

September 2022

# CHINA

## COLD STORAGE LOGISTICS

Chilled space on the boil





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## COLD STORAGE

## LOGISTICS





# CONTENTS

|    |                                   |
|----|-----------------------------------|
| 04 | Executive summary                 |
| 05 | Introduction                      |
| 06 | Cold chain industry performance   |
| 09 | Industry drivers                  |
| 19 | The cold storage logistics market |
| 25 | Property trends                   |
| 33 | Key takeaways                     |
| 34 | Appendix                          |
| 36 | Business contacts                 |
| 38 | Research contacts                 |



# EXECUTIVE SUMMARY

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.

According to the China Cold Chain Committee 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.

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:

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

When examining information and data from Warehouse In Cloud, and focusing on seven selected city markets in China, (namely, Beijing, Shanghai, Shenzhen, Guangzhou, Wuhan, Chengdu, and Chongqing), Shanghai has the largest stock of cold storage warehouse space, at 902,286 sq m. The next two sizable markets in the city group are Guangzhou and Beijing.

Given the continued demand for this type of space, we expect available space for lease to be limited, with rentals anticipated to see uplift in a number of markets.

When considering investment and in this case, investment deal number, according to RCA data, the industrial property sector took the top spot regarding investment volume in China in 2021. Of the 37% registered, 96% of deals were recorded as 'other industrial', while cold storage logistics warehouse facilities, at 16 transactions for the year, made up 4% of industrial deals in 2021.

Finally, 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:

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





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# INTRODUCTION

This report focuses its attention on the cold storage logistics warehouse market in China.

The report begins by centring on the cold chain industry in China and its performance, before detailing some of the industry drivers, such as consumer spending power, food safety and food security.

The cold storage logistics warehouse market itself in China is the third topic that is examined in the report, with the report finishing with a look at the latest cold storage logistics warehouse property trends before closing out with some key takeaways.

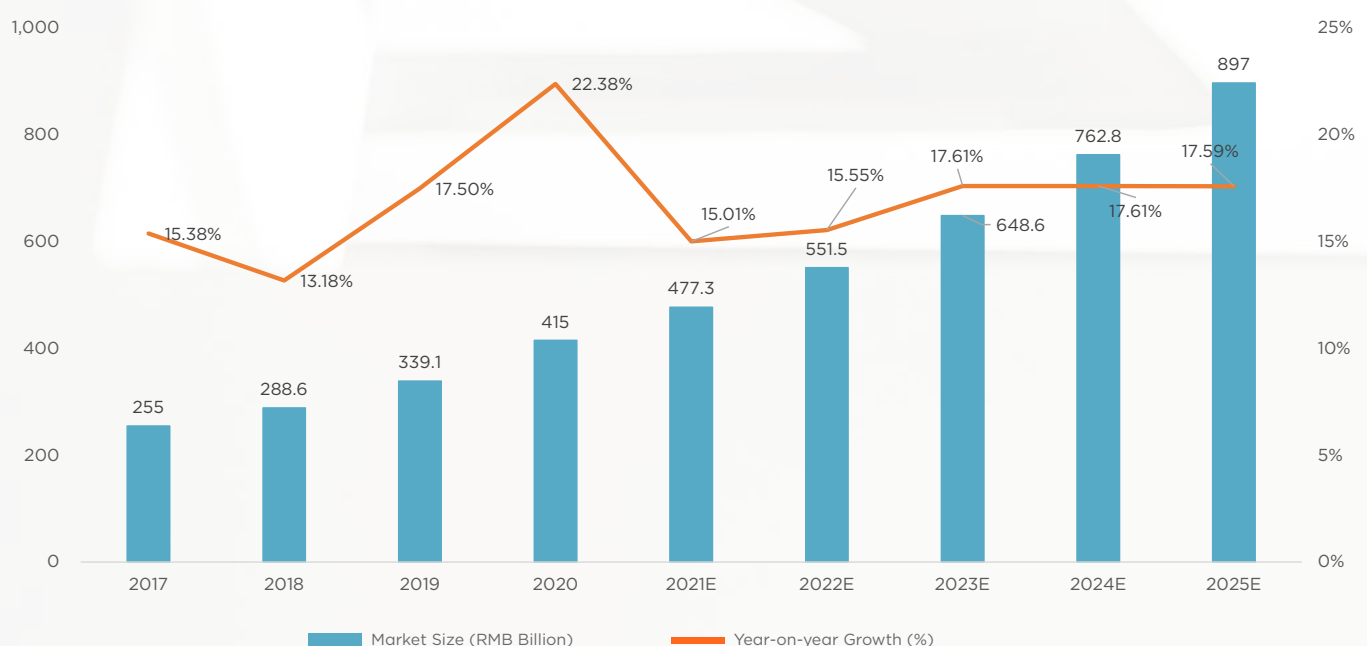


# Cold chain industry performance

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.

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 1).

**Figure 1: China's cold chain logistics industry growth (2017-2025)**

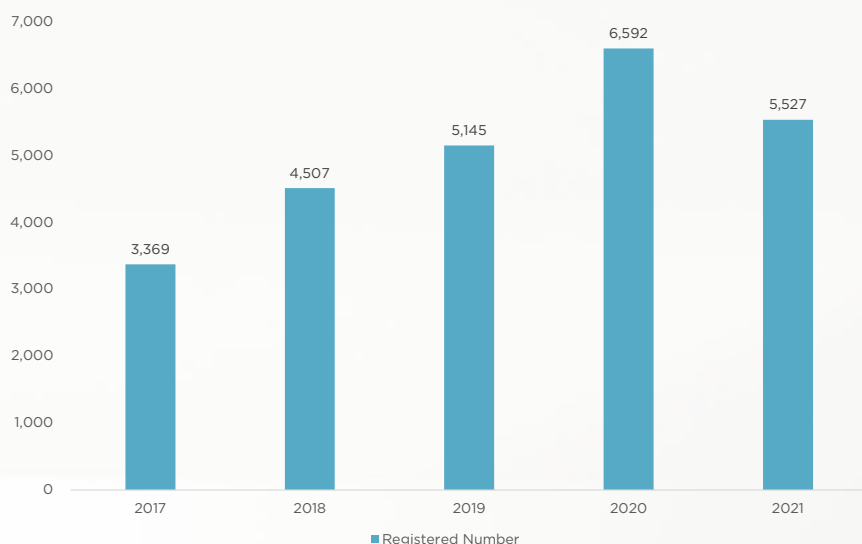


Source: Cold Chain Logistics Committee (CFLP), The Intelligence Research Group, Cushman & Wakefield Research



This growth trend is also reflected in the number and scale of related cold chain enterprise registrations. In recent years, the registration number of cold chain logistics-related enterprises in China has been on an upward trend, especially in 2020 when affected by the epidemic, the demand for cold chain logistics increased significantly. During that year, the number of cold chain logistics-related enterprises registered rose rapidly to 6,592 and fell back to 5,527 in 2021 (Figure 2).

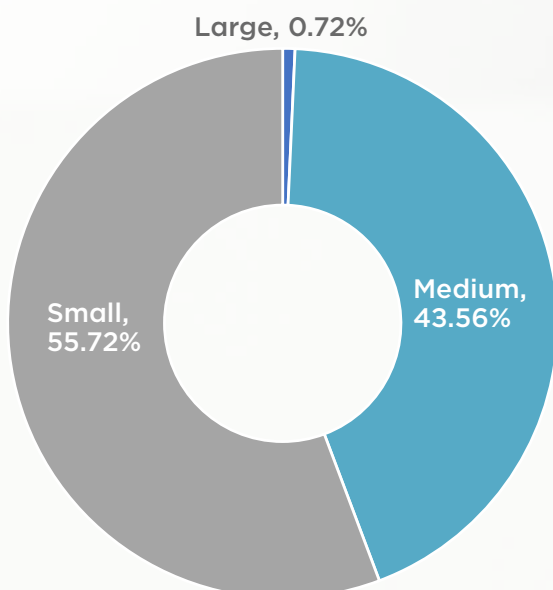
**Figure 2: The number of registered cold chain logistics enterprises in China (2017-2021)**



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

When considering the makeup of the current cold chain industry cold chain enterprises are mainly small and medium-sized enterprises, accounting for 99.28% of the total enterprises in the sector (Figure 3).

**Figure 3: Cold chain industry composition in China by enterprise size (2022)**



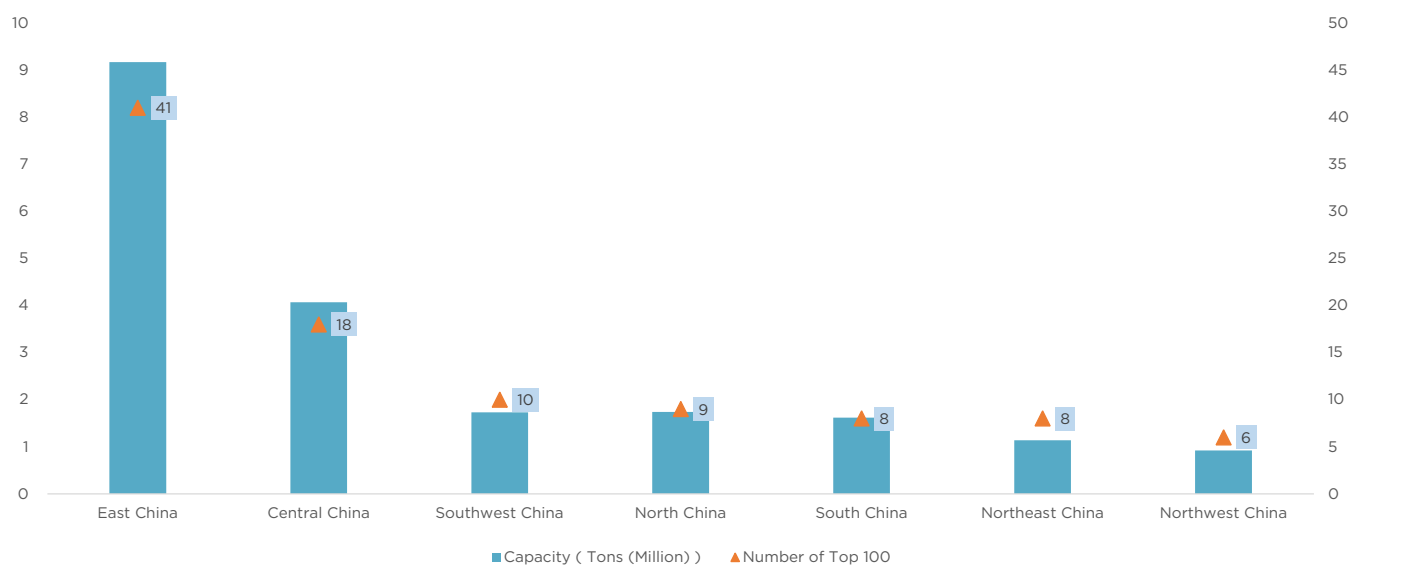
Source: Warehouse In Cloud, Cushman & Wakefield Research





From the perspective of regional distribution, the current regional distribution of China cold chain enterprises is widely spread. In 2021, the top 100 cold storage warehouse enterprises are distributed across 23 provinces and cities, of which, at 41, just under half the number of top enterprises have their business base in East China (Figure 4).

