

- ◆ New industry opportunities ◆ The fifth age of cities
- ◆ A healthier tomorrow ◆ Beyond technology
- ◆ From risk to resilience



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Horizons

A BLUEPRINT FOR
SUSTAINABLE CITY
DEVELOPMENT



Livelihood, environment,
technology

Building communities stronger,
smarter and more sustainable

In association with



RICS® ARUP

Horizons

Building communities stronger, smarter and more sustainable

The sands of time are shifting, and China's economy and property markets must adapt to a new reality.

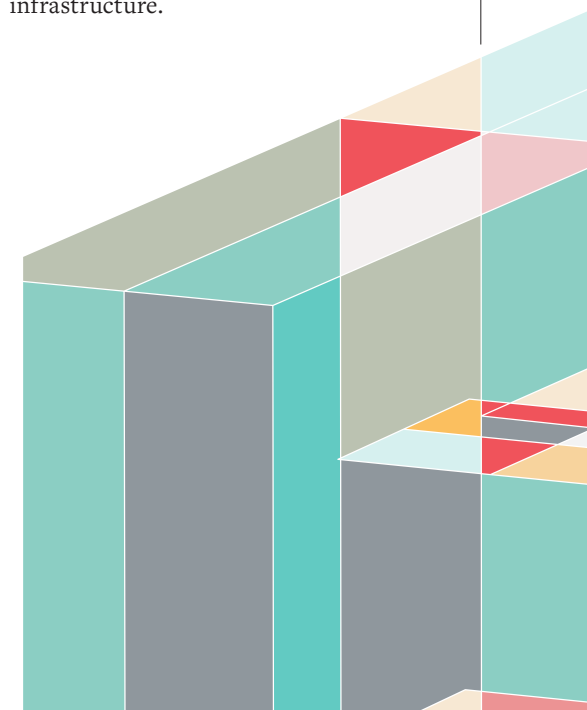
Local authorities are proactively exploring new ways to attract investment, business and talent to relocate to their cities; however, they often resort to tried and tested, though sometimes outdated, methods. It is essential to look to new ways to generate growth through city collaboration, identifying industries' innate strategic advantages and playing to their strengths instead of going after highly-coveted sectors. It is also essential to develop dialogue with industry leaders and not just offer tax discounts, but identify what steps authorities can take to make businesses more efficient and profitable. Real estate should be viewed not as a net output of growth or a way to create growth, but a platform that helps businesses and communities to generate economic activity. As the platform for other ecosystems, the built environment should build technology into its core through every stage of its life cycle – in its design, construction, operation/

maintenance, repositioning and decommissioning. The digital twinning of the real world enables planners, architects, designers, owners and operators to optimise design and management of projects and communities to a level not previously possible, enabling increased efficiency and reduction of operational leakage. Additionally, the wealth and variety of data now available is mind-boggling and provides a 360 degree perspective not possible in the real world, whether it be the inferred consumer characteristics, the geotagging of social media posts, socio-demographic data, layering of land usage rights, homeownership data, POI and infrastructure capacity.

Cities around the world consume two-thirds of the world's energy while producing more than 70% of greenhouse gas emissions and, at the same time, they house 55% of the population while producing 80% of economic activity. Cities are not going to disappear, so we need to develop more sustainable ways of building them, especially given the high sunken costs and the fact that the long lifespan of structures will mean the

decisions made now will have long-term implications. We also need cities to provide healthier and more resilient environments for communities to thrive and drive economic prosperity and form a harmonious society.

We would like to give our most sincere thanks to our friends over at USGBC, RICS and ARUP for contributing excellent sections exploring aspects of sustainability, wellness, design, construction and management tools, city resilience and new infrastructure.



Content

06

Livelihood

Getting back on your feet

- 8 **City clusters**
Forging economies of scale
- 10 **City collaboration**
Spreading the wealth
- 12 **Industry clusters**
Playing to your strengths
- 16 **The fifth age of cities**
Liveability and affordability
- 18 **Ease of doing business**
Overcoming businesses' pain points
- 20 **Education**
Workforce training, industry partnership and company creation
- 22 **Urban redevelopment**
Reimagining urban cores

- 24 **Tourism**
Driving domestic consumption and job creation



26

Environment

A healthier tomorrow

- 28 **Green buildings**
From nice-to-have to must-have
- 32 **Beyond buildings**
A human-centric approach
- 34 **From risk to resilience**
The adaptive approach to urban development

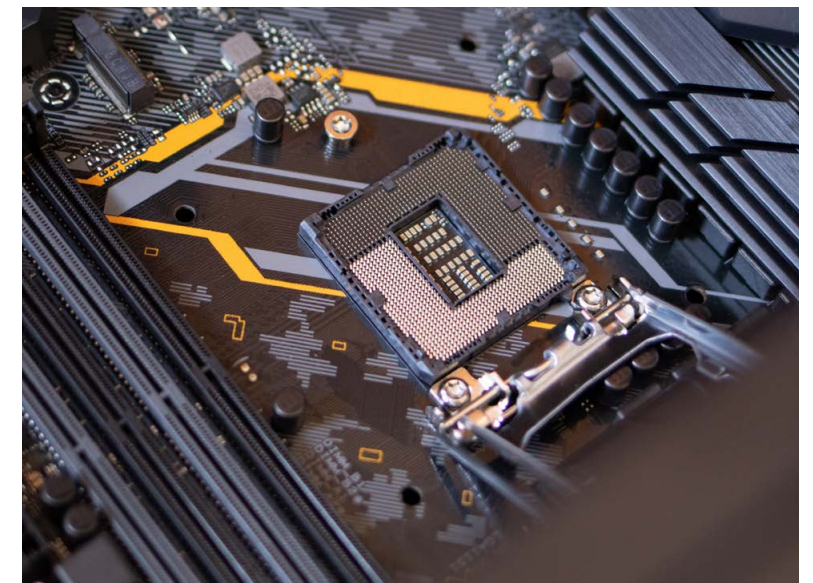


37

Technology

Leading the way

- 38 **New infrastructure**
Driving sustainable city development
- 40 **Big data in design**
Data is the new oil
- 42 **BIM**
And beyond
- 44 **PropTech in management**
Efficiency, consistency and profitability
- 46 **Data centres**
The workhorse of the digital age



Livelihood

Getting back on your feet

Savills Research

China's economy, demographics and job markets have been significantly transformed over the last two decades. The nation's GDP grew from RMB9.1 trillion in 1999 to RMB99.1 trillion in 2019, and the tertiary sector grew from 38.6% of the economy to 53.9%. The population grew from 1.26 bn to 1.40 bn, with the working-age population growing by 138 million and seniors by 89 million to 176 million, while the urbanisation rate has increased from 34.8% to 60.6% with the addition of 411 million people to cities. Urban employment now accounts for 57.1% of the country's 775 million workforce, up from 31.4%, while state-owned companies only contribute 13.2% (2018) of urban employment, down from 38.2%.

The historical drivers that catapulted China from the seventh-largest economy in the world in 1999 to the second, in current US dollar terms, in 2019 are close to spent and new drivers of investment, employment, productivity and value creation must be found to augment growth in the decades to come. Covid-19 has had a tremendous impact on the economy, but it is also an opportunity to reconsider past growth strategies, adjust priorities and policies and make new investments into future economic drivers.

City clusters

Forging economies of scale

The advantages of grouping economic activity together within cities are well known. Proximity provides incentives for suppliers to locate closer together, which means they can offer a more diverse and less expensive range of products. Common infrastructure and transportation framework costs can be shared, and cities can draw upon a larger and more diverse labour pool, which helps both firms and workers. Pools of specialised workers raise their skill levels, while innovations are shared more easily and diffuse through the economy more quickly.

The theory of “borrowed size” argues that closer links among urban areas can offer mid-sized cities the chance to achieve performance levels normally associated with larger peers—the whole is greater than the sum of its parts—and that aggregating city markets increase their overall appeal. The theory of agglomeration shadow affects smaller cities that fall under the gravitation of larger cities—the increased competition from the more efficient larger city can sometimes limit the growth of smaller cities. It is therefore just as important to strengthen ties between smaller cities within city clusters as it is to strengthen ties to the larger economic drivers. However, other cities may be happy to position themselves as a low-cost centre taking companies and jobs that are uneconomical in some of the costlier, larger cities. The other option may be to build up specialisations and centres of excellence that may be harder to dislodge and relocate given the economies of scale present in a region. ■

China's new-type urbanisation: Urban cluster features and statistics

Region	Population density (per sq km)	Urbanization rate (%)	Economic density (RMB mn per sq km)
Beijing-Tianjin-Hebei	463	60.48	21.7
Yangtze River Delta	772	66.5	64.3
Pearl River Delta	546	71.83	68.2
Middle reaches of Yangtze River	402	36.33	11.35
Chengdu Chongqing	450	43.86	9.65
Harbin-Changchun	166	41.84	5.84
Mid-southern Liaoning	318	52.85	16.75
Shandong Peninsula	556	46.29	28.96
Central Henan	773	30.29	22.73
Guangdong	330	32.02	7.73
Jiang-Huai	427	41.25	12.43
West Coast of Taiwan Strait	625	39.52	21.4
Beibu Gulf	312	38.37	5.87
North Tianshan Mountain	70	76.6	4.1
Hu-Bao-E-Yu	50	38.52	3.48
Central Shanxi	222	40.16	6.23
Ningxia Yellow River	94	46.89	2.8
Lanzhou-Xining	185	30.46	3.28
Central Guizhou	299	38.03	4.61
Central Yunnan	215	36.62	4.45
All urban clusters	340	45.43	14.21

Source: International Transport Forum

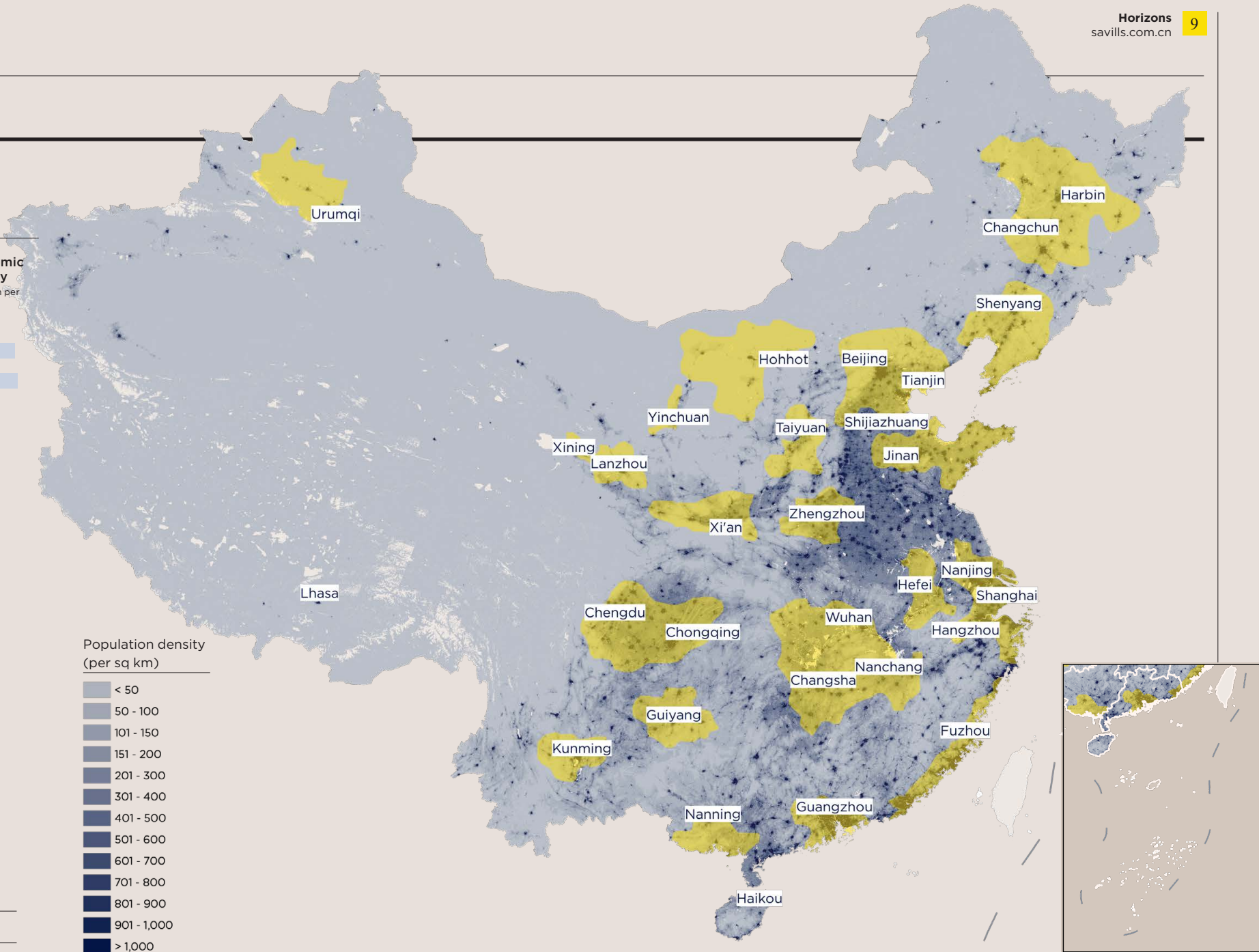
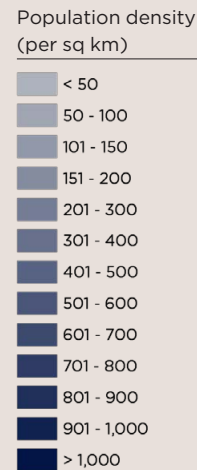
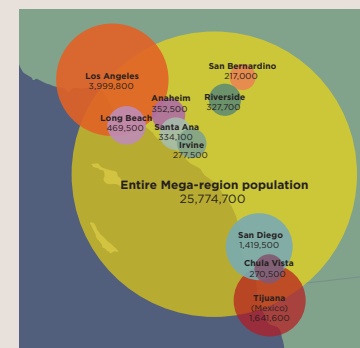


TABLE 1: Benefits of urban clusters

	Supply side	Demand side
Agglomeration		
Higher economic concentration; high spatial proximity of firms and consumers	Supports knowledge sharing, labour matching and pooling; promotes accumulation of capital	Supports consumption of urban amenities and a more efficient distribution of public goods and services like education and healthcare
Specialisation		
Economies of scale	Leads to higher productivity	External competitiveness supported by export demand; requires industrial upgrading
Network effects		
Efficient allocation of production factors through mobility and connectivity	Supports the increase in total factor productivity through more efficient allocation of production factors (labour and capital)	Requires investment in infrastructure

Source: International Transport Forum

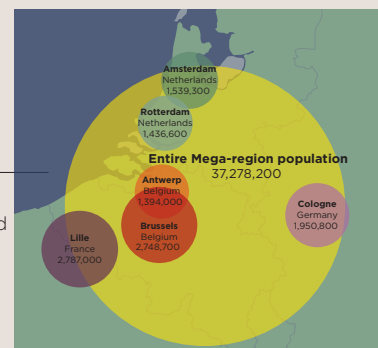
International mega-regions



The bulk of the Southern California mega-region is in the US, stretching from LA to Tijuana, Mexico. As a mega-region, it is one of the largest economies in the US, with key sectors including entertainment, tourism, tech, automotive and finance.

Amsterdam-Brussels-Lille-Ruhr

This mega-region spans four countries in northwest Europe, including the major urban centres of Amsterdam, Rotterdam and Brussels. It is an interconnected network for knowledge exchange and business innovation, housing some of Europe's best universities such as Delft University of Technology, the University of Amsterdam, Eindhoven University of Technology and Leiden University.



