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# Bay to Bay

China's Greater Bay Area Plan and Its Synergies  
for US and San Francisco Bay Area Business



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## About the Institute

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# Contents

<b>Executive Summary</b> .....	<b>1</b>
<b>Overview</b> .....	<b>5</b>
Historic Significance.....	6
Cooperative Goals.....	7
<b>CHAPTER 1</b>	
<b>China's Trade Portal and Laboratory for Innovation</b> ...	<b>9</b>
GBA Core Cities.....	10
GBA Key Node Cities.....	12
Regional Development Strategy.....	13
Connecting the Dots .....	18
<b>CHAPTER 2</b>	
<b>Hong Kong and Macao:</b>	
<b>One Country, Two Systems 2.0</b> .....	<b>21</b>
Hong Kong.....	21
Macao .....	26
<b>CHAPTER 3</b>	
<b>The Potential of GBA Integration</b> .....	<b>27</b>
Hong Kong: Systemic Complementarity .....	30
<b>CHAPTER 4</b>	
<b>Hong Kong, Guangdong,</b>	
<b>and the San Francisco Bay Area</b> .....	<b>35</b>
A Shared History With Unique Characteristics.....	35
San Francisco–Hong Kong Parallels .....	36
Trade and Investment Profile .....	37
Hong Kong Trade .....	38
Two-Way Foreign Direct Investment with the GBA ..	38
<b>CHAPTER 5</b>	
<b>Going Forward: Opportunities for Collaboration</b> ...	<b>43</b>
Climate Change .....	44
Clean Energy.....	45
Healthcare.....	47
Electric and Autonomous Vehicles .....	48
Biomedicine and Pharmaceuticals.....	50
Financial Technology (Fintech).....	54
Targeted Service Sector Opportunities.....	58
<b>Conclusion</b> .....	<b>59</b>
<b>Notes</b> .....	<b>60</b>



## Executive Summary

The Guangdong-Hong Kong-Macao Greater Bay Area (GBA) is a long-term planning project by the government of China to economically integrate the Hong Kong and Macao Special Administrative Regions with nine cities in Guangdong Province: Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen and Zhaoqing. The goal is a strategically unified southern China region that enables the accelerated flow of people, capital, goods, and services, and deepens the “One Country, Two Systems” format that joins Hong Kong and Macao with the mainland. The plan is an integral part of China’s continued “opening up” to the world begun in 1978; its “Made in China 2025” initiative that aims to strengthen China’s leadership in technology and manufacturing; and its “going out” global strategy as exemplified by the Belt and Road Initiative. The term “Greater Bay Area” is derived by reference from the experience of the San Francisco Bay Area, a multijurisdictional region that is the world’s leading platform for technology and innovation; following that model, China’s Greater Bay Area plan also seeks to make Southern China’s Pearl River Delta region an integrated global innovation hub.

The GBA encompasses an area of about 56,000 square kilometers (nearly 22,000 square miles), has a combined population at 2020 year-end of more than 86 million, a combined GDP of US\$1.67 trillion and a per capita GDP of US\$19,400.<sup>1</sup> Its integration confronts several challenges. The participating jurisdictions have different social systems, different legal systems, and

different customs regimes. This places a premium on jurisdictional coordination and integrated planning. While there is underlying competition between the participants at the local level, the national nature of the initiative positions Beijing as the arbiter.

The Guangdong-Hong Kong-Macao Framework Agreement lays out a set of distinct goals for each entity, as well as for the unified Greater Bay Area as development advances:

- **Guangdong** will be China’s “pilot zone” for reform and “opening up” and a primary engine for growth through its base of advanced manufacturing and modern service industries and through planned technology and industrial innovation centers.
- **Hong Kong** will consolidate and enhance its status as an international financial, services, transportation, and trade center. This includes strengthening its position as a hub for global offshore renminbi business and international asset management; developing its professional services, innovation, and technology sectors; and establishing itself as a regional Asia-Pacific center for international legal and dispute resolution services.
- **Macao** will pursue a more diversified and sustainable economy, retaining and expanding its tourism and leisure base in gaming while building an economic and trade cooperation framework that connects China and Portuguese-speaking countries and serves as a Chinese base for intercultural exchanges and cooperation.