Figure 4: Regional distribution of the top 100 cold chain logistics warehouse enterprises in China (2021)



Source: Cold Chain Logistics Committee (CFLP), 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:

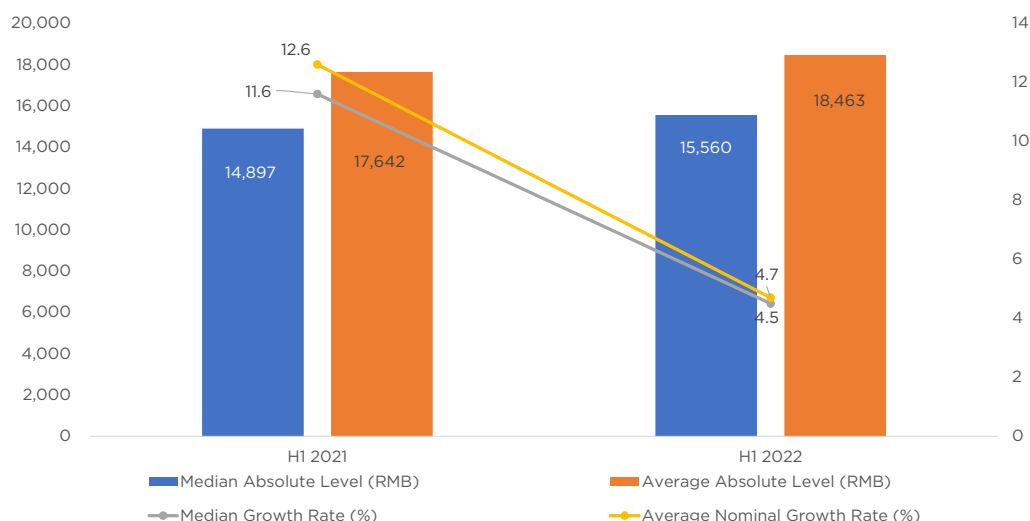
- Greater consumer spending power;
- A further emphasis on food safety;
- Continued importance placed on food security;
- More value being added to goods during the time between when they enter and exit the cold chain system, and;
- Even though playing a small role in cold chain services demand, an increasing 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 5).

**Figure 5: Average and median per capita disposable household income in China (H1 2021 and H1 2022)**



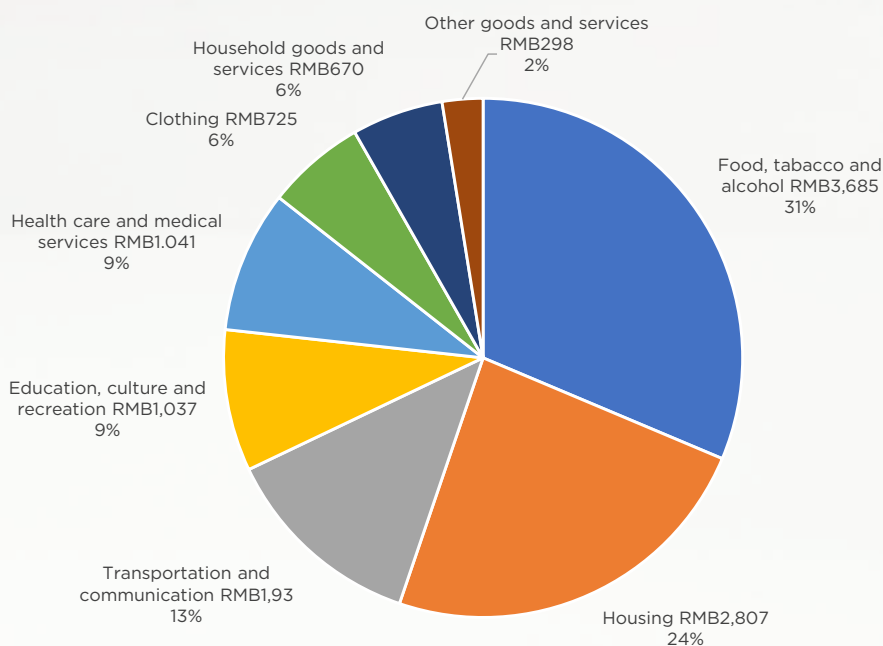
Source: National Bureau of Statistics, China, Cushman & Wakefield Research



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%.

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 6).

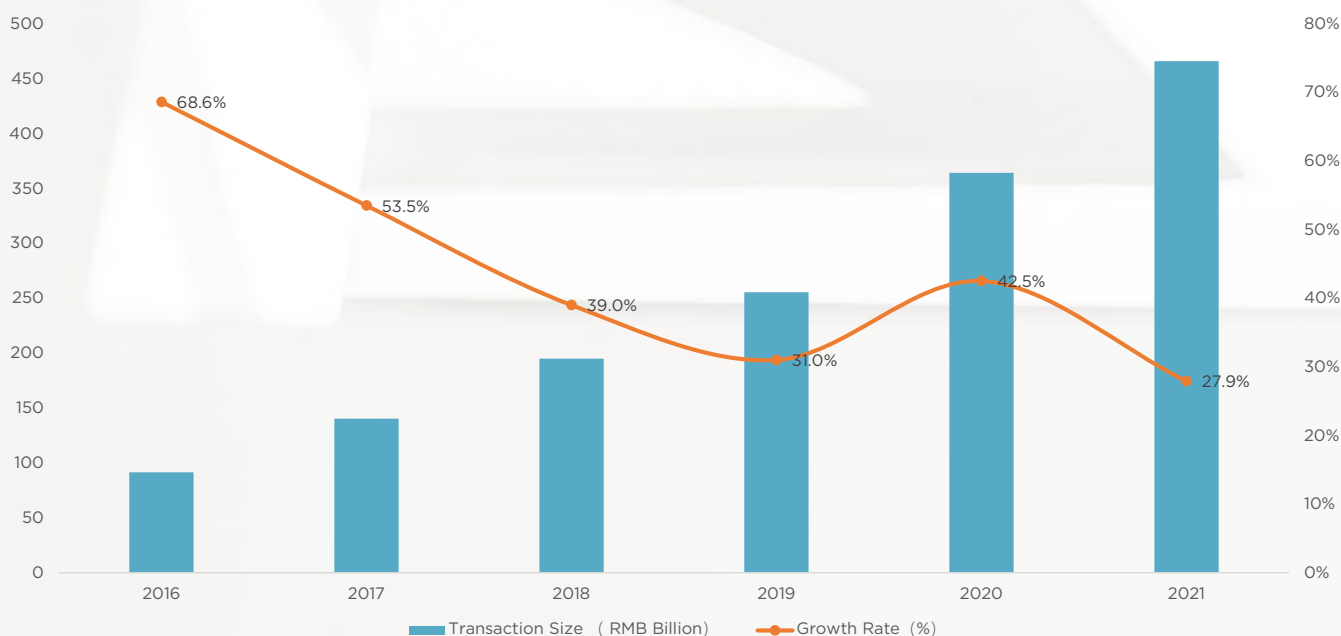
**Figure 6: Median per capita household consumption expenditure breakdown in China (H1 2022)**



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

The increase in consumer spending power, in online consumption and spending on fresh food has driven growth in China's fresh food e-commerce industry transaction volume and penetration rate in recent years. In 2021, the fresh food e-commerce industry transaction volume in China reached RMB465.81 billion, an increase of 27.9% year-on-year, while the market penetration rate stood at 7.91%, an increase of 1.93% when compared to the figure achieved 2020 (Figure 7).

**Figure 7: China's fresh food e-commerce industry transaction volume (2016-2021)**



**Source: 100ec.cn , Cushman & Wakefield Research**

In the future, fresh food will continue to be a sizeable element of household consumption in China, which in turn will increase market size and the need to store this type of produce in quality warehouse space.

## Food safety

Food preservation and safety are 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:

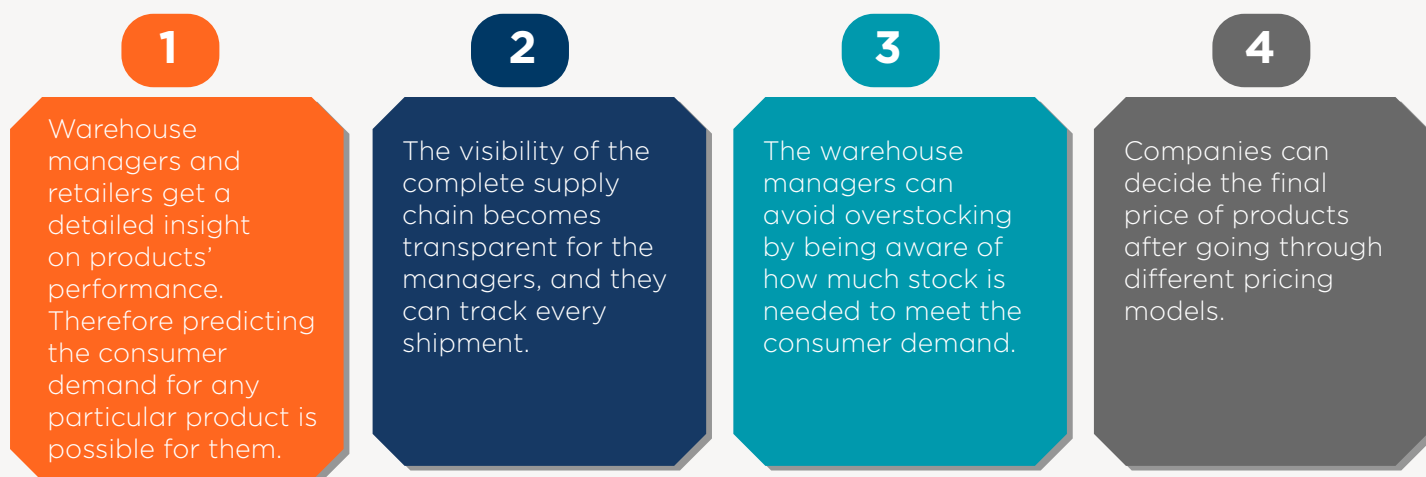
- Big data;
- The Internet of Things (IoT);
- Artificial intelligence (AI) and machine learning;
- Autonomous vehicles;
- Smart cold chain shelving, and;
- Cold chain robots.



### 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 8).

Figure 8: 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 9).