City collaboration

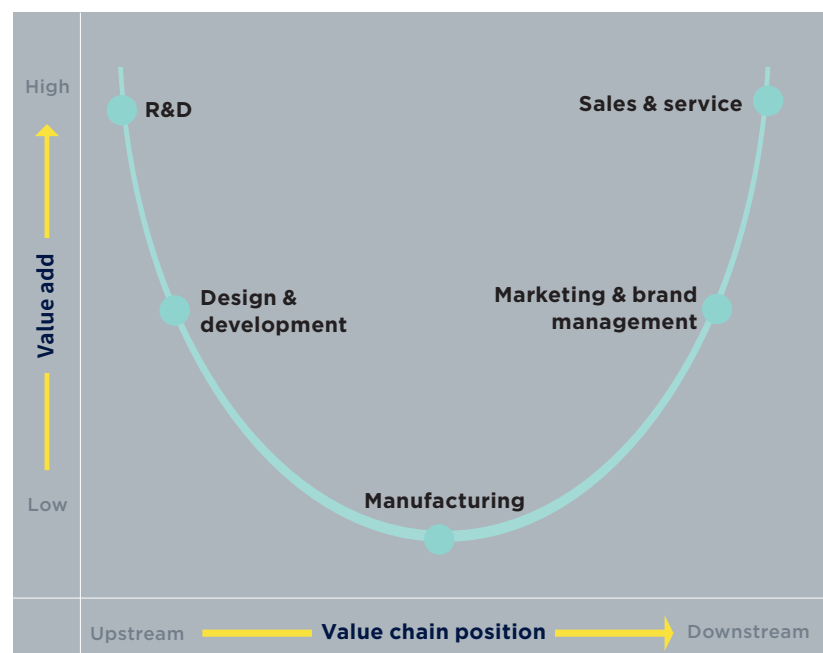
Spreading the wealth

With globalisation expanding over recent decades, supply and value chains have been stretched across the globe in search of lower costs and higher efficiencies. Nevertheless, the more these chains are stretched, the more prone they are to disruption. Recent years have put supply chains to the test, and, in response to rising geopolitical disputes, labour costs, technological improvements and natural disasters, many companies are looking at adjusting supply and value chains while nations are developing their self-reliance in products, technologies or talent.

Supply and value chains are increasingly becoming local as

product development and manufacturing get closer to rapidly evolving local markets and as we see increasing speed to market and a higher level of customisation and localisation of products and services. While supply and value chains are increasingly local, that does not necessarily mean they have to be located within one urban area as different parts of the value chain have different add value and operating margins. City agglomerations and collaboration between cities with different wage profiles and skillsets are perfectly suited to developing local or “micro” supply and value chains.

FIGURE: The “Smiling Curve” Challenge

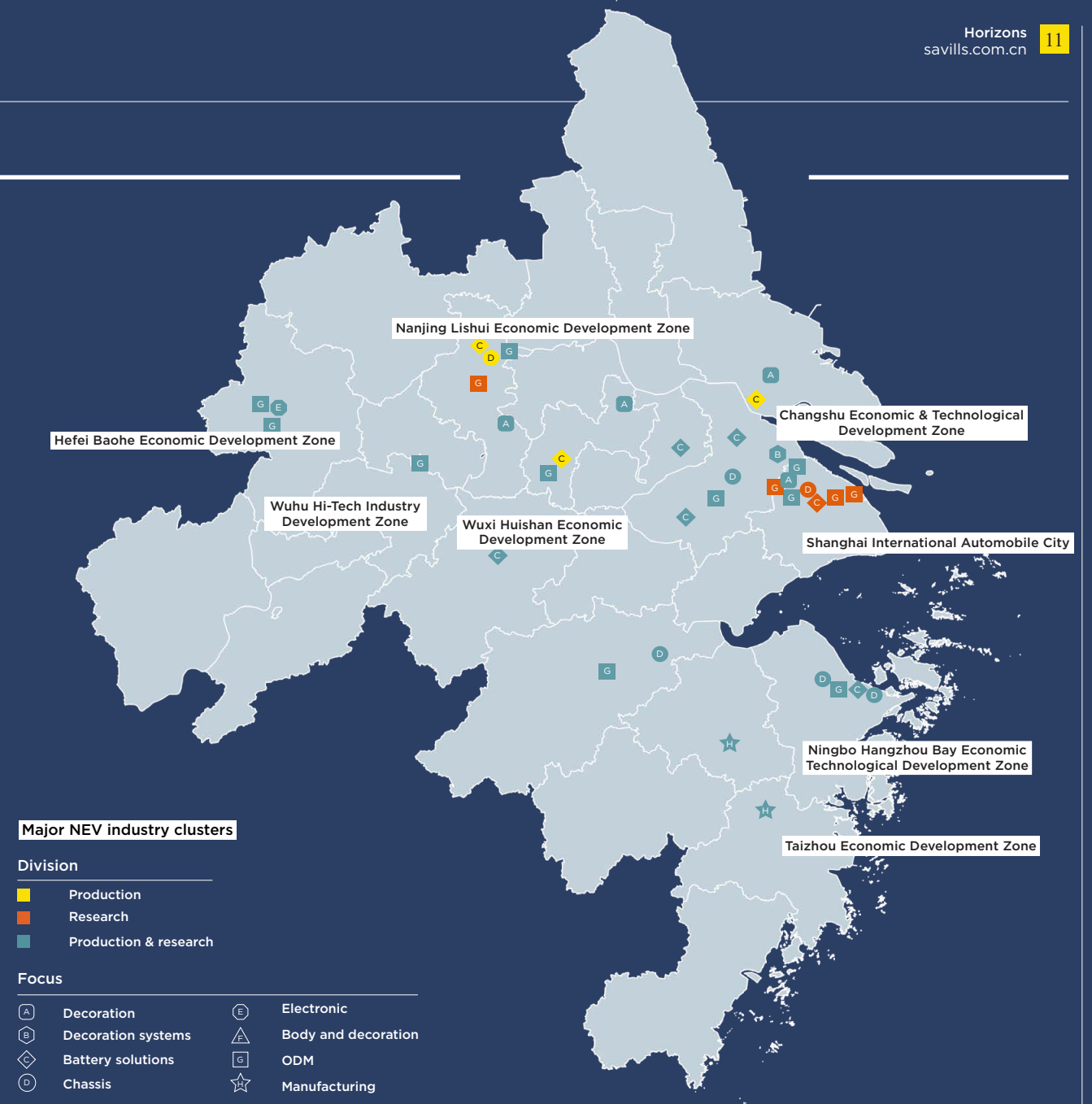


Case study: NEVs in the Yangtze River Delta

China is the world’s largest market for NEVs, accounting for over 50% of global NEV sales. NEVs have been recognised as a strategic sector with long-term ecological benefits and a key role to play in smart city building despite its small market share (4.5%) in China, the ongoing search for a profit-making model and challenges associated with charging infrastructure. China’s NEV industry plan (2021-2025) expects NEV sales to reach 6-7 million, or 25% of all car sales, by 2025 as part of a plan to promote self-driving smart cars in commercial use.

A major base for producing whole cars and car parts, the YRD region also plays a pivotal role in the research and development of smart cars and self-driving cars. Of the top 10 car makers by NEV sales in 2019, four are headquartered in the YRD region, namely SAIC Motor, Geely, Chery and JAC Motors. The region also houses the headquarters of emerging brands NIO and WM Motor. Tesla’s Gigafactory in Shanghai’s Lingang area has started production and is looking to hit its 2020 production target of 150,000 electric cars, or 30% of its global target for the year. This will mean opportunities for both parts suppliers and consumers, though it may also cause some disruptions in the market.

The YRD region is home to two of the four national innovative NEV industry clusters, namely the Shanghai International Automobile City in Shanghai’s Jiading District



Major NEV industry clusters

Division

- Production
- Research
- Production & research

Focus

- | | |
|--|---|
| A Decoration | E Electronic |
| B Decoration systems | F Body and decoration |
| C Battery solutions | G ODM |
| D Chassis | H Manufacturing |

and the Wuhu NEV Industry Cluster Base. Automobiles are the pillar industry for Jiading, which accounted for 64% of the city’s auto industry output in 2019, compared to 30% in Pudong.

About 80% of Tesla and NIO’s existing and potential suppliers have operations in the YRD region, with R&D and design teams mainly based in Shanghai and parts supply offices located in Jiangsu

and Zhejiang. Shanghai comes first, housing 34% of those suppliers, followed by Suzhou (17%) and Ningbo (12%). Ningbo accounts for 48% of the production value of Zhejiang’s above-scale auto manufacturers and sold 4.4 sq km of land to auto industry players in 2018, more than any other city in China.

Internet of vehicles and autonomous driving will be the future of the auto

industry. Traditional players, upcoming NEV brands and tech firms are all seen actively pursuing market share. Shanghai has China’s first intelligent car demonstration area, while Wuxi is building the world’s first city-level LTE-V2X (vehicle to everything) application demonstration area. As 5G development gains pace, the electric car parts sector is likely to see a new round of tech innovation.

Industry clusters

Playing to your strengths

Industry clusters exist where the economic activities in a set of related industries in a location reach critical mass through economies of scale. It is at this point that local linkages begin to have a meaningful impact on the performance of companies, and important opportunities for local collaboration among firms and other organisations in the relevant fields arise.

Clusters can emerge naturally in the market process, though they can also be shaped by authorities through incentives and policies, providing productivity benefits to companies as they grow. Clusters become attractive to companies looking for a new locations and continue to grow through the improved performance of companies already located there. Companies in clusters gain access to specialised regional suppliers, service providers and institutions, and can also benefit from deep pools of skilled employees and shared infrastructure dedicated to their needs.

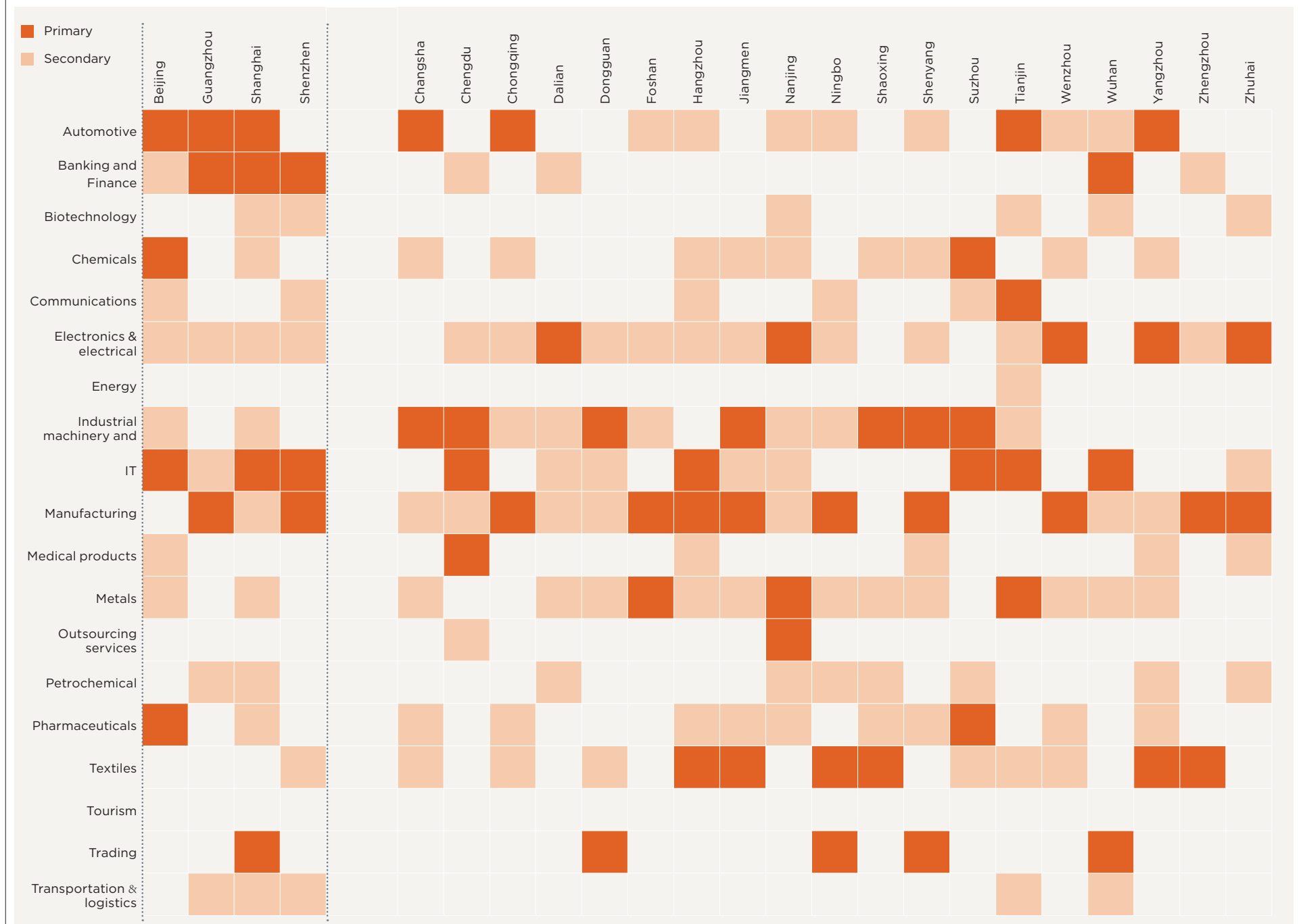
Industry clusters play a fundamental role in driving regional economic competitiveness by encouraging higher rates of job growth, wage growth, new business formation and innovation in the regions they are located in.

While it is tempting for local authorities to mimic larger cities or to go after high-prestige, high-value, high-growth sectors (such as finance or technology), this is often not possible in many locations as competition is likely to be fierce and local authorities may not have the resources, market size or industry appeal to attract companies from those targeted industries. It is better to identify the inherent advantages of the city, native industries and corporate champions that are already thriving and provide them with the support and infrastructure they need to excel.

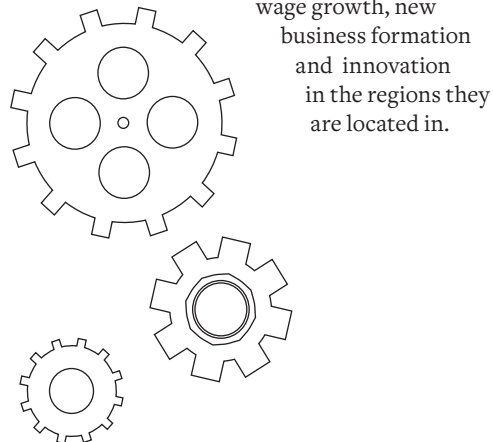
As the business environment evolves and becomes more supportive of certain industries, more companies from the same industry are likely to set up shop in the same area. This proximity, and the accompanying tight linkages, yield better market insights, more refined research agendas, larger pools of specialised talent and faster deployment of new knowledge, becoming hubs of innovation.

This is not to say that cities should become solely reliant on one industry for jobs and growth or that this focus should remain fixed. As trade relations, consumer preferences, government regulations and technologies change so will specific industry's growth prospects. Local authorities will need to read the tea leaves and adapt to changing environments while also continuing to support local trade industries to provide a base of employment and economic prosperity. ■

FIGURE: China city industry focus



Source Dezan Shira & Associates; Savills Research



Case study: Life sciences

There has been tremendous growth of innovation districts in cities such as San Francisco, Boston and Cambridge in both the UK and USA. But now, the intersection of these technology-rich environments with the demand for advances in medicine and healthcare means that the life sciences sector is truly reaching a tipping point.

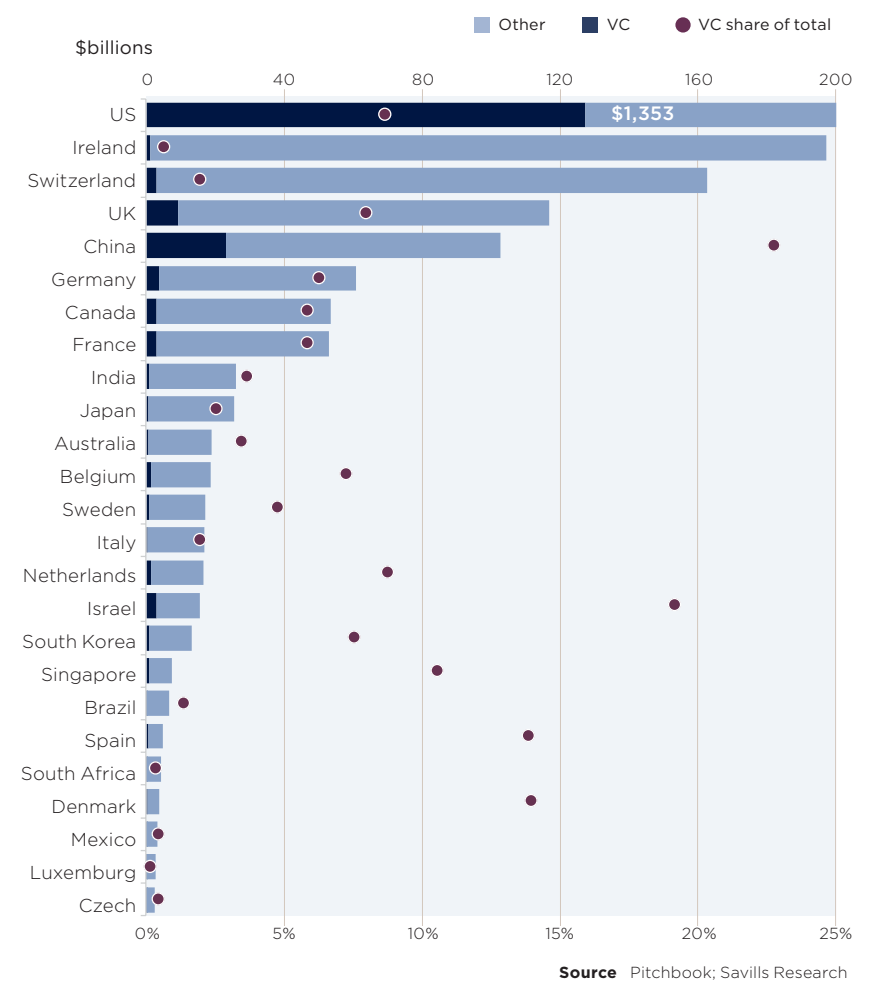
Life sciences cover a wide range of medical fields, such as biotechnology, pharmaceuticals, biomedical technologies, life systems technologies, nutraceuticals, and environmental and biomedical devices. Funding levels are as deep as the sector is broad. During the past five years, more than \$2.5 trillion of capital has been raised globally, a 111% rise on the previous five-year period. One major influencing factor is technology. Global funding for the digital health market reached \$22 billion in 2019, a pace that has essentially doubled every two years over the past decade. Potential for software and hardware tech offers new avenues to improve human health, whether through artificial intelligence (AI) and machine learning, or data-driven approaches to health solutions.