This integration is intended to create a world-class metropolitan cluster that serves as a showcase to attract residents, workers, and visitors under the Chinese “One Country, Two Systems” model. Key areas for cooperation include

1. airport, roadway, bridge, and light rail infrastructure projects to support an integrated and more efficient system for moving people and goods;
2. a mix of economic development incentives and regulatory easing that allows people, goods, and capital to move more freely within the region, integrating markets and production; and
3. leveraging the advantages of specific cities—in education, research, manufacturing, and services—to build clusters that both add value to the regional economy and advance its leadership in global innovation.

In the vision outlined in the GBA Framework Agreement, regional integration begins with the linking of the core cities with each other and in strategic pairings with node cities based on proximity and complementary advantages—specifically Hong Kong-Shenzhen, Guangzhou-Foshan and Macao-Zhuhai. That integration targets multiple objectives, including the deeper integration of Hong Kong’s economy with the mainland’s and the creation of a city cluster that associates and leverages diverse capabilities. Core capabilities to be linked include manufacturing in Guangdong province, the financial system and open economy of Hong Kong, and Shenzhen’s technology and innovation base.

Specific urban centers where resources will be focused include the Qianhai-Shenzhen-Hong Kong free trade zone (to be developed as a regional center for service industries), the Guangzhou-Nansha New Area (to be developed as a regional center for financial and logistics services linked to trade), and the Zhuhai-Hengqin free trade zone adjacent to Macao (which will focus on finance, logistics, e-commerce and tourism, leveraging Macao’s visitor offerings with non-gaming ecotourism.)

This merger of capabilities would be enabled by the more fluid movement of people and goods across the region through major investments in connecting transportation infrastructure. A multifaceted “urban

track + intercity track + expressway” transportation network is under construction—branching out from Hong Kong, Guangzhou, and Zhuhai—that is intended to connect GBA cities and, from there, link the region to the rest of China. This includes large-scale investment already underway in bridge, road, and rail links, and the expansion of major airports.

For the region to fully benefit from these improvements to physical infrastructure, Guangdong must work out with Hong Kong and Macao clearance processes, passport processing, foreign exchange provisions, and *hukou* mobility procedures to enable an easier flow of talent and capital among the region’s cities. Meeting these requirements places a premium on intergovernmental coordination.

Major investments are also being made in the region’s research and scientific infrastructure. These include in Hong Kong two key research clusters at the Hong Kong Science Park: Health@InnoHK, which focuses on healthcare technologies, and AIR@InnoHK, which focuses on artificial intelligence and robotics. Strategically bordering Shenzhen, the new Hong Kong-Shenzhen Innovation and Technology Park will expand the city’s R&D space and increase its ability to tap into supply chains, manufacturing, and talent across the border. The Guangzhou AI and Digital Economy Pilot Zone will encompass 81 square kilometers. Shenzhen is developing the Shenzhen High-Tech Core Zone, Robotic Town, and a national bioindustry base.

Regional integration is gradual but moving forward. To understand the economic contribution that an integrated, connected Pearl River Delta region would bring, it is important to understand the ways in which the region could as a whole be greater than the current sum of its parts.

First, the GBA brings together “One Country, Two Systems” (the Hong Kong and Macao SARs) and three customs zones (Nansha, Qianhai/Shekou, and Hengqin) within Guangdong Province, providing a balanced allocation of services, technology, manufacturing, and resources. At the provincial, prefectural, and town levels, and with central government support, policy makers are relaxing foreign and domestic (*hukou*) immigration and customs controls; harmonizing tax, trade, and

investment policies; and standardizing licensing regimes and regulations. At a still more granular level, cities are experimenting with cross-border small business permits, personal bank accounts in dual currencies, and shared driver's licenses. As this occurs, the GBA is seen as a laboratory and prototype for what China hopes to accomplish in its other potential Bay Areas—Hangzhou Bay adjacent to Shanghai and Bohai Bay near Beijing.

Hong Kong is intended to play a role that leverages its assets as an Asia-Pacific headquarters and business services and innovation center, with emphases in finance, trade, and logistics; legal, accounting, consulting, and other professional services; media and advertising; and fashion and design. Two key advantages related to trade are (1) renminbi convertibility in cross-border financing and transaction settlement, and (2) commercial arbitration of cross-border disputes for overseas companies doing business with China. Its independent judiciary and common law system offer rule of law assurance for contracts, intellectual property protection, and commercial dispute settlement.