Figure 9: IoT - Value add to cold chain

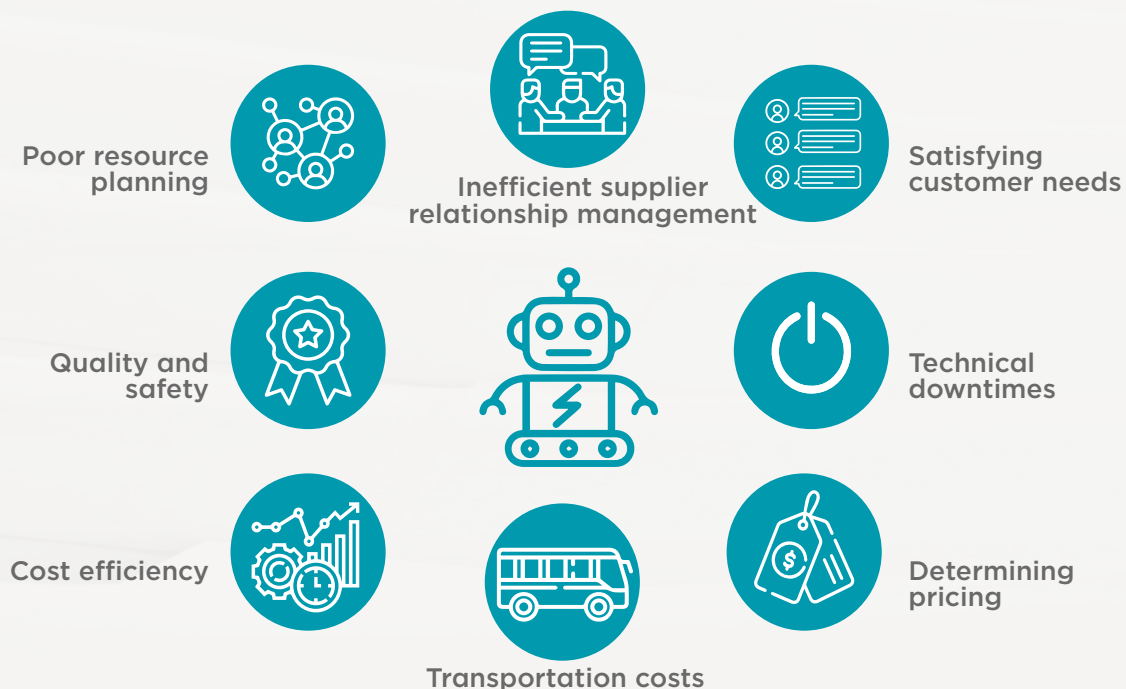


Source: Ambimat Electronics, Cushman & Wakefield Research

## 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 10).

Figure 10: Machine learning and AI - Cold chain challenges which can be solved

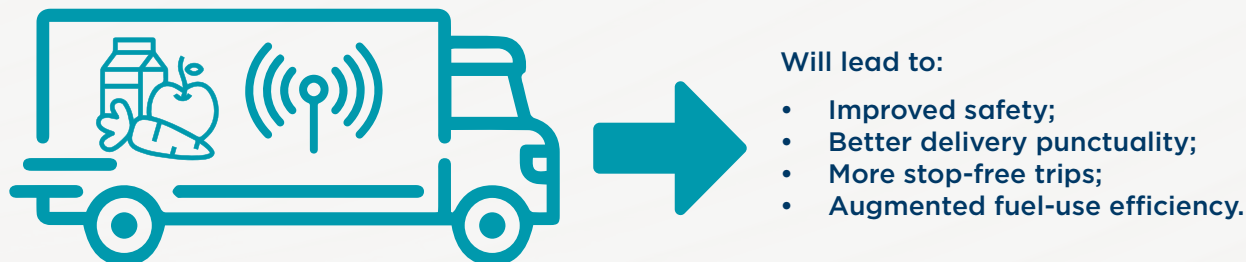


Source: Supply Chain Junction, Cushman & Wakefield Research

## 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 11).

Figure 11: Autonomous vehicles – Selected examples of cold chain service improvement



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 12).

Figure 12: 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 13).

Figure 13: Cold chain robots – Use examples



Source: AGV Network, Cushman & Wakefield Research

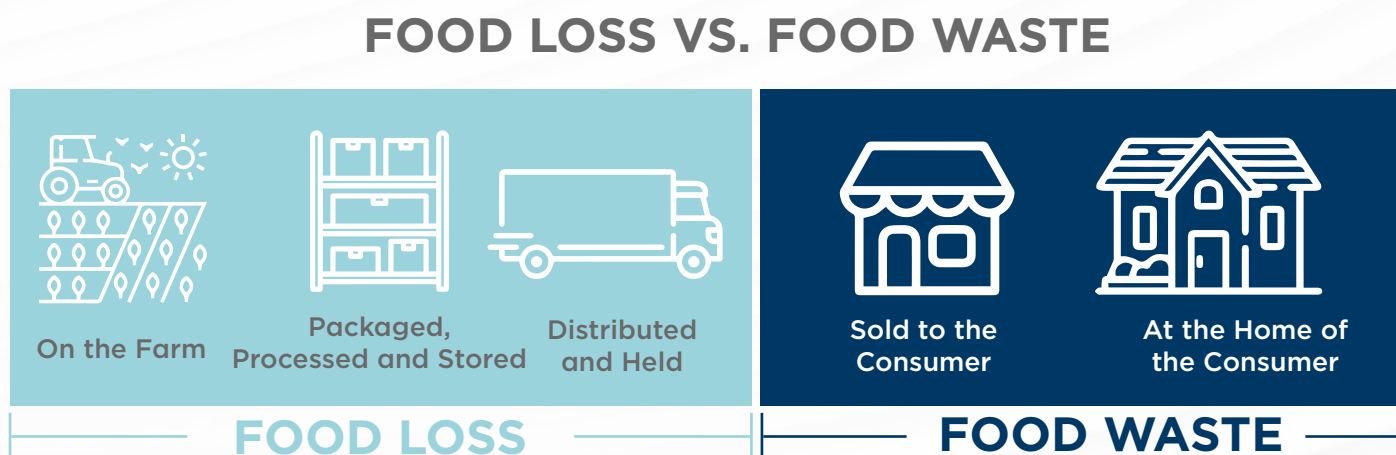
## Food security

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 14).

Figure 14: 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:

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

## 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:

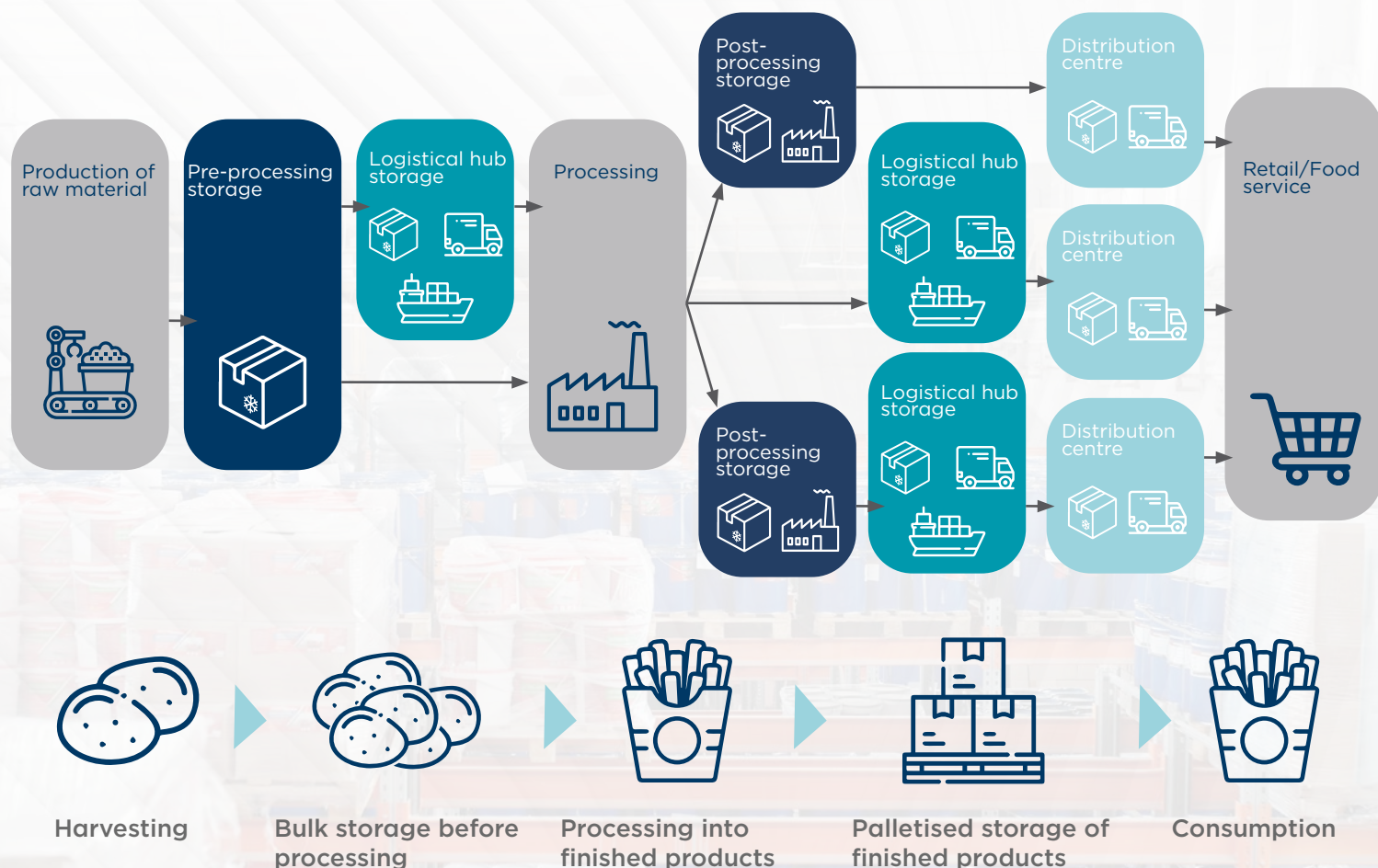
- Food processing and portion packaging, and;
- Custom pallet building (Figure 15).

## 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.



Figure 15: 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.