This growth has not gone unnoticed by traditional technology companies. Google entered the health market five years ago with the acquisition of DeepMind, which uses AI in the development of new drugs. Tencent, Alibaba and other tech platforms have also been making inroads in areas such as image recognition for CT scans, online consultations and medicine delivery services.

In a post-COVID-19 world, there will be a rise in the vaccine sector as well. The early money into this sector, being venture capital (VC), for the last five-year period (2015-2019) has seen around \$5 billion invested globally. This is 150% higher than the preceding five-year period.

Life Sciences

FIGURE: Capital raised by the top 25 countries, 2015-2019



Life sciences as a real estate sector

The rise of life sciences has ramifications for real estate, and life sciences may soon be recognised as a real estate sector in its own right. Life sciences give investors a chance to build a portfolio around investments that benefit from clustering in innovation districts and the triple helix of government, universities and industry to deliver on specific aims.

Most cutting-edge research will likely be carried out in core innovation markets that are able to create places where researchers feel they are part of a community and can have collaborations with venture capitalists and entrepreneurs. Biotech companies and research institutions will likely seek out experienced, well-capitalised owners with full-service, integrated platforms to ensure their mission-critical facilities operate without interruption.

From start-up incubators and R&D facilities to major headquarters, the sector can also offer a diversity of investments. Capital flowing into life sciences can help be a predictor of future real estate demand. When it comes to VC money, merger and acquisition activity and private equity investments, the USA dominates the field, taking a 61% share of countries that raised \$1 billion or more in the past five years. China came fifth (US\$102 bn), though boasted the second-highest share of venture capital investment (US\$23 bn).

The fifth age of cities

Liveability and affordability

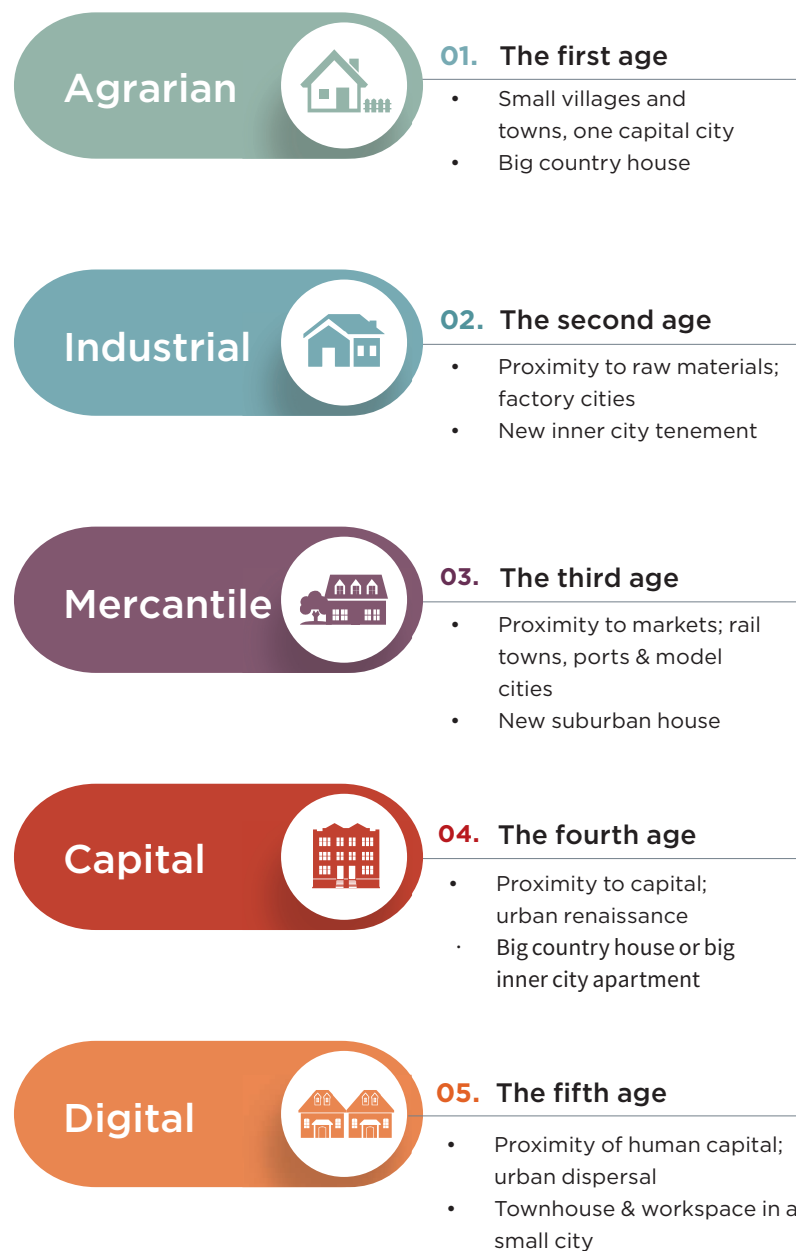
There are myriad of reasons that humans gather together, and few have changed over the centuries.

The most recent age of cities – the fourth age – started in the late 20th century and concentrated on financial capital. This was reflected in real estate—big buildings on big grids occupied by big, finance-related tenants. The globalisation of capital was reflected in premier, world-class cities—London, New York, Tokyo, Shanghai and Hong Kong.

Out of this legacy of car-dominated, high-cost, sometimes congested and increasingly difficult-to-live-in fourth age cities, we have seen the rise of the digital, or fifth-age, city. This is especially true given the impact that COVID-19 has had on societies and the acceleration of trends and adoption of technologies that were already starting to take form.

When a handheld device can provide access to everything everywhere, and people no longer have to be in a particular place to live, work and play, authentic, real-world experiences and face-to-face encounters become more valuable. Active, vibrant, mixed streets enable spontaneous encounters and create successful relationships. Good city neighbourhoods have a social, as well as an economic, value.

In fifth-age smart cities, citizens share data (smartphones), homes (Airbnb) and workspaces (co-working). These citizens are skilled, scarce and globally



footloose, so employers are attracted by the cities that attract them. Employers follow the talent, not the other way around, with good city neighbourhoods with a vibrant local street scene coming at a premium.

The preference for urban ‘live-work-play-stay-make’ accommodations have had an impact on real estate and its investment attractiveness. Investment in ‘multifamily’ rental housing is rising as younger generations prefer to rent affordable homes in attractive urban centres.

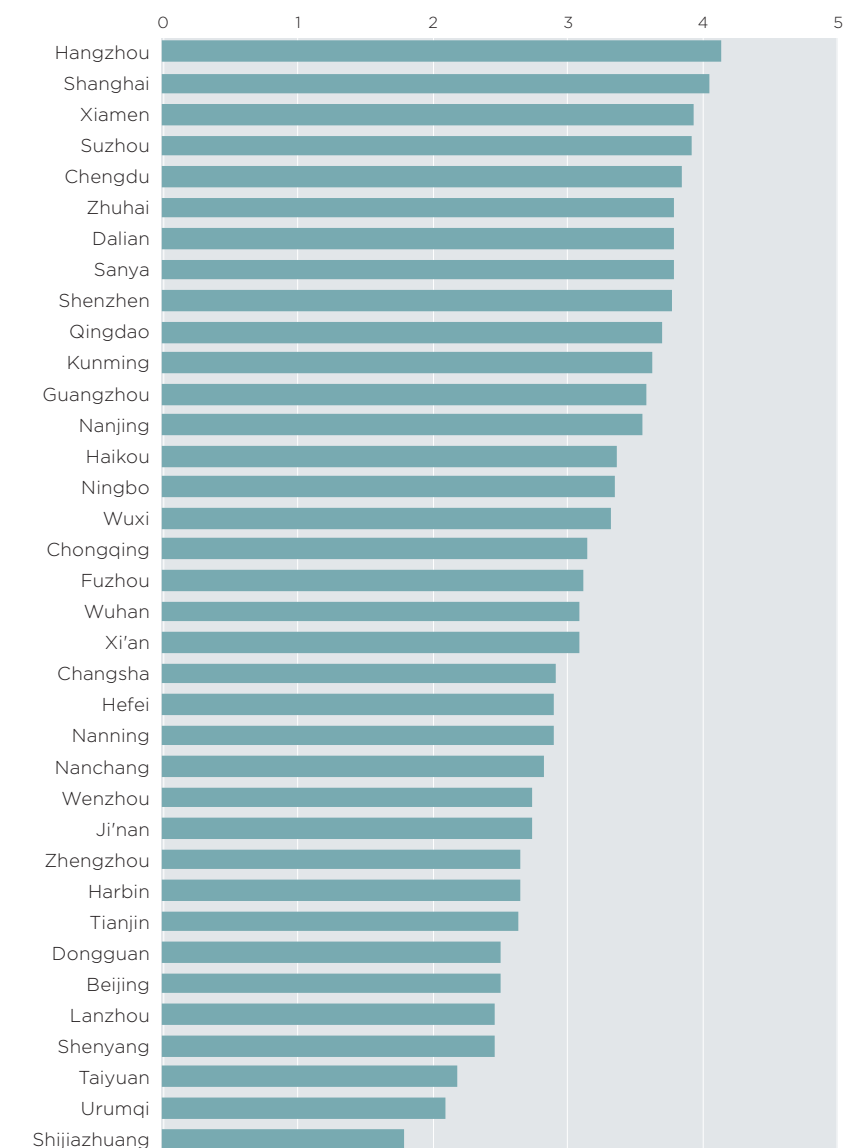
New developments work best when they are connected to the cultural, commercial and leisure hubs of the city. Appropriate and well-managed regeneration can rehabilitate local economies and create a greater social and property mix. New waves of residents, workers and employers create significant value and opportunities for locals as well as investors prepared to back appropriate regeneration and refurbishment of old buildings.

Outlying but accessible towns and cities with the right streetscape and urban fabric are attracting young, creative workers unable to compete for high-price space in big cities. Investors could do well to look more closely at these cities which, although small, offer unique and attractive urban experiences. These could be European capital cities such as Dublin, Amsterdam, Stockholm and Copenhagen or smaller non-capital cities such as Nashville, Austin and Portland in the US, Parramatta and Hobart in Australia, and Glasgow and Manchester in the UK. In China, this might translate to second-tier cities such as Hangzhou, Nanjing and Chengdu, or smaller cities such as Xiamen, Guilin, Zhuhai and Sanya.

Fifth-age cities are dispersed and multi-centred. They make it logical for real-estate investors to view hitherto secondary, even tertiary, locations as lower risk than previous.

Investing in flexible, multi-function buildings on good streetscapes in rising neighbourhoods may make more sense than some conventional asset classes. ■

FIGURE: City liveability index, 2015



Source ULI; Savills Research

Ease of doing business

Overcoming businesses' pain points

There are many obstacles / issues that businesses face, and they will vary depending upon the nationality, industry segment and size of the company. Some issues are possible to overcome—others may be more intractable. In most surveys carried out in recent years by think tanks or Chambers of Commerce, there is a consensus that there has been significant improvement in the business environment, though this progress varies by industries or geographical regions.

Some of the common issues still faced by businesses fall into five broad

categories (see Table on the right page).

While talent attraction policies, house purchase permits and tax incentives may be able to attract individuals and companies to relocate to a particular location, only the right type of business environment will enable them to flourish, grow and create the right jobs and career opportunities that enable businesses to make sizeable, long-term commitments and allow families to put down roots.

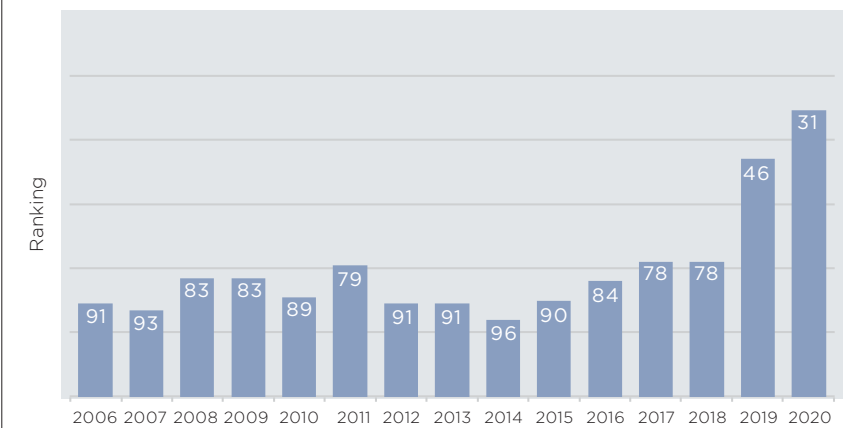
While it may not be in the power of local authorities to affect change with

regards to some or all these issues, an awareness and an open and frank dialogue with businesses to understand the issues that they are facing are equally important.

China came the 31st out of 190 countries in 2020 for ease of doing business. China was particularly strong with regards to the ease and speed of contract enforcement and access to electricity, though accessing credit and tax payments were challenging for businesses. China ranks behind several upper-middle-income economies, though ahead of many high-income countries such as France and Italy.





China has made significant improvements over the years and moved steadily up the rankings from 96th place in 2014 to 31st place in 2020. In 2015, the national reform initiative looked to delegate power, streamline administration and optimise government services. In later years, China implemented a unified negative list system for market access across the country and introduced the Foreign Investment Law in early 2020. While China is looking to develop the Dual Circulation strategy, by which to protect itself from external shocks, it still sees international firms playing a significant and critical role in the

FIGURE: China's global ranking



Source World Bank; Savills Research

TABLE: Common issues faced by businesses

	Market	<ul style="list-style-type: none"> Increasing costs Slowing growth Rising uncertainty
	Intellectual property	<ul style="list-style-type: none"> Intellectual property rights protection R&D capacity
	Level-playing field	<ul style="list-style-type: none"> Market access restrictions Unfair treatment Biased arbitration
	Consistency	<ul style="list-style-type: none"> Regulatory transparency Consistent implementation
	Information	<ul style="list-style-type: none"> Data security Data access

development of the Chinese economy. Authorities are continuing to open access to financial firms, while also encouraging renewed foreign direct investment; they are also looking to encourage banks to lend to SMEs with

the corporate credit score systems expected to give financial institutions greater confidence in reduced counterparty risk, while also clarifying corporate and personal bankruptcy procedures. ■



Education

Workforce training, industry partnerships and company creation

Higher education and industry share a symbiotic relationship, especially in new economy industries that will increasingly drive future growth. The wider economy benefits from university research—innovation drives investment, both locally and globally, to promote exports and ensure the economy is more balanced.

Higher education institutions produce graduates who are eventually absorbed into industry while research work in universities is often taken up by industry and turned into commercial products and services. Often industry concerns will help to focus research and identify new research topics.

Industry, on the other hand, looks to academia for solutions to their problems while tailoring their courses to turn out graduates whose skillsets are aligned with industry requirements.

Knowledge economy
Knowledge creation has been identified by economists as a key driver of economic growth. This is largely due to greater efficiency. Highly-skilled staff requires less supervision, are more productive and add greater value.