Other Hong Kong assets include a highly regarded research base. The city claims several globally recognized universities, such as the University of Hong Kong, the Chinese University of Hong Kong, Hong Kong University of Science and Technology, City University of Hong Kong, and Hong Kong Polytechnic University. The Hong Kong Science & Technology Parks Corporation (HKSTP), a public-private research and innovation entity, provides infrastructure for companies and entrepreneurs, primarily in artificial intelligence and robotics, biomedicine, data analytics, smart city solutions, and fintech. Another government-owned digital tech hub, Cyberport, focuses on AI, big data, blockchain, fintech, smart living, digital entertainment, and cybersecurity.

Although it is easier for companies to go directly to China than it was in the past, Hong Kong also provides a platform for global companies connecting to China as a convenient “offshore” global clearinghouse for cross-border capital and investment flows; as a laboratory for studying, testing, and refining convertibility across China over time; and as a rules-based pathway into China for overseas investors. Hong Kong is Asia's leading financial center: financial services account for 20% of its GDP,<sup>2</sup>

and the city ranks among the top five centers globally for IPOs, currency trades, and interest rate derivative transactions.<sup>3</sup> The territory's professional and business services sector is also positioned to support overseas companies entering the China market and conversely offers similar services to Chinese state-owned and private companies “going out” to global markets.

Hong Kong's success as a partner within the GBA is intertwined with internal developments. In particular, the National Security Law enacted in the summer of 2020 and subsequent measures to rein in opposition lawmakers and their supporters have raised concerns regarding freedom of expression, the potential erosion of judicial independence, risks for foreigners, and by implication, risks to Hong Kong's reputation as an open global business center.<sup>4</sup> The law's impact on business activity will ultimately depend on how it is interpreted and enforced. For the foreseeable future, however, the new political environment is unlikely to directly impact the operations of most foreign companies, Hong Kong's financial markets, or the integrity of commercial law or commercial arbitrations that have historically made Hong Kong attractive as a global business center.

There are many pieces to the GBA puzzle: in particular, how its cities and SARs will connect with each other while at the same time differentiating themselves, and how the GBA as a whole will function in relation to outside partners. Time will tell whether, apart from investment in new infrastructure, the whole of the GBA will be more than the sum of its already considerable parts. Whatever the answer to that question turns out to be, its size and the support being given to the GBA concept by China's central government suggest that the Pearl River Delta region's role as a driver of China's economy and a key node in the global economy will be strengthened.

As the structural and policy challenges in the GBA are gradually overcome, there are significant opportunities for companies and institutions in the Silicon Valley/San Francisco Bay Area to leverage the region's assets. Initially these might emphasize areas of cooperation that (1) pose low intellectual property risk, (2) rely on or create open source technology that will be shared and/or made publicly available, and (3) produce innovation that yields demonstrable social benefit in areas such as health, mobility, environmental protection, and climate change.

The paths toward deeper engagement will not always be straightforward. Areas for cooperation will need to reflect complementary interests and assets, while recognizing tensions in US-China relations that will continue to constrain cooperation in many technology fields.

Fields with particular potential for future Bay-to-Bay partnerships include

- climate change (such as shoreline resilience planning and design as cities adapt to sea level rise);
- clean energy (including zero emission fuels and vehicles, smart grid/distributed energy, demand-side management, green design, and smart appliances and lighting);
- healthcare (including home robotics, telemedicine, medical equipment and wearable devices);
- electric and autonomous vehicles (including research and pilot program testing and deployment);
- biomedicine and pharmaceuticals (including diagnostics and therapeutics, clinical trials and compliance, disease research, medical data analytics, personalized medicine, and patient monitoring/wearables); and
- fintech (including payments and securities settlement, digital authentication, AI for credit and risk evaluation, insurance vehicles, and green finance).

