstone Pharmaceuticals, Ascentage Pharma, SinoMab and Alphamab Oncology were listed on the HKEX, and BrightGene listed on the Shanghai Stock Exchange (SSE) STAR Market; in 2020, Kintor Pharma, JW Therapeutics, and Harbour BioMed were listed on the HKEX. Lastly, in 2021, Gracell, HOB, CareRay, Basecare, and Adagene were listed on the NASDAQ, the HKEX and the SSE STAR Market.

RAFFLES CITY THE BUND SHANGHAI



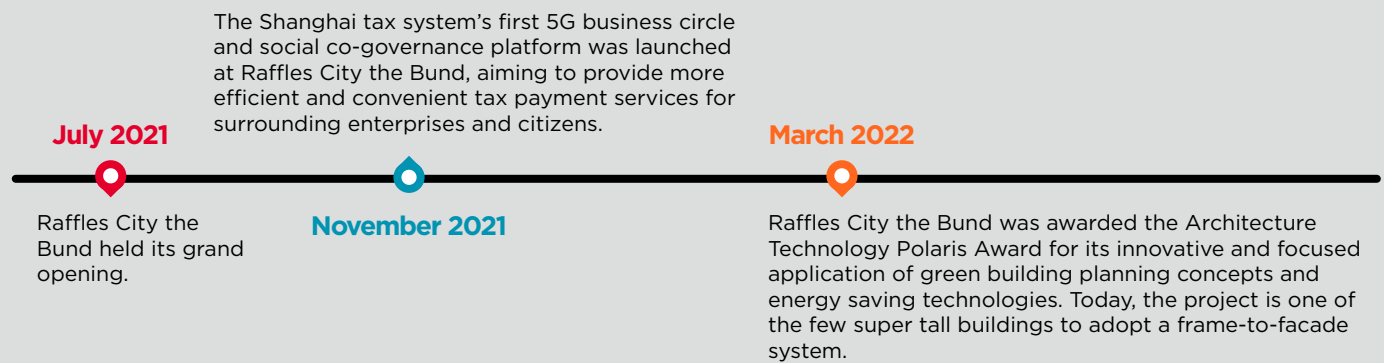
A retro-inspiring shopping centre for Shanghai

2021 – Present

Summary

Raffles City the Bund has become a well-known Internet celebrity check-in place in Shanghai. Part of the Basement 2 floor has been transformed into an old Shanghai retro street. The alley scene in the 1990s has been reproduced realistically, to replicate the historical features of the Tilanqiao area. Combining the regional characteristics of Shanghai with the focused theme of 'culture, art, technology, and tourism', Raffles City the Bund provides consumers with a shopping centre with rich business formats, strong themes and diversified features.

Timeline of major milestones reached:



Overview:

- Raffles City the Bund is the tenth Raffles City project in the world and the third Raffles City project in Shanghai;
- The GFA of Raffles City the Bund is 120,000 sq m. The project has introduced more than 200 brands.

Impact:

- Raffles City the Bund attracts not only a large number of local consumers, but also domestic and international tourists and consumers;
- Raffles City the Bund has become a new Instagram-worthy location.

How it was done:

- Part of the Basement 2 floor in the shopping centre has been retro developed to look like the old Shanghai street scenes from the Tilanqiao area in the 1990s;
- The “bridge + spark” complex space on floor L1 provides a platform for brand display and incubation, as well as a social gathering place for consumers;

- The shopping centre has also set up various types of pedestrian corridors, including the connection between the pedestrian overpass and floor L2, and the seamless connection with Line 12 Tilanqiao Metro Station (Line 19 will be connected in the future) by underground and above-ground entrances.

Results:

- Tourists and consumers are from all over China given the wide-ranging retail, F&B and entertainment offering to be found at Raffles City the Bund;
- More than 50% of the stores are first stores in China, East China or Shanghai.

Key takeaways:

- Combined with Shanghai style, Raffles City the Bund has something for everyone in terms of its all-around retail shopping experience;
- What's more, the diverse scenes and the activities organised are appealing to a wide range of age groups and go a long way in enhancing the shopping experience of tourists and consumers alike.