A knowledge-based economy is characterised by dependence on a highly-skilled, well-educated and technically-minded workforce. It makes use of advancements in technology alongside intellectual capital to move away from material consumption and aim towards an economy built on knowledge and data.

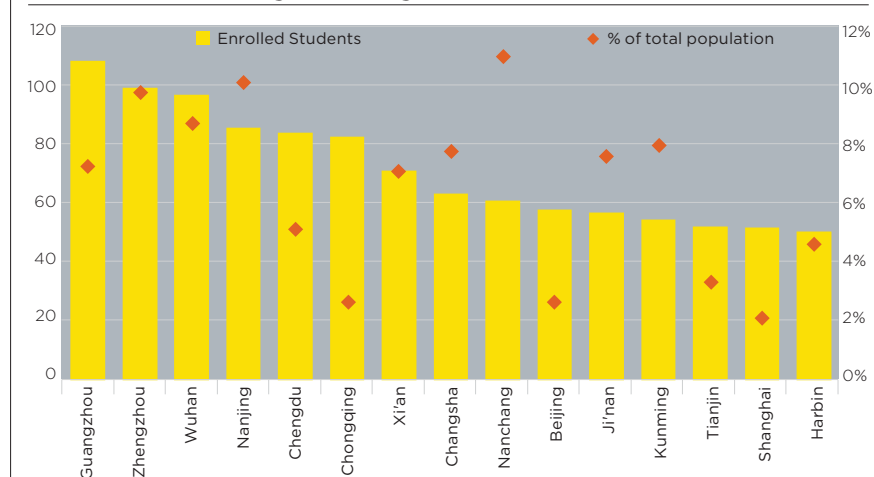
Graduates with the rights skills
Collaboration between academia and industry can ensure that training programs include the needs of industry with technological and workplace skills taught adjacent to an academic curriculum. Universities should be proactive in arranging opportunities for current students to develop industrial expertise through work experience and internships.

Industry collaboration
Through collaborations with industry, universities can receive increased funding to set up laboratories and provide guest faculty and placement opportunities.

Industry can utilise higher education resources to reduce early-stage research expenditure while still having access to cutting-edge research. Alternatively, many ideas from research in universities are used through collaboration between universities and firms.

Universities tend to prefer long-term collaboration over one-off contracts to reduce the lengthy period of negotiation that would otherwise preface each research project. Imperial College London works in partnership with more than 500 companies and has

FIGURE: Number of regular undergraduates



Source: Local Municipal Bureau of Statistics; Savills Research

corporate partnerships and processes in place to manage all aspects of relationships including IP and technology transfer.

Keeping universities at the cutting edge

Universities may face brain-drain if they do not proactively collaborate with industry as pay in the education sector is comparatively low. The transfer of brainpower has critical long-term ramifications for universities as it narrows the pipeline of those who can teach the next generation.

Open source and “blue skies academics”, being relatively impartial to commercial interests, can bring together experts to discuss state-of-the-art projects and potential research agendas in a way that commercial enterprises cannot. Industry is also often willing to sponsor academic research that is more futuristic than the shorter-term, commercially-minded, in-house research that industry supports.

University spin-offs, early-stage venture capital firms and technology transfer offices

Universities not only collaborate can

often invent technologies that have commercial value, through their blue-sky research, that can either be licenced out through university technology transfer offices or spun off into start-ups, often with the assistance of venture capital firms. This, as well as the industry collaboration, have the added benefit of keeping recent graduates in the same city and having them become active contributors to the local community rather than losing them to a bigger city.

Real estate implications

It’s helpful for universities and their collaborative partners in industry to be geographically close to create research hubs that attract the best academics and industrial investment. International examples of collaboration between academia and industry include Stanford University and Silicon Valley. In China, Tongji University recently signed an agreement with Jiading to build the National Science and Technology Park of Tongji University, aiming to achieve a long-term development in new-energy and intelligent vehicles, smart manufacturing, intelligent travel, intelligent networks and intelligent health care industries. ■

Urban redevelopment

Reimagining urban cores

The concept of urban redevelopment means different things to different people, though typically includes the demolition of existing premises for new construction, renovation and improvement of an existing structure or the preservation of a historical edifice. Urban redevelopment is a combination of all of the above, employed in order to meet planning requirements and the owner's financial considerations. Given the often-challenging nature of urban redevelopment resulting from multi-party coordination (governments, residents and other key stakeholders) as well as the long project return cycle, only developers with strong financial backing and development capabilities tend to take on these projects.

After decades of rapid growth, which saw new real estate completions peak in 2014 at 1.1 billion sq m, and with demand from urbanisation (standing at 60% in 2020) starting to slow, cities have shifted their attention to the redevelopment of their urban cores and

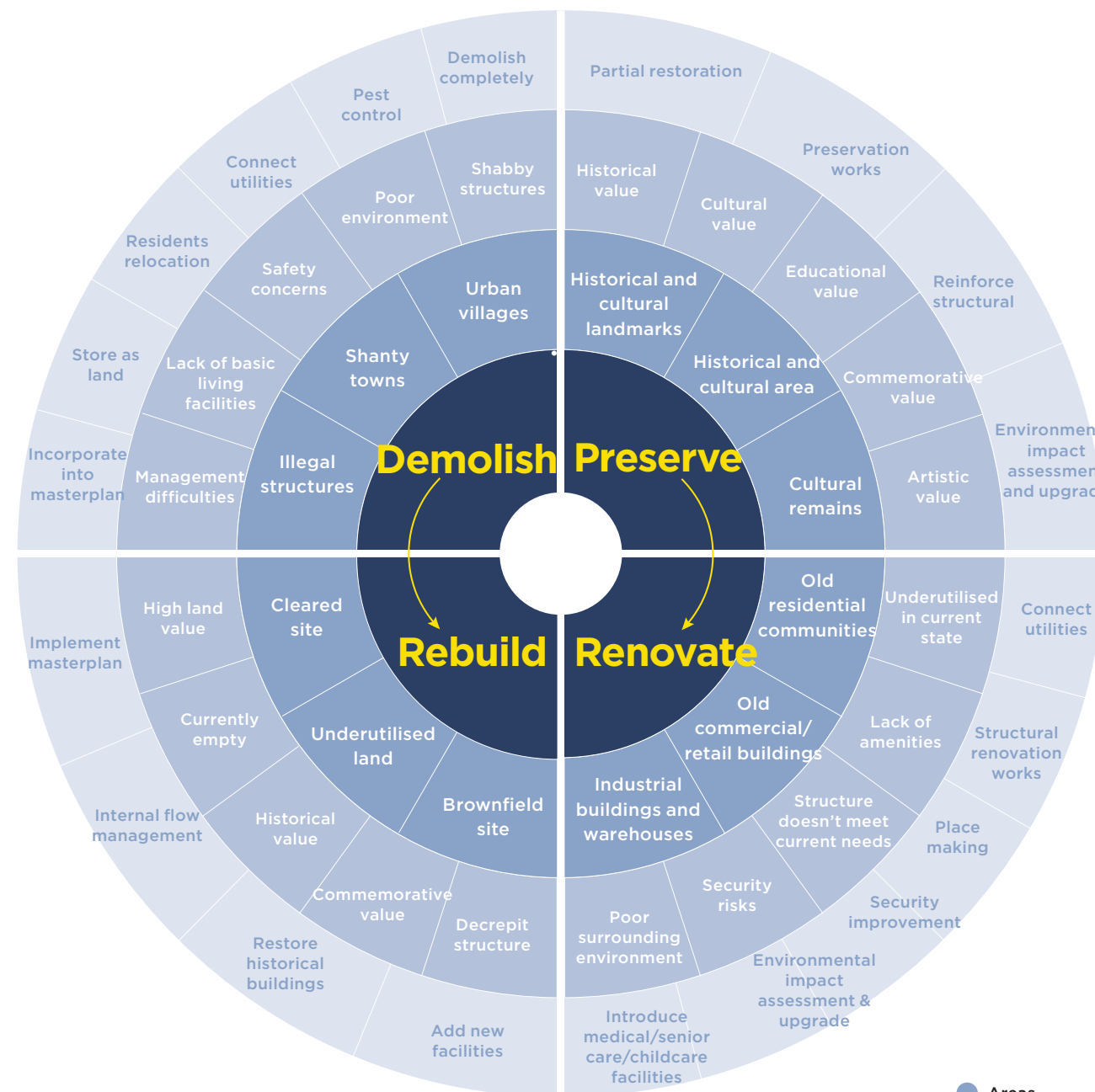
raising or repurposing existing stock. First-and second-tier cities also envisage only moderate increases in their total construction land, forcing land planners to improve the efficiency of existing stock. While sometimes more challenging and with longer development cycles, urban redevelopment projects can be assured a reasonably good market reception after completion given the relative mature business environment of the surrounding locations and established municipal facilities.

More leading developers are exploring opportunities in the urban redevelopment market with 47% of the top 100 listed developers currently engaged in one or more projects; that figure increases to 61% with the top 50 developers. It is not just developers, either, with a number of other property services providers heeding the call from the government and sensing the commercial opportunities that urban redevelopment represents. In 2020, the

State Council officially issued guidelines for promoting the renovation of old urban residential communities, outlining framework, financing and responsible departments. The plan for 2020 is to renovate 39,000 old urban residential communities, comprising 7 million households and covers approximately 3 billion sq m. This represents a tremendous opportunity for property management companies capable of providing the required expertise.

While some cities are just starting down the urban redevelopment path, others, especially in the more mature first-tier cities of Beijing, Shanghai, Guangzhou and Shenzhen, are seeing urban redevelopment and preservation as a primary strategy for new projects. While planning approval and policy support may be more forthcoming in these cities and are still prerequisites for development, many technical challenges and fundraising, design, planning, construction and operating obstacles remain. For those that are able to successfully execute these developments, however, not only are there significant economic benefits but also the opportunity to rebrand or change their corporate image through value added to the local community.

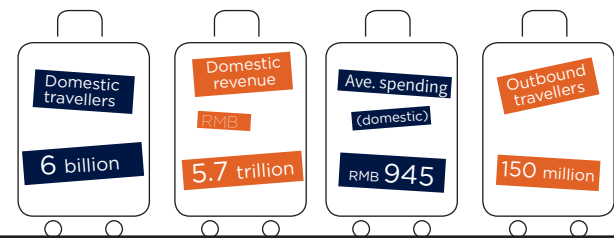
Historical architecture and cityscapes are full of memories and bear witness to changing times. The unique culture and heritage value are increasingly recognised as having very real economic and social value. As some of the structures enter their twilight years and their usefulness diminishes, we must consider how to protect and incorporate these structures into modern developments and breathe new life into these historical gems. ■



- Areas
- Status
- Approach



China's tourism in 2019



Tourism

Driving domestic consumption and job creation

Tourism is a vital part of any nation's economy. According to the World Travel & Tourism Council, tourism accounted for 330 million jobs worldwide and generated \$8.9 trillion, or 10.3%, to global GDP. China's tourism and culture sector directly employed 5.2 million individuals in 350,500 companies in 2019, with the tourism sector directly generating revenues of RMB6.6 trillion (RMB5.7 trillion of which is from domestic tourism), equivalent to 6.7% of GDP.

Tourism has a significant flow-on effect for a region's economic prosperity, reaching into many other sectors, such as construction, manufacturing and IT services. It has been estimated that every job in the core tourism sector creates about 1.5 additional or indirect jobs in the tourism-related economy.

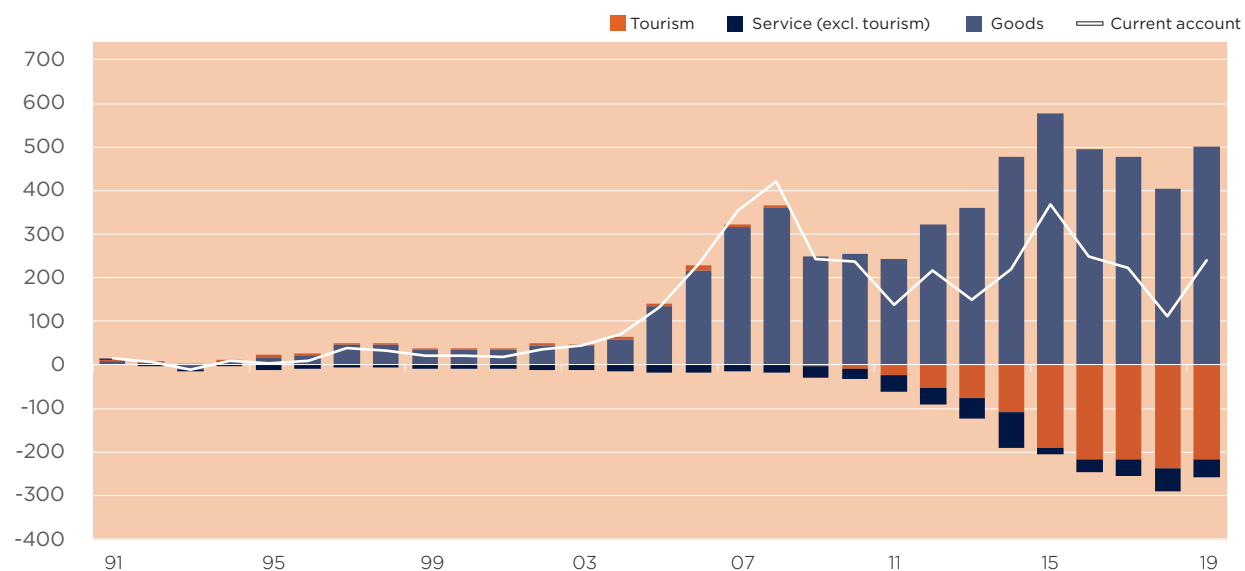
Employment opportunities are often suitable for lower-skilled workers and are often created in less-developed areas where other industries and gainful employment are scarce.

China's tourism industry benefits from a large domestic population with more disposable income. While some may explore overseas markets (154 million trips in 2019), many enjoy the convenience, affordability and familiarity of travelling domestically, especially as more duty-free facilities pop up around in the country. In particular, Hainan's promotion of duty-free shops has proven to be wildly popular with duty-free sales in July 2020 increasing 234% YoY. China has a large landmass with a diverse range of climates and topographies, as well as regional cuisines, customs and dialects

to explore. Infrastructure improvements and new policy initiatives have also opened up parts of the country, making them much more accessible than in the past.

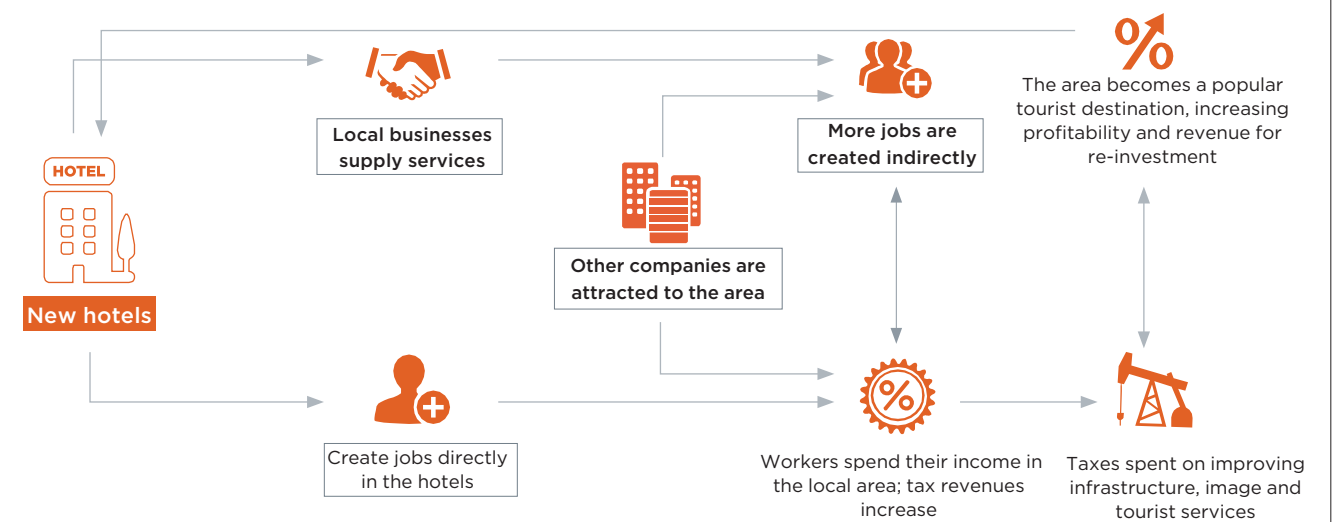
Tourism and hospitality are still recovering from the impact of COVID-19. Cities around the country have rolled out preferential policies to help support the flagging tourism sector—including Wuhan, which offered RMB80 million worth of vouchers for cultural and tourist sites, and Beijing which offered RMB50 million to promote its cultural industry. There are steps the government can take to improve the policy environment, but what are the trends that industry and local economies can capitalise on to improve the tourism industry and the overall economy?