Looking forward, the concentration of manufacturing capacity in China's Greater Bay Area—with its vast network of producers and suppliers—will ensure the GBA's central role in global manufacturing chains for the foreseeable future. Hong Kong plays a unique role in this regional complex, distinguishing the Greater

Bay Area from other "Bay Areas" in China. Its distinct contribution is its common law system, the transparency of its adjudicatory processes, established rules for intellectual property, open flows of information, and a cosmopolitan environment that is attractive for foreign businesses and executives. While the application of the National Security Law raises long-term issues, Hong Kong's core assets as a business center are unlikely to be impacted in the near term. What remains to be seen is whether China's tighter embrace will allow Hong Kong's open economy, which is the HKSAR's distinct contribution to the GBA, to continue to thrive.

Even with growth in Shenzhen, Hong Kong brings a financial services and capital markets sector that will be pivotal for the region. And for all the growth that cities in Guangdong Province have experienced, they remain essentially Chinese, with a relatively small international presence and few overseas entrepreneurs, given their size. This speaks to another Hong Kong asset: its role as a global business center that attracts Asia-Pacific headquarters and global business executives.

China's Greater Bay Area—the Pearl River Delta region that has played a historic role in China's commercial opening to the world since the mid-1800s—is a work in progress. Embedding the region more deeply into China and the global business map will require its constituent parts to overcome jurisdictional and systemic differences and implement multidimensional infrastructure investment to increase both physical mobility and economic capacity in fields from science to services. In the end, whether or not China's Greater Bay Area consolidates as a fully integrated regional economy, this investment will be its most enduring legacy.



## Overview

The Guangdong-Hong Kong-Macao Greater Bay Area (Greater Bay Area) is a long-term planning project by the government of China to economically integrate the Hong Kong and Macao Special Administrative Regions with nine cities in Guangdong Province: Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen and Zhaoqing. The goal is a strategically unified southern China region that enables the accelerated flow of people, capital, goods, and services. The plan further implements the “One Country, Two Systems” policy joining Hong Kong and Macao with the mainland. It is also an integral part of China’s continued “opening up” to the world begun in 1978; its “Made in China 2025” initiative that aims to raise competence in manufacturing and technology and develop global champions; and its “going out” global strategy as exemplified by the Belt and Road Initiative. The term “Greater Bay Area” is derived from the experience of the San Francisco Bay Area, a multijurisdictional region that is the world’s leading platform for technology and innovation; following that model, China’s Greater Bay Area plan also seeks to make the Southern China region surrounding the Pearl River Delta a global innovation hub.

The Greater Bay Area (GBA) concept was formalized in a July 2017 Framework Agreement among the central government and local governments of Guangdong Province, Hong Kong, and Macao to expand economic cooperation and integration. The GBA encompasses an area of about 56,000 square kilometers (nearly 22,000 square miles), has a combined population

at 2020 year-end of more than 86 million, and has a combined GDP of US\$1.67 trillion and a per capita GDP of US\$19,400.<sup>1</sup>

### Guangdong-Hong Kong-Macao Greater Bay Area



Source: Hong Kong Trade Development Council

Integration and economic coordination on this scale amount to more than just another regional economic development initiative. The GBA’s founding documents—the February 2019 Outline Development Plan, issued by the Chinese Communist Party’s (CPC’s) Central Committee and the State Council,<sup>2</sup> and the 2017 Framework Agreement<sup>3</sup>—outline a number of strategic development objectives:

- to fully and accurately implement the principle of “One Country, Two Systems”;
- to fully leverage the composite advantages of Guangdong, Hong Kong, and Macao;

- to deepen cooperation among the mainland, Hong Kong, and Macao in support of both China's internal development and its opening up to the world, in particular via the Belt and Road initiative;
- to maintain the long-term prosperity and stability of Hong Kong and Macao and enhance the well-being of their residents and businesses; and
- to integrate Hong Kong and Macao into the development of the mainland and instill a shared sense of historical responsibility and national pride across the pan-Pearl River Delta region.

Notably, the plan has an immediate-term component for integration and development through 2022 and a longer-term component through 2035—respectively, the halfway and three-quarter markers in the 50-year transition period following the establishment of the Hong Kong Special Administrative Region on July 1, 1997.

