Cities of Opportunity
Series Special Report

Shenzhen and Hong Kong - Agglomeration of Strengths for Mutual Development
The Guangdong-Hong Kong-Macao Greater Bay Area (GBA) is one of the most open and dynamic economic regions in China and maintains an important strategic position for the nation’s overall development. A key issue in the ‘14th Five-Year Plan’ is to leverage the advantageous position of the GBA to strengthen co-operation with the Mainland, and to further enhance the region’s role in supporting and leading the economic development and opening up of the country.

Shenzhen and Hong Kong are the core engines of regional development. They have not only continued to grow bigger and stronger, but have also taken on the important responsibility of stimulating the development of neighbouring areas. As the saying goes, ‘everyone has their own strengths’. Promoting the integrated development of the two cities in their respective leading industries means making the most of Hong Kong as an international financial centre and Shenzhen as China’s national city of innovation, to enable better results with greater efficiency.

With the establishment of the Shenzhen-Hong Kong Innovation and Technology Co-operation Zone at the Lok Ma Chau Loop and the Northern Metropolis of Hong Kong, along with the gradual refinement of their development strategies, Shenzhen and Hong Kong have entered a new phase of growth. The two cities have been working closely at the regional level and are expected to improve their level of co-operation. This will provide a base for both the integrated development between industries in the two cities, and the introduction and cluster development of scientific research projects. In the future, the two cities will join forces to develop complete industry value chains for scientific and technological innovations and build world-class science and innovation hubs with laboratories for predominant disciplines, innovation research centres, national research platforms, youth innovation and entrepreneurship in Hong Kong and Macao, technology and innovation and financial technology.

Technology is a major consideration when it comes to innovative development. In a fiercely competitive international environment, innovation-driven development is critical for the long-term success of China’s development under the 14th Five-Year Plan. It is more important than ever to use technology to assist economic and social development and improve people’s livelihoods. The co-operation between Shenzhen and Hong Kong stands to benefit from an unprecedented development opportunity. We should firmly grasp this development opportunity to create a better future.
Core cities are crucial to accelerating and strengthening overall regional economic development. Shenzhen and Hong Kong, core cities in the Greater Bay Area, have long played a special role in China's journey of economic development and opening-up. We believe both cities can play an even greater part in China's high-quality future development.

Hong Kong is a global financial centre. It has world-class professional services, attracts highly qualified international talent and has leading scientific research power. Shenzhen possesses a full range of high-tech industries across the value chain, and has cultivated many top science and technology enterprises. The combined, and complementary, strengths of these two dynamic and innovative cities have helped shape the vision and propel the growth of the Greater Bay Area. Together, they have fostered vigour and vitality across the thriving integrated business and economic hub.

China’s new era of development offers challenges and opportunities for Shenzhen and Hong Kong. They can create further synergies by playing to their unique advantages and deepening their collaboration under the "dual circulation" strategy. The two cities are joining forces to create the Shenzhen-Hong Kong Innovation and Technology Cooperation Zone to promote a two-way flow of technology, talent and capital. They can also capitalise on the strategic opportunities available in fast-growing domains such as technological innovation, digital transformation and green sustainable development. Together, Shenzhen and Hong Kong will be able to jointly deliver the sustained outcomes for China that the architects of the Greater Bay Area envisioned.

PwC has consistently supported the growth of the Greater Bay Area, especially the integrated development between Shenzhen and Hong Kong. We are very honoured to have the opportunity to work with the China Development Research Foundation to explore the potential of deeper collaboration between these two cities of opportunity, and to conduct comprehensive research into future areas of interest. We hope you enjoy reading the report as much as we have enjoyed putting it together, and that the observations and recommendations will be of help to you.

Raymund Chao
PwC Asia Pacific and China Chairman
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Executive summary

Research background

Since 2014, PwC China and the China Development Research Foundation launched the ‘Cities of Opportunity’ thought leadership series, wherein we observe the development of Chinese cities from multiple angles from a global perspective, while respecting China’s actual development status and the characteristics of each city. In March 2021, the Outline of the 14th Five-Year Plan (2021–2025) for National Economic and Social Development of the People’s Republic of China and the Long-Range Objectives Through the Year 2035 (‘the 14th Five-Year Plan’ or ‘the Plan’) was passed. It emphasises that the added value of the strategic emerging industries highlighted in the Plan will account for more than 17% of national GDP, while ensuring the roles of core cities and urban clusters are to drive regional coordinated development as a policy priority. Therefore, this special report in the ‘Cities of Opportunity’ series mainly focuses on exploring the opportunities brought about by the development of the Shenzhen and Hong Kong urban cluster. This report, ‘Shenzhen and Hong Kong — Agglomeration of Strengths for Mutual Development’, is the first in this special report series.
The strategic importance of the Shenzhen-Hong Kong integrated development

This report focuses on economic development opportunities in Shenzhen and Hong Kong. Future editions in this series will continue to focus on Shenzhen and Hong Kong, and will also include more in-depth research into different industries and potential development opportunities.

Shenzhen and Hong Kong are core cities in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) and their growth has been incorporated into the national development strategy, marking an increasing importance of the region for the entire country. The 14th Five-Year Plan incorporated the Shenzhen-Hong Kong Innovation and Technology Co-operation Zone at the Lok Ma Chau Loop into the infrastructure for the GBA co-operation platform for the first time. The two cities will work hand-in-hand to build a pilot area for open collaboration in innovation and technology (I&T) in Shenzhen and Hong Kong to facilitate the development of an international I&T hub in the GBA. Additionally, in the 2021 Policy Address, Carrie Lam, Chief Executive of the Hong Kong S.A.R., proposed the ‘Twin Cities, Three Circles’ concept and emphasised the commitment to promoting the rapid development of the Hong Kong Northern Metropolis in order to maintain the city’s competitive advantages and strengthen the co-operation between the two cities. This demonstrates that the development of Hong Kong, Shenzhen and the GBA carries increasingly greater significance to the country.

In fact, good foundations were laid for Shenzhen and Hong Kong to co-operate on matters of technological innovation a long time ago. In terms of technological innovation, Shenzhen has cultivated large tech enterprises such as Tencent, Huawei, DJI, and BYD. International enterprises such as Apple and Siemens have also established research and development (R&D) centres in Shenzhen. As an international financial centre, Hong Kong has unique advantages in fundamental scientific research, and connecting with global technological innovation bodies and promoting international co-operations. The city possesses 16 of China's national key laboratories, which provide a steady impetus for fundamental frontier scientific research and original technological innovation. The Plan specifically supports establishing Hong Kong as an international I&T hub to introduce I&T research results to Shenzhen and the Mainland as a way to further deepen regional co-operation.

Shenzhen and Hong Kong need to jointly establish their future strategic positions and respectively make use of their unique advantages. By further leveraging Hong Kong’s role as China’s ‘super connector’ and promoting its co-operation with Shenzhen, the ‘Technology Hub’, it will create a strong synergy. It will drive industrial development in both cities for the next five years, thereby bringing even larger investment opportunities to businesses.
Shenzhen and Hong Kong's competitive industries and development opportunities

This research focuses on the strategic emerging industries mentioned in the 14th Five-Year Plan and the Outline Development Plan for the Guangdong-Hong Kong-Macao GBA (the Outline Plan). Having considered Hong Kong and Shenzhen's obvious advantages and the potential for complementary development, we believe that biotechnology (biotech), new materials, next-generation information technology (next-gen IT), financial technology (FinTech), new energy vehicles, and new energy should be prioritised as the key areas of co-operation between the two cities. We also believe these will be important economic development focal areas and will bring investment opportunities for both Shenzhen and Hong Kong in the future.

Biotech is one of the most competitive industries in the world and has great potential for development. It is also one of the nine strategic emerging industries identified in the Plan and one of the four new pillar industries that the GBA is focused on developing. The global biotech market is expected to reach USD2.44 trillion by 2028, with a compound annual growth rate of 16%. Shenzhen and Hong Kong are very competitive when it comes to biotech, especially in terms of the transformation of innovative pharmaceutical achievement.

Hong Kong has a solid advantage in scientific research. The University of Hong Kong and the Chinese University of Hong Kong's biotech and medicine departments were ranked 55th and 78th respectively in the QS World University Rankings 2021–2022. Their cutting-edge research in biotech has reached world-class standards. Shenzhen also has excellent industry value chains that can industrialise the results of research completed in Hong Kong. As of September 2021, Hong Kong was home to 214 startup enterprises in the biotech, medical and healthcare industries. If combined with Shenzhen's excellent biotech industry value chain, the intercity co-operation would certainly create synergy that would further elevate the technological and industrial competitiveness of the GBA, leading to great development potential and investment opportunities in the future.

The Outline Plan proposes to accelerate the growth of the new materials industry, which aligns with Shenzhen's own development priorities. In 2019, the output value of Shenzhen's new materials industry reached RMB41.619 billion, a growth rate of 27.6%. Shenzhen is also brimming with organisations focused on the R&D of new materials. As of 2021, there were more than 3,000 new materials enterprises in Shenzhen.

On the other hand, Hong Kong mostly focuses on material innovation and R&D. Not only are Hong Kong's many research-focused universities listed among the world's top 100, but they also have outstanding advantages in terms of new materials R&D and applications, making the city a global hub for the high-technology (high-tech) industry. Hong Kong's Nano and Advanced Materials Institute (NAMI) won a total of 14 medals at the 2021 Geneva International Exhibition of Inventions, including eight golds, five silvers, and one bronze. Among which, five of the gold medals were the prestigious Gold Medals with commendations from the jury.

New materials play a significant role in strengthening the ‘Made in China’ initiative and are also an important driving force for the new wave of the global industrial revolution.
According to the China Fintech Operations Report (2020), China’s FinTech industry reached RMB1.44 trillion in revenue in 2019, a year-on-year growth of 48.1% compared to 2018. The FinTech industry’s fast growth and the establishment of the Qianhai Shenzhen-Hong Kong Modern Service Cooperation Zone (Qianhai New District), which focuses on the development of financial services, indicates China’s determination to use technology to improve the efficiency of financial services.

In fact, Hong Kong is home to 48 of the world’s top 100 FinTech companies and 86% of the banks in the city were incorporating FinTech into various financial services in 2020. As of September 2021, there were 472 FinTech startups in Hong Kong, the highest among all industries in Hong Kong. These companies have huge development potential. Their comprehensive financial services, interdisciplinary talents and experience, in addition to their familiarity with international financial laws, will help the Qianhai New District become China's economic pilot zone and play a crucial role in promoting industry reform and economic development in the GBA.

Investing in FinTech is set to become an important opportunity and a major trend in the digital transformation of the global financial industry.
China is the world's largest manufacturer of new energy vehicles. Between 2010 and 2020, China manufactured approximately 4.6 million electric vehicles, accounting for 44% of the total global production. The New Energy Vehicle Industry Development Plan (2021–2035), published in 2020, reflects China’s aspiration of becoming the world leader in this area and the country’s commitment to establish globally applicable new energy vehicle standards. The country aims to further improve its industry value chains and production capacity, create international brands and seize overseas market opportunities.

As an important automobile manufacturing base, the GBA has been dedicated to deploying the new energy vehicle industry, speeding up the formation of new energy vehicle industry clusters. With the successive, early-stage implementation of several projects, the new energy vehicle industry cluster has begun to take shape.