FORMER SWIRE COLD CHAIN LOGISTICS (NOW OWNED BY VANKE LOGISTICS) **SHANGHAI**

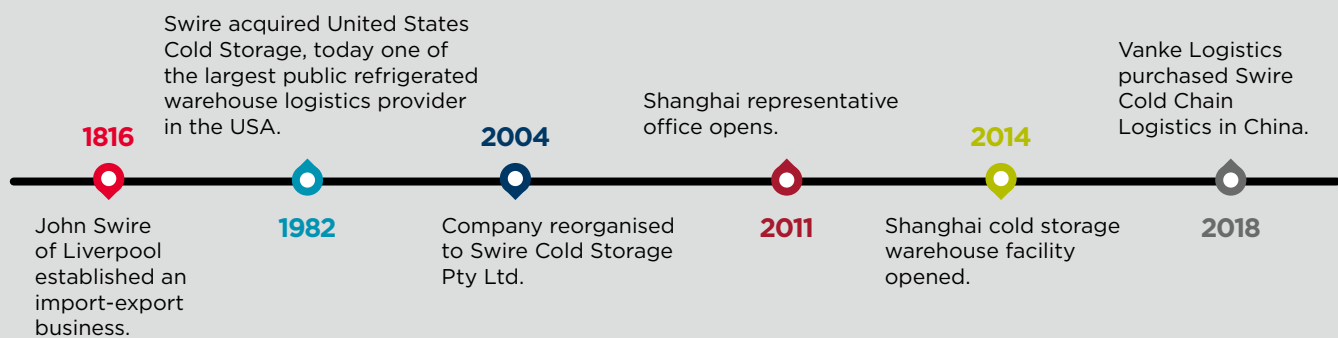
Cold Storage with fine temperature control and sustainable facilities

1816 – Present

Summary

Swire has nearly 60 years of experience in operating best-in-class cold storage facilities. The Shanghai cold storage facility has fine temperature control system, energy-saving facilities and environmental-friendly features.

Timeline of major milestones reached:



Overview:

- Swire has nearly 60 years of experience in operating cold storage facilities.
- Swire has cold storage facilities in Australia, the USA, Vietnam and Sri Lanka.
- Swire ranks at number three in terms of capacity on the International Association of Refrigerated Warehouses' Global Top 25 list.

Impact:

- The Shanghai cold storage facility incorporates world-class warehouse design and management technology, offering strong logistics support for fresh food with multi-temperature refrigerated storage.

How it was done:

- The Shanghai cold storage facility has multi-temperature refrigerated control that can provide temperature control from -25°C to 18°C.
- The sophisticated warehouse management system includes RF barcode scanning technology that increases efficiency and accuracy and enables

customers to access inventory data and track orders in real-time around the clock.

- It also includes a rainwater recycling system, LED lighting and a geo-thermal heat exchange system.

Results:

- The multi-temperature refrigerated controls in the Shanghai cold storage facility provide strong logistics support for fresh food. At the same time, it has gained LEED Platinum certification, the green building certification programme's highest rating, with features designed to lessen environmental impact.

Key takeaways:

- Multi-temperature refrigerated storage meet requirements for different fresh food.
- World-class warehouse design and management technology help increase efficiency for customers.
- Environmental-friendly features lessen environmental impact.

EQUINIX REDWOOD CITY



Ensuring business growth through structural business change

1998 – Present

Summary

Equinix adapted to the changing macro-economic environment and successfully transitioned to a real estate investment trust (REIT) to ensure business growth and shareholder value.

Timeline of major milestones reached:



Overview:

- Equinix, Inc. is an American multinational corporation with its global headquarters located in Redwood City, California.
- The company’s business focus is centred on Internet connection and data centres.
- Equinix is a leader in global colocation data centre market share.
- The company has 220 data centres in 26 countries on five continents.

Impact:

- In 2015, Equinix converted to a real estate investment trust (REIT) to gain tax advantages and add shareholder value.