At the central government level, the Greater Bay Area plan is overseen by the Guangdong-Hong Kong-Macao Greater Bay Area Development Leading Group, a committee chaired by China's Vice Premier that includes the Chairman of the National Development and Reform Commission (NDRC), the Chief Executive of Hong Kong, the Chief Executive of Macao, the Director of the Hong Kong and Macao Office of the State Council, the Director of the central government's Hong Kong Liaison Office, the Director of the Macao Liaison Office, and principals from relevant ministries and commissions. The Leading Group is based in the National Development and Reform Commission (NDRC), which is responsible for execution. Within the region, Greater Bay Area committees operate in Guangdong Province, Shenzhen, and the Panyu District of Guangzhou, each led by senior Party and government officials, with local execution by government agencies. A Steering Committee for the Development of the Greater Bay Area, chaired by Hong Kong's Chief Executive and including all the relevant Directors of Departments and Secretaries of Bureaus, operates in Hong Kong.<sup>4</sup>

The Greater Bay Area plan is also connected to China's 14th Five-Year Plan, announced in March 2021, which sets broad goals for China's economic development in the next five years and over a period extending to

2035. Infrastructure, particularly around urbanization, is prioritized. Innovation is also a major theme, as seen in a commitment to increased R&D investment: funding will grow 7% each year, with an increased focus on basic research. Advanced technologies identified as priorities include AI, biotechnology, blockchain, neuroscience, quantum computing, and robotics. In this respect, the 14th Plan builds on earlier plans that promoted "indigenous innovation" and developing "strategic emerging technologies."

The Plan foresees a stronger role for the state in directing the national economy and its actors. A key theme is the concept of "dual circulation" which seeks to reduce China's vulnerability to external forces by increasing its reliance on domestic production, consumption, and technology. The international dimension, which parallels the domestic one, seeks access to foreign markets and technologies, primarily in fields that will help build China's domestic capabilities. A key implication is that while China will continue to selectively "open up" to foreign investment and partnerships, the goal of that activity will be to strengthen domestic self-reliance.<sup>5</sup> The GBA plan should be seen as supporting the national goals that the 14th Five-Year Plan outlines.

Implementing the Greater Bay Area plan's vision confronts several challenges. The GBA's participating jurisdictions have different social systems, different legal systems, and different customs regimes. Underlying issues include uneven levels of development across the region and the management of production overcapacity in manufacturing. This places a premium on jurisdictional coordination and integrated planning. While there is underlying competition between jurisdictions at the local level, the national nature of the initiative positions Beijing as the arbiter.

## Historic Significance

The "Pan-Pearl River Delta" region has historically served as both China's commercial heart and its window on the world. Hong Kong, Shenzhen, and Guangzhou are major air and sea transportation/logistics hubs for the country's export manufacturing and two-way trade.



Guangzhou—earlier called Canton by Westerners—had been a trading port with Southeast Asia from the 2nd Century BC and received Indian, Arab, and Persian traders since as early as the 7th Century AD.<sup>6</sup> It was the single port of entry for all foreign trade into and out of China under the Qing Dynasty from 1757 until the end of the Opium Wars in 1860.<sup>7</sup> The Treaty of Nanjing signed at that time opened external trade to five Chinese ports but also ceded the island of Hong Kong to Britain as a location for repairing and provisioning ships.<sup>8</sup> With an 1860 expansion to include the adjacent Kowloon peninsula and a 99-year lease for the New Territories in 1898, Hong Kong developed as a maritime, financial, and trading gateway in its own right.

Macao became a Portuguese colony in 1557, under a perpetual lease granted by the Ming Court. At the mouth of the Pearl River, Macao later evolved as a staging and inspection cargo point for foreign cargo bound for Guangzhou, with Portuguese and Chinese ships providing a deterrent to other foreign incursions and piracy.<sup>9</sup> Portugal was granted full sovereignty over Macao in 1887. The territory was returned to China in 1999.

As a region, the GBA today has a population that is larger than that of the United Kingdom and twice as large as Canada's; accounts for 12% of total Chinese GDP; moves more air freight by volume annually than San Francisco, New York, and Tokyo combined; and is home to three of the world's top 10 container shipping ports.

## Cooperative Goals

The Guangdong-Hong Kong-Macao Framework Agreement lays out a set of distinct goals for each entity, as well as for the unified Greater Bay Area as development goes forward:

- **Guangdong** will be China's "pilot zone" for reform and "opening up," as well as a primary engine of economic growth through its advanced manufacturing and modern service industries and its planned technology and industrial innovation centers.
- **Hong Kong** will consolidate and enhance its status as an international financial, transportation, and trade center. This includes strengthening its position

as a hub for global offshore renminbi business and international asset management; developing its professional services, innovation, and technology sectors; and establishing itself as an Asia-Pacific regional center for international legal and dispute resolution services.