In the future, Hong Kong can consider incorporating the customised production of new energy vehicles and developing testing facilities in the development strategy of the Northern Metropolis. At the same time, Hong Kong will be able to protect the intellectual properties of inventions from technological R&D and brands more effectively in these industries, helping Mainland China’s new energy vehicle industry go global.

The development of renewable and new energy industries is one of the key global initiatives to achieve sustainable development.

In terms of production capacity, China is the country with the widest adoption of renewable energy in the world. China currently produces over 70% of the world's solar panels and has taken the lead in wind turbine production in the past decade. Additionally, the country aims to achieve carbon neutrality by 2060 and is actively seeking development opportunities to 'go global' by exporting Chinese new energy technologies around the world. Mainland Chinese companies can leverage Hong Kong as a platform to obtain global patents, thereby enhancing its R&D capabilities.

Furthermore, in order to meet the requirements of customers in foreign markets, R&D centres can be set up in Hong Kong, recruiting and training international talent to keep up with cutting-edge developments. In addition, Hong Kong is committed to becoming a leading green and sustainable financial centre in Asia and the world; in 2019, the Hong Kong Monetary Authority established the Centre for Green and Sustainable Finance to provide technical support and an experience-sharing platform for the green development of Hong Kong’s banking and financial sectors. With these initiatives, Hong Kong is set to become a green investment hub in the new energy sector, connecting international investors with the Mainland Chinese market. This includes the issuance of sustainable development and green transformation bonds to finance China's large-scale new energy investment projects and helping China’s new energy industry go global.
Based on the aforementioned six priority areas of co-operation, and the economic development needs of Hong Kong's Northern Metropolis and Shenzhen’s ports, our research proposes the following seven key recommendations in order to promote close co-operation between the two cities.

### Seven key recommendations for promoting close co-operation between Shenzhen and Hong Kong

**Shenzhen and Hong Kong should promote multifaceted ‘industry-university-research’ collaboration.**

They should make use of cross-boundary platforms that have been jointly set up by the two cities’ governments to promote cross-institutional and cross-disciplinary co-operation between state-owned and private organisations. In addition to attracting international R&D talent and young people to conduct fundamental research, Shenzhen and Hong Kong should also achieve industrialisation by setting up comprehensive operations in up-, mid-, and downstream industry value chains and establish a large industrial ecosystem that spans both cities.

**Hong Kong’s Northern Metropolis should become the core area for the development of Hong Kong’s I&T sector and the integration of the two cities with focuses on the six priority development areas.**

Lau Fau Shan, Hung Shui Kiu/Ha Tsuen New Development Area, and San Tin Technopole, which are adjacent to Qianhai and Futian, should be the priority development areas to promote co-operative development between Shenzhen and Hong Kong. Based on PwC’s estimates, these six priority areas for co-operative development in the Northern Metropolis will create approximately HKD700 billion to 750 billion annually in GDP for Hong Kong’s economy.

**The governments of both cities should explore spatial planning strategies for Shenzhen and Hong Kong’s border areas.**

This is especially important for the seven land boundary crossings currently along the Hong Kong and Shenzhen Port Economic Belt, and the transport infrastructure that links the two cities. An effective strategy will enable the coordinated development of key areas in Hong Kong's Northern Metropolis with Shenzhen’s development and achieve common goals in terms of the economy, infrastructure, people’s livelihoods, and ecological environment. It will also enable the pooling of resources and promote integrated development.

**Hong Kong’s Lau Fau Shan and Hung Shui Kiu/Ha Tsuen New Development Area should connect with the Qianhai New District in Shenzhen and pave the way to becoming a core business district of the Northern Metropolis.**

Shenzhen and Hong Kong should conduct research on expanding the cross-boundary rail to connect the Qianhai New District in Shenzhen with Lau Fau Shan and Hung Shui Kiu/Ha Tsuen New Development Area in Hong Kong, as well as a third central business district on the Kau Yi Chau artificial island in Hong Kong’s Lantau Tomorrow Vision.
Hong Kong’s San Tin Technopole should become an economic and talent centre for I&T development. This would have a knock-on effect on the development of Shenzhen’s technology park — attracting talent from both abroad and within Mainland China, optimising the industrial structure in Shenzhen and Hong Kong, and creating new economic growth areas — thereby accelerating Shenzhen’s I&T development while driving Hong Kong’s economic transformation.

Smart borders will effectively promote connectivity in the GBA. By implementing the right smart border technology, it will greatly reduce the amount of time that people spend on travelling, further promote interconnectivity in the GBA, and create favorable conditions for attracting talent from both the Mainland and abroad for the development of the GBA.

The Government should consider public-private partnerships with enterprises that can contribute financial resources for development. This would increase the overall development capacity and speed up the progress of important infrastructure and facilities. In Shenzhen and Hong Kong’s integrated development in the future, the government should call on industries and businesses to seize I&T development opportunities to participate in the advancement of both cities.

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1.1 Background

The ‘Cities of Opportunity’ thought leadership series discusses the development of Chinese cities from multiple angles based on a global perspective, while respecting China’s actual development status and each city’s characteristics. ‘Cities of Opportunity’ provides observations on selected cities based on the city assessment tools jointly developed by PwC and the China Development Research Foundation. All of the Guangdong-Hong Kong-Macao Greater Bay Area’s (GBA) 9+2 cities were included among the 47 cities studied in the ‘Cities of Opportunity 2021’ report.

In March 2021, the Outline of the 14th Five-Year Plan (2021–2025) for National Economic and Social Development of the People’s Republic of China and the Long-Range Objectives Through the Year 2035 (‘the 14th Five-Year Plan’ or ‘the Plan’) was passed and is now in effect. The Plan emphasises that scientific and technological innovation can comprehensively shape new advantages for China’s development. It also stresses the importance of self-reliance and establishing a comprehensive modern industrial system in the fields of science and technology in China. According to the Plan, China should rely on its huge domestic market to establish its new ‘dual circulation’ development pattern.

The 14th Five-Year Plan emphasises the role of core cities and urban clusters to promote coordinated regional development. The Plan indicates that Shenzhen and Hong Kong are the core cities of the GBA and for the first time includes the Shenzhen-Hong Kong Innovation and Technology Co-operation Zone at the Lok Ma Chau Loop (Co-operation Zone) within the scope of the region’s construction of important co-operative platforms. The Plan stresses that Shenzhen and Hong Kong should work together to build a pilot area for open collaboration in innovation and technology (I&T) in Shenzhen and Hong Kong, and facilitate the development of an international I&T hub in the GBA. In the 2021 Policy Address, Carrie Lam, Chief Executive of the Hong Kong S.A.R., proposed the Hong Kong Northern Metropolis Development Strategy and the ‘Twin Cities, Three Circles’ concept. They aimed at strengthening the co-operation between Shenzhen and Hong Kong as well as upgrading the seven land boundary control points, to promote easier boundary crossings between Shenzhen and Hong Kong and the economic development of the ports.

This special report in the ‘Cities of Opportunity’ series is the first study on the development of the Shenzhen-Hong Kong urban cluster. The purpose of this report is to propose how Shenzhen and Hong Kong can play their respective roles in the high-technology (high-tech) industry, while meeting the needs of both cities for more opportunities and common prosperity.

The development of the GBA is now included in the national development strategy. When the COVID-19 pandemic ends, the development of Shenzhen, Hong Kong and the GBA will become even more important to China. It will be necessary to establish a strategic positioning plan to meet China’s development goals and promote co-operation between Shenzhen and Hong Kong within the GBA. Hong Kong must leverage its unique strengths to provide two-way support and services for Shenzhen enterprises, and provide an important platform for China to ‘attract foreign investment’ and ‘go global’.

The advanced technology sector has a wide range of focuses. In this report, we offer several recommendations for developing the six competitive I&T areas in Shenzhen and Hong Kong and promoting closer co-operation between the two cities.
1.2 Significance of this special report

This report seeks to go beyond the administrative boundaries that exist between Shenzhen and Hong Kong, and propose new directions and insights to support the long-term development prospects of the technology industry in the two cities. In addition to considering the strengths of each city, this report also advises on how to leverage the advantages and development momentum of other cities in the GBA, so that their strengths can complement each other, thereby providing new focus and impetus for the development of the GBA.

This special report adopts a high-level, cross-boundary macro perspective in proposing strategies that can be leveraged for the advancement of the six main I&T areas, and provide insights on promoting the integrated development of Shenzhen and Hong Kong’s economies and ports. Not only can the insights of this report be referenced when the governments of Shenzhen and Hong Kong are formulating development strategies, but they can also help enterprises and investors seize future opportunities.
2.1 The trend of integrated development

The 14th Five-Year Plan clearly states that the country will ‘support Hong Kong and Macao in consolidating and enhancing their competitive advantages and better integrate them into China’s overall development’. The Plan emphasizes the integration to ‘foster the complementary and coordinated development with the Mainland’.

The Outline Development Plan for the Guangdong-Hong Kong-Macao GBA (the Outline Plan), published in February 2019 by the State Council, clearly indicates a need to ‘develop a vibrant and internationally competitive first-class bay area and world-class city cluster’. The Outline Plan also states the need to ‘foster closer co-operation between the Mainland and the two SARs, thereby creating more opportunities for the socio-economic development of the two SARs and for Hong Kong and Macao residents wishing to develop careers on the Mainland, as well as maintaining the long-term prosperity and stability of the two cities.

China is the second largest economy in the world, with an enormous market size with a population of 1.4 billion. The GBA is a world-class urban cluster with a population of over 86 million, accounting for approximately 11% of China’s GDP as of 2020. In fact, according to data from 2020, the population, area, and economic growth of the GBA have surpassed the other three bay areas in the world, namely, Tokyo Bay, New York Bay, and San Francisco Bay.

In 2020, the combined economic outputs of Shenzhen and Hong Kong exceeded RMB5 trillion, accounting for 45% of the total amount in the GBA. Shenzhen has repeated success in I&T by cultivating leading tech enterprises such as Tencent, Huawei, DJI, and BYD. International enterprises such as Apple and Siemens have also set up research and development (R&D) centres in Shenzhen as the city exemplifies market-oriented transformation, with a clear focus on enterprises.

Hong Kong, on the other hand, is strong in cutting-edge fundamental research and original innovation capabilities in the high-tech field. In 2021, five universities in Hong Kong were listed among the top 80 in the QS University Rankings, possessing 16 national key laboratories among them. Hong Kong has unique advantages in connecting with global I&T systems and advancing international co-operation with its wealth of experience in intellectual property rights and financial law.