FIGURE: China's current account



Source: State Administration of Foreign Exchange; Savills Research

FIGURE: Tourism multiplier effect



How can a destination attract tourists?

Many locations around China are finding it difficult to differentiate themselves in an increasingly competitive landscape. The key is working with the tools and resources available to become the best they can be given their circumstances.

Culture

In Xizhou, Dali, Yunnan, a boutique hotel and cultural exchange called the Linden Centre resides in a traditional Bai ethnic group styled courtyard home built in 1948. The hotel has been renovated with strict detail afforded to local culture and history and stands as a testament to sustainable hospitality. With China's wealth of cultural history and numerous minority ethnic groups, many far-flung locations in China can utilise their unique cultural aspects to bring in tourists and build up the local economy. Many across China are looking for ways to incorporate local traditions and culture into sustainable ventures. Moganshan in Zhejiang is a giant lure for tourists thanks to its historical sites integrated into lush, winding mountain paths. The tourism infrastructure plays to the area's history as a summer retreat for Shanghai's 20th-century urban elite, and many old inns and villas remain.

Staycations

One of the wide-reaching ramifications of COVID-19 has been the dramatic

shortening of trip lengths across China. This has led to a further increase in 'staycations', especially in many satellite cities surrounding the mega-metropolises in China. Especially with the integration of regions like the Greater Bay Area and the Yangtze River Delta, travel within these regions is easier than ever, and staycations are proving popular as another way to boost local consumption. Destination hotels like the InterContinental Shanghai Wonderland, built into an abandoned quarry, and Alila Yangshuo, a former sugar mill near Guilin, are popular for nearby visitors thanks to their easy access and unique settings. These types of hospitality properties are great ways for smaller, more rural destinations on the periphery of major cities to boost their local economies.

Theme parks/experiential tourism

Built in 2016, Disney's first mainland China theme park in Shanghai set off an increase in international theme parks in China, with famous entertainment companies like Lionsgate Entertainment (Zhuhai, 2019), Universal Studios (Beijing, 2021), and Legoland (Shanghai, 2023) all having or planning a presence in China. In non-COVID times, these theme parks will also serve as a beacon for international travellers as well as drawing in regional travellers in much the same way as Disneyland Paris does

for Europe. Big cities in China, with strong infrastructure capabilities, can bolster their domestic and international tourist reputation with these large theme parks, not to mention the benefits stemming from tourist spending and taxes provided by these large draws.

Outlook

Tourism is a vital pillar in achieving Xi Jinping's push to eradicate poverty in China. The overwhelming proportion of poverty exists in rural areas of the country and moving tourism to farther-flung places could support the "internal circulation" aspect of the Dual Circulation policy put forth in early 2020. A significant amount of money flows out of China due to international tourism (in 2018, for example, outbound tourism spending for China totalled USD277 billion, nearly double the scale of the next largest – the US) and, if that money can be diverted inwards, then that can lift many of these places out of poverty where few other industries could.

China has a wealth of natural and cultural assets to help propel its vision. With new trends appearing, growing disposable income and improving infrastructure, more Chinese travellers will explore their country, and China can utilise that interest to develop areas that need it the most. ■

As the economic, social and health impacts of unconstrained industrialisation become more apparent and the consequences of climate change are better understood, the know-how and technology to improve our environment are of paramount importance.

We need to ensure that the impact of human activity on the environment is minimised and possible to be reversed. The built environment has a large part to play in this by building greener buildings from more sustainably-sourced materials which require less energy to run and produce less waste as well as designing cities that rely less on private vehicles, encouraging public transportation and increasing walkability. The built environment should also ensure a better environment for the occupants or users of a building, ensuring indoor air quality, natural sunlight, human-centric design to name but a few.

While society should take every step possible to reduce climate change, the ball has already been set in motion, and the likelihood and frequency of extreme weather events, natural disasters, water crises and pandemics will continue to rise, and the impact on society and economy will continue to grow. Governments and societies need to prepare themselves for a more uncertain future by building resilience into the design and structure of buildings, cities and economies.



Environment A healthier tomorrow

Green Buildings

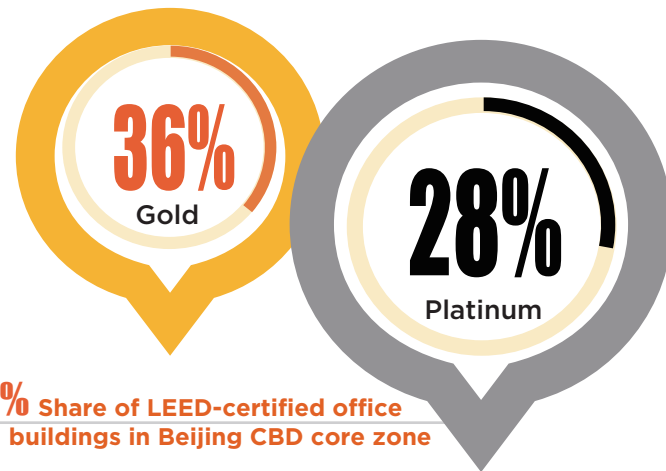
From nice-to-have to must-have



Words
Jing Wang
Director, North Asia, USGBC

The *Special Report on Global Warming of 1.5°C*, released by UN IPCC in 2018, proposed the 1.5°C temperature rise target to avoid irreversible extreme events. To achieve that goal, the world needs to reach net zero emissions by 2050, which requires rapid and far-reaching changes in construction, agriculture, energy and cities among others. The real estate industry not only has to assume the great responsibility to reform, but also faces multiple risks caused by climate change. A 2018 report by Geophy and Four Twenty Seven found that, of more than 73,500 properties managed by 321 listed REITs worldwide, 35% of the properties are under the threat of climate disasters. The assets in Hong Kong and Singapore display the highest exposure to rising sea levels.

According to the UNEP, building construction and operation account for 40% of carbon emission globally. The huge potential for carbon reduction from buildings makes it an important solution for climate change. Over 100 companies, institutions and cities, including Goldman Sachs, Grosvenor, Lendlease, London, Paris and Tokyo, have joined the Advancing Net Zero by World Green Building Council, making commitments that all new buildings



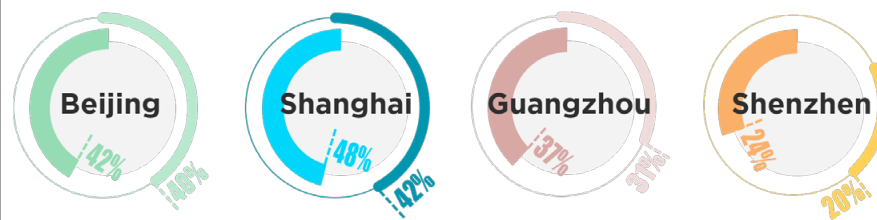
Note Beijing CBD is located in the core area of Chaoyang District, Beijing. It is one of the city's high-end core industrial functional areas. It spans from Dongdaqiao Road in the west to East Fourth Ring Road in the east, covering an total site area of 7 square kilometres. It offers a diversity of assets and resources, including Grade A office buildings, luxury hotels, high-end apartments, foreign embassies, multinational company headquarters and other enterprises, international organisations, and commerce chambers.

will achieve net-zero carbons by 2030 and all existed buildings will be net-zero carbons by 2050. Green buildings are more than simply a tag or differentiator for project owners, but essential consideration for sustainable development. More forward-looking developers include green buildings as a part of their sustainability strategy, echoing to social expectations through the triple bottom line.

Change drivers for green buildings
Taking LEED as an example. LEED was first introduced in China nearly 20 years ago through certifying office

interior design at foreign companies. Some office landlords have started to realise that LEED-certified buildings help attract quality MNC tenants, while some local governments have also encouraged new buildings to get LEED certification due to environmental requirements or investment promotion, resulting in enhancement of building quality in the region. The landlords' efforts and the government policies have both contributed to the improvement of building codes as the building economy thrives.

FIGURE: Share of LEED-certified offices in first-tier cities



Note Inner ring refers to area, outer ring refers to number of offices
Source USGBC

Take the Beijing CBD core area for example. Its planning guidelines require all land plots to meet the green building standards, and it is the first area in China led by the government and developed by multiple landlords to achieve LEED Neighbourhood Development (Gold Certified). Chaoyang district, where CBD core zone is located, included LEED Certification into its green building initiative in 2015. By mid-2020, Beijing CBD has a total of 25 Grade A offices, 16 of which have achieved LEED certification, which makes Beijing's CBD one of the most "green" CBDs in the world.

The findings of multiple research papers in recent years have shown that, compared to non-LEED office buildings, LEED-certified projects usually enjoy a premium on both rental and price levels in China's first- and major second-tier cities. Economic benefits to landlords have convinced more project owners to apply for LEED certification. Beijing, Shanghai, Guangzhou and Shenzhen are leading the application of LEED projects, with Shanghai saw highest percentage of LEED-certified offices accounting for 42% of the total number of Grade A office buildings. Not only are new projects or those under development

seeing LEED certification as a must-have but the number of existing projects that registered LEED is also growing significantly. Sustainability has already become a key concept for project development and daily operation, and existing buildings are increasingly playing a major role in the go-green campaign of office buildings.

Green financing
Since 2016, green financing tools, such as green bonds and sustainability-linked loans, have started to gain momentum in the real estate sector. More investors and developers, including Link, Swire, Hung Lung Properties, Modern Land, and Longfor, are seeking green financing, and the scale of LEED-certified buildings is regarded as a key metric to count their green achievements. For instance, green financing accounts for about 25% of Link REIT's overall financing and will potentially take up a majority share in its debt portfolio. According to Link's green finance framework, all properties under development or in operation shall have obtained or be about to receive the LEED or Hong Kong BEAM certification.

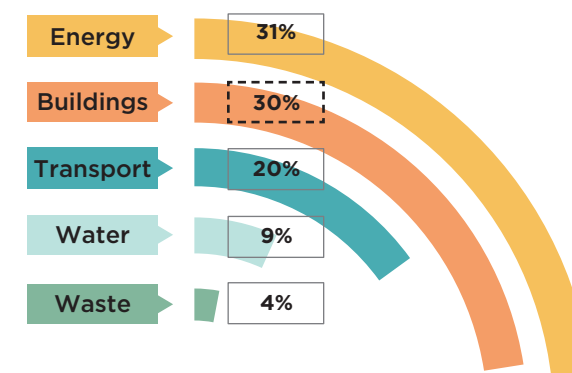
The reason behind the drive of green finance is a growing call for green reform in the financial sector

as responsible investment gains popularity. Participants of sustainable finance are expanding from institutional investors such as pension funds and sovereign funds to insurance companies and private funds. Since the European Investment Bank issued the first green bond in 2007, total green bond issuance globally has exceeded USD250 billion by the end of 2019. Although green bonds only accounted for 5% of global bond value, the potential of sustainable finance is manifested through its fast-growing scale and maturity of relevant regulations.

Buildings are the second-largest placement of global green bonds, only after the energy sector. According to the Climate Bond Initiative, 30% of global green bonds issued in 2019 are directed to low carbon buildings. As the largest green bond issuer, Fannie Mae issued USD18.7 billion to support the construction sector. Others, such as the French government and Dutch State Treasury Agency, have also actively supported building upgrades.

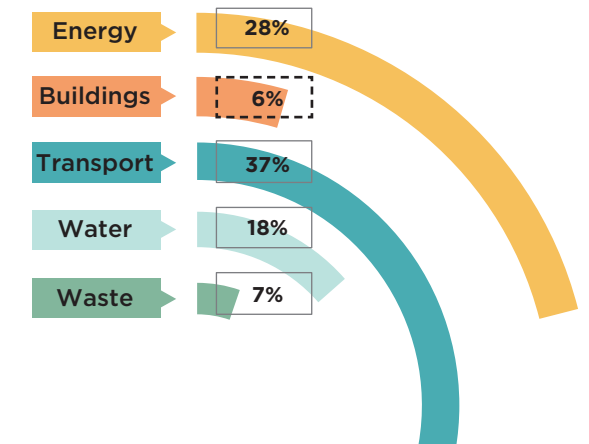
Compared to Hong Kong, where 61% of green bonds are used in buildings, the percentage for Mainland China is 6%. However, the scale of existed buildings and the status of green bond

FIGURE: Utilisation of green bond issued worldwide in 2019



Source Climate Bonds Initiative; USGBC

Utilisation of green bond issued in Mainland China



issuance makes Mainland China a key focus for the future.

Concerns from investors have also urged companies to take serious measures to implement sustainable development. The capital market tends to require more disclosure of ESG (Environmental, Social, and Governance) issues of companies. In 2015, HKEX first published an ESG Reporting Guide, which requires listed companies to disclose ESG performance under the framework and indicators of HKEX. The “comply or explain” provisions require issuers to state in their annual reports or ESG reports whether they have complied with the guidelines set out in the guideline for the relevant financial year and, if they have not, they must give considered reasons in their ESG reports. In 2019, ESG Guide were further amended to improve ESG governance and disclosure. Real estate is one of Hong Kong’s pillar industries. Many large domestic developers, such as China Resources and China Overseas, have been listed in HKEX, which means green buildings will play an important role as a part of their ESG performances.

Green expansion

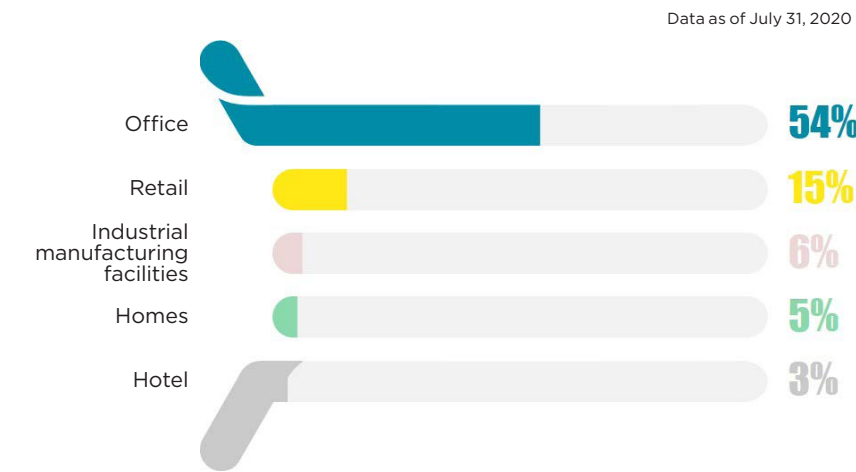
Of all types of LEED-certified buildings, offices account for the largest share in both China and worldwide. In recent years, niche assets such as logistics and data centres are also moving towards green and sustainable as more investors entering the sector. With more companies starting to understand the importance of sustainable development and care about carbon emission during the full life cycle, buildings on the whole supply chain—from the factory to warehouse to retail and service space—will all contribute to a more sustainable business model.

Driven by demand from both investors and end-users, the types of LEED-certified buildings are more diversified than ever before. Among the LEED-registered projects in China in 2019, retail spaces and warehouses saw a significant increase in the market share. Now, different types of buildings

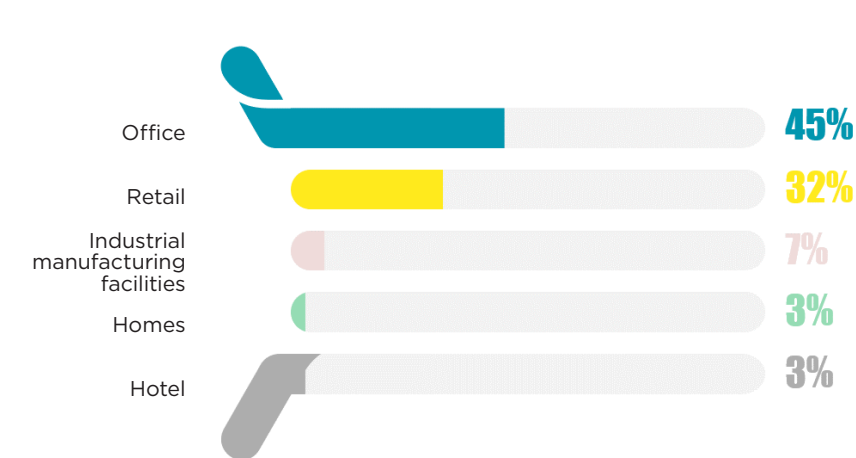
can comply with a variety of standards. With green buildings expanding to more cities around China, it not only brings a safe and healthy environment to the people but also brings more economic and social benefits to the communities. ■

FIGURE: Types of LEED-certified buildings in China

Share of LEED-certified buildings in China, by type (Top 5)



Share of LEED-certified buildings in China in 2019, by type (Top 5)



Source USGBC



Savills case study: LIPPO Plaza

Lippo Plaza, one of the earliest Grade A office buildings in Shanghai, has successfully achieved LEED v4 O+M: Existing Buildings certification in Gold Level, advised by Savills.