- **Macao** will pursue a more diversified and sustainable economy, retaining and expanding its global tourism and leisure base while building an economic and trade cooperation platform connecting China and Portuguese-speaking countries and serving as a Chinese base for intercultural exchanges and cooperation.

Integration of Guangdong, Hong Kong, and Macao is intended to create a more dynamic Greater Bay Area economic region, a world-class metropolitan cluster which serves as a showcase attracting residents, workers, and visitors under a distinctly Chinese "One Country, Two Systems" model. Key areas of cooperation include

1. a series of airport, roadway, bridge, and light rail infrastructure projects to support an integrated, more efficient system for moving people and goods;
2. a mix of economic development incentives and regulatory easing that allows people, goods, and capital to move freely within the region, contributing to market integration; and
3. leveraging advantages in various cities—in education, research, manufacturing, and services—to build and nurture clusters which both add value to the regional economy and strengthen its role in global innovation.

As the Guangdong-Hong Kong-Macao GBA moves forward, it has inspired two other regional "Bay Area" proposals.

One is **Hangzhou Bay** bordering Zhejiang province, a region of 30 million people opposite Shanghai that includes Hangzhou, Cixi, and Ningbo.<sup>10</sup> Hangzhou, a leading entrepreneurial and technology center, is home to companies such as Alibaba. Ningbo is a major port and industrial city. To the west of Shanghai, Suzhou's large science park has attracted significant foreign investment. The development of the region is linked to

the Yangtze River Delta Integration Plan that covers three provinces—Jiangsu, Zhejiang, and Anhui along with the municipality of Shanghai, a major logistics, financial and international business center. It is unclear, however, whether Shanghai will be formally part of the Hangzhou Bay Area, as the initiative is led by Zhejiang Province.

The other Bay Area being considered is **Bohai Bay** in Northeast China, with an updated 2006 plan to integrate 11 large cities in Hebei Province plus the Tianjin municipality and (inland) Beijing as an area with a combined population of 110 million and 10% of the nation's GDP.<sup>11</sup> The region also includes Shandong Province as well as cities on the eastern side of Bohai Bay such as Dalian.<sup>12</sup> Tianjin, a major port city, would focus on logistics, advanced manufacturing R&D and financial innovation through its free trade zone.<sup>13</sup> Hebei Province would transition its economy from heavy to light industry, particularly in the Xiongan New Area.<sup>14</sup> Beijing would build on its role as the nation's political center and an important hub for science and technological innovation.<sup>15</sup>

Like the GBA, these other Bay Areas also confront jurisdictional questions—in Bohai Bay, for example, how to address diverse levels of economic development, and in Hangzhou Bay whether the region should be defined as including Shanghai. To date, however, only the Guangdong-Hong Kong-Macao Greater Bay Area in Southern China is officially embedded in national economic policy.

The focus of this report is to analyze the economic and innovation potential of the GBA project in the context of recent global trends and to examine synergies with the Silicon Valley/San Francisco Bay Area that might facilitate collaboration beyond the longstanding relationships the region already enjoys with China and with Hong Kong in particular.



Source: Su Jingbao / China Daily  
Image Processing: Bay Area Council Economic Institute



Source: News.com.au  
Image Processing: Bay Area Council Economic Institute



## China's Trade Portal and Laboratory for Innovation

The Pearl River Delta (PRD) has been a manufacturing and trading center linking China to the outside world for centuries—a meeting ground for traders from the Middle East, the Indian subcontinent, Southeast Asia, and the Chinese hinterlands since well before the arrival of Europeans in the 16th century. Its role was strengthened following the establishment of the 13 Canton Factories where western trade was officially concentrated in Guangzhou (Canton) from 1757 until the end of the Opium Wars in 1860.