It is vitally important for the long-term economic development in Shenzhen, Hong Kong, and the region that the two cities work together on I&T and give full play to their respective strengths to achieve synergy. In doing so, the two cities will drive development for the whole GBA and insert greater economic externalities for the entire country.
### Chart 2-1: Population and economic figures for important global bay/metropolitan areas in 2019

<table>
<thead>
<tr>
<th>Region</th>
<th>Population</th>
<th>Area</th>
<th>Local GDP</th>
<th>Local GDP growth in real terms</th>
<th>Per capita GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Guangdong-Hong Kong-Macao GBA</strong></td>
<td>86.17 million</td>
<td>56,098 km²</td>
<td>USD1,679.26 billion</td>
<td>4.4%</td>
<td>USD23,116</td>
</tr>
<tr>
<td><strong>Tokyo Bay Area</strong></td>
<td>19.22 million</td>
<td>21,479 km²</td>
<td>USD1,861.15 billion</td>
<td>1.2%</td>
<td>USD96,853</td>
</tr>
<tr>
<td><strong>New York Metropolitan Area</strong></td>
<td>7.74 million</td>
<td>17,887 km²</td>
<td>USD995.08 billion</td>
<td>4.0%</td>
<td>USD128,573</td>
</tr>
<tr>
<td><strong>San Francisco Bay Area</strong></td>
<td>44.34 million</td>
<td>36,898 km²</td>
<td>USD1,991.64 billion</td>
<td>1.4%</td>
<td>USD45,084</td>
</tr>
</tbody>
</table>

Data source: The Government of the Hong Kong Special Administrative Region
Note: Data for the Tokyo Bay Area is from 2018
Chart 2-2: Important population and economic figures for the GBA in 2020

<table>
<thead>
<tr>
<th>City</th>
<th>Area</th>
<th>Population</th>
<th>GDP</th>
<th>Per capita GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhaoqing</td>
<td>14,891 km²</td>
<td>4.11 million</td>
<td>RMB231.1 billion</td>
<td>RMB56,193</td>
</tr>
<tr>
<td>Foshan</td>
<td>3,798 km²</td>
<td>9.5 million</td>
<td>RMB1,081.7 billion</td>
<td>RMB113,869</td>
</tr>
<tr>
<td>Zhongshan</td>
<td>1,784 km²</td>
<td>4.42 million</td>
<td>RMB315.1 billion</td>
<td>RMB71,333</td>
</tr>
<tr>
<td>Jiangmen</td>
<td>9,507 km²</td>
<td>4.8 million</td>
<td>RMB320.1 billion</td>
<td>RMB66,712</td>
</tr>
<tr>
<td>Zhuhai</td>
<td>1,736 km²</td>
<td>2.44 million</td>
<td>RMB348.2 billion</td>
<td>RMB142,728</td>
</tr>
<tr>
<td>Macao</td>
<td>33 km²</td>
<td>680,000</td>
<td>RMB167.8 billion</td>
<td>RMB246,334</td>
</tr>
</tbody>
</table>

Data source: Provincial Government of Guangdong, the Government of Hong Kong Special Administrative Region, and the Government of Macau Special Administrative Region.
2.2 Shenzhen and Hong Kong complement each other’s strengths in developing the innovation and technology industries

The early days of co-operation between Shenzhen and Hong Kong were characterised by the ‘front shop, back factory’ model. This has developed into the current ‘twin cities economy’, embodying the co-operation between Shenzhen and Hong Kong. The 2021 Global Innovation Index Report, published by the World Intellectual Property Organization (WIPO), indicates that the Shenzhen-Hong Kong-Guangzhou technology cluster is second only to the Tokyo-Yokohama technology cluster in Japan among the world’s 100 most vibrant technology clusters. Furthermore, in 2020, the combined GDP of Shenzhen and Hong Kong’s totaled up to RMB5 trillion (USD783 billion), surpassing Switzerland to become the 18th largest economy in the world.

The 14th Five-Year Plan clearly supports Hong Kong’s development into an international I&T hub to further deepen the I&T co-operation between Shenzhen and Hong Kong, as well as with other cities in Mainland China. This shows the importance that the Central Government attaches to I&T and its development in the Shenzhen-Hong Kong Lok Ma Chau Loop. Shenzhen and Hong Kong have been partnering in I&T development; the country aims to develop the Hong Kong-Shenzhen Innovation and Technology Park (HSITP) into a world-class knowledge hub and I&T centre, bringing in I&T research achievements from Hong Kong and abroad. At the same time, Hong Kong is the Mainland’s window and ‘super connector’ to the outside world, enabling the city to meet the country’s needs in developing international relations and play its role in Mainland enterprises going global and integrating into the global innovation network.

Based on the strategic emerging industries mentioned in the 14th Five-Year Plan and the Outline Plan¹, this report summarises the ten key industries Hong Kong can co-operate and develop with Shenzhen using its rich experience and institutions to attract foreign investment and to help companies ‘go global’. After considering Shenzhen and Hong Kong’s respective advantages and complementary development potential, we believe that the following six areas should be prioritised for I&T co-operation and development:

- Biotechnology (Biotech)
- New materials
- Next-generation information technology (Next-gen IT)
- Financial technology (FinTech)
- New energy vehicles
- New energy

¹ Based on the nine strategic emerging industries in the 14th Five-Year Plan and the Outline Plan, as well as Shenzhen and Hong Kong’s future co-operation prospects in FinTech, this report summarises the following ten important industries for co-operation: Biotech, new materials, next-gen IT, FinTech, new energy vehicles, new energy, high-end equipment manufacturing, environmental protection, aeronautics and astronautics, and marine equipment.
<table>
<thead>
<tr>
<th>No.</th>
<th>Emerging industry</th>
<th>Advantages of the emerging industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Biotechnology</td>
<td>Biotech is one of the nine important strategic emerging industries mentioned in China’s 14th Five-Year Plan and one of the four new pillar industries driving development in the GBA. Hong Kong is the GBA’s leader in healthcare with its quality medical services and strong biomedical R&amp;D capabilities. At the same time, Hong Kong’s 2021 Policy Address also stressed the recommendation to set up an InnoLife Healthtech Hub in the Hong Kong-Shenzhen Innovation and Technology Park (HSITP), to focus on R&amp;D in the life and health disciplines, and to develop biotech.</td>
</tr>
<tr>
<td>2</td>
<td>New materials</td>
<td>The Outline Plan proposed accelerating the growth of the new materials industry and recommends that Shenzhen actively strengthen co-operation with Hong Kong by bringing in Hong Kong’s research achievements in new materials to elevate the industry’s international influence. Shenzhen considers new materials as an essential field that provides guidance for the city’s development. By the end of 2022, Shenzhen will complete the initial deployment of a world-class science city. The city is also set to complete the initial development of a technological and industrial innovation hub with global influence by 2035.</td>
</tr>
<tr>
<td>3</td>
<td>Next-generation information technology</td>
<td>The next-gen IT industry is one of the key strategic emerging industries for both the country and Shenzhen as outlined in the 14th Five-Year Plan. Next-gen IT includes the Internet, big data, cloud computing, AI, the Internet of things (IoT), and 3D printing, etc. Among these, AI is a key area of cooperation for Shenzhen and Hong Kong. Shenzhen leads the way in China in terms of AI and its application, and Hong Kong has always been at the forefront of AI research and development. If Shenzhen and Hong Kong can complement and work with each other under the beneficial policies of the Qianhai Plan, it would encourage AI startups and unicorn companies in the two cities to expand their business abroad and drive technological and economic development in the GBA.</td>
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<td>4</td>
<td>Financial technology</td>
<td>Hong Kong is home to 48 of the world’s top 100 FinTech companies, which have great competitive advantages in the fields of big data, AI, blockchain, and personal finance. The governments of Shenzhen and Hong Kong have implemented a series of financial co-operation measures in order to expedite the cross-boundary application of FinTech and build advantages in the following areas: ability to leverage the GBA’s comprehensive industrial systems and supply chains; introduce R&amp;D achievements from Hong Kong’s FinTech companies as well as the city’s regulatory and market systems; and advance the status of Shenzhen and even the Mainland in the global FinTech through marketisation.</td>
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<td>5</td>
<td>New energy vehicles</td>
<td>China is the world’s largest manufacturer of electric vehicles. China has manufactured approximately 4.6 million EVs between 2010 and 2020, accounting for 44% of the total global production. China is also the world’s largest producer of new energy vehicle batteries, with its current production capacities far exceeding the combined total of other countries. The GBA has been striving to deploy the new energy vehicle industry. Shenzhen has already developed one of the most comprehensive new vehicle industry value chains in the world. If Hong Kong can provide R&amp;D and technical support to companies in Shenzhen and Mainland China, it will lead to technological upgrading of the new energy vehicle industry and facilitate its development across Mainland China.</td>
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<tr>
<td>6</td>
<td>New energy</td>
<td>Developing renewable energy is one of the leading global initiatives to achieve sustainable development. In terms of production capacity, China is the country with the widest adoption of renewable energy in the world. The country currently produces over 70% of the world’s solar panels and has taken the lead in wind turbine production in the past decade. China’s new energy equipment manufacturers can enhance their R&amp;D capabilities by acquiring patented technologies through Hong Kong. The city can also function as a green investment platform that connects international investors with the Mainland market, thereby helping China’s new energy industry expand internationally.</td>
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2.3 The six competitive industries in Shenzhen and Hong Kong

**Biotechnology**

Biotech has great development potential and is one of the most competitive industries in the world. Biotech is one of the nine strategic emerging industries mentioned in the 14th Five-Year Plan and one of the four emerging pillar industries driving development in the GBA.

According to Grand View Research, an American market research company, the global biotech market is expected to reach USD2.44 trillion by 2028, making it a booming industry. Due to the COVID-19 pandemic, there is increasing interest in regenerative medicine and the improvement of basic medical infrastructure. As biomedical applications play an increasingly important role in the global biotech industry, China has also issued policies reflecting the segment’s high strategic value. With the support of talent, policy and capital, China’s biopharmaceutical industry has entered a rapid development phase in recent years. In fact, China’s contribution to global pharmaceutical R&D had already reached 6% by 2018, bringing it up to Tier 2 globally. China has also achieved great results in combating the COVID-19 pandemic with its research outputs: two of the eight vaccines granted emergency use listing by the World Health Organization were developed by Chinese companies, namely Sinopharm and Sinovac Biotech. Therefore, the development of medical biotech will become a major market trend.

In May 2015, the State Council released its Made in China 2025 strategy. It proposed to achieve the commercialisation of 20 to 30 innovative Pharmaceuticals by 2025 and strive to achieve world-class pharmaceutical innovation ability, production capacity, and international competitiveness.

**By 2028, the global biotech market is expected to reach USD2.44 trillion**

China’s contribution to global pharmaceutical R&D had already reached 6% by 2018, bringing it to tier 2 globally.

**USD2.44 trillion**

The Made in China 2025 roadmap proposes that by 2025, 20–30 innovative pharmaceuticals will be commercialised, and China will strive to achieve world-class pharmaceutical innovation ability, production capacity, and international competitiveness.

As of June 2021, there were 33 pre-revenue biotech companies listed in Hong Kong, which have raised a total of HKD87 billion, making Hong Kong the world’s second largest biotech financing hub, subsequent only to the NASDAQ in the US.
Shenzhen and Hong Kong both have advantages when it comes to biotech. However, whether the two core cities can work together to complement each other’s strengths and become the core driving engine of the GBA remains to be seen. Hong Kong has reached world-class standards in pioneering biotech R&D; the University of Hong Kong and the Chinese University of Hong Kong's biotechnology and medicine departments were ranked 55th and 78th respectively in the QS World University Rankings 2021–2022. There are many universities in Hong Kong that have set up their own academic centres in Shenzhen and have collaborated with the Mainland Chinese city in the field of medical treatment. These include the University of Hong Kong Shenzhen Institute of Research and Innovation; the Chinese University of Hong Kong, Shenzhen; HKBU Institute for Research and Continuing Education; and the University of Hong Kong-Shenzhen Hospital. Shenzhen also possesses comprehensive industry value chains that can industrialise research achievements from Hong Kong.