How it was done:

- Equinix was established in 1998.
- The organisation promoted its data centre platform as a neutral place where competing networks could connect and share data traffic.
- The business made the most of the “network effect”, through which each new customer would widen the attraction of its platform.
- Equinix enlarged its business footprint to the Asia-Pacific region in 2002 and to Europe in 2007.
- This expansion was followed by Latin America in 2011 and the Middle East in 2012.

- In September 2020, the company modified its branding to define itself as a “digital infrastructure company”.

Results:

- As a result of the business conversion, Equinix was able to successfully transition its business structure to that of a REIT.

Key takeaways:

- By converting to a REIT, Equinix has been able to acquire a number of business advantages:
- Firstly, Equinix had to and has to continue to ensure high yield, low risk characteristics to meet the needs of investors – which in turn has resulted in a high stock price.
- Secondly, there is the advantage of a lower tax burden. Equinix is able to avoid double taxation by exempting REITs from income tax on rental income and dividends from property sales.
- Thirdly, Equinix enjoys an enhanced financing capacity. Since 2015, Equinix’s capital expenditure has grown rapidly, and its operating income has improved significantly.
- Lastly, Equinix’s asset structure has been optimised. Financing has been easier since transforming to a REIT, and the gearing ratio has steadily declined while the company has maintained rapid business expansion.

LANDSEA YUE MANSION HANGZHOU



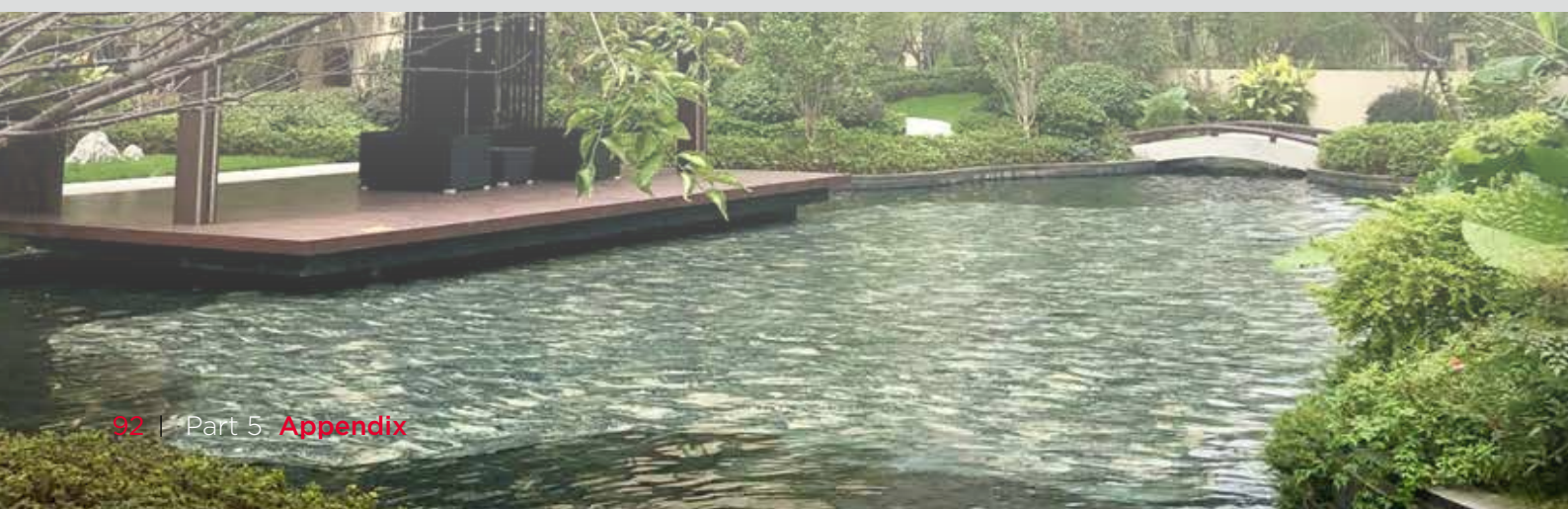
People-oriented project for a new era in healthy residential buildings

2015 – Present

Summary

Landsea Yue Mansion encompasses a healthy residential building design concept and optimised building materials in terms of health and safety. The project is also home to a variety of associated healthy building technologies. By incorporating these features, the project has achieved significant improvements in the quality of its indoor and outdoor environment, its air quality, its water quality, and the quality of its building materials and general facilities, over the norm – to the benefit of its user and owner groups. Subsequently, Landsea Yue Mansion has obtained a healthy residential housing three-star certification under the Evaluation Standard for Healthy Housing (T/CECS 462-2017) scheme.