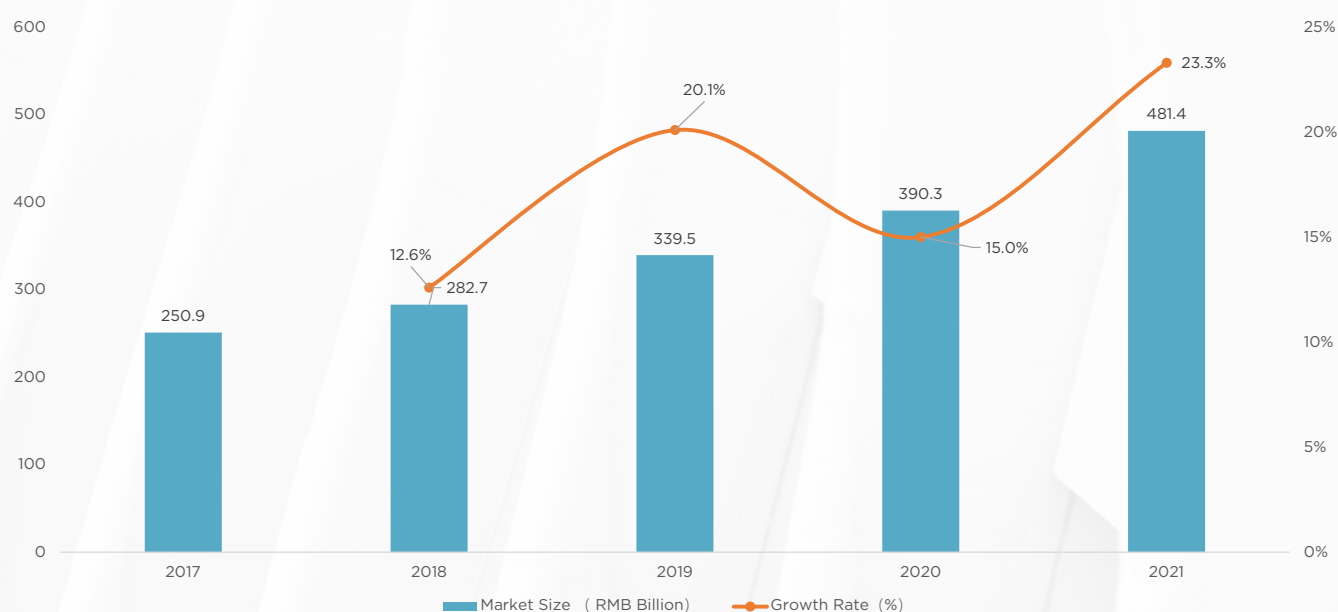
## Medicines

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

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

Influenced by the epidemic, the pharmaceutical cold chain logistics market size has grown significantly in China, with the market size exceeding RMB480 billion in 2021, up 23.3% year-on-year. As people in the country pay more attention to their health, the pharmaceutical cold chain market size is expected to expand further and exceed RMB560 billion by the end of 2022 (Figure 16).

**Figure 16: China pharmaceutical-related cold chain market size (2017-2021)**



Source: China Federation of Logistics & Purchasing Pharmaceutical Logistics Sub-branch, Cushman & Wakefield Research



In response to the growing market, 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:

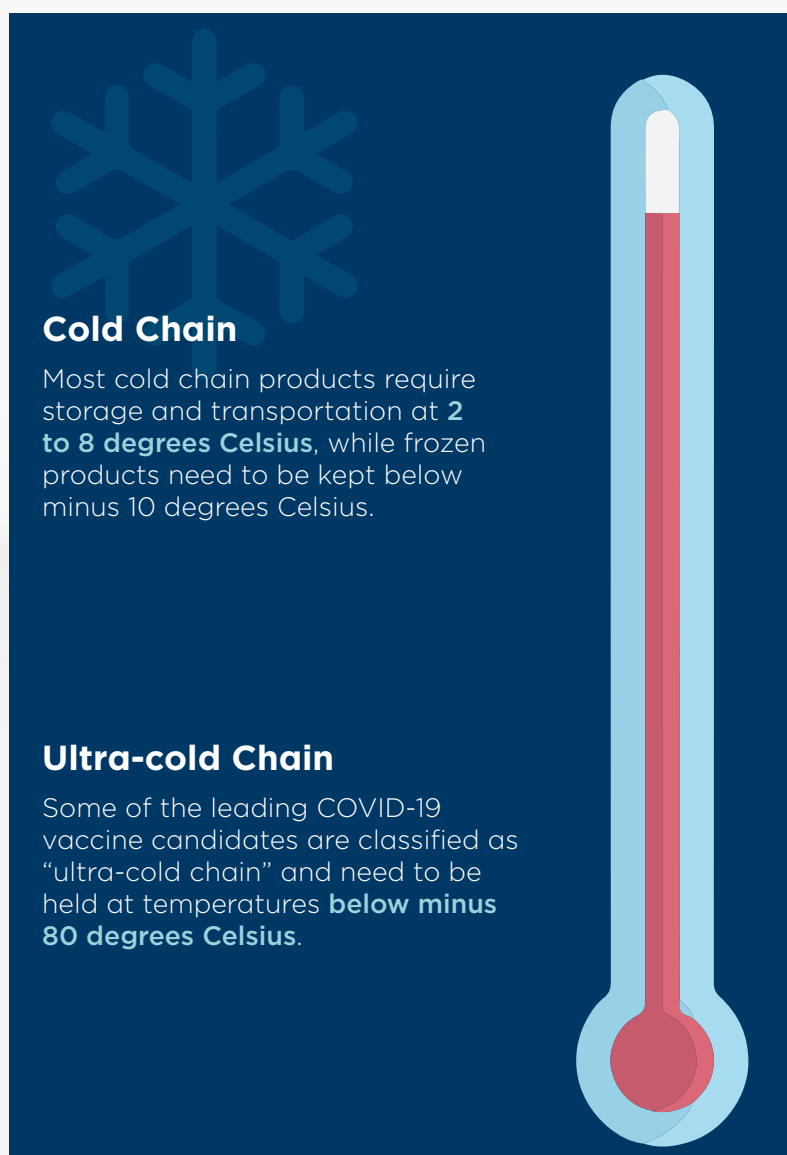
- Packing (if part of the service) and shipping consistent with suggested procedures, and;
- Storing medicine products within the recommended temperature range during warehouse storage and transportation.

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 centigrade. In the case of some COVID-19 vaccines, they need to be stored at temperatures below minus 80 degrees Celsius (Figure 17).

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.

Figure 17: Cold chain and ultra-cold chain



Source: Healthcare Distribution Alliance, Cushman & Wakefield Research

# The cold storage logistics market



## *Sector policy*

Policy plays a significant role in the development of real estate in China, including the development of cold storage logistics warehouse space. Of late, there have been a number of related policies issued at both the national level and the local level. Below is a list of some of the key recent policies released over the last year (Table 1).





**Table 1: Selected recent policies related to the cold storage logistics market**

| No.      | Date       | Department                                                                                                                                                                      | Policy                                                                                                                                          | Key Points                                                                                                                                                                                                                                                                                                                     |
|----------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> | 19.01.2021 | The State Administration for Market Regulation                                                                                                                                  | Notice on Further Implementing the Requirements of Food Safety Inspection in Wholesale Markets for Edible Agricultural Products                 | Strengthen the inspection, supervision, tracking and tracing of imported food products.                                                                                                                                                                                                                                        |
| <b>2</b> | 29.01.2021 | The Fujian Provincial Department of Agriculture and Rural Affairs                                                                                                               | Opinions on the Implementation of Key 2021 Agricultural and Rural Work Deployment within Fujian Province                                        | Speed up the development of a number of cold chain logistics facilities in Fujian for storing, keeping fresh, and refrigerating agricultural products.                                                                                                                                                                         |
| <b>3</b> | 21.02.2021 | The General Office of the State Council                                                                                                                                         | No.1 Central Document of 2021: Opinions on Comprehensively Promoting Rural Revitalisation and Accelerating Agricultural and Rural Modernisation | Accelerate the construction of cold chain logistics facilities for storage and preservation of agricultural products.                                                                                                                                                                                                          |
| <b>4</b> | 19.04.2021 | The General Office of the Ministry of Agriculture and Rural Affairs, the Office of the Ministry of Finance                                                                      | Notice on Comprehensively Promoting the Construction of Refrigerated and Fresh Produce Storage Facilities for Agricultural Products             | Improve cold chain logistics capacity in agricultural production areas.                                                                                                                                                                                                                                                        |
| <b>5</b> | 10.05.2021 | The National Development and Reform Commission                                                                                                                                  | Notice on Key Work Related to Cost Reduction in 2021                                                                                            | Improve transportation and logistics infrastructure and promote the construction of a comprehensive national cold chain logistics network.                                                                                                                                                                                     |
| <b>6</b> | 11.06.2021 | The Central Leading Group Office for Rural Work, the National Development and Reform Commission, the State Administration for Market Regulation, etc. (17 departments in total) | Opinions on Strengthening the Construction of County Commercial Systems to Promote Rural Consumption                                            | Strengthen the development of cold chain logistics facilities.                                                                                                                                                                                                                                                                 |
| <b>7</b> | 12.06.2021 | The General Office of the People's Government of Guangxi Zhuang Autonomous Region                                                                                               | Policies and Measures for Accelerating the Development of the Modern Service Industry                                                           | Focus on cultivating leading logistics enterprises involved in cold chain logistics, LCL freight, urban distribution and network freight. Provide one-time development subsidy of RMB2 million, RMB1 million and RMB 500,000 to newly established 5A, 4A and 3A enterprises, respectively, for logistics project construction. |

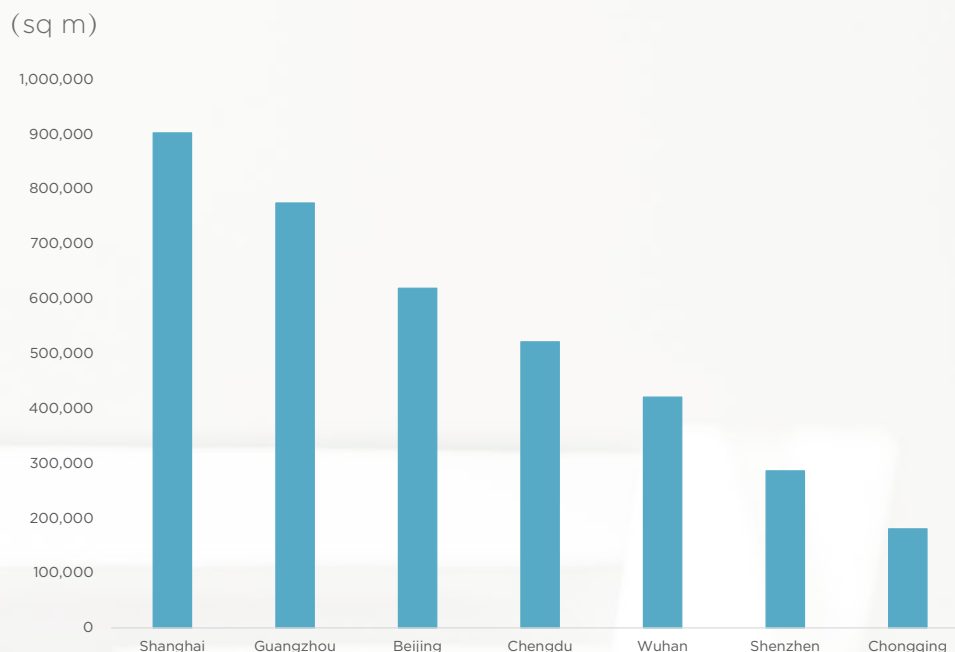
**Source: Cushman & Wakefield Research**

Additional to these policies, the government has promoted the phasing out of ammonia refrigeration, and various planning and design institutes have developed specific best-practice design and building standards for cold storage logistics warehouses.