The governments of both Shenzhen and Hong Kong also attach great importance to the development of biotech. The Hong Kong Government has identified biotech as one of the four key areas where the city enjoys clear advantages and has allocated significant financial support to the industry over the past couple of years. For example, the Government injected HKD5 billion to set up the Health@InnoHK medical technology innovation platform.

With policy support from the state and Guangdong’s provincial governments, Shenzhen has also established bio-pharmaceuticals as one of its seven strategic emerging industries. The city has promoted the formation of the ‘multiple centres around a single core’ arrangement with Pingshan National Bio-

Industry Base to develop biotech. Therefore, the collaborative development in biotech between Shenzhen and Hong Kong will help both cities create new economic growth engines and enhance the competitiveness of the GBA.

Additionally, the Work Plan for Regulatory Innovation and Development of Pharmaceutical and Medical Device in the Guangdong-Hong Kong-Macao Greater Bay Area was jointly published by the National Medical Products Administration, the National Health Commission and other departments. It aims to authorise the use of drugs and medical devices that are registered in Hong Kong and Macao by Mainland medical institutions in the GBA by 2022. In March 2021, Shenzhen also reviewed and passed the Work Plan for Regulatory Innovation and Development of Pharmaceutical and Medical Device in the Guangdong-Hong Kong-Macao Greater Bay Area; the first batch of medicines in the Gangyaotong programme, also known as Hong Kong Medicine Connection, was implemented in 2021. The University of Hong Kong-Shenzhen Hospital has been set up as a pilot site, which introduced two new cancer drugs to provide alternative therapies, bringing a renewed hope of recovery to patients in Shenzhen.

In 2018, Hong Kong Exchanges and Clearing (HKEX) added article 18A to its Listing Rules, which allows biotech companies with no revenue to be listed as long as they have a market value of no less than HKD 1.5 billion and meet the same listing criteria as other listed biotech companies. Following the implementation of the new system, as of June 2021, there were 33 pre-revenue biotech companies listed in Hong Kong, which have raised a total of HKD8.7 billion, making Hong Kong the world’s second largest biotech financing hub, subsequent only to the NASDAQ in the US.

Examples of industry development for biotech in Shenzhen and Hong Kong

Through co-operation with the Department of Ophthalmology and Visual Sciences at the School of Medicine at the Chinese University of Hong Kong, Shenzhen Chujian Technology Co., Ltd. has introduced research on an AI-aided ophthalmic diagnosis platform and has set up the first AI glaucoma diagnosis project. The focus was to provide AI solutions based on the developments of a web-based custom interface, through which image data can be analysed on a large scale across multiple platforms and devices. By training AI to recognise optical coherence tomography images, eye problems in the cornea, retina, and macula lutea can be examined more effectively. As this technology can effectively assist the early detection and assessment of eye disease, patients can receive early-stage treatment for serious eye diseases such as glaucoma.

A team from the University of Hong Kong successfully developed the first nasal spray vaccine against COVID-19 in 2020, for which they won the highest prize at the Geneva International Exhibition of Inventions. The State Key Laboratory of Emerging Infectious Diseases in the Department of Microbiology at the University of Hong Kong’s School of Medicine worked with Xiamen University and Beijing Wantai Biological’s research team and announced their development of a viral vector-based influenza vaccine against COVID-19 which was approved for clinical trials by the National Medical Products Administration. The vaccine simultaneously targets the coronavirus disease and influenza viruses. The vaccine activates the local mucosal immune response and systemic immune response by imitating the natural infection pathways of respiratory viruses, thereby creating a high level of targeted protection.
Development and collaboration opportunities for the biotechnology industry in Shenzhen and Hong Kong:

Developing biotech with the ‘front research, back production’ ecosystem with fundamental research conducted in Hong Kong and industrialisation in Shenzhen plays to the cities’ respective advantages in fundamental research and AI. The two cities can incorporate their own strengths into high-end medical devices, with a division of roles in R&D, quality management of medical engineering and software programming. As of September 2021, there were 214 biotech and medical startup companies in Hong Kong. If they could leverage Shenzhen’s comprehensive biotech industry value chains, it will create synergy and unleash a greater potential for future development and investment opportunities.

Hong Kong’s strength in fundamental research also enables it to excel in drug and vaccine clinical trials, which along with the positive externalities it brings, plays an important role in biotech value chains. Clinical trial data from Hong Kong has received multiple recognition from pharmaceutical regulatory bodies in China, the US, and Europe. The University of Hong Kong Clinical Trials Centre was a founding member of the International Clinical Trial Center Network along with Harvard University and the University of Cambridge. The University of Hong Kong Clinical Trials Centre is planning to expand into Shenzhen, bringing its international clinical trial management experience to Mainland China. This will improve the standard of clinical trials conducted in Mainland Chinese hospitals. Since Hong Kong’s fundamental research strength is focused on initial research and phase I clinical trials, this combined with a limited number of cases of illnesses in the city, it is difficult for Hong Kong to complete later phases of clinical trials on its own. If Hong Kong could work with Shenzhen on phase II and III clinical trials, the two cities could complement one another and biotech research in Shenzhen and Hong Kong can reach new heights.

In terms of Hong Kong’s recently proposed Northern Metropolis Development Strategy including the San Tin Technopole Construction Plan, if Shenzhen and Hong Kong can jointly build a large biotech research facility in the Lok Ma Chau/San Tin area, it would be an effective way to attract top-quality international talent and train industry talents in a sustainable way. More importantly, the research facility will attract leading enterprises to the Lok Ma Chau Loop to connect with the research facility's midstream and upstream fundamental research as well as its applied research outputs. It will enable collaboration throughout the whole industry value chain to industrialise the research outputs from these universities. It would also develop the Lok Ma Chau Loop as the centre of Shenzhen-Hong Kong’s biotech innovation.

Detailed modes of collaboration and the division of labour within Shenzhen and Hong Kong’s industry value chains are still to be decided. The Shenzhen Municipal Government has published a biomedicine development policy roadmap and, in August last year, a blueprint and support measures for Shenzhen’s part of the Cooperation Zone at the northern part of the Lok Ma Chau Loop. The policy and blueprint were developed with the intention of identifying the most beneficial mechanism for innovation both in Hong Kong and internationally. However, Hong Kong is yet to make a detailed industry plan to facilitate technology transfer and collaboration for its part of the Lok Ma Chau Loop. In the future, Hong Kong should actively explore and upgrade the modes of co-operation with Shenzhen in order to give full play to each city’s respective advantages, thereby bringing biotech innovation collaboration between Shenzhen and Hong Kong to the next level.
New materials refer to traditional materials that are engineered with significantly improved properties or new functions, or newly discovered materials that have special properties. As the world strives to reduce carbon emissions and moves towards an environmentally friendly future, the new materials industry in China and the rest of the world, is now evolving towards green, low carbon, precise, and economical solutions. This has stimulated the rise of new green and low-carbon materials with excellent performance and special functions. Additionally, in light of the COVID-19 pandemic and the resulting public health risks, there is a massive need for antibacterial and antiviral materials globally, including China.

At present, new materials are being actively developed globally, including environmentally friendly and antibacterial materials. China's new materials industry continues to grow steadily, with gross industrial output expected to reach USD1.6 trillion in 2025 and the compound annual growth rate reaching 13.5%.

The Notice from the People's Government of Shenzhen Regarding Issuance of Shenzhen New Materials Industry Revitalisation and Development Plan (2011–2015) also proposes new efforts to develop the new materials industry. The notice recommends that Shenzhen actively promotes the Shenzhen-Hong Kong collaboration, improve the international influence of the new materials industry, and strengthens co-operation with Hong Kong’s R&D institutions and higher education institutions as well as within the Shenzhen-Hong Kong Innovation Circle to introduce research results for new materials from Hong Kong. The GBA will be built into a global hub for new materials and a world-class new materials industrial cluster in accordance with China's overall strategic position and the industry's capabilities.

In 2019, the production output of Shenzhen's new materials industry reached RMB41.619 billion, with a growth rate of 27.6%. Additionally, prominent new materials R&D organisations such as Kuang-Chi, BYD, and Zhongjin Lingnan have emerged in Shenzhen. Multinational enterprises such as DuPont, Sumitomo Group, and Nitto Denko Corporation have also set up their bases in Shenzhen. As of 2021, there were over 3,000 new materials companies in the city.
Shenzhen has issued a series of green policies, including the Action Plan for Creating a City of Green Buildings, and the Shenzhen Sustainable Development Plan (2017–2030). These policies promote the use of new materials in environmental protection and the development of green buildings in Shenzhen, while striving to build a green city with low pollution. Additionally, Shenzhen strongly promotes plastic pollution management in its Action Plan on Plastic Pollution Control in Shenzhen. In 2021, Shenzhen went from restricting plastic to banning plastic; non-compostable plastic bags and cutlery are now officially a thing of the past at malls, supermarkets, and food delivery services. The demand for biodegradable plastic bags will also increase in the future. Shenzhen’s requirements for environmentally friendly new materials are outlined in the policies that it issues. The government of Shenzhen demonstrates the importance it attaches to the new materials industry through the funding it provides to technological innovations in this area.

Hong Kong, with a focus on R&D in materials innovation, is home to many research-intensive universities that are not only ranked among the world’s top 100, but also lead the way in new materials R&D and application. This makes Hong Kong a strategic source for the world’s high-tech industries. The original innovation capabilities in the R&D of new materials at Hong Kong’s research universities make the city a strategic source for the global high-tech industry, which driving Shenzhen’s independent innovation developments in its new materials industry. In fact, the Hong Kong Polytechnic University won three global innovation prizes in the fields of advanced textile materials, new materials synthesis, and precise positioning technology at the Global Innovation Summit 2021 in October 2021.

In addition to universities, Hong Kong’s Innovation and Technology Commission launched five R&D centres in 2006 to promote and coordinate the development of applied R&D in five key areas. Among which nanotechnology, advanced materials, textiles, and ready-to-wear clothing are closely related to the R&D of new materials innovation. Technological inventions from Hong Kong’s NAMI won a total of 14 medals at the 2021 Geneva International Exhibition of Inventions, including 8 golds, 5 silvers, and 1 bronze. Five of the gold medals also received commendations from the jury.

In November 2021, the People’s Government of Guangdong issued its Notice on the 14th Five-Year Plan for Educational Development in the Guangdong Province, wherein it prompted top universities such as the Shenzhen University and the Southern University of Science and Technology to become part of the country’s Double First Class University Plan. The plan was issued with the goal of producing research outputs of the highest quality, originality, and academic value that have important social influence and can lead development in both the Guangdong Province and China as a whole.

At the same time, many of China’s leading universities have established academic branches and research institutions in Shenzhen. Examples include the University of Science and Technology of China, Peking University, and Tsinghua University. As of early 2019, there were 72 scientific research institutions in Shenzhen established by six universities from Hong Kong, with nearly 300 research outputs and technical services transformed, and 151 projects that received joint innovation funding from Guangdong and Hong Kong. The collaboration between Shenzhen and Hong Kong will help transform Shenzhen into the national city of innovation in the GBA. National higher education institutions and scientific research institutions have set up key laboratories in Shenzhen to drive R&D in the city’s new materials innovation, while also relying on local manufacturing and other industries for scientific innovation and connections to international markets.