Timeline of major milestones reached:



Overview:

- Hangzhou Landsea Yue Mansion has a floor area of 80,600 sq m and it is the third generation of healthy residential project offerings launched by Landsea Green Properties in 2015. 'Yue Mansion' is a series of residential product offerings that places health as its main feature and puts the health of its residents at the forefront when designing, constructing and operating the project.
- This project adopts a 'Passive Housing' concept, where the project is designed according to the local environment and the needs of people living there. The project maximises the use of natural conditions like sunlight, wind, temperature and humidity instead of the use of high-load electricity. Also, 'Leju Living System' is used to fully control the indoor environment to achieve living comfort and low energy consumption.

Impact:

- This project is innovative and self-developed to fit the human life cycle.
- Hangzhou Landsea Yue Mansion is the first built 'Yue Mansion' series project, which now offers a new healthy way of living. At present, this series has multiple built projects, which have completed in number of cities of China. All these projects are great examples of green and technologically advanced healthy residences.

How it was done:

The project was designed based on calculated indoor energy consumption and the health needs according to the surrounding environmental conditions. It achieves a comfortable and healthy indoor environment through temperature control, air quality control, light control and sound control. The main ways it has achieved this are:

- Excellent exterior systems, such as insulation, shading, open curtain walls and high air-tightness windows and doors keep the building at a habitable interior temperature with natural air circulation. In summer, for example, air circulates through the back of the open curtain wall and removes extra heat from the building structure, which reduces the overall building temperature naturally. More importantly, the project focuses on body temperature rather than just room temperature, it keeps the temperature difference between the building structures and the interior to less than three degrees centigrade, which creates a comfortable living space.
- In terms of air quality, this project uses the Finnish

Classification of Indoor Climate S1 as a standard to regulate formaldehyde, which is an internationally recognised rating system. The air conditioning system with UV sterilisation is able to replace the indoor air every hour, allowing a constant circulation of fresh air. At the same time, the PM 2.5 filtration technology can filtrate over 95% of PM 2.5 particles. Furthermore, the 'Leju Living System' can monitor the temperature, humidity, PM2.5, CO2 concentration, formaldehyde, TVOC and other environmental indicators in real-time. This smart living system is able to set the temperature at between 20 and 26 degrees centigrade and the humidity at between 30% and 70%, which achieves living comfort and safeguards the breathing health of occupants.

- For light control, the project simulates the illumination angle to find the best orientation of the building. Meanwhile, in addition to temperature control, the exterior fabric shading roller shutter also avoids direct sunlight in the summer, which reduces light pollution and damage from ultraviolet rays to the human body.
- In addition, the thick insulating building materials and high air-tightness windows insulate the interior spaces from exterior noise.
- Lastly, the project is equipped with a drinking water system, a water quality treatment system and an online water quality monitoring system to ensure the health of water use.

Results:

- Hangzhou Landsea Yue Mansion project obtained a healthy residential housing three-star certification under the Evaluation Standard for Healthy Housing (T/CECS 462-2017) scheme.

Key takeaways:

- Hangzhou Landsea Yue Mansion is a good example of a healthy residential building in China. The appropriate use of the site and the people-oriented approach are both keys to its success.
- The 'Passive Housing' concept and the 'Leju Living System' help to meet the healthy building standards while achieving green and low energy cost benchmarks.
- A series of 'Yue Mansion' projects have completed in a number of cities across China, which emphasises the start of a new era in healthy residential buildings in China.