## Stock distribution

When examining information and data from Warehouse In Cloud, and focusing on seven selected city markets in China, (namely, Beijing, Shanghai, Shenzhen, Guangzhou, Wuhan, Chengdu and Chongqing), Shanghai has the largest stock of cold storage warehouse space, at 902,286 sq m. The next two sizable markets in the city group are Guangzhou and Beijing (Figure18).

**Figure 18: Cold storage logistics warehouse stock in seven selected cities in China (Q2 2022)**

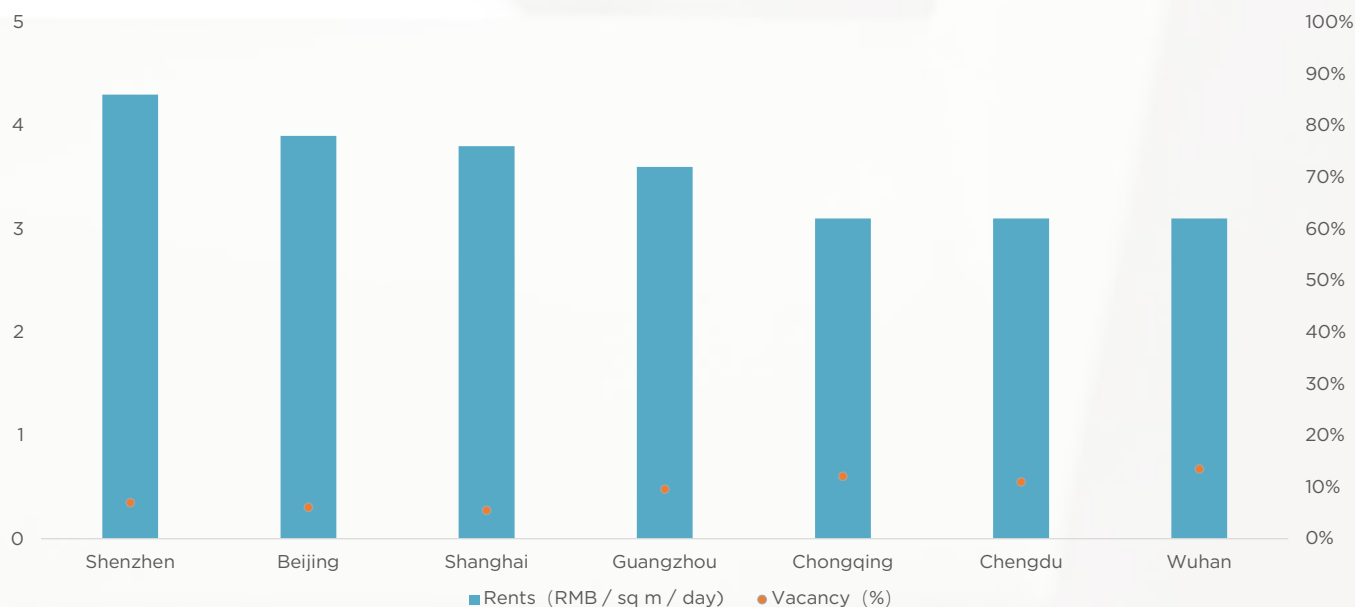


Source: Warehouse In Cloud, Cushman & Wakefield Research

## Vacancy and rental

Currently, standing at 5.5%, Shanghai has the lowest vacancy rate out of our selected seven cities in China. This low rate is followed by Beijing and Shenzhen (Figure 19).

**Figure 19: Cold storage logistics warehouse rental and vacancy rate in seven selected cities in China (Q2 2022)**



Source: Warehouse In Cloud, Cushman & Wakefield Research

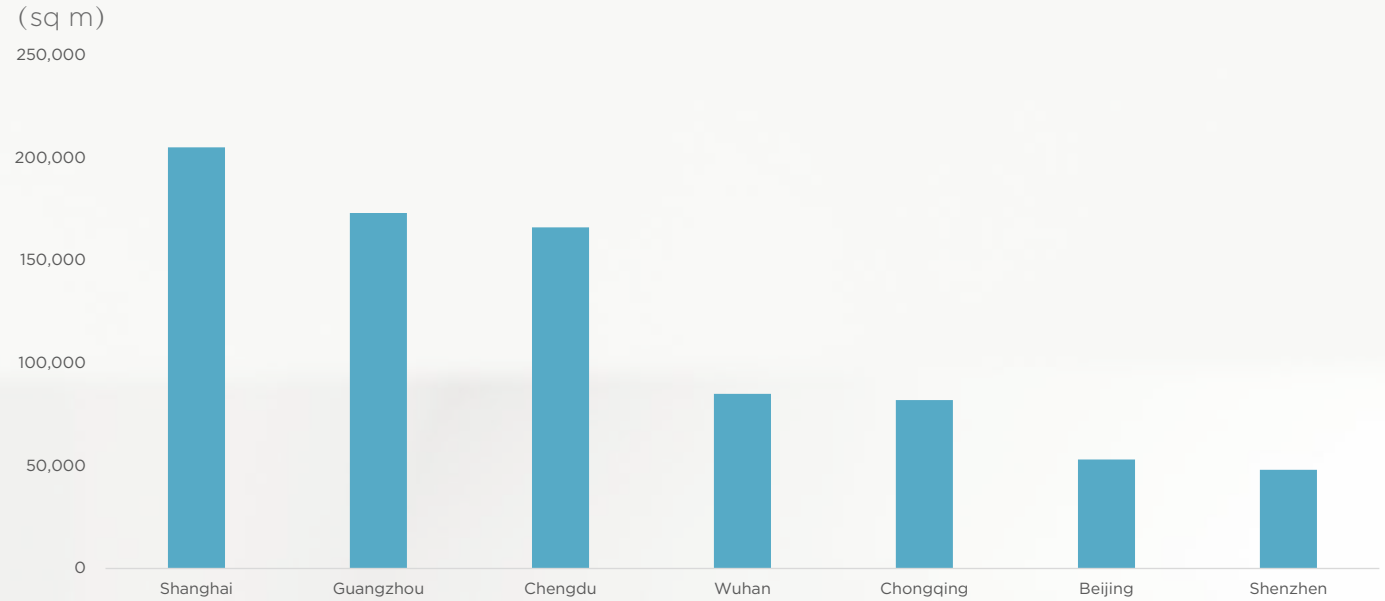
In terms of rental, as of Q2 2022, at RMB4.3 per sq m per day, the highest rental in our seven selected city market group was Shenzhen. Taking second and third spot were Beijing and Shanghai, at RMB3.9 per sq m per day and RMB3.8 per sq m per day, respectively.



# Outlook

Ahead and into next year, nearly 800,000 sq m of quality cold storage logistics warehouse space will be brought to the market in our seven selected city markets (Figure 20).

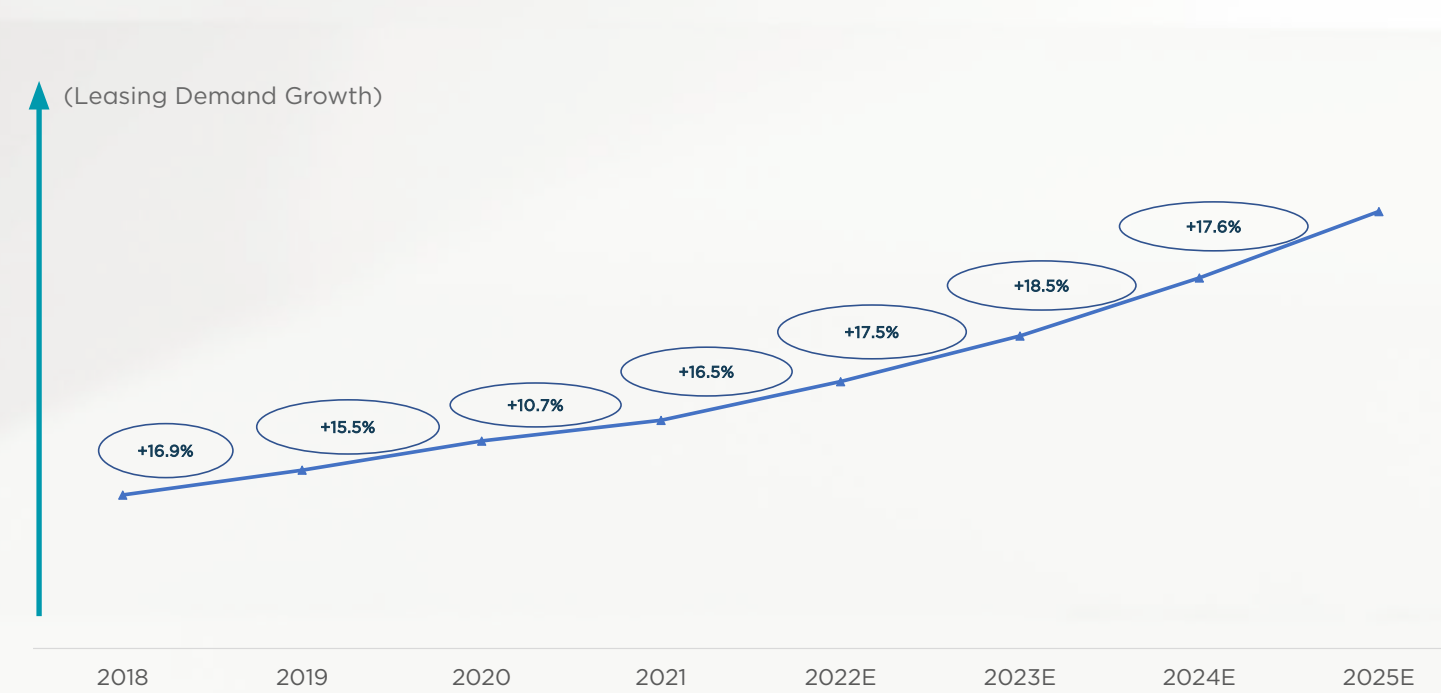
**Figure 20: Cold storage logistics warehouse future supply in seven selected cities in China (Q3 2022-Q2 2023)**



Source: Warehouse In Cloud, Cushman & Wakefield Research

Given the continued demand for this type of space, we expect much of this supply to be absorbed and with available leasing space being limited, we anticipate quality cold storage logistics warehouse space rentals to increase as well (Figure 21).