Hong Kong’s new materials industry enjoys easy access to funding from the city’s capital market. Every new material involves a great deal of time to progress from initial research to practical implementation. This also requires enormous amounts of capital, which means that corporate finance channels are extremely important. Shenzhen is China’s first special economic zone and receives huge amounts of foreign direct investment. At the same time, Hong Kong is one of the most active financial centres in the world. The two cities can work together to provide an excellent financing environment for the development of the new materials industry.

Shenzhen and Hong Kong - Agglomeration of Strengths for Mutual Development
Development and collaboration opportunities for the new materials industry in Shenzhen and Hong Kong

New materials R&D have a long development lifecycle and require specialised staff to undertake long-term research, development, and production work. This comes at a relatively high investment cost. Shenzhen has issued policies that encourage the development of the new materials industry. However, currently, its high-tech materials are not internationally competitive as it heavily relies on importing key materials. Research and statistical data from China's Ministry of Industry and Information Technology in 2018 shows that 32% of 130 types of key materials for more than 30 large Chinese enterprises are not available locally, while 52% are relying on imports. Therefore, collaboration between universities and research institutions in Shenzhen and Hong Kong can support the construction of public service platforms, such as the Shenzhen-Hong Kong industrial design I&T results transformation centres. These organisations also provide the training of talent in Shenzhen and Hong Kong and information exchange platforms, through innovation bases such as the Shenzhen/Hong Kong Innovation Circle Interactive Base, the PKU-HKUST Shenzhen-Hong Kong Institution, the Hong Kong Polytechnic University Shenzhen Research Institute, and the business incubators in Shenzhen/Hong Kong Innovation Circle Interactive Base. Through cultivating and introducing key materials that meet low carbon and green requirements, providing research outputs while simultaneously advancing research in key fields, and increasing investment in training scientific research staff, the overall level of technology in the new materials industry can be upgraded.

New materials are especially significant for strengthening the ‘Made in China’ initiative and are one of the driving forces for a new round of global industrial revolution. In this regard, the governments of Shenzhen and Hong Kong jointly established the Cooperation Zone. Within the Shenzhen Innovation and Technology Zone in the Cooperation Zone, 370,000 m² of high-quality scientific research space has been prepared and already put into use. This is where they have set up the Shenzhen-Hong Kong Collaborative Innovation Center, the Shenzhen-Hong Kong International Technology Park, the International Quantum Academy, and the International Biomedicine Industry as four bearers of innovation to take the lead in developing high-end scientific innovation resources from Hong Kong and abroad.

Additionally, the Advanced Materials Product Engineering Team from the Chinese University of Hong Kong (CUHK) set up an advanced materials laboratory in Longgang District of Shenzhen in 2018. With a focus on the frontier of internationally advanced material technology development and major national strategic needs, they developed new polymer (composite) materials with high performance, functional integration, and smart research. They are dedicated to creating platforms that integrate fundamental research, application development and innovation talent training. Shenzhen relies on CUHK’s strong scientific research ability and the solid industrial base of the GBA. Led with technological innovation and guided by market services, they have jointly participated in the research of high performance, high-end polymer materials. The team currently receives support on several large projects.

Examples of industry development for new materials in Shenzhen and Hong Kong

City University of Hong Kong has used innovative methodology combined with nanocomposite methods to create steel with enhanced strength. Apart from being light, this new steel also possesses excellent toughness, weldability, and corrosion resistance. The technology has already been used by high-tech steel manufacturers in Mainland China. Products from Mainland Chinese manufacturers have been used by more than 70 medium and large-sized steel factories in India, Brazil, and Saudi Arabia.

Hong Kong’s Chiaphua Industries Ltd. and the Hong Kong University of Science and Technology (HKUST) jointly developed an environmentally friendly Germagic antiviral coating, which uses patented microencapsulation technology to encapsulate and delay the release of microbicides, effectively killing 99.9% of germs and viruses, with its effectiveness lasting up to 90 days. This antiviral coating has widespread applications in air purifiers, water purifiers, and waste management. R&D for these types of new material solves Shenzhen and Hong Kong’s needs for antibacterial and antiviral solutions.
Next-gen IT industry refers to the industry that makes smart transformations to information and network-related firmware, as well as its infrastructure and service capabilities, through the development and application of next-gen IT and equipment. Next-gen IT includes the Internet, big data, cloud computing, AI, the IoT and 3D printing. Among these, AI is quickly becoming the strategic technology that leads the technology revolution and industrial reform.

The 14th Five-Year Plan highlights the importance of the next-gen IT industry and proposes a focus on accelerating the digital development of several key areas such as AI in order to build ‘Digital China’. At the same time, China's national policy has already positioned AI as one of the nine strategic emerging industries with high strategic values. In the Next Generation of Artificial Intelligence Development Plan released by the State Council in 2017, China aims to become the world leader in AI by 2030. The plan proposes that China makes huge breakthroughs in the field of fundamental AI theory by 2025, with some technologies and applications attaining global leadership status. China aims to be the global leader in AI theory, technology, and applications by 2030 and become the world’s major AI innovation centre. At the same time, next-gen IT is also one of the seven strategic emerging industries in Shenzhen’s 14th Five-Year Plan, and is also the fastest-growing and largest industry by market size in Shenzhen. The Shenzhen Next Generation of Artificial Intelligence Development Plan (2019-2023) proposes that by 2023, Shenzhen will become a leading, world-class region for AI applications, with the AI core industry expected to break through RMB30 billion, while pushing the value of related industries to RMB600 billion.

In 2020, the global AI market size was worth USD35.92 billion. It is expected to grow from USD47.47 billion in 2021 to USD360.36 billion in 2028, at a compound annual growth rate of 33.6%. With the support of talent, policy, and capital, China's AI industry recently entered a highly productive development period and the number of AI companies has quickly increased to make the country the second largest in the industry globally. As of the end of 2020, the size of China's AI industry was estimated at RMB185.8 billion, with 26.4% located in the GBA. China's AI industry is expected to be worth over RMB1 trillion by 2025. Shenzhen is one of the pioneering cities of AI development, housing 1,318 AI enterprises, ranking second in China.

Shenzhen will become the world’s leading hub of AI application by 2023, with the size of the AI core industry expected to break through RMB30 billion. In the 2021–2022 QS World University Rankings, computer science and IT systems technologies department from three Hong Kong universities have been included in the global top 50 list with cutting-edge research meeting global standards.

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1,318 AI enterprises, ranking second in China.
Shenzhen and Hong Kong both have unique advantages when it comes to AI. Whether the two core cities can work together to complement each other's strengths as the key to drive successful development in the GBA remains to be seen. Hong Kong has been in an advantageous position for AI R&D with five universities listed in the top 100 for engineering and technology majors. Among them, HKUST ranks 30th and 20th in the world for Computer Science and Information Systems; and Electrical and Electronic Engineering majors respectively, meeting global standards in its cutting-edge research in AI.

Shenzhen possesses comprehensive AI industry value chains, with leading enterprises also focusing on industrial demand in carrying out global leading technology R&D. For example, Huawei’s investment in R&D in 2018 was RMB101.5 billion, accounting for about 14% of its sales income, the highest proportion among enterprises in China. Peng Cheng Laboratory and WeBank have set up their AI Finance Joint Laboratory in Shenzhen to promote the use of AI in financial services, especially in machine learning and blockchain. Tencent AI Lab and CUHK (Shenzhen) have also jointly launched their Laboratory of Machine Intelligence to collaborate on machine learning, computer vision and natural language processing.

Shenzhen leads the way for AI and its applications in China, which includes smart security, smart homes, smart retail, smart finance, and smart healthcare. However, the upstream fundamental research of Shenzhen’s industry value chains is still reliant on imports. In 2019, Shenzhen received approval to build the National AI Innovation and Application Pilot Zone and the National AI Innovation Development Pilot Zone. Universities in Hong Kong could leverage these zones to strengthen industry-university-research co-operation with Shenzhen. Shenzhen also possesses comprehensive industry value chains that can commercialise Hong Kong’s research to further stimulate digitalisation in other industries and smart development in both cities, as well as the rest of the GBA.

The governments of both cities consider AI as an important field for technology development. For example, in the Hong Kong Smart City Blueprint 2.0, the Hong Kong Government proposes developing digital infrastructure and investing in the Hong Kong Science and Technology Park by setting up the technical innovation platform, AIR@InnoHK, to focus on AI and robotics. With policy support from the state and Guangdong’s provincial governments, Shenzhen is prioritising the development of AI chips, smart drones, smart robots, intelligent connected vehicles (ICVs), and image recognition technologies in its AI zones.

The co-operative development of Shenzhen and Hong Kong in the AI field is beneficial in providing a new driving force for future economic growth. With the set-up of the Lok Ma Chau Loop in the HSITP, AI has been cemented as one of the six priority areas of co-operative development to improve the technological and industrial competitiveness of the GBA.

Examples of industry development for next-generation information technology in Shenzhen and Hong Kong

SmartMore was originally a research project at the CUHK in 2019. The team developed their own technology to broaden the applications of visual computing. Currently, SmartMore has developed and mass-produced more than 30 smart manufacturing software and hardware integration products and has presented AI solutions for smart manufacturing, including image/object localisation, visual recognition, visual guidance, and object measurement. The company also adopted a ‘Designed in Hong Kong, Made in China’ innovation model, and works with well-known enterprises from around the world, using Hong Kong as the R&D base, with branches in Shenzhen, Shanghai, Tokyo, and Singapore. At the end of 2021, SmartMore became a unicorn with an estimated value of over USD1 billion.

Malong Technologies is a startup enterprise headquartered in Shenzhen. It is an AI company that focuses on providing state-of-the-art computer vision technology services. Malong Technologies has applied for 125 patents in China, 46 PCT patents, and 15 patents in the US. It has had dozens of papers accepted and presented at global computer vision conferences such as Conference on Computer Vision and Pattern Recognition (CVPR), International Conference on Computer Vision (ICCV), and European Conference on Computer Vision (ECCV). The company works with higher education institutions in Mainland China and Hong Kong, such as the University of Hong Kong, Nanjing University, and the Southern University of Science and Technology, to train talent for industrial construction, and R&D.
Development and collaboration opportunities for the next-generation information technology industry in Shenzhen and Hong Kong

Hong Kong possesses solid fundamental research capabilities and international platforms that can attract the world’s brightest AI talent to meet the future staffing needs of the AI industry in Shenzhen and the GBA. In 2021, four universities in Hong Kong were listed among the top 50 of the QS World University Rankings. Among them, the computer science and information systems technology majors, and engineering and technology majors at HKUST were both ranked number one in Hong Kong. In 2018, HKUST established the first AI research centre in Hong Kong and started working on research projects with organisations such as the Shenzhen Research Institute. The university expects to attract top researchers from different disciplines to carry out high-quality fundamental research in AI for industrialisation in Shenzhen, Hong Kong and the GBA.

Additionally, AI has been identified as one of the six priority development areas for cross-boundary collaboration by the HSITP. In the future, this will help accelerate the commercialisation of Shenzhen and Hong Kong’s AI industries, achieve industrial agglomeration and stimulate the development of surrounding areas through AI. It will nurture information service industries such as cloud computing, big data, industrial Internet, as well as associated industries, to accelerate the digital transformation of the next-gen IT and manufacturing industries.

As big data has become an inseparable part of AI development, Shenzhen and Hong Kong will be able to make use of policies to collaborate on the development of ‘cross-border data flows’.