The PRD was central to China's "reform and opening up" launched by Deng Xiaoping in 1978—which first opened China to foreign investment and allowed private business ownership, and later privatized some state-owned enterprises and lifted price controls. Shenzhen, created as one of China's first four Special Economic Zones in 1980, became the laboratory for these reforms. This led to development of large-scale contract manufacturing for export, backed up by gateway financial services, logistics, transport, hospitality, commercial property,



Port of Canton, circa 1830

Source: Wikimedia Commons

technology, and retail activity in Hong Kong. China's entry into the World Trade Organization in 2001 accelerated the opening up process. Over the period from 1978–2013, China experienced an average of 9.5% annual GDP growth, with the PRD a major contributor.

Today, the Greater Bay Area is among the world's fastest-growing regional innovation clusters according to the World Intellectual Property Organization (WIPO), with a combined US\$6.5 trillion value for the Hong Kong and Shenzhen Stock Exchanges, four of the world's top universities, and more than 3,000 venture capital organizations. The region's top 100 innovation enterprises held 55% of global patents in computing,

telecommunications, and electronic equipment manufacturing, plus 23% of patents in electrical machinery and equipment in 2017.<sup>1</sup>

At the core of the GBA concept is the integration of Guangdong province and its two largest cities, Guangzhou and Shenzhen, with Hong Kong and Macao under the "One Country, Two Systems" model. That integration is viewed as key to extending the benefits of growth and modernization inland through the development of coordinated research and economic clusters and specializations across the entire PRD. It is important in that context to understand what GBA cities currently bring to the table.<sup>2</sup>

## GBA Core Cities



Source: Estial on Wikimedia Commons

### Hong Kong

**Population:** 7.47 million

**GDP:** US\$349.45 billion

**Exports:** US\$506.32 billion

**Subsectors:** Finance, Shipping/logistics, Retail, Property, Tourism

**Special Administrative Region:**

Financial services/offshore renminbi center

APAC air/sea transshipment hub

Commercial arbitration

University research cluster

8th largest trading entity

APAC media/creative center

Free trade/investment under Mainland-Hong Kong

CEPA (Closer Economic Partnership Arrangement)

Free trade/investment under Hong Kong-Macao CEPA



Source: Milkomède on Wikimedia Commons

### Shenzhen

**Population:** 17.56 million

**GDP:** US\$401.17 billion

**Exports:** US\$246.07 billion

**Key industries:** Technology, Logistics, Financial Services, Media/creative

**Subsectors:** Biotech, Internet, Energy Conservation, Environment, Robotics

**Economic Zone:**

Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone



Source: Azwari Nugraha on Wikimedia Commons

## Guangzhou

**Population:** 18.68 million

**GDP:** US\$362.73 billion

**Exports:** US\$78.69 billion

**Key Industries:** Automotive, Electronics, Petrochemicals, Port city—50 industrial areas/parks

**Subsectors:** Automobiles, Marine engineering, Nuclear power equipment, Computer controls, Steel



Source: Brenden Brain on Wikimedia Commons

## Macao

**Population:** 0.68 million

**GDP:** US\$24.33 billion

**Exports:** US\$1.35 billion

**Key Industries:** Gaming, Tourism

**Special Administrative Region:**

No foreign exchange limits

Free port

Separate customs territory

Free trade/investment under Mainland-Macao CEPA (Closer Economic Partnership Arrangement)

Free trade/investment under Hong Kong-Macao CEPA

Source: "Statistics of the Guangdong-Hong Kong-Macao Greater Bay Area," HKTDC Research, Hong Kong Trade Development Council, 2021, <https://research.hktdc.com/en/article/MzYzMDE5NzQ5>.

Notes: GDP at current market prices, 2020; mainland cities population based on the Seventh National Population Census of Guangdong Province; figures calculated based on the latest annual data from Census and Statistics Department of Hong Kong, Statistics and Census Service of Macao, the statistics bureaus of the relevant PRD cities, and Hong Kong Trade Development Council.