LEYEJU SMART HOTEL SHENZHEN



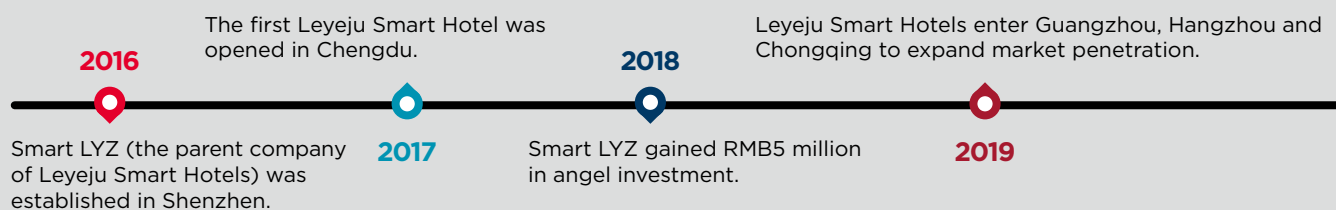
Innovative use of artificial intelligence (AI) and the Internet of Things (IoT) has initiated a revolution in hotel operation

2016 – Present

Summary

Launched in 2016, Leyeju Smart Hotel has become a popular unmanned hotel brand, which is transforming the traditional labour-intensive hospitality industry through the use of technology.

Timeline of major milestones reached:



Overview:

- The Leyeju Smart Hotel brand is owned by Smart LYZ, a high-tech company specialising in developing AI and IoT platforms as solutions for smart hotel services;
- The brand mission is to “stimulate the power of technology to create smart lives”;
- By providing an affordable, high-tech oriented and comfortable accommodation experience, the Leyeju Smart Hotel group targets China’s Millennials and Generation Z;
- Smart LYZ plans to open a large number of Leyeju Smart Hotels in the next five years. Target properties are core-area Grade B office projects in which space can easily be transformed to a hotel.

Impact:

- Leyeju Smart Hotel incorporates Internet platforms, cutting-edge smart devices, Big Data and Cloud services into its properties. It seamlessly links these with hotel operation and management to create a new type of smart hotel, featuring unmanned services that are performed by the use of technology;
- By making best use of the latest AI and IoT technologies, the Leyeju Smart Hotel in Shenzhen solves the industry-wide pain points of homogenization and high labour costs. By solving these issues, the hotel is playing its part in pushing intelligent technology upgrading across the entire hospitality industry and establishing a new ecosystem for smart hotels.

How it was done:

- Utilising smart technology, front desk services can be completed without the use of hotel employees;
- All reservations can be made via WeChat or the hotel’s app;
- Guests who have reserved rooms can scan their identity (ID) card to begin check-in and complete identity confirmation via facial recognition technologies. The room number and room-entry password will then be automatically sent to the guest’s smartphone;
- The one-minute check-out process can be completed by clicking on the hotel’s app;

- A comfortable accommodation experience is facilitated by AI and IoT technologies;
- Equipped with a navigation and positioning system, an AI robot called ‘Xiaole’ guides guests to their rooms and automatically opens room doors;
- Guest rooms are equipped with an assortment of smart terminal devices, which are connected together via sensors and AI algorithms. Room features, such as lighting, air conditioning, TV, electrically drawn curtains and shower heads can be automatically adjusted to suit a guest’s desired preference;
- In terms of security, a monitoring system is installed throughout the common areas of the hotel. From the time a guest enters the hotel, background data is automatically uploaded, and the guest is identified. If the guest has an accident in any part of the common area, an alarm system will immediately issue a warning to security staff and they will be in a position to immediately respond, knowing exactly which part of the hotel the guest is located in at any given time.

Results:

- Lower manning costs enable the hotel to offer affordable room rates between RMB200 to RMB500 per night, attracting many cost sensitive business and leisure travellers;
- The pre-COVID-19 occupancy rate throughout the group’s hotel portfolio in China has reached 95% on average. What’s more, 80% of hotel customers are returning guests.

Key takeaways:

- As the first unmanned hotel chain in China, Leyeju Smart Hotels integrate AI terminals with machine learning technology, Big Data and IoT platforms to create a unique high-tech accommodation experience. The realised cost reduction, along with the satisfactory operating performance, has proven the feasibility of following this particular unmanned hotel mode of operation;
- Many of China’s tech-savvy travel consumers have quickly accepted Leyeju Smart Hotel’s concept for unmanned hotels, given the quality and convenience on offer.



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