For example, by using Mainland Chinese medical data, both cities can expand the scope of big data as a foundation to advance AI deep learning, thereby promoting the development of AI and next-gen IT industry. Article 11 of the Data Security Law of the People’s Republic of China proposes the advancement of a framework for cross-boundary data security and flow. If the governments of Shenzhen and Hong Kong coordinate on this and comply with the conditions of the data security law, they could leverage the HSITP in the Lok Ma Chau Loop to build a new cross-boundary big data storage and processing centre. They can use it as a pilot zone to attract technology companies from the GBA and around the world, and seize the opportunity to promote big data interconnection.

As of August 2020, Hong Kong’s annual investment in data centres accounted for 54% of the Asia-Pacific total. In the future, international technology leaders and providers of the Internet, cloud services, and data centres will continue to expand their business with Hong Kong’s world-class digital communications infrastructure. Cross-boundary data from the Lok Ma Chau Loop will help Hong Kong maintain its position and international appeal as a data hub in the Asia-Pacific region. It will also speed up the development of the AI and next-gen IT industries in both cities.

Six of the 18 unicorn companies in Hong Kong in 2021 were in the AI and robotics segments. If Hong Kong could leverage Shenzhen’s comprehensive AI industry value chain, this would promote the cross-boundary business expansion of AI startups and unicorn companies. This, in turn, would bring huge investment opportunities for the AI industry in both cities in the future.
In recent years, FinTech reforms have swept across China against a backdrop of stable economic growth and rapid development of Internet technology. China has already succeeded in using technology to improve the efficiency of financial services, as it gradually transitions from a cash economy to a digital economy. According to surveys, there are nearly 890 million people in China using digital payment platforms, such as WeChat Pay and Alipay. China's FinTech sector has seen rapid growth in revenue – RMB1.44 trillion in 2019, an increase of 48.1% from 2018, according to the China FinTech Operations Report (2020). The 14th Five-Year Plan proposes that China promotes the R&D of digital currency and establishes financially valid mechanisms that support real economic systems, in order to improve the standard of financial technologies. Additionally, subsidiary organisations of the Digital Currency Institution of the People’s Bank of China have established FinTech innovation platforms in Shenzhen to promote FinTech innovation research, making them pioneers in this area.

As FinTech further develops, China’s leading FinTech hub Shenzhen, will see a huge demand for interdisciplinary professionals who are proficient in both technology and financial services. However, since it takes a long time to train interdisciplinary talents, the supply will still be insufficient in the short term. Hong Kong, on the other hand, is a treasure trove of talent and has frequent talent exchange with the rest of the world. Its international financial regulations will be an important intangible asset to promote the development of FinTech in both the GBA and the rest of China. Therefore, it is very important for Shenzhen, and even Mainland China, to embrace Hong Kong’s interdisciplinary talents and its international financial regulations for the long-term supervision of FinTech development.

According to statistics, there are currently over 600 FinTech companies and startups in Hong Kong. In addition, 48 of the world's top 100 FinTech companies have set up offices in Hong Kong. These companies all perform well in terms of big data, AI, blockchain, and personal finance. On top of this, Hong Kong connects the world’s biggest FinTech markets such as China and Southeast Asia. The city can provide a conducive business environment for FinTech companies in both Shenzhen and Hong Kong to launch their innovations.

In the wake of the pandemic, Hong Kong made some quick adjustments to adapt and weather the storm – it became one of the first cities in Asia to launch virtual banking. After its first virtual bank formally opened for business in 2020, eight more virtual banks have successfully launched their services in the city. Now nearly 86% of banks in Hong Kong are gradually integrating FinTech into various financial services.
Development and collaboration opportunities for the financial technology industry in Shenzhen and Hong Kong

The Outline Plan indicates that long-term collaboration in the FinTech industry is an important part of development in the GBA. As a trial zone of innovation-driven development, Shenzhen is also China’s pilot zone for FinTech. The development of the Qianhai New District has furthered the capacity for collaboration between Shenzhen and Hong Kong. This includes enhancing the connection between financial markets in Hong Kong and the Mainland, enabling cross-boundary use of RMB, easing the set up of bank accounts, and strengthening green finance collaboration.

Shenzhen possesses comprehensive tech industry value chains and is capable of adopting Hong Kong’s reliable FinTech regulation system and market system, thereby promoting FinTech development in Shenzhen and the GBA and pursuing global leadership in this area. It can also bring in world-class financial resources, strong scientific research capabilities, and leading innovations from Hong Kong, and achieve transformation through its application. Additionally, Shenzhen can attract and encourage professionals from Hong Kong’s financial sector to collaborate with high-tech talents in Shenzhen. This will encourage the collaboration between domestic and international talents to develop FinTech solutions, thereby furthering FinTech development.

In September 2021, the State Council issued its Plan for Comprehensive Deepening Reform and Opening Up of the Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone in order to further promote the reform and opening-up of the Qianhai New District. Its plan aimed to further expand the space for development in the region from a total area of 14.9 km² to 120.6 km². Hong Kong’s advantages in the financial services sector will attract even more high-end enterprises from Qianhai to set up offices in Lau Fau Shan and Hung Shui Kiu/Ha Tsuen New Development Area in Hong Kong’s Northern Metropolis.

Examples of industry development for financial technology in Shenzhen and Hong Kong

Tencent Finance Academy, a subsidiary of Tencent, was established in 2018. The academy leverages Tencent’s resources to create open platforms to train ‘Internet + finance’ interdisciplinary talents and collaborate on advancing the long-term development of Hong Kong’s FinTech. In addition, in 2019, Tencent Finance Academy signed a co-operation memorandum with the University of Hong Kong and HKUST to train local FinTech talents and collaborate on related research and projects together. This helps students improve their FinTech knowledge through real business cases.

WeLab Bank opened in 2020 as Hong Kong’s first virtual bank. With support from investors such as CK Hutchison’s TOM Group and Alibaba, the bank became a unicorn company in 2021. The bank’s Shenzhen office employs many technically-experienced staff, while its Hong Kong office focuses on finance professionals. The bank shares its talent pool among both cities to expand the company and nurture the GBA market.
New energy vehicles

Over 80 million new vehicles were sold in 2020. As the global economy has been continuously disrupted by the COVID-19 pandemic, new energy vehicles were one of the few sectors that went against the trend and achieved growth. China manufactured approximately 4.6 million electric vehicles (EVs) between 2010 and 2020, accounting for 44% of global production. Europe ranked second with 25% of market share and the US was third, accounting for just 18%.

In November 2020, China released its New Energy Vehicle Development Plan (2021–2035), wherein it indicates that by 2035 China will dedicate itself to formulating globally accepted standards for new energy vehicles and will take the lead in connecting autonomous vehicles to the Internet. China aims to become the global leader in manufacturing new energy vehicles. It aims to further improve its industry value chains, production capacity, create international brands and capitalise on overseas market opportunities.

In fact, Chinese cars have established their presence in overseas markets for a long time now. For example, electric buses developed by Shenzhen’s BYD Co. Ltd. has captured a good market share in many countries in Europe and North America, while XPeng Inc. has been exporting its vehicles to Norway to test market response. NIO, on the other hand, has already started exporting to European markets and plans to enter other international markets in 2022.

In addition to new energy vehicles, China is also the world’s largest producer of new energy vehicle batteries, with its current production capacity far exceeding the combined total of other countries. According to a UBS report, Chinese lithium battery manufacturers, Contemporary Amperex Technology Co. Ltd. (CATL) and BYD Co. Ltd., dominate the global market with one third of the market share. Since the costs of raw materials for new energy vehicles in China are lower than those in overseas markets, Chinese new energy vehicle supply chain enterprises are expected to make a significant inroad into overseas markets in the next five years.

The GBA serves as an important car manufacturing base in China and is dedicated to deploying the new energy vehicle technology and speeding up the development of its industry clusters. Industry clusters in the GBA are now starting to achieve economies of scale. A complete lithium battery industry value chain is taking shape. According to statistics from January 2021, four of China’s ten largest battery enterprises are located in the GBA, namely BYD, BAK Power Battery, Eve Energy, and Great Power.
Shenzhen possesses strong R&D capacity and comprehensive supply chains for electronic components that can assist with the development of the new energy vehicle industry. Shenzhen has already developed into a city with one of the most comprehensive new energy vehicle industry value chains in the world, making it a leader in the synergistic development of associated industries such as car manufacturing, batteries and raw materials, motor drives, electronic control systems and charging facilities. Leading enterprises are emerging in all of these areas, such as BYD Co. Ltd. In addition, innovation in related advanced technologies is also driving the development of China's new energy vehicle industry. For example, as a leading global tech giant, Huawei, headquartered in Shenzhen, is able to use its mature 5G network, cloud platform, and big data to leverage specialised knowledge in AI and complementary sectors to help the new energy vehicle industry develop smart cars.

In fact, Hong Kong's R&D in new energy vehicles is comparable to that of other countries. However, Hong Kong lacks support in commercialisation and productisation. As early as 2009, the first electric car developed by the Hong Kong Polytechnic University, MyCar, garnered recognition in Europe. However, the brand lacked sufficient support from the governments and financial groups, and it was eventually sold to an American company, where it landed in Mississippi in 2012. Through collaboration, companies in Shenzhen and Mainland China can support Hong Kong’s R&D capabilities to develop new energy vehicle technology in both cities for further growth.

Examples of industry development for new energy vehicles in Shenzhen and Hong Kong

BYD Co. Ltd. is listed in both Shenzhen and Hong Kong and has a market value of over RMB100 billion. The company set up a research centre in the Hong Kong Science Park as early as 2011 and started collaborating on research for electric cars with Hong Kong’s Automotive Parts and Accessory Systems R&D Centre and the Hong Kong Productivity Council. BYD combined its electric vehicles and their technology with three auto part technologies developed in Hong Kong, and utilised them in application demos, paving the way for future research. At present, BYD’s new energy vehicles have a full coverage of seven general fields (including private cars, taxis, urban public transport, tour buses, urban goods logistics, urban construction logistics, and sanitation vehicles) and four specialised fields (including warehousing, ports, airports, and mining).

Huawei is the global leader in autonomous vehicles with L4 driving capabilities and radar systems. Once the navigation system is switched on and a destination is entered, the system will plan a corresponding route and then automate the driving process. These vehicles can drive autonomously for 1,000 kilometers in downtown areas with no interference, surpassing the driverless vehicle technology adopted by Tesla which only utilises pure computer vision technology and video lenses.

Development and collaboration opportunities for the new energy vehicle industry in Shenzhen and Hong Kong

New energy vehicle enterprises from Shenzhen need Hong Kong's support in professional services in areas such as testing, law and accounting to go global. They will need to use Hong Kong's business consultancy services in order to better understand the foreign investment environment, to help more domestic new energy vehicle brands go global and improve their position in the international market. For companies that have gone global, Hong Kong can help solve intellectual property issues and effectively protect their R&D achievements and corporate brands in overseas markets.

Hong Kong’s Automotive Parts and Accessory Systems R&D Centre (the Centre) is currently researching technologies related to electric cars. In 2014, the Centre developed a fast charger for electric cars that significantly reduced charging time from several hours to less than one hour. The development of new energy vehicle technology is critically important in establishing internationally recognised brands for export from Shenzhen. Hong Kong’s R&D and innovation capabilities, as well as its credibility around the world can help Shenzhen's new energy vehicle enterprises build more competitive advantages and access more international opportunities.