**Figure 21: Cold storage logistics warehouse leasing demand growth in the Chinese mainland (2018-2025)**

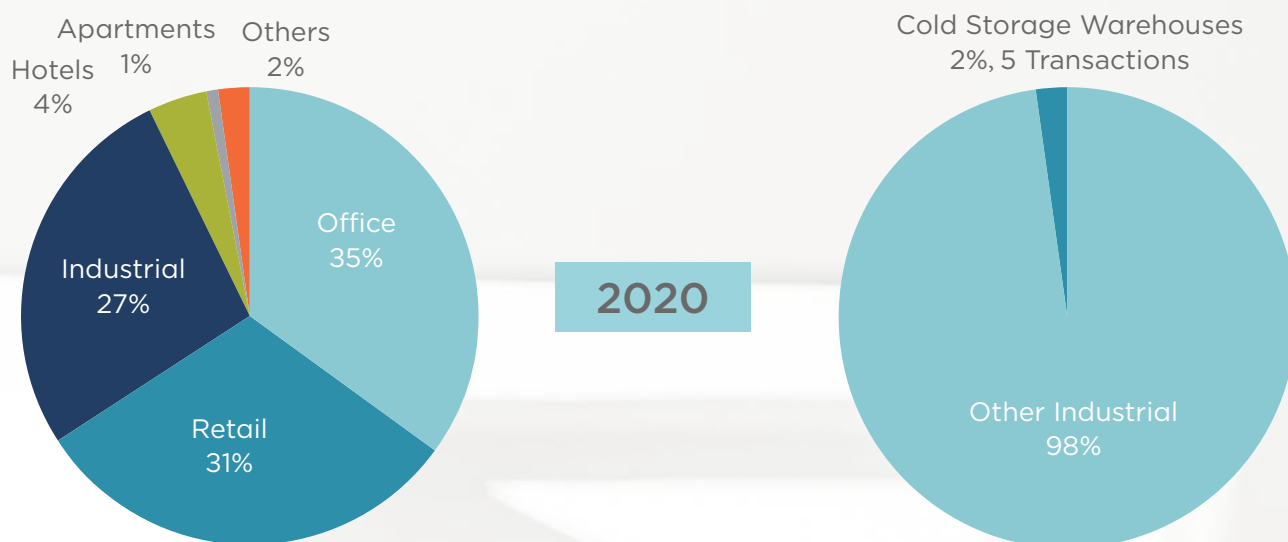


Source: The Cold Chain Journal, Cushman & Wakefield Research

## Sector investment

When considering investment, and in this case, investment deal number, according to RCA data, the industrial property sector took third spot behind the office and retail sectors in terms of investment volume in the Chinese mainland in 2020. Of the 27% recorded, 98% of deals were registered as 'other industrial', while cold storage logistics warehouse facilities, at five transactions for the year, made up 2% of industrial deals in 2020 (Figure 22).

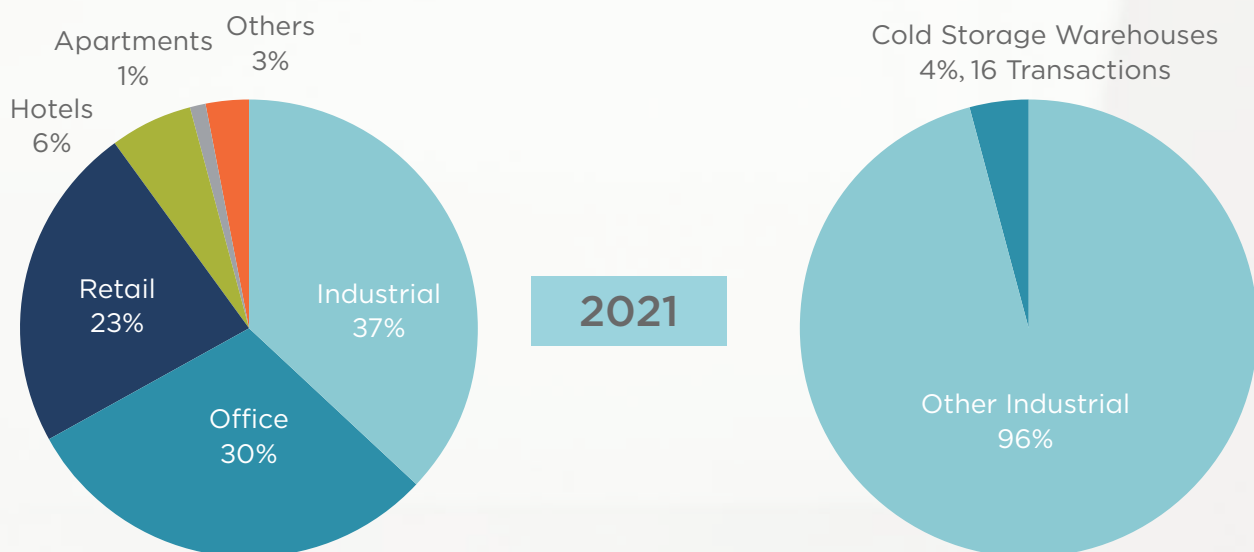
**Figure 22: Property sectors – Share of investment transaction volume in the Chinese mainland (Number of investment deals) (2020)**



Source: RCA, Cushman & Wakefield Research

2021 painted a more optimistic picture for cold storage logistics facilities investment volume in the Chinese mainland. According to RCA data, the industrial property sector took the top spot regarding investment volume in China in 2021. Of the 37% registered, 96% of deals were recorded as 'other industrial', while cold storage logistics warehouse facilities, at 16 transactions for the year, made up 4% of industrial deals in 2021 (Figure 23).

**Figure 23: Property sectors – Share of investment transaction volume in the Chinese mainland (Number of investment deals) (2021)**



Source: RCA, Cushman & Wakefield Research

These new cold storage logistics investments in 2021 are not only located in southern China but are also being developed in inland cities, such as Beijing, Chengdu, Shijiazhuang and Zhengzhou. Additionally, compared to 2020, the buyers of cold storage logistics in 2021 were no longer all foreign buyers, with some domestic buyers entering the market as well.

It is worth noting that Warburg Pincus-backed New Ease has made six investments in the cold chain logistics park and warehouse markets in 2021. The entity has recently merged with D&J, another Warburg Pincus-backed entity, to form DNE Group, a new economy infrastructure investor and services operator.

Meanwhile, at the beginning of 2021, Asia Cold received financial support from Hillhouse Capital. Moreover, Blackstone's investment vehicle, BPP Life Science, was set up specifically to make

long-term investments in a number of related industry assets, including assets associated with the cold chain logistics sector.

Into 2022, further reflecting the strong appetite for cold storage logistics warehouse investment by overseas investors, Macquarie, and its partner, Metropoly Holdings Limited, held an opening ceremony for their Metcold warehouse in Xi'an. Metcold is a modern storage service platform integrating cold chain and ambient storage, with projects mainly located in first and second tier cities in China.

Looking ahead, given the factors that are driving the expansion of the cold chain industry sector in China, we expect investment volume that targets cold storage logistics warehouse properties in China to continue to increase.







# 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:

- Sustainability;
- Technology, and;
- 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:

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

- Carbon offsetting;
- Carbon avoidance;
- Embodied carbon, and;
- 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:

- Solar power;
- Wind power;
- Hydropower;
- Geothermal power;
- Tidal power, and;
- 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:

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

Finally, 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 24 and Case Study 1 in the Appendix).

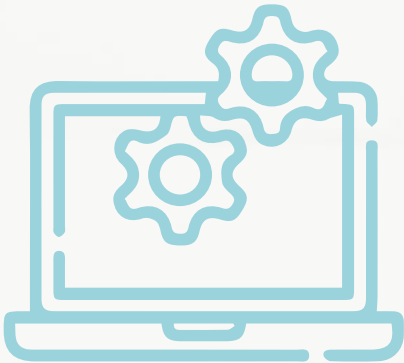
**Figure 24 Former Swire rather than Swire’s Cold Chain Logistics Facility (now owned by Vanke Logistics), Shanghai timeline**

|      |                                                                                                                                  |
|------|----------------------------------------------------------------------------------------------------------------------------------|
| 1816 | John Swire of Liverpool established an import-export business.                                                                   |
| 1982 | Swire acquired United States Cold Storage, today one of the largest public refrigerated warehouse logistics provider in the USA. |
| 2004 | Company reorganised to Swire Cold Storage Pty. Ltd.                                                                              |
| 2011 | Shanghai representative office opens.                                                                                            |
| 2014 | Shanghai cold storage warehouse facility opened.                                                                                 |
| 2018 | Vanke Logistics purchased Swire.                                                                                                 |

Source: Cushman & Wakefield Research

### Technology

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 small as possible and technology will be key for delivering these solutions.



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## Energy consumption hits the bottom line

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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).

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## New technology for a new age

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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 25).

**Figure 25: The IoT – Streaming information and data via linked devices**



Source: Cushman & Wakefield Research

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## Efficiency, leading to reduced energy consumption and lowered costs

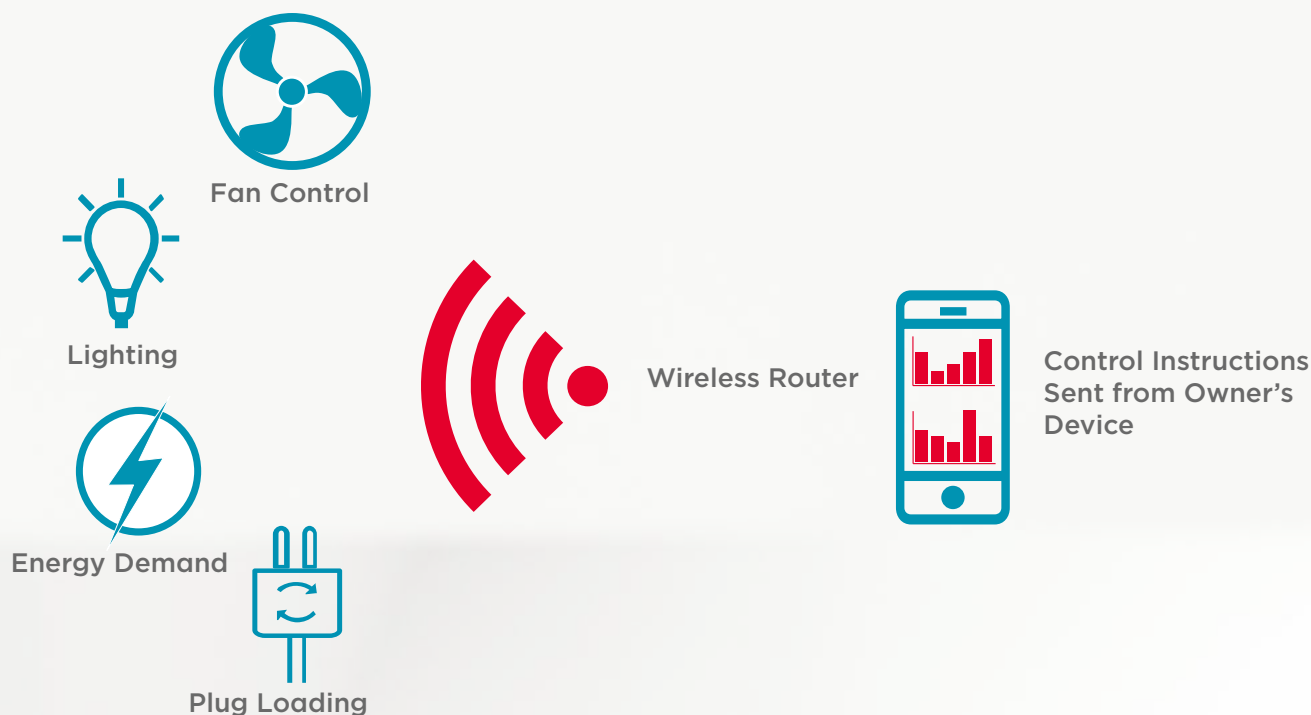
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What's more, once a decision is made, by using the same linked system and building control technology, owners and property managers can issue turn up, turn down, and on or off control signals remotely to plant and machinery embedded in a smart cold 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:

- 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;
- 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;
- 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;
- 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 26).