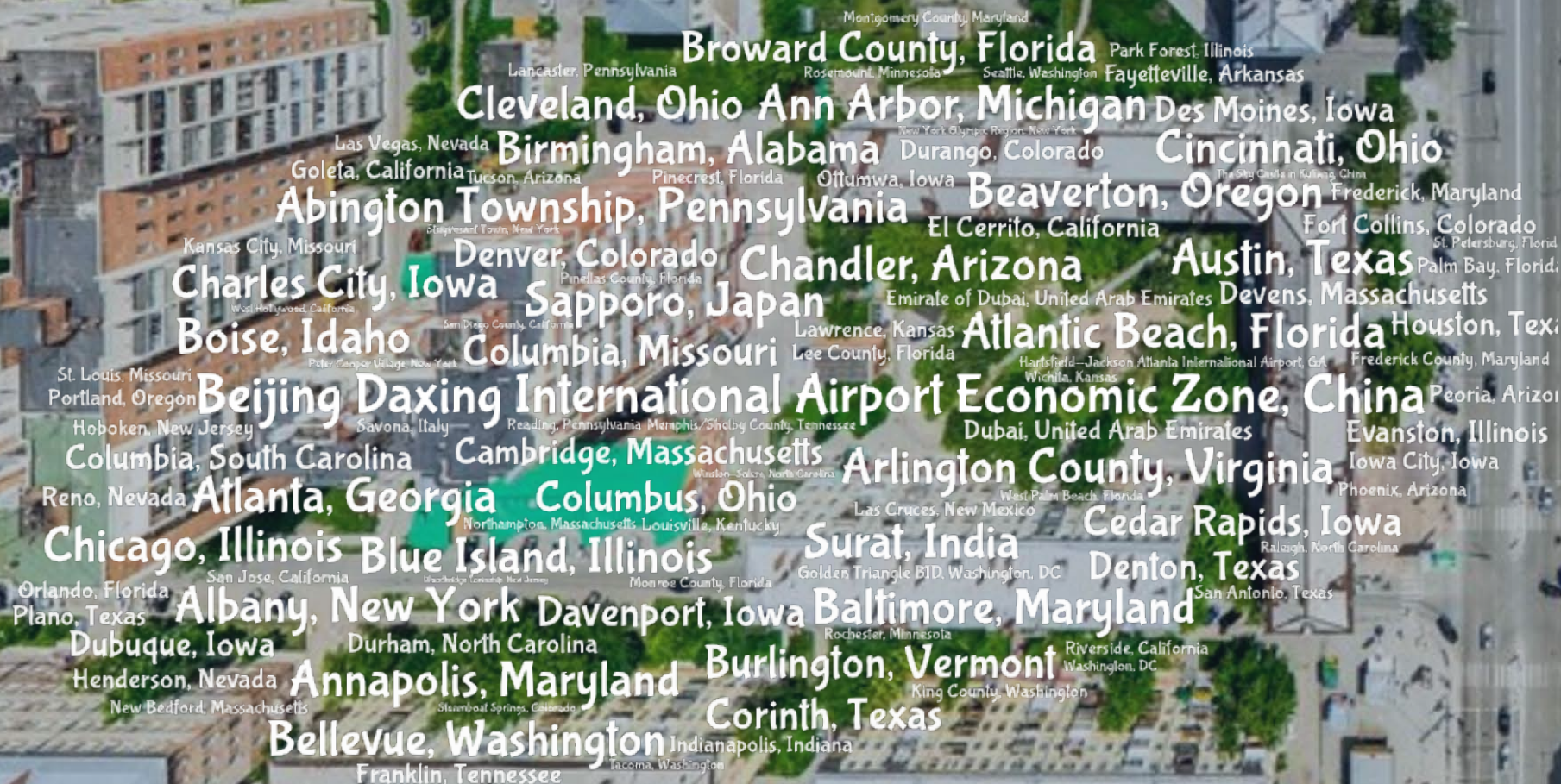
With a guideline of environmental protection and cost control, Lippo Plaza is optimising energy consumption and fulfilling its social responsibility through a series of active measures such as upgrading

air-conditioning and electrical equipment that was previously energy inefficient.

Other key measures include upgrading its fresh-air filtering system, optimising water-saving sanitation, category management of solid waste and regulating the process of pest management. The building saw its energy consumption decrease around 10% and indoor air

quality improve around 15% after renovations.

During the LEED certification process, the owner obtained a better understanding of its strengths and progress through communication with tenants. Tenants expressed increasing satisfaction with management services and greater convenience after internal circulation improvement.



More than 110 cities and communities around the world have received LEED certification, including Beijing Daxing International Airport Economic Zone (the Beijing part), and Culture Town in Guling of Fuzhou, Fujian; Sutra in India, Sapporo in Japan, and Dubai in UAE. In addition, Chongli Taizicheng Resort in Zhangjiakou, China, Vanke Wonderland in Hangzhou, and Beijing Modern Times have all obtained LEED pre-certification.

Beyond buildings

A human-centric approach



Words
Jing Wang
Director, North Asia, USGBC

People spend 90% of their time in buildings. The way a building is designed, constructed and operated has an impact on the environment and people's wellbeing. Green buildings have traditionally been associated with energy saving and environmental protection, but the concept of green buildings has evolved to a much broader definition, with a greater focus on its influence on people, its interaction with communities and urban areas and how buildings can promote the sustainable development of society. Green buildings should be able to contribute to a better life through better design, construction, operation and use of buildings.

Health and wellness

Despite a traditional focus on “energy saving and environmental protection”, most established green building certifications, be it LEED or China's Three Star system, look at indicators that are clearly related to people's health and wellbeing — indoor air quality, natural lighting, use of harmless materials, and the design and usage of outdoor space and green plants, to name a few. Using LEED 4.1 as an example, indicators related to the health and wellbeing of building occupants or surrounding communities account for at least two-thirds of the total score. In recent years, multiple systems have emerged that focus on user experience and facility environment, such as China's healthy building evaluation standards, WELL and Fitwel, as an active response to rising concerns about public health.

The public's health awareness has been increasing, from “a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity” as defined by the World Health Organization (WHO) in 1948, to “One Health” that recognises the interconnection between people, animals, plants and their shared environment. The outbreak of COVID-19 has made it clear that the quality of life is not entirely up to individuals but also depends on local governance and the way society operates.

For developers and corporate tenants, investing in healthy buildings/office spaces has always been an important consideration for attracting tenants and talents. At post-epidemic times, it is more essential than ever to improve the health and wellbeing of occupants.

There have been discussions on “future buildings” and how to enhance building resilience so that occupants can carry on communication and cooperation while following social distancing measures during epidemic outbreaks like COVID-19.

At the same time, health considerations should be forward-looking rather than

dwelling on the superficial “human experience”. Take waste management, which is included in many green building certifications, as an example. Many cities have put waste classification on the agenda, which has meant new challenges of property management. In fact, waste reduction in any form — reducing harmful gases/substances produced by waste

incineration and landfills or reducing microplastics that flow into the ocean — will have a direct and profound positive impact on people's health. The underlying idea of healthy buildings should be a comprehensive consideration of factors affecting health and wellbeing and systematic improvement of property management to influence tenant behaviour.

From Buildings to Cities

From complexes to transportation-oriented developments to “speciality towns”, the role of developers has gradually expanded from the single building development and operation to community development, operation and management. Many forward-looking developers have started to reposition themselves as “urban operators” with a services-oriented strategy. The people-centric approach will undoubtedly have more important implications for community buildings. LEED for Cities and Communities, established in 2016, differentiate from LEED Green Building Certification in that they also measure

overall governance, social performance and the quality of life at a citywide or community level.

While buildings define the physical height of a city, the “textures” of urban life, including public space, educational facilities, green space, roads and transportation, define the happiness of urban residents. As the concept of sustainability prevails, broader standards have emerged for respective urban textures, such as Parksmart that advocates sustainable parking structures, SITES that promote sustainable landscapes and the TRUE program for

zero waste certification. A city can only become sustainable when sustainability is recognised and practised in every aspect of urban life.

The concepts of resilience, health, fairness and greenness have painted a desirable vision of sustainable cities. As the risk of climate change lingers, “black swan” events like COVID-19 may occur more frequently. Developers that reposition themselves as urban operators need to figure out how to help cities handle such crises and operate in a more sustainable way to alleviate the impact. ■

From risk to resilience

The adaptive approach to urban development

ARUP Words Dr. Allen Sun, Associate Director and China Risk & Resilience Leader, Arup
Jo da Silva, Director, Arup International Development Leader

Why urban resilience?

Ten years ago, no one was talking about resilience, and now everyone is. Why?

- The number of people is increasing and where they live is creating massive demands on infrastructure.
- More people live in cities than ever before.
- More people rely on urban systems than ever before to meet their daily needs.
- We are increasingly dependent on global markets and systems.
- Our planet is under stress from an increasing population and patterns of consumption.
- We are only beginning to see the impact of climate change.

Urban populations are facing increasing challenges from numerous natural and human-made pressures such as rapid urbanisation, climate change, terrorism and increased risks from natural hazards. Cities must learn to adapt and thrive in the face of these diverse challenges—they must learn how to build resilience in an uncertain world. Armed with this knowledge, governments, donors, investors, policymakers and the private sector will be able to develop effective strategies to foster more resilient cities.

What is urban resilience?

City resilience describes the capacity of cities to function so that the people living and working in cities—particularly the poor and vulnerable—survive and thrive no matter what stresses or shocks they encounter. Resilience is a term that emerged from ecology to describe the capacity of a system to maintain or recover functionality in the event of disruption.

It applies to cities because they are complex systems that are constantly adapting to changing circumstances. The notion of a resilient city becomes conceptually relevant when chronic stresses or sudden shocks threaten widespread disruption or the collapse of physical or social systems. The conceptual limitation of resilience is that it does not necessarily account for the power dynamics that are inherent in the way cities function and cope with disruptions.

In the context of cities, resilience has helped bridge the gap between disaster risk reduction and climate change adaptation. It moves away from traditional disaster risk management, which is founded on risk assessments that relate to specific hazards. Instead, it accepts the possibility that a wide range of disruptive events may occur but are not necessarily predictable. Resilience focuses on enhancing the performance of a system in the face of multiple hazards, rather than preventing or mitigating the loss of assets due to specific events.

Compared to disaster prevention, resilience has unique features as below:

- The ability of complex systems to respond to sudden shocks or chronic stresses.
- The ability of complex systems to function when faced with disruptive circumstances.
- The ability to withstand and recover from chronic stress or extreme events.
- The ability to adapt to changing circumstances and transform if necessary when faced with crises.
- The capacity of cities (individuals, communities, institutions,

businesses and systems) to survive, adapt and thrive no matter what kinds of chronic stresses and acute shocks they experience.

- Resilience describes the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between variables.

A resilient system has seven qualities:

Reflective: Reflective systems accept the inherent and ever-increasing uncertainty and change in today's world. They have mechanisms to continuously evolve and will modify standards or norms based on emerging evidence, rather than seeking permanent solutions based on the status quo.

Robust: Robust systems include well-conceived, constructed and managed physical assets, so that they can withstand the impacts of hazard events without significant damage or loss of function. Robust design anticipates potential failures in systems, making provisions to ensure failure is predictable, safe and not disproportionate to the cause.

Redundant: Redundancy refers to spare capacity purposely created within systems so that they can accommodate disruption, extreme pressures or surges in demand. It includes diversity—the presence of multiple ways to achieve a given need or fulfil a particular function.

Flexible: Flexibility implies that systems can change, evolve and adapt in response to changing circumstances. This may favour decentralised and modular approaches to infrastructure or ecosystem management.

Resourceful: Resourcefulness implies that people and institutions can rapidly find different ways to achieve their goals or meet their needs during a shock or when under stress. Resourcefulness is instrumental to a city's ability to restore the functionality of critical systems, potentially under severely constrained conditions.

Inclusive: Inclusion emphasises the need for broad consultation and engagement of communities, including the most vulnerable groups.

Integrated: Integration and alignment between city systems promotes consistency in decision-making and ensures that all

Arup City Resilience Index



UN's Global Goals for Sustainable Development



Resilience in urban environments
Under the UN's Global Goals for Sustainable Development (see above), resilience underpins almost all the 17 goals, and it is more and more recognised as an approach to adopt the city to the uncertainty future and sustainable development.

The risks associated with a specific hazard may also change over time. To bring the risk under an acceptable level, proper intervention measures or preventions should be adopted in accordance with precautionary approaches, and single intervention applied at the start to manage risk over the whole life. In the framework of resilience, several interventions over time should be adopted to dynamically manage risk.

When encountering to stress or shocks, there are multiple pathways that result in a city's resilient recovery like failure prevention, expediting recovery and transforming performance.

How to scale resilience for cities?
Supported by the Rockefeller Foundation, the City Resilience Index (The Index) is being developed by Arup. The Index has been designed to enable cities to measure and monitor the multiple factors that contribute to their resilience. Its primary purpose is to diagnose strengths and weaknesses and measure relative performance

over time. This provides a holistic articulation of city resilience structured around four dimensions, 12 goals and 52 indicators that are critical for the resilience of our cities. This structure also forms the foundations of the Index, which cities will be able to access and operationalise through the online platform.

Four dimensions
Our research suggests city resilience relates to four key dimensions:

- Health and wellbeing—ensuring the health and wellbeing of everyone living and working in the city;
- Economy and society—the social and financial systems that enable urban populations to live peacefully and act collectively
- Infrastructure and environment—human-made and natural systems that provide critical services, protect and connect urban citizens;
- Leadership and strategy—the need for informed, inclusive, integrated and iterative decision making in our cities.

The Index enables cities to assess and measure their present-day performances and assess their trajectory towards a more resilient future. This is achieved through the assessment and measurement of both qualitative and quantitative information.

Cities can use the Index to identify and understand their trajectories towards resilience by considering what they are currently doing to improve their performance (within each sub-indicator area). As it is generally not possible to quantitatively measure future performance, the Index gathers qualitative data that will help signpost the city's resilience trajectory. This assessment process involves the city contemplating their own performance (including the actions they are undertaking) against each sub-indicator, based on a series of qualitative questions. Cities assign a quantitative score based on guidance that defines what worst and best performance could look like.

Cities can also measure their present-day performance based on quantified data where possible. As resilience is an abstract concept that can only be truly measured following a real-life shock or period of stress, this part of the City Resilience Index is based on proxy measurements within each sub-indicator which indicate how the city is currently performing. This quantitative part of the Index allows cities to establish a baseline, identify aspects of their resilience profile that may need strengthening, compare performance between jurisdictions and track progress over time. ■

Technology

Leading the way

Advances in technology have disrupted industries from media and IT to professional services and the financial sector. The construction and real estate sectors have remained relatively unchanged in recent years. Nevertheless, given the size and importance of the market and its impact on businesses, society and climate change, the sector has gained increased interest from tech firms who see opportunities to increase efficiencies and transparency within what is an incredibly opaque and inefficient market.

Throughout the whole lifecycle of a building—from market research to design and construction to operation and management as well as transaction and renovation—technology will provide increased transparency, modelled simulations that enable refined designs and construction precision and cost savings, through to increased operational efficiencies and more sustainable management, while also enabling more frictionless and equitable transactions.

Adoption of widespread sensors and more autonomous devices will also require the related infrastructure to support such networks from power generation to the 5G networks and the data centres that will be required to crunch the numbers. The technological revolution will bring challenges but also benefits to the real estate and construction markets. Increasing tech adoption is inevitable, and practitioners and stakeholders would be advised not to resist but to embrace the change.

New infrastructure

Driving sustainable city development

ARUP **Words** Dr. Alex Han, Manager of Digital Acceleration Hub, Arup
Andrew Luong, Director, Arup

In 2018, the Central Economic Work Conference proposed to “strengthen the construction of new types of infrastructure such as artificial intelligence, industrial internet and Internet of Things”. This was the first time new infrastructure construction was formally proposed by the central government in China. Since then, the central government has repeatedly mentioned “new infrastructure construction” (herein referred to as “New Infrastructure”) in relevant meetings, and local governments have successively introduced plans related to New Infrastructure.