In the future, the development strategy for Hong Kong’s Northern Metropolis could incorporate custom manufacturing and the development of testing facilities for new energy vehicles. This will better protect the intellectual property of R&D outputs and brands in these industrial clusters, thereby helping new energy vehicle enterprises from Shenzhen and Mainland China strengthen their position in international markets.
Developing renewable energy is one of the key initiatives for both China and the rest of the world in order to achieve sustainable development and meet the United Nations' sustainable development goals for 2030. In terms of production capacity, China is the country with the widest adoption of renewable energy in the world. As of the end of 2019, the gross installed capacity of China's renewable energy accounted for 30% of the global total. Between 2012 and 2020, the proportion of renewable energy in China's total energy consumption increased from 9.1% to 15.9%. Consequently, China has set a clear goal for the country – renewable energy will account for 25% of total energy consumption by 2030, and wind and solar energy consumption will increase to 16.5%.

China is currently moving towards a green economy model as guided by state policies. It is implementing innovation-driven development strategies in the energy sector to improve innovation capabilities for energy technology and is striving to achieve carbon neutral goals. The electric power plan in the 13th Five-Year Plan (2016–2020) already proposed increasing the proportion of non-fossil fuels in electricity production. By the end of 2020, clean energy such as natural gas, hydro, nuclear, and wind increased to 23.4% of the country's overall energy consumption.
In addition to the increased use of clean energy, the Chinese Government aims to achieve carbon neutrality by 2060. This means that there will be changes in energy models and energy generation structures. China will speed up the adoption of renewable energy and will require expanded climate financing, especially in the new energy sector. As of 2020, energy was the second largest category in China’s outstanding climate-related bond market, second only to transport and rail freight. The energy bond market size grew to USD48.5 billion, accounting for approximately 15% of China’s outstanding climate-related bonds.

Shenzhen is a leader in renewable energy adoption within China. As of the end of 2019, 30% of Shenzhen’s power came from renewable energy. Since the 18th National Congress, Shenzhen has amassed nearly RMB3 billion in energy investments and has implemented over 200 energy-saving and environmental improvement projects, over 40 pollution treatment projects and over 100 ecological conservation assessment tasks. With its experience, Shenzhen can perform as a model for the realisation of carbon neutrality and the construction of a national carbon market.

Large renewable energy enterprises in Shenzhen are actively searching for overseas development opportunities, selling ‘Made in China’ brands to the rest of the world. Taking Shenzhen Energy as an example, the group has publicly announced that it will accelerate its transformation into an integrated energy enterprise. They are developing renewable energies with clean coal and gas, as well as large-scale wind, solar, and hydro projects, thereby making the industry structure greener and lowering carbon emissions. They are also continually expanding the distribution of overseas energy resources.

As of May 2021, Huawei’s FusionSolar had exported over 175 GW of power globally to more than 60 countries. The Huawei-HKUST Joint Laboratory will make use of Hong Kong’s technological advantages and talent to explore cutting-edge 4G and 5G+ communication networks, wireless technology, core technology, machine learning algorithms, and relevant emerging technologies through industry-university-research co-operation and innovation models. The lab will also leverage cutting-edge studies to support Huawei’s technological development and upgrade.

DuPont was the first company to settle into the Solar Energy R&D Support Centre at the Hong Kong Science Park. With USD160 million of investment in solar energy projects in Shenzhen and Hong Kong, the company has set up a global thin-film photovoltaic R&D centre. By leveraging Hong Kong’s position as an international platform, as well as its excellent technological research experience and strong international trade connections, DuPont has attracted renewable energy enterprises from Shenzhen and Mainland China to collaborate on expanding the Mainland Chinese market. Meanwhile, it is also leading China’s renewable energy enterprises in the exploration of the international market, creating mutual benefits in terms of technology and trade connections.
Development and collaboration opportunities for the new energy industry in Shenzhen and Hong Kong

The World Bank’s Doing Business 2020 report indicates that Hong Kong leads the world in business efficiency and economic performance. Hong Kong could share its talent pool and excellent management experience with Shenzhen and other cities in Mainland China to help them expand into overseas markets. China is currently the world’s largest producer of new energy equipment. Given academic research is a long-term undertaking, Chinese enterprises could use Hong Kong as a platform to obtain patented technologies and improve research capacity. They could also set up research organisations in Hong Kong to recruit and train international talent in order to keep up with cutting-edge technological developments, thereby meeting the needs of overseas markets and customers.

Hong Kong could help China’s solar energy become prominent in the international market, as well as satisfy different requirements that customers have for solar energy application. For example, New Energy Financing and Consulting Limited (NEFIN) makes tailor-made solar energy solutions for business owners and enterprises, providing them with multiple targeted services. The company has successfully launched over 150 MW of solar energy projects all over the world, including large, ground-based solar power plants, rooftop and distributed solar energy systems, and building-integrated photovoltaic (BIPV) systems.

In 2019, China’s green bonds totaled RMB386.2 billion, an increase of 67% from 2016, making China one of the world’s largest markets for green bonds. Hong Kong is committed to becoming a leading green and sustainable financial centre for Asia and the world. In 2019, the HKMA Infrastructure Financing Facilitation Office set up the Centre for Green Finance to provide technical support and an experience-sharing platform for the development of green finance in the Hong Kong banking industry. HKEX also launched its Sustainable and Green Exchange (STAGE) in 2020, the first multi-asset sustainable investment product platform in Asia, supporting the fast-growing global demand for sustainable finance. In the context of the new energy industry, Hong Kong can be the gateway for international investors to invest in green finance in Mainland China. This could include sustainable development and green transformation bonds to finance China’s massive new energy investment projects, which would help the country’s new energy industry go international through Hong Kong.
2.4 Interpretation of the positioning in Hong Kong’s Northern Metropolis

In the 2021 Policy Address, Carrie Lam, Chief Executive of the Hong Kong S.A.R., proposed the Hong Kong Northern Metropolis Development Strategy and the ‘Twin Cities, Three Circles’ concept. It aims to facilitate cross-boundary information exchange with Shenzhen and gradually form a new dual-core development pattern with I&T development in the north and financial development in the south of Hong Kong. According to the Northern Metropolis Development Strategy proposed by the Hong Kong Government, the area would cover multiple boundary crossings and include four primary new development zones and hubs. It would become an important region to promote co-operative development between Shenzhen and Hong Kong and cement Hong Kong’s connection with the GBA.

By leveraging Hong Kong’s strategic position next to Shenzhen, and the developments in the GBA and the Qianhai New District, the Northern Metropolis should promote the cross-boundary development of I&T industry to establish a second economic engine for Hong Kong. With this, the city would also play a bigger part in the development strategy for the GBA and the country as a whole.

Setting up the Northern Metropolis is part of the strategic blueprint for Hong Kong to promote new economic and I&T development. The Northern Metropolis will provide 926,000 homes for 2.5 million people and create more than 650,000 job opportunities, including 150,000 jobs in the I&T industry. Working together as the ‘twin cities’, Shenzhen and Hong Kong would develop from west to east to form the ‘three circles’, namely the Shenzhen Bay Quality Development Circle, the Hong Kong-Shenzhen Close Interaction Circle and the Mira Bay/Yan Chau Tong Eco-recreation/tourism Circle. These circles would connect with the seven land boundary crossings and the linked transport infrastructure, promoting close collaboration for economic and I&T development between the two cities.

As discussed above, by taking into account Shenzhen and Hong Kong’s respective strengths and complementary development potential, the two cities have the opportunity to co-operate in the six priority areas of new technology development, namely: biotech, new materials, next-gen IT, FinTech, new energy, and new energy vehicles. The Northern Metropolis’ strategic location would enable it to become the base for co-operation in the six priority areas. By moving in tandem with the development of Lau Fau Shan, Hung Shui Kiu/Tuen Mun/Sha Tin New Development Area, and San Tin Technopole, the two priority action zones adjacent to the Qianhai New District and Futian, it will further the development and collaboration between the two cities.

By focusing on the six prioritised development areas for co-operation, the Northern Metropolis is expected to create approximately HKD700 billion to 750 billion in GDP for Hong Kong’s economy. The two cities should have a series of policies to support these six major industries and ancillary industries, improve public–private partnership between government and private sector, and call upon businesses to participate in development, thereby integrating them into the country’s advancement.
PwC Hong Kong’s interpretation and preliminary industry recommendations for the four action zones in the Northern Metropolis include:

**Lau Fau Shan, Hung Shui Kiu/Ha Tsuen New Development Area: Core business areas for financial technology/regulatory technology supporting the Qianhai New District**

- Establish large-scale landmark I&T facilities centred around FinTech, regulatory technology (RegTech), wealth management, AI, and cybersecurity technologies, while setting up related R&D institutions.
- Establish a securities and green finance exchange similar to the NASDAQ in the US, to provide financial, financing, and carbon trading services for enterprises in Hong Kong, the Qianhai New District, and the GBA.
- Operate modern logistics to support the e-commerce industry and set up a distribution network that works with an ‘East in East out, West in West out’ strategy.

**San Tin Technopole: New Hong Kong-Shenzhen integrated I&T centre**

- Set up a comprehensive I&T ecosystem and industry value chain that focuses on R&D in high-tech industries such as biotech, new materials and new energy, as well as prototype production and testing.
- Attract world-class universities and research institutes to set up research and education centres.
- Provide testing facilities for new energy vehicles and drones.
- Set up a pilot ‘smart city lifestyle trial zone’ that initially focuses on the next-gen IT industry to promote smart city planning.

**Lo Wu/Man Kam To: Integrated development hub**

- Establish an experiential sports and leisure centre for Hong Kong.
- Co-operate with Shenzhen’s Luohu Business District to develop multi-purpose venues for retail, dining and entertainment.
- Set up sports and entertainment facilities with virtual reality technology, that can be used by both the public for recreation and professional athletes for training.

**New Territories North New Town**

- Set up new zones for agricultural technology development and ecotourism in Hong Kong.
- Use Industry 4.0 innovation technology to promote high-tech food safety research, agricultural technology, and food production.
- Set up an ecotourism park to promote ecotourism and cultural tourism, enhancing the conservation of natural species and habitats as well as cultural heritages.
- Act as a logistics hub to meet the logistics needs of the Northeast New Territories as well as the cross-boundary transportation needs of the high-tech manufacturing industry.
Chart 2-3: Our views on industry development at the Northern Metropolis

**Lau Fau Shan, Hung Shui Kiu / Ha Tsuen New Development Area**
Core business district in FinTech/RegTech oriented towards the Qianhai New District

- Establish large-scale landmark I&T facilities centred around FinTech, RegTech, wealth management, and cybersecurity technologies, while setting up related R&D institutions.
- Establish a securities exchange similar to the NASDAQ to provide financial and financing services for enterprises in Hong Kong, the Qianhai New District, and the GBA.
- Operate state-of-the-art logistics to support the e-commerce industry and set up a distribution network that supports the ‘East in East out, West in West out’ strategy.

**San Tin Technopole**
New Shenzhen-Hong Kong integrated I&T centre

- Set up a complete I&T ecosystem and industry value chain that focuses on R&D in high technologies, as well as prototype production and testing.
- Attract world-class universities and research institutes to set up research and education institution branches.
- Provide testing facilities for new energy vehicles and drones.
- Set up a smart city lifestyle pilot zone that initially focuses on the next-gen IT industry to promote smart city planning.