Figure 26: The IoT – Linking devices, conveying control instructions



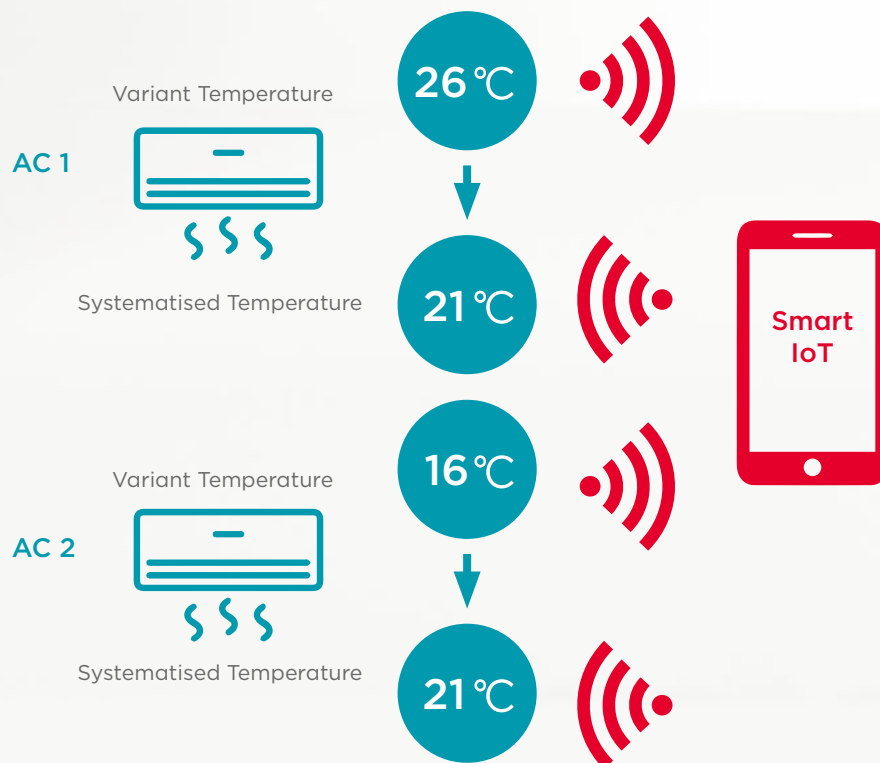
Source: Cushman & Wakefield Research

## Smart software promotes operational effectiveness

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 27).

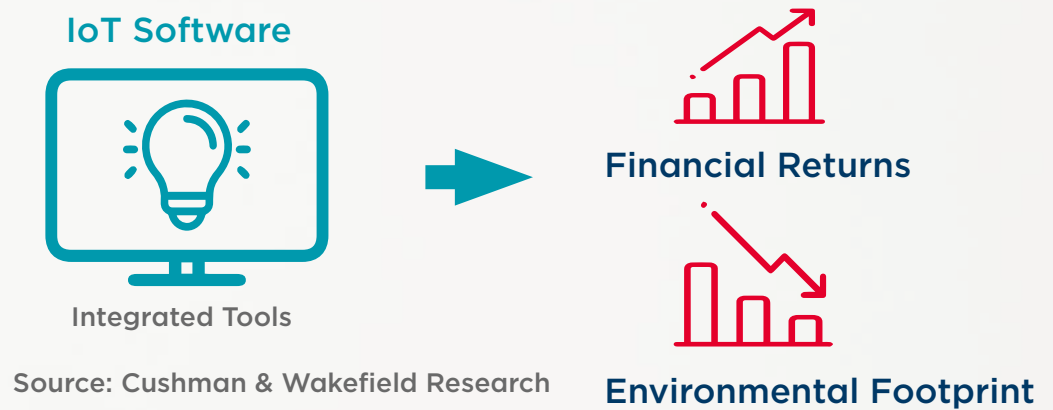
Figure 27: IoT software systematising corrective action



Source: Cushman & Wakefield Research

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 28).

**Figure 28: IoT software augmenting financial and environmental returns**



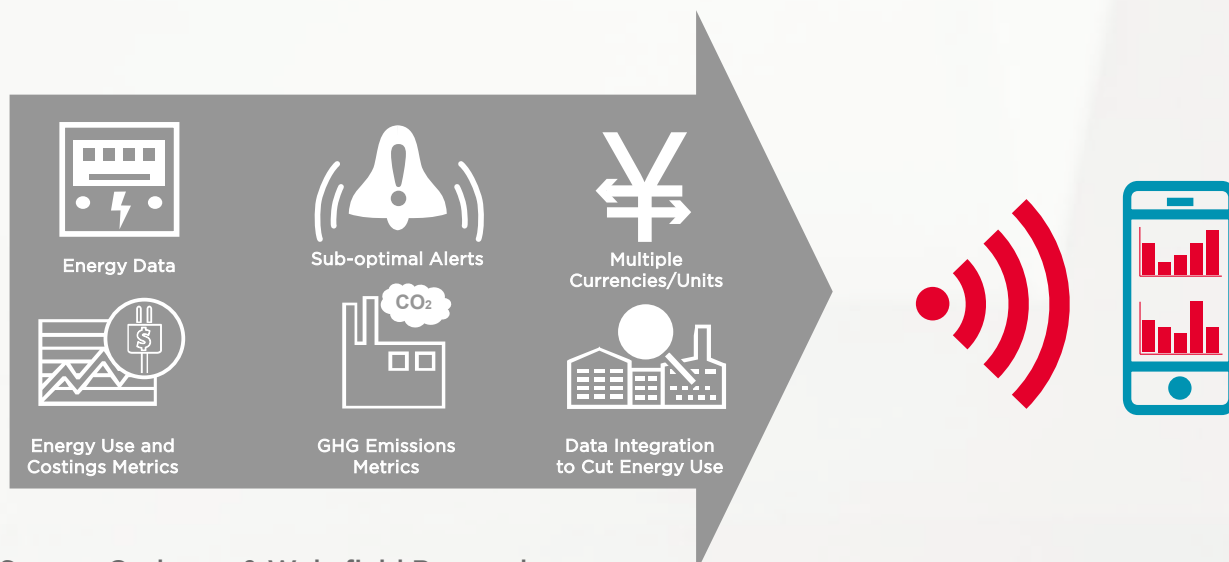
## Long-term gains rather than short-term wins

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:

- Automatically obtaining building energy data from energy monitors and building management systems;
- Providing real-time alerts to sub-optimal conditions occurring in a building, such as concurrent heating and cooling, system leaks, etc;
- Displaying multiple currencies and units of measurement for energy and area for global reporting purposes;
- Offering performance metrics to examine and predict energy use and costs against internal and external energy benchmarks;
- Offering performance metrics to examine greenhouse gas emissions against internal and external benchmarks, and;
- Integrating environmental and energy management with facilities management and capital projects to streamline energy and environmental impact reduction stratagems (Figure 29).

**Figure 29: Smart building energy management software output deliveries**



Source: Cushman & Wakefield Research

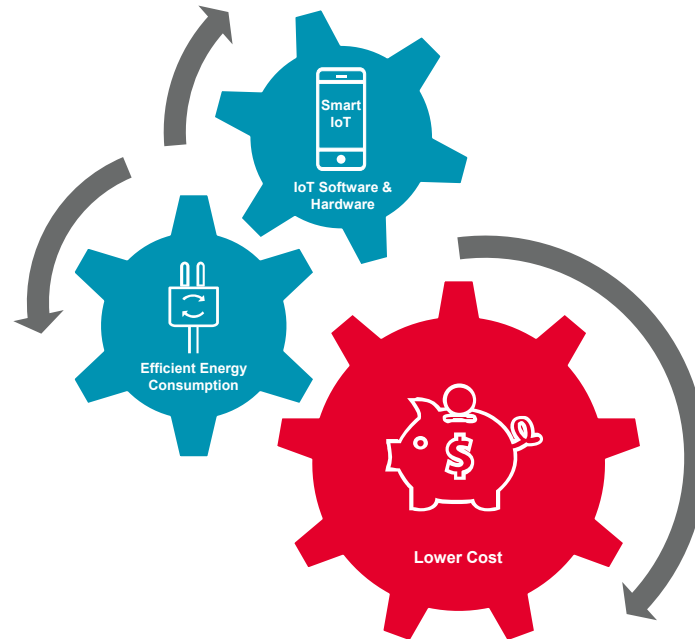
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# The IoT hardware and software set to proliferate within the built environment

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Finally, 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 30).