What is New Infrastructure?

The Department of Innovation and High-Tech Development of the National Development and Reform Commission declared in April 2020 that the New Infrastructure is driven by technological innovation, based on information networks, meets the needs of high-quality development and provides services such as digital transformation, intelligent upgrading, convergence and innovation. At present, it mainly includes three main directions—information, convergence and innovation infrastructure.

As an emerging concept corresponding to traditional infrastructure, there is no consensus on the definition and potential of the New Infrastructure at this stage. A general recognition is that the core content of the New Infrastructure is the new generation of information technology and digital technology infrastructure represented by 5G networks, industrial Internet, Internet of Things, data centres, cloud computing, artificial intelligence and others.

New Infrastructure consolidates the foundation for sustainable city development

Infrastructure is the cornerstone of city development. Traditional infrastructure is dominated by the physical presence of buildings, machines, equipment and facilities. While it might include some digital technologies and services, each of these pieces of the built environment often provides a single function. In a complex system, the separation of subsystems often results in the lack of data interoperability and a lack of macro-level data analysis and judgement, leading to inefficient management and failure to maximise facility performance.

The New Infrastructure is centred on digital technologies such as communication connectivity, computing power, algorithms and data applications. It can complement the shortcomings of traditional infrastructure and equip it with digital and intelligent capabilities, thus optimising infrastructure services and enhancing the safety, efficiency and sustainability of the city.

Arup is committed to using a variety of information, communication and digital technologies to assist the sustainable and high-quality development of cities. For example, at Boston Seaport Innovation District, we established the future operating mechanism, organisational structure and digital technology experience of the local area through the development of digital technology architecture and implementation plan to attract residents, tenants and visitors; in Denmark, we worked with the Municipality of Frederikshavn to develop a digital vision for the Vinge new town, including design principles and an assessment framework based on the sustainability needs of the city.

Big data drives sustainable city development

With the further advancement of New Infrastructure, the coverage of communication networks represented by 5G and IoT will grow, access to various urban data will be more convenient, data coverage will be greatly enhanced and data transmission will be more rapid and stable. As data centre, cloud computing and other infrastructure, data calculation and processing capacity will also be enhanced and the role of data-driven urban governance in the sustainable development of cities will be further demonstrated.

In the Hong Kong Kowloon East Smart City project, we have collaborated with the government, IT companies and other



HSBC Building Tseung Kwan O (Hong Kong)
© Leigh Orange Ltd.



Digital Osaka 1 (Japan)
© Photo Communication Inc.

stakeholders for several smart pilot projects to transform old districts using advanced information communication and data analysis technologies and enhance public wellness and improve the image of the city. These pilots include intelligent people management system—using sensors and image data to improve the efficiency of people management; intelligent recycling bin system—monitoring data and utilising artificial intelligence to improve the efficiency of waste recycling; pedestrian guidance system—using artificial intelligence to provide different route suggestions based on user needs and preferences; parking and on-street loading/unloading area monitoring systems—using image analysis technology to assist traffic enforcement.

Data-driven applications in energy saving, emission reduction and sophisticated operation of urban buildings are also widely available. For example, in the Hong Kong One Taikoo Place, we use Neuron, an intelligent building control platform, to integrate various data from the building management system and building operations. Through algorithms based on AI and machine learning, we proactively determine and predict building operational trends, assist clients in managing and improving building performance, optimise energy consumption and predict possible failures and perform predictive maintenance.

In another example, we developed a smart office pilot program in our Melbourne office, where we analysed the relationship between the office environment and employee productivity through a digital twin model combining sensors, IoT and smart algorithms, and optimized the environment control to increase overall productivity by 11%. In terms of energy efficiency, we can save up to 20% of energy consumption by

monitoring the air conditioning and lighting systems and matching the actual use of office space.

New Infrastructure stimulates new demand and scenarios for city development

New Infrastructure is expected to give birth to new businesses, stimulate new demands and new scenarios through the new generation of digital technology and become a new driving force to promote socio-economic development and improve city governance.

Take the application of digital twin technology in crowded areas as an example. With the support of extensive connectivity, fast transmission and massive computing power, we can accurately collect real-time distribution people flow data, transmit it to the computing centre through high-speed communication networks, screen and extract data of various scenarios and moments, use powerful computing power to simulate scenarios through tools and combine with big data to predict and analyse people flow so decision-makers can judge people flow direction in advance and prepare corresponding control measures and guidance.

Extended reality (XR) application of BIM is another example. Current XR solutions requires a huge BIM model to be preloaded into terminal devices, and the virtual BIM model is rendered in real-time by capturing the device position and pose information in real-time. Thus, the terminal device must be equipped with high-performance graphics computing power. However, with current hardware conditions, the portability and performance of devices often cannot be achieved simultaneously—portable mobile devices require sacrificing visualisation, while high-quality visualisation requires bulky hardware.

Combining 5G and cloud computing can solve this problem very well. Taking advantage of 5G’s features of large bandwidth, high reliability and low latency and the powerful computing power of the cloud platform, the real-time data captured by the terminal equipment can be transmitted to the cloud platform. The BIM model can be visualised and rendered through the cloud platform then the calculated image can be sent back to the terminal for display. This technology will further improve the implementation and convenience of BIM XR applications. Resident engineers can apply XR to large construction sites for BIM model comparison and acceptance, and experts who use drones for remote inspection can also easily ‘see’ the virtual building effects in real-time through the returned images.

Vision

China’s city development has entered a new stage of people-oriented, result-oriented, integrated, intensive and collaborative innovation. The focus of city development will shift to creating quality environments and designing long-term sustainable development mechanisms. The gradual improvement of New Infrastructure will promote sustainable urban development and improve governance and efficiency. At the same time, the industry also needs to promote the sustainable development of New Infrastructure—promoting energy conservation and environmental protection, turning waste into energy, diversifying the use of space, resisting extreme weather and climate disasters and providing a source of power for safe, resilient and sustainable development of cities. ■



CSCS (Switzerland) © Arup

Arup Neuron digital platform © Arup



Big data in design

Data is the new oil

The digital revolution and the push to develop smart cities in the last few years has contributed to the exponential growth in the generation of data. Globally, the data-sphere (total data created, captured and replicated) reached 40 zettabytes by 2019 and is expected to grow to 175 zettabytes by 2025. Meanwhile, the flow of data across the internet is expected to grow to 4.75 zettabytes by 2020. The value of big data can only be truly realised if unstructured data, including those from surveillance footage, social media and images, are tagged and analysed and added to the more traditional structured big data sets. This data, along with other technologies, has the potential to transform opaque markets and disrupt current industry structures, including the real estate industry.

As for China, the data boom was kicked into overdrive with the widespread adoption of mobile payment platforms in the 2000s. The country's banks processed 62.1 billion electronic payments in Q4/2019, of which, 30.7 billion were mobile transactions, representing a YoY increase of 73.6%. WeChat Pay and Alipay now dominate the country's mobile payments. Additionally, there were 882 million smartphone users in 2019, and, should user numbers increase 3-5% per annum, this will reach 1.135 billion users in 2025.

Retail

Highly-engaged mobile users generate a sea of granular, geotagged data which reveals individual characteristics, enabling people-oriented development and urban planning. Consequently,

China has seen a rise of data analytics companies which focus on providing anonymised consumer data. By aggregating data sets and creating models, these data analytics companies can enlighten retailers, mall operators and advertising companies where target consumers are most likely to live, work or play and identify key transit routes. In addition, data can also help to identify changes in spending patterns. Possible applications could be developers and mall operators looking to gain insights into how consumer behaviour has changed post-COVID-19 or how to better position malls as the consumer market recovers.

Workplace

Workplace wellness is a key focus among landlords as they seek to improve staff productivity and safety, especially in the wake of COVID-19. According to a 2019 report by Zhaopin, an online recruitment services provider, physical wellness was the most important factor affecting lifestyle quality, placing above financial and career success in the ranking. Another survey by Honeywell showed that 60% of those surveyed are worried about air quality. A healthy workplace can increase productivity, help companies to attract and retain talent and optimise energy consumption. Greater monitoring of interior environments combined with human resource and other corporate data can help draw strong correlations and convince landlords and tenants alike of the advantages of better-designed workspaces.

City planning

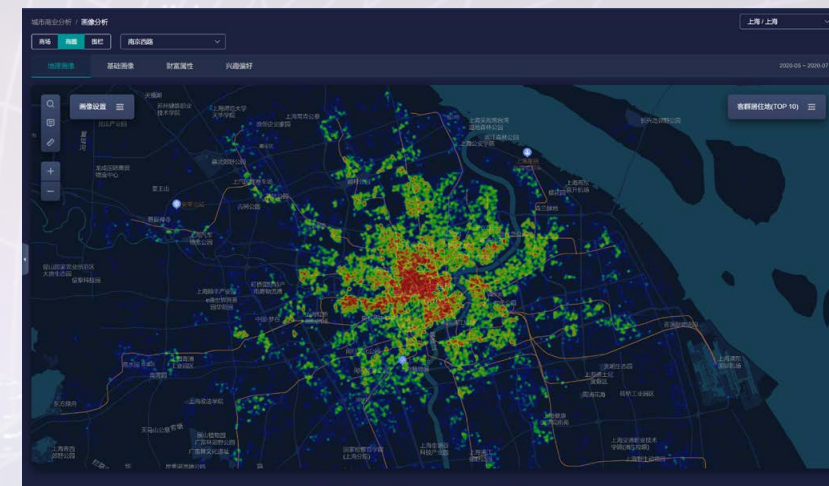
Traditional city planning is very much top-down—there is normally an overarching masterplan, a vision and then each aspect of the plan, including land use, transportation and utilities. Big data enables planners to gain a better understanding of the local population and enables them to better meet the needs of city dwellers.

Big data also enable planners to make adjustments based on real-time feedback systems. Leading tech companies can work with local governments to improve traffic conditions in cities; for example, Alibaba has applied its 'City Brain' system in Hangzhou, helping the city drop down the rankings of most congested cities in China from 5th to 57th in just two years. Another example is Yinchuan in Ningxia province, which is considered by some as a blueprint for smart cities in China, thanks to its smart traffic management, big data approach, optimised garbage collection and telemedicine services.

Caveat

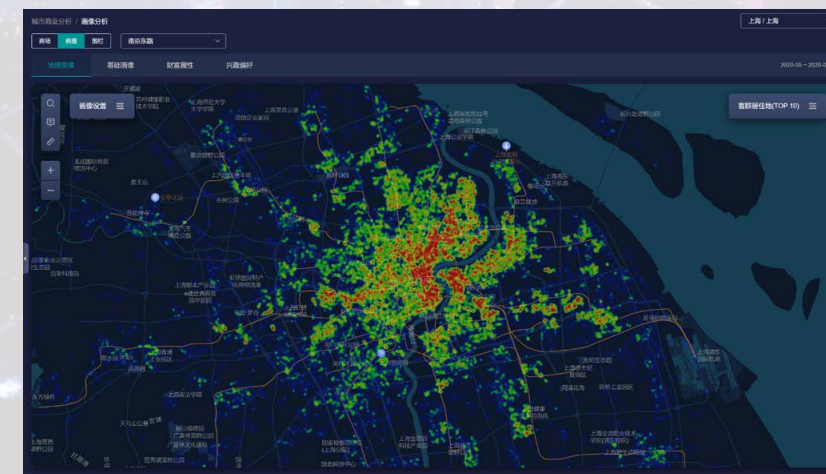
While increased data availability can help planners, developers and other stakeholders to make better-informed decisions, it is important to view the data in context and use the data to better inform our understanding of the real world rather than making decisions solely on the data collected. It is also important to remember that sustainable development cannot succeed without balancing social, environmental and economic aspects.

Case study: MobTech Smart Map Nanjing Road (W), Shanghai



Source MobTech

Nanjing Road (E), Shanghai



Source MobTech

Mobtech is a leading integrated intelligent technology enterprise; from its SaaS platform, users are able to view the geographic spread (day-time[work] and night-time[home]) of visitors to certain projects or areas, other characteristics about the population inferred from mobile usage as well as app downloads and travel history.

From the above screenshots of the SaaS platform, it can be inferred that visitors to Nanjing West Road (NJW) are more concentrated on the city centre and particularly Puxi. Nanjing East Road (NJE), on the other hand, would seem to have a broader appeal and a larger catchment area that encompasses parts of Pudong. By combining this data with knowledge of the local market, we might infer that the reason for NJE's larger catchment area might be its wider range of retail options at multiple price points as opposed to NJW's more exclusive retail location with higher price points.

NJW is also more likely to have a high percentage of white-collar workers working for bigger corporates. This is understood from local market knowledge, but can also be inferred from the data about user app downloads given the fact that 68.4% of NJW users had installed WPS office, while it didn't even appear in the top 10 apps downloaded for NJE. Meanwhile, JD.com users were higher in NJW: 77.4% vs. NJE: 75.1% and Pinduoduo users were lower NJW 69.1% vs NJE 72.2%.

BIM and beyond



Words Alan Muse, Global Director, Built Environment, RICS

Integration is key. Construction planning, design and operations can be most effectively improved by seamless collaboration, digital inter-operability and the upskilling of these processes. Building Information Modelling (BIM), and associated digital advances, offer tools to implement these imperatives. Present covid-19 realities offer an added catalyst for the industry to digitally integrate and improve efficiency and productivity.

Construction is the biggest industry in the world, and yet, even outside of crises, it is not performing well. The industry represents 13 percent of global GDP, but construction has seen a meagre productivity growth of 1 percent annually for the past two decades. Time and cost overruns are the norm and overall earnings before interest and taxes (EBIT) are only around 5 percent despite the presence of significant risk in the industry.

A combination of sustainability requirements, cost pressures, skills scarcity, new materials, industrial approaches, digitalization, and a new breed of player looks set to transform the industry. The shifts ahead include productization and specialization and greater customer- centricity and branding. Consolidation and internationalization will create the scale needed to allow higher levels of investment in digitalization, research and development and sustainability as well as human capital.

We have already seen concrete signs of change: for example, the permanent modular- construction market share of new North American real-estate construction projects has grown by 50 percent from 2015 to 2018, Research and development spending among the top 2,500 construction companies globally has risen by approximately 77 percent since 2013, and a new breed of player has emerged to lead the change. According to recent research by McKinsey, many believe that covid-19 will lead to an acceleration of the transformation, and half have already raised investment in that regard.

To date, though, the benefits of BIM have tended to be limited in scope to the work within individual disciplines, particularly design, or phases. New advances in computing and software now make project wide improvements possible—from conception, through

construction and commissioning. Realizing this potential, however, depends not just upon this new level of information technology integration, but also, as importantly, upon a change in mind-set across the project. It is also depending upon using more collaborative processes and contract arrangements – including inter-disciplinary working – an area where construction professionals may need upskilling to break down silo-thinking. In this new paradigm, the client, or owner, and each participant can benefit to the extent that their own digital work is appropriately accessible to and securely shared with others. This further enables automated workflows and digital visibility spanning the overall project.

Potential benefits are immense. Digital integration substantially eases the handover from construction to

operation, accelerating investment returns from asset performance. Moreover, the digital context and digital component data, cumulatively populating the digital environment from design through construction, can then help serve as the asset’s “digital DNA” for operations and maintenance. In addition, clients are the ultimate beneficiaries of the capacity for continuous and comprehensive design reviews during project delivery—improving the client’s project performance visibility into emerging problems in time for intervention to avert schedule or cost overruns. In short, cost, time, design, sustainability, and asset management trade-offs and choices can be much better informed in a digitally integrated environment.