**Key I&T industries**

- **FinTech/RegTech**
- **Cybersecurity and data analysis**

**Other industries**

- **Modern logistics**

**Legend:** Stages of value chain coverage by industry activities

- **R** Research
- **D** Development
- **P** Prototyping & Testing
- **M** Manufacturing

**San Tin Technopole**

- **Biotech**
- **Advanced materials**
- **New energy vehicles and drones**
- **Robotics technology**
Northern Metropolis development overview

- **300 km²**
  - total land area
- **2.5 million**
  - population
- **650,000**
  - job opportunities
- **150,000**
  - jobs in the I&T industry
- **Approximately HKD700 billion - 750 billion**
  - in GDP

Lo Wu/Man Kam To Integrated Development Hub

- Experiential sports and recreation centre
- Co-operate with Shenzhen’s Luohu Business District to develop multi-purpose venues for retail, dining, and entertainment.
- Provide sports and entertainment facilities that adopt virtual reality technology, that can be used by the public for recreation and by athletes for professional training.

New Territories North New Town

- New Hong Kong agricultural technology and ecotourism zones
- Use Industry 4.0 innovation technology to promote high-tech food safety research, agricultural technology, and food production.
- Set up an ecotourism park to promote ecotourism and cultural tourism, enhancing the conservation of natural species and habitats as well as cultural heritages.
- Act as a logistics hub to meet the logistical needs of the Northeast New Territories as well as the cross-boundary transportation needs of the high-tech manufacturing industry.

Key I&T industries

- Experiential retail, dining, and entertainment
- Agricultural technology
- Food safety and production
- Modern logistics
- Ecotourism

Other industries

- Modern logistics
- Ecotourism
Shenzhen and Hong Kong form the core urban cluster in the GBA. The emphasis on its development has been elevated, and included in the national development strategy of China. According to the 14th Five-Year Plan and the Outline Plan, Hong Kong’s Northern Metropolis Development Strategy will provide valuable opportunities for I&T co-operation and development between Shenzhen and Hong Kong. In addition to proposing six priority I&T areas for the development of Shenzhen and Hong Kong, this special report also puts forth seven recommendations to promote close co-operation between the two cities. We expect that such co-operation would increase China’s competitiveness in the I&T industry and promote the simultaneous development of high-tech industries while also creating significant investment opportunities for businesses in both cities.

**Recommendations for deepening the co-operation between Shenzhen and Hong Kong**

**Shenzhen and Hong Kong should promote multifaceted ‘industry-university-research’ collaboration**

Shenzhen and Hong Kong should make use of cross-boundary co-operation platforms that have been set up by the governments in both cities to promote cross-institutional and cross-disciplinary collaboration between state-owned and private organisations. In addition to attracting international R&D talent to engage in fundamental research, Shenzhen and Hong Kong should also encourage enterprises to transform research outputs into products. Both cities should achieve industrialisation by setting up complete up-, mid-, and downstream industry value chains and establishing a large, industrial, cross-boundary ecosystem.

**Hong Kong’s Northern Metropolis should become the core zone for I&T development and collaboration with Shenzhen**

The Northern Metropolis is strategically situated along Hong Kong’s boundary with the Mainland. With an area of 300 km², it has the potential to become the core zone to develop its I&T industry. There should also be plans to upgrade the seven land boundary crossings in the area to facilitate cross-boundary development of the port economic belt.

In addition, the Northern Metropolis should also take the six priority areas as the base for co-operative development, and move in tandem with Lau Fau Shan, Hung Shui Kiu/Ha Tsuen New Development Area and San Tin Technopole. Based on PwC’s estimates, these six emerging industries will create approximately HKD700 billion to 750 billion annually in GDP for Hong Kong’s economy.
The Lau Fau Shan and Hung Shui Kiu/Ha Tsuen New Development Area in Hong Kong should connect with the Qianhai New District and become the core business district of the Northern Metropolis

The Lau Fau Shan and Hung Shui Kiu/Ha Tsuen New Development Area is the foundation for the Hong Kong-Shenzhen Western Development Corridor, which is expected to expand collaboration with the Qianhai New District to form a robust economic model. Shenzhen and Hong Kong should conduct research on expanding the new cross-boundary rail to connect the Qianhai New District with Lau Fau Shan, and Hung Shui Kiu/Ha Tsuen New Development Area. They could also further establish a third central business district by connecting the artificial island of Kau Yi Chau in the Lantau Tomorrow Vision with the Qianhai New District and the Northern Metropolis.

San Tin Technopole should become an economic and talent centre for Hong Kong’s I&T development

The proposed San Tin Technopole in Hong Kong’s Northern Metropolis is adjacent to the Lok Ma Chau Loop, making it the perfect location for the HSITP, which provides a base for the industry-university-research co-operation of Hong Kong’s I&T industry. The San Tin Technopole can also work with the Shenzhen Park of Shenzhen-Hong Kong Innovation and Technology Co-operation Zone to develop and strengthen the I&T talent pool in both Shenzhen and Hong Kong. The two cities should consider working together to attract talent from other areas of Mainland China and abroad to facilitate entrepreneurial opportunities and create new economic growth engines, further optimising the industry structure to speed up I&T development while driving Hong Kong’s economic transformation.

Promote public-private partnership and encourage industries and businesses to take part in development

The governments should consider the public-private mix as the key to unlock the development of the Northern Metropolis and the important infrastructure and industrial development in Shenzhen and Hong Kong. If the governments and enterprises work closely together to take on the financing requirements for development, it would improve the overall capacity, and speed up the development of important infrastructure and facilities.

In future Shenzhen-Hong Kong collaborations, the local governments should encourage businesses to seize development opportunities in the I&T industry to jointly take part in the development of the two cities.

Promote smart borders that enable seamless cross-border flow of business, people, and transportation

Considering the global trend of improving cross-border connectivity, smart borders would effectively promote interconnectivity across the GBA. Prior to the COVID-19 pandemic, the numbers of arrivals and departures passing through the seven land boundary crossings are on the rise year by year. In 2019, before the COVID-19 outbreak, more than 236 million arrivals and departures passed through Hong Kong’s land boundary crossings. With the right technology at smart borders, it would greatly reduce the travel time, thereby promoting connectivity within the GBA, and attracting both domestic and international talent to work in the GBA.
The development of urban clusters and regional economic integration has brought new opportunities to China's economy. The Cities of Opportunity report series, published by PwC and the China Development Research Foundation, observes and ranks selected cities in Mainland China and Hong Kong S.A.R. against ten dimensions. It is our hope that these observations will assist cities in identifying their own strengths and weaknesses, while appreciating each city’s advantages. The Chinese Cities of Opportunity 2021 is the eighth report in the series. The number of cities studied has expanded from 15 in our first report to 47 in 2021.

Dimension analysis and ranking of cities in China, including Shenzhen and Hong Kong

The ten dimensions in the Cities of Opportunity report include intellectual capital and innovation; technical maturity; major regional cities; urban resilience; transportation and urban planning; sustainable development; culture and quality of life; economic clout; costs; and ease of doing business. In 2021, Shenzhen came in at number three and Hong Kong at number ten out of the 47 cities.

1. In terms of intellectual capital and innovation, Shenzhen ranked second in science and technology spending while Hong Kong ranked first with its educational level. Shenzhen, Guangzhou, Hong Kong, and Macao possess excellent higher education foundations among the GBA cities. Shenzhen has strong capabilities in transforming scientific and technological achievements with its many advanced technologies. With important strategic support from the country to advance the development of the GBA, cities in the region will be able to develop complementary advantages and share achievements in I&T, thereby advancing the industry’s development.

2. In terms of technical maturity, Shenzhen ranked first, far ahead of all other cities. The city also ranked first with Hong Kong closely behind at number two in various areas, including 'granted patents', 'penetration rate of new energy vehicles', 'mobile Internet', and ‘digital cities’.

3. Both Shenzhen and Hong Kong were among the top ten in the dimension of major regional cities. Hong Kong ranked fifth while Shenzhen came as seventh, after Shanghai, Guangzhou, Chongqing, and Beijing.

4. In the dimension of urban resilience, Shenzhen and Hong Kong were among the top three for ‘public investment in healthcare’, ‘public safety investment’, and ‘disaster prevention and emergency management’. These variables mainly observe a city’s reserve funds for potential crises and stockpiled strategic materials, thereby measuring a city’s preparedness against vulnerability.

5. In the dimension of transportation and urban planning, Hong Kong continued to perform exceptionally well by coming first in ‘bus transport’ and ‘urbanisation’. While Shenzhen ranked second overall, Hong Kong ranked twentieth overall.

Hong Kong’s urban space is somewhat cramped. Hong Kong has strictly controlled the number of private cars by increasing the cost of car ownership with a first-time registration tax, as well as fuel and license plate fees. At the same time, the scientific design and smooth operation of buses and rail lines have provided residents with convenient travel solutions, thereby maintaining the high efficiency of the overall transportation system.
6. The dimension of sustainable development observes the balance and potential of urban development from the angles of natural resources and population. Shenzhen ranked second overall and first in terms of population size while Hong Kong ranked twenty-third overall and second in terms of sewage treatment.

7. ‘Achieving new heights in the civilisation of the society’ and ‘attaining new standards in people's welfare’ are the two objectives of the 14th Five-Year Plan (2021–2025), which also means meeting the increasingly rich cultural and material needs of residents in cities. Shenzhen ranked third overall and Hong Kong ranking ninth in the dimension of cultural and quality of life.

Within this dimension, Shenzhen came first in ‘library collections’ and second in ‘cinemas’, indicating Shenzhen’s rich public cultural resources. Hong Kong came first in ‘resident income’, showing its strong potential to drive an increase in consumption, new products and technologies, thereby promoting the healthy development cycle of the city and its residents.

8. The dimension of economic clout assesses seven variables, including the city’s ‘economic status’, ‘financial influence’, ‘industrial structure’, and ‘level of vitality’, to measure its overall strength in terms of economic development and influence. Hong Kong ranked first and Shenzhen came seventh in this dimension.

With its position as the financial centre of the Asia-Pacific region, Hong Kong came first in terms of ‘foreign direct investment’, ‘well-known enterprises’, ‘proportion of the tertiary industry’; second in ‘per capita regional GDP’; third in ‘deposits and loans of financial institutions’; and fourth in terms of ‘regional GDP’. On the other hand, Shenzhen came third in terms of ‘regional GDP’ and ‘per capita regional GDP’, and fourth in terms of ‘well-known enterprises’ and ‘deposits and loans of financial institutions’.


10. Shenzhen came second while Hong Kong came fourth in the dimension of ease of doing business. Shenzhen came second in ‘express delivery logistics’ and third in ‘entrepreneurial vigour’. Hong Kong came first in the variables of ‘reliance on foreign trade’ and ‘business environment’.
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In recent years, PwC has been tracking development opportunities and urbanisation progress in Chinese cities. PwC has developed a scientifically rigorous and systematic methodology. With it, PwC has also accumulated extensive experience in the areas of urban and regional development strategies, comprehensive evaluation, business environment optimisation, urban resilience enhancement and sustainable urban development. We hope to provide practical foundations and forward-looking, in-depth analysis regarding the progress of urban development, so that we can help cities improve the quality of their development and governance.

Please contact us to learn more about our urban development research methodology or our practical experience in the above areas.

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