**Figure 30: IoT proliferation to lead to ever lower costs**



**Source: Cushman & Wakefield Research**

## *Design*

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:

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

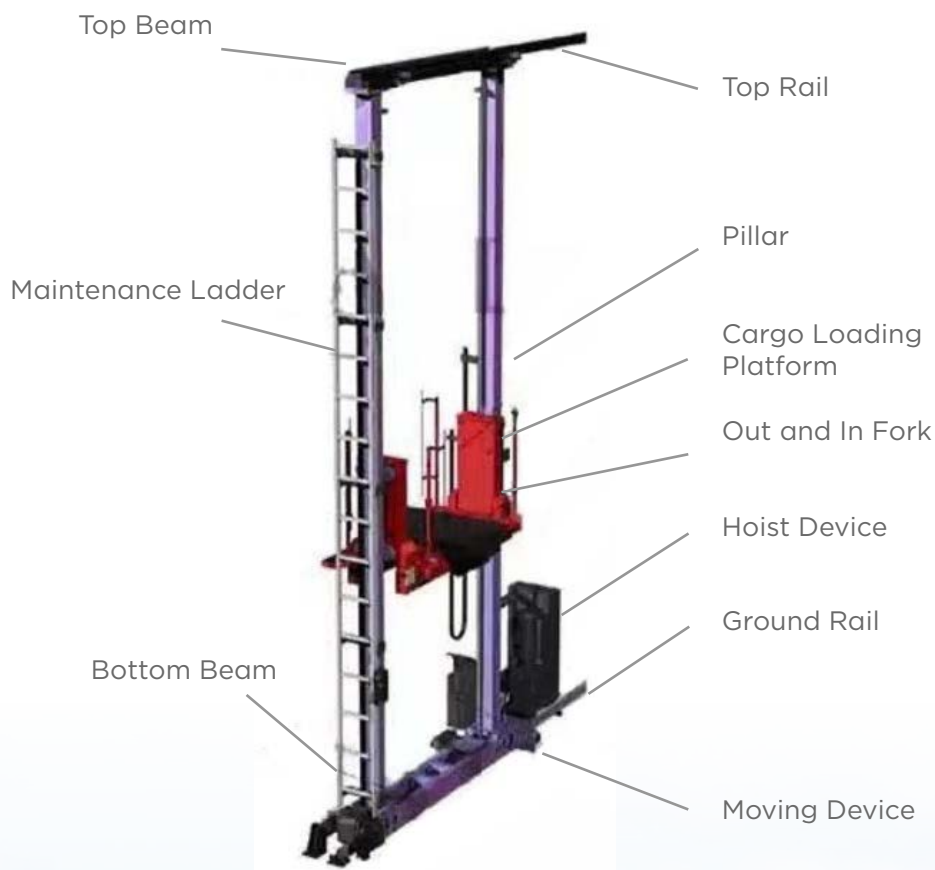


# The automation system

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 31).

**Figure 31: A typical stacker crane**



**Source: EYDA, Cushman & Wakefield Research**

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.

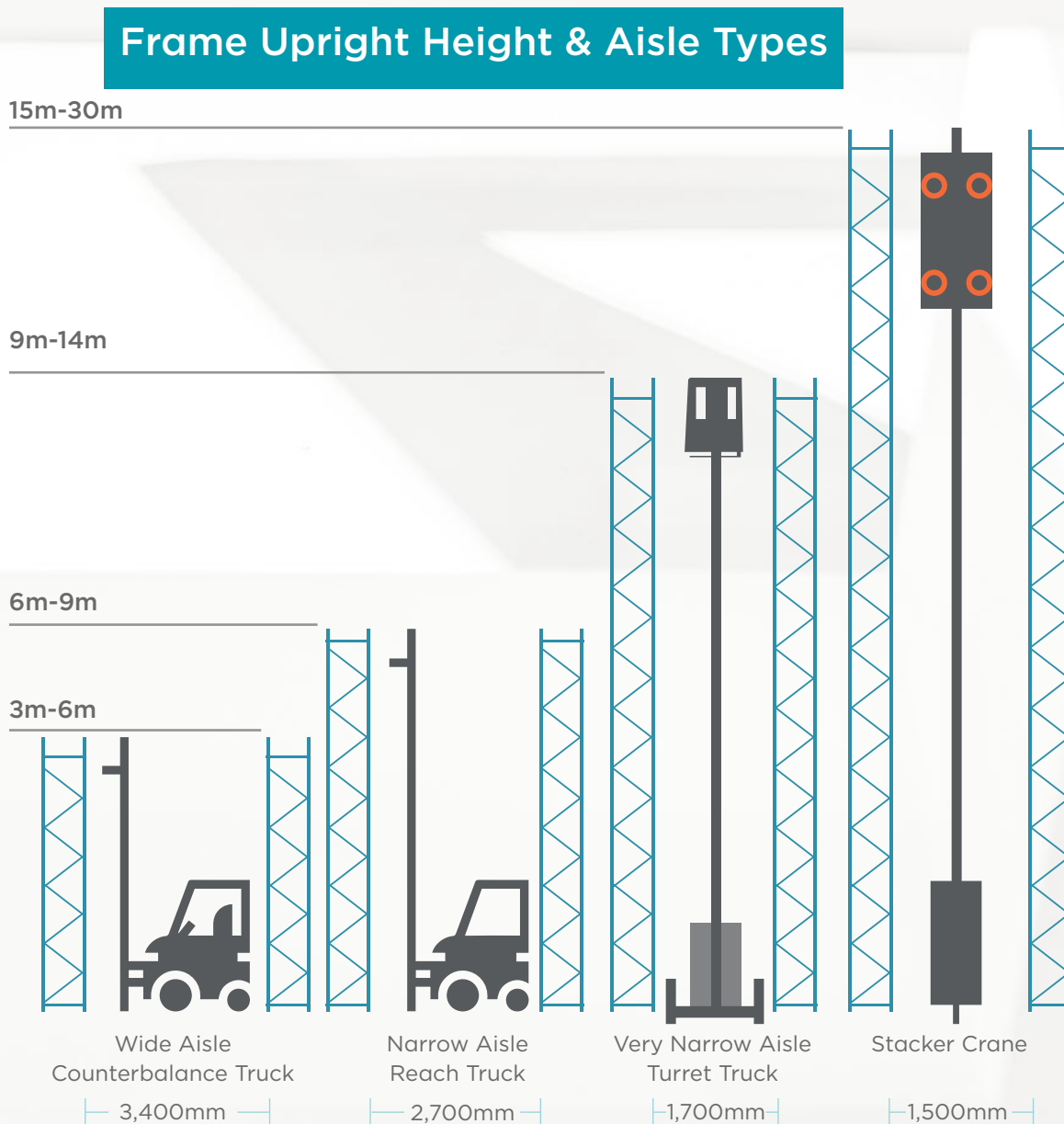


## Facility height

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 32).

Figure 32: Cold storage warehouse heights, aisle widths and stacking systems



Source: S&P, Cushman & Wakefield Research

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.



# Key Takeaways

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

In the coming years, we expect to see more 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 cold storage logistics warehouse development space to cater to the need to store more perishable medicines.

Cold storage logistics warehouse space in China will also improve on quality, through enhanced sustainability, having more advanced integrated technology, and being designed to be more optimised operationally.

Finally, in view of increasing market demand as well as ever-improving facilities, cold storage logistics warehouse properties in China are set to continue to pique investor interest for the foreseeable future.



# Appendix

## Case Study 1

### Former Swire Cold Chain Logistics Facility (now owned by Vanke Logistics), Shanghai

*Cold Storage with fine temperature control and sustainable facilities*

#### 1816 – Present

##### Summary:

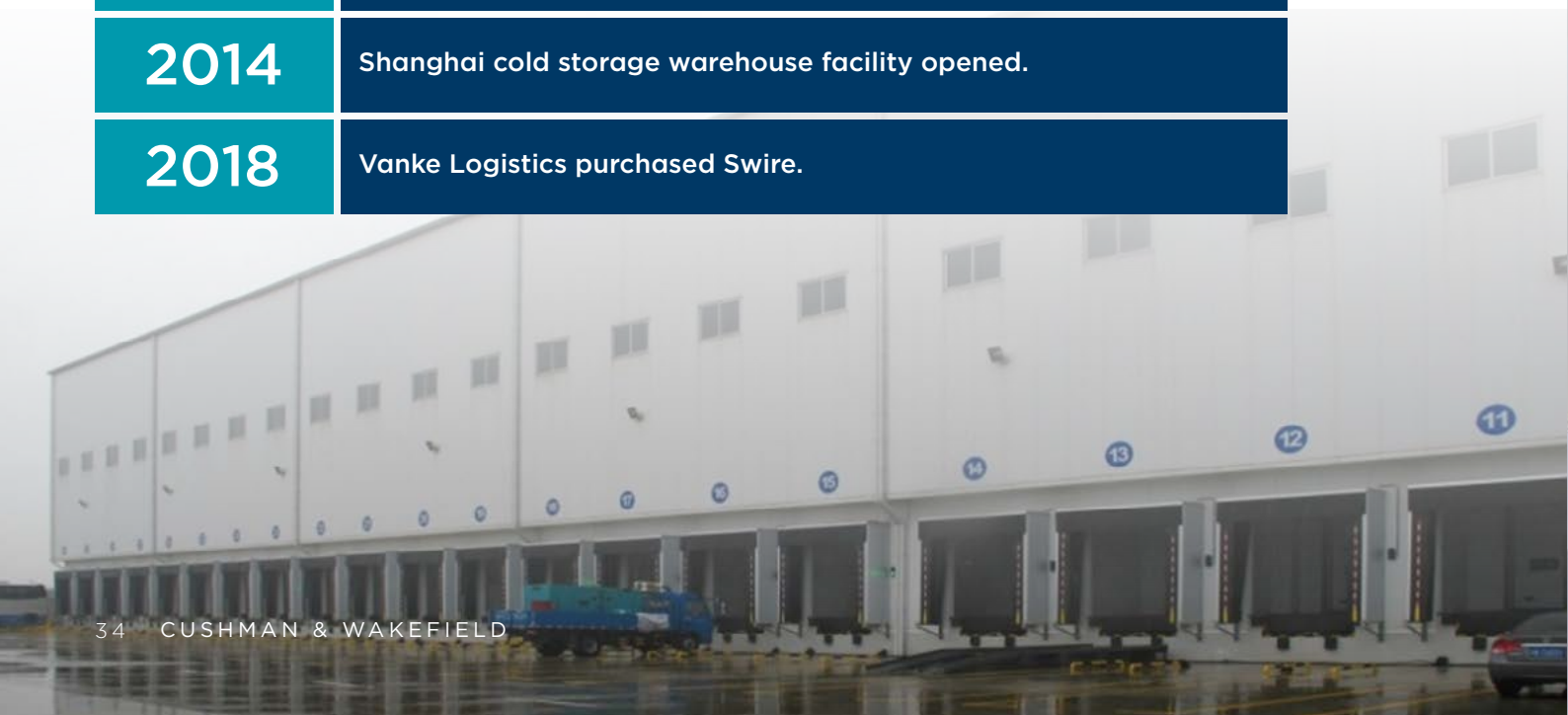
Swire has nearly 60 years of experience in operating best-in-class cold storage facilities. The Shanghai cold storage facility has fine temperature control system, energy-saving facilities and environmental-friendly features.

##### 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.

#### Timeline of major events / milestones reached:

|      |                                                                                                                                  |
|------|----------------------------------------------------------------------------------------------------------------------------------|
| 1816 | John Swire of Liverpool established an import-export business.                                                                   |
| 1982 | Swire acquired United States Cold Storage, today one of the largest public refrigerated warehouse logistics provider in the USA. |
| 2004 | Company reorganised to Swire Cold Storage Pty. Ltd.                                                                              |
| 2011 | Shanghai representative office opens.                                                                                            |
| 2014 | Shanghai cold storage warehouse facility opened.                                                                                 |
| 2018 | Vanke Logistics purchased Swire.                                                                                                 |



## 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.

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