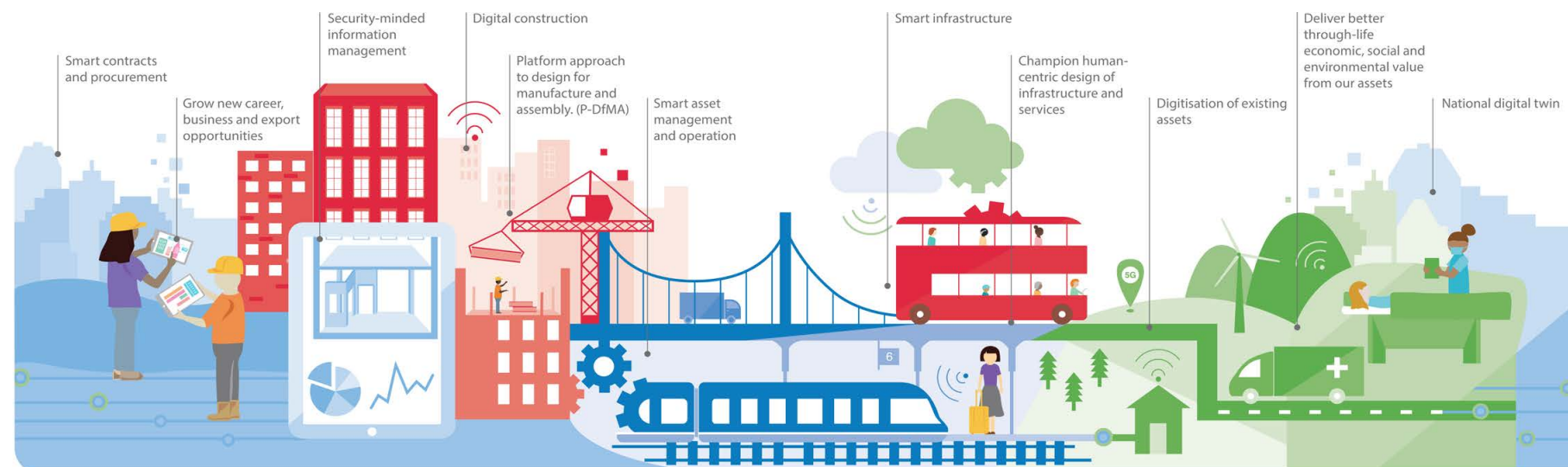
In a digitally integrated project, the interoperable functions within the BIM model and common data environment

will empower owners to fruitfully deploy analytics for visibility into project performance. It will be possible for owners’ analytics, through automated monitoring of the project digital environment, to dashboard the quality and consistency of project information. For example, analytics could continuously compare scheduled work package requirements against the reality of construction trade availability.

Further, project owners will then also benefit from applying analytics’ machine learning across a portfolio of projects, for instance to establish correlations between completed projects’ realized performance and their respective information “footprints.” The voluminous common data environments activity journals of current projects would be inspected for patterns (perceptible only with such analytics) to indicate the extent to which a project is on, or off track, based upon actual experience.

RICS is very aware of this huge digital opportunity for industry improvement. Our recently published Insight Paper on The Future of BIM (www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/construction/future-of-bim_1st-edition/) details more about this opportunity. Critical, also, is our collaborative work with other professional bodies around the world in developing international data standards such as ICMS (www.icms-coalition.org). These standards work at the global profession: technology interface and allow capital and life cycle cost decisions to be integrated with design and asset management decisions – critical if digital integration for decision support is to be truly achieved. ■

Digital Built Britain



Design

Use best practice, secure by default, information management and digital techniques to get data right from the start and design better-performing homes, buildings and infrastructure.

Build

Exploit new and emerging digital construction, information management, and manufacturing technologies and techniques to improve safety, quality and productivity during construction.

Operate

Use effective information management to transform the performance of the built environment and the services it delivers.

Integrate

Understand how the built environment can improve citizens’ quality of life and use that information to drive the design and build of our economic and social infrastructure and the operation and integration of the services they deliver.

Source Centre for Digital Built Britain

PropTech in management

Efficiency, consistency and profitability



Words Steven Zheng, Associate Director, Savills MDI

The property management industry is undergoing a profound transformation. Traditionally a labour-intensive industry with manpower accounting for 60% of operating costs, the sector has started to evolve beyond carrying out the often repetitive work of simple maintenance and site management. In addition to automating, tracking and recording the more conventional workload and thereby creating greater transparency and accountability, property management platforms are also evolving into service platforms powered by automation, machine learning and interconnectedness.

As urbanisation slows and development margins are squeezed, developers are looking for new ways to generate returns. At the same time, the scale of properties under management has continued to increase, meaning any incremental rise in project revenues can generate an outsized effect on group profits. As prices continue to rise and increasing amounts of capital are tied up in property, these developments require greater wealth preservation through higher-quality, proactive management.

Technology is becoming increasingly pervasive in all sectors of the real estate and all stages of the property lifecycle. While much discussion is given to the advances in the design and construction of properties, the less glamorous operations and maintenance provide the most fundamental and universal application scenarios of PropTech.

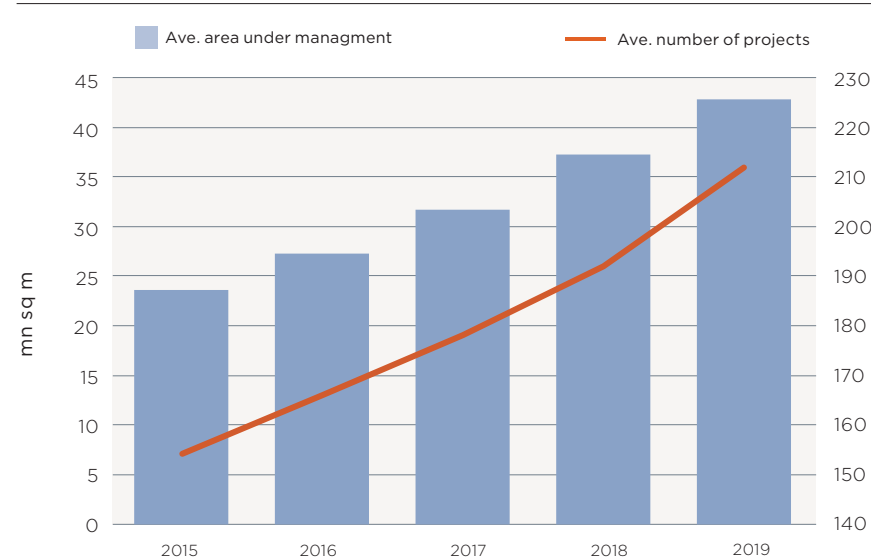
Savills MDI is an integrated, digital service platform that aims to provide real estate solutions throughout the lifecycle of a development, including development, marketing, leasing, transaction, property management and asset management. With a focus on mobilisation, digitisation and intelligence, Savills MDI integrates a range of technologies that have formed a unique ecosystem of property products and services.

On-Demand Services – Joining the WeChat ecosystem for lower cost and higher efficiency
The Savills MDI mini-program on

WeChat provides a full range of services from marketing to management services (including value-add services). Running within the WeChat ecosystem, it allows service publishing, access, delivery, digital operation and service transactions all on a familiar user interface. Here, real-world service scenarios have been reinvented with technological advances to provide enhanced user experiences and identify potential value enhancement opportunities.

Digitisation – Leading to greater efficiency of on-site management
A digitalised platform allows the on-site management team to receive reports and assign repair orders on mobile phones by scanning QR codes

FIGURE: Top 100 property management firm operational scale

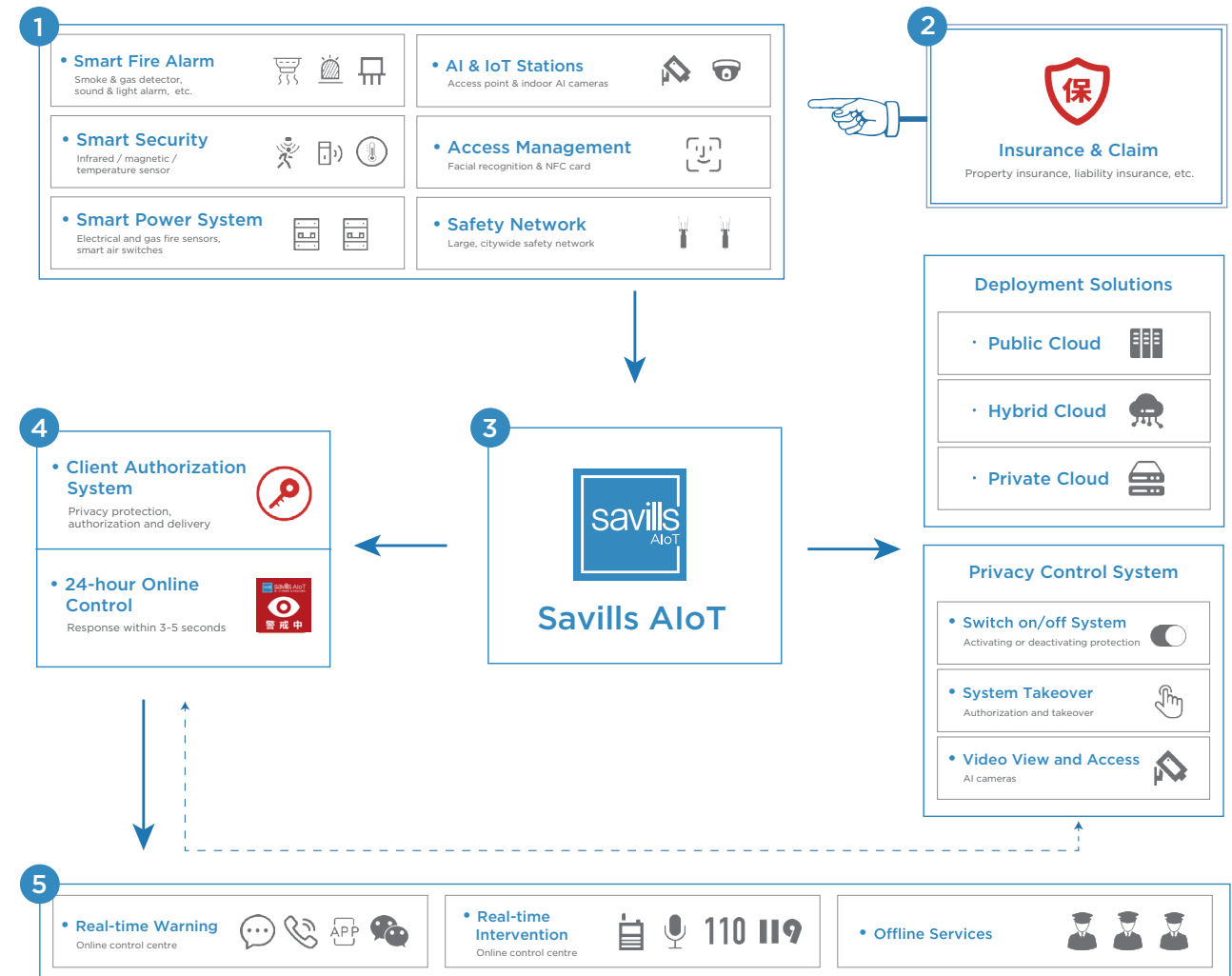


Source CREIS; Savills Research



One-stop integrated security service system

Providing reliable security services through extensive sensing system, information sharing and rapid response



or reading NFC tags given to specific areas or devices. The location and status information is then fed into the annual work plan system that will remind, create and track corresponding tasks. It deals with routine or unplanned, temporary work in security, cleaning and facility management in a timely manner, enabling quick response by assigning work to the nearest available staff according to

their real-time location. With all business and work data circulating on the cloud, the staff's key performance indicators (KPI) can be assessed and tracked, which will lead to greater efficiency and improved services.

Intelligence – Enhancing safety and security with AIoT
Traditional security solutions face many hidden risks. Savills AIoT

combines IoT big data, cloud computing, mobile networking and geo-visualisation technologies to create a dynamic security and fire protection system that collects a variety of information on potential hazards, facility maintenance, daily management, fire alarms and natural disasters to enable real-time early warning and provide support for safety management decision-making. ■

Data centres

The workhorse of the digital age

China is believed to be the second-largest data centre market worldwide after the United States and continues to grow rapidly. By the end of 2019, there were 2,213 data centres and 2.217 million racks, up from 1.24 million in 2016. There is still significant scope for growth with the population significantly underserved on a per capita basis.

The Internet Data Centre (IDC) market is estimated at RMB156 billion by the end of 2019 and is expected to grow at a CAGR of 27% through to 2022 by which point the market will have grown to RMB320 bn.

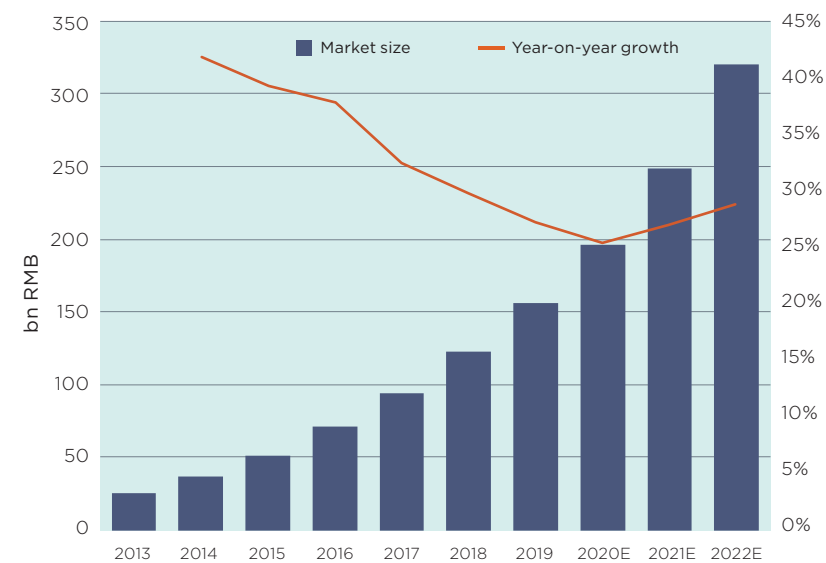
Government support and regional distribution

China's cybersecurity law, promulgated in 2017, signalled a push to increase productivity levels and strategic competition in new economy sectors including data centres. More recently,

China announced, as part of a fiscal stimulus package in response to COVID-19 and a sluggish economy, an ambitious plan to invest RMB10 trillion (US\$1.4 trn) in the six years to 2025 encompassing areas such as AI, IoT, ultra-high voltage lines and high-speed rail.

Many data centres in China are located around the key economic clusters centred on Beijing, Shanghai, Guangzhou and Shenzhen. However, some of these leading cities, concerned about energy consumption, land usage and pollution generated by these facilities, are strictly controlling new developments unless they meet stringent guidelines. New developments have consequently been pushed to neighbouring cities with proximity to customer bases and reduced latency being key considerations. Utilisation rates typically run in the 80-90% range.

FIGURE: IDC market size



Source IDCQian; Savills Research



Meanwhile, a number of hyperscale facilities are being constructed in more remote locations of China where land is less expensive, guidelines less stringent, electricity more plentiful and climate more suitable for data centres. However, these locations tend to be harder to service and have higher latency, making them inappropriate for certain types of usage. Utilisation rates can be much lower in the 50-70% range.

Selected regional governments have been looking to promote data centre development as a means of stimulating economic development. Hebei Province, in particular, is aiming to develop a similar data centre cluster to North Virginia, USA, while the more remote Guizhou province has also established a large base given geological features that make it ideal for data centre development.

Demand drivers and operators

Demand drivers include cloud computing platforms provided by some of the large tech companies—Alibaba, Tencent and Baidu—AI/machine learning, video streaming, ecommerce and online gaming. Many of these sectors were recording strong growth prior to COVID-19 but saw an added boost as businesses and consumers behaviour changed in response to social distancing and work from home policies. Some of these sectors will also receive an added boost from technological advancements and government support for nationwide rollouts of 5G stations and smart cities. Autonomous vehicles could throw off vast amounts of data producing 3-4 terabytes of data an hour, though much of that will remain within the vehicle.

The nature of the demand is also likely to change with increased demand for

reduced latency and edge data centres close to economic clusters in addition to the more remote hyperscale centres with cooler climates reducing running costs and access to more renewable energy and land resources.

The Chinese telecom providers (China Telecom, China Unicom, and China Mobile) have roughly a 50% share of the total market with other leading operators including GDS, 21Vianet, Sinnet, Centrin Data Systems and ChinData.

Investment appetite

Investors looking for higher returns and more stable income than can be achieved in the commercial markets have been increasing their exposure to niche markets with strong fundamental growth in recent years. Several JV announcements have been made, including Bridge Data Centres' (owned

by Bain Capital since 2017) merger with Chin Data, Gaw Capital's partnering with Centrin Data Systems and GIC's JV with GDS Holdings Ltd.

Outlook

In the same way that the construction of industrial facilities, highways and ports have facilitated the growth of China's world-beating manufacturing sector during its industrial transformation, so too is the development of data centres, IoT, broadband and satellite communications essential to facilitate the development of the digital economy in the information age. The government is acutely aware of this issue and is taking steps to ensure adequate investment and capacity is available to ensure bottlenecks do not appear. As such, data centre development will most likely receive a significant boost in the coming years. ■

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Savills plc

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