## GBA Key Node Cities



Source: Vmenkov, Wikimedia Commons

### Zhuhai

**Population:** 2.44 million

**GDP:** US\$50.48 billion

**Basic Industries:** IT, appliances, electricity and energy, biopharmaceuticals and medical devices, petrochemicals, precision machinery, printing supplies, yacht building



Source: haier7917, Wikimedia Commons

### Foshan

**Population:** 9.50 million

**GDP:** US\$156.82 billion

**Basic industries:** machinery, appliances, ceramic materials, metallurgy, textiles/garments, IT, food/beverages, chemicals, pharmaceuticals, optoelectronics, electric vehicles



Source: ZH, Wikimedia Commons

### Huizhou

**Population:** 6.04 million

**GDP:** US\$61.21 billion

**Basic Industries:** IT, petrochemicals, automotive, mining (iron, coal, tungsten, titanium), specialty agriculture, forestry, food processing, clean energy, tourism



Source: GBA Development Office

### Dongguan

**Population:** 10.47 million

**GDP:** US\$139.91 billion

**Basic Industries:** IT, electrical machinery/equipment, textiles and garments, leather goods, food/beverage processing, paper products, LED lighting, flat-screen displays, photovoltaics



Source: GBA Development Office

### Zhongshan

**Population:** 4.42 million

**GDP:** US\$45.69 billion

**Basic Industries:** Transportation equipment, appliances, textiles/garments, electronics, lighting, healthcare, pharmaceuticals, furniture, hardware products, yacht building



Source: GBA Development Office

## Jiangmen

**Population:** 4.80 million

**GDP:** US\$46.41 billion

**Basic Industries:** Motorcycles, auto parts, textiles/garments, papermaking, shipbuilding, food, packaging materials, bathroom fixtures, printing, electromechanics, lighting, new materials, green appliances, agriculture



Source: GBA Development Office

## Zhaoqing

**Population:** 4.11 million

**GDP:** US\$33.51 billion

**Basic Industries:** Electric vehicles, advanced equipment, energy/environment, IT, biomedicine, mining (gold, limestone, gypsum, granite, inkstone), tourism

Source: "Statistics of the Guangdong-Hong Kong-Macao Greater Bay Area," HKTDC Research, Hong Kong Trade Development Council, 2021, <https://research.hktdc.com/en/article/MzYzMDE5NzQ5>. Notes: GDP at current market prices, 2020; population based on the Seventh National Population Census of Guangdong Province; figures calculated based on the latest annual data from the statistics bureaus of the relevant PRD cities.

## Regional Development Strategy

Under the vision outlined in the GBA Framework Agreement, regional integration begins with the linking of core cities with each other and in strategic pairings with node cities based on proximity, relative size, and complementary advantages—specifically Hong Kong-Shenzhen, Guangzhou-Foshan and Macao-Zhuhai. Core capabilities targeted for linkage include the manufacturing capacity of Guangdong province, Hong Kong's financial system and open economy, and Shenzhen's technology cluster. As part of this thrust, the government is looking to upgrade Shenzhen and Guangdong's science capacity from its historic focus on applied research to one with deeper capacity in basic science. Development will also be pushed outward from the core cities to the region's hinterlands. The merger of capabilities would be enabled by the more fluid movement of people—Hong Kong and Macao residents, for example, will have ID cards that will enable them to travel within the region in the same way as Chinese citizens—and by major investments in connecting transportation infrastructure.

In a 2019 analysis of the GBA,<sup>3</sup> Deloitte China notes that the region's cities have a greater degree of interconnection than is the case for Bohai Bay and are

more internationally-focused than in Hangzhou Bay, due to the global orientation of Hong Kong and Macao and Shenzhen's position as a global center for contract manufacturing, trade, and logistics.

An integrated GBA will have a broad range of institutions and service capabilities at its disposal to attract talent and foreign investment, and to facilitate capital flows and trade. One core asset is the area's diverse industrial base, allowing for important cross-fertilization and innovation; 20 of the world's top 500 companies are based within the GBA. Many of those are in Shenzhen, the city with the highest per capita income in mainland China, among them internet portal Tencent, drone maker DJI, auto manufacturer BYD, global property and construction firm China Vanke and telecom firms Huawei and ZTE. It is also a major logistics hub, with the world's third largest container port.

Guangzhou, also a significant port and technology center, is home to a large automotive sector and is a growing pharmaceutical center. Academic and science park clusters have contributed to an active startup environment. Guangzhou University Town, in the Panyu District, is home to 12 universities and approximately

200,000 faculty and students. Many startups cluster in the Science and Technology Innovation Corridor (STIC) in Huangpu, where two main incubators—Huaxin Park and the Guangzhou Torch Hi-tech Innovation Centre—occupy a combined 660,000 square meters (163 acres). Sun Yat-sen University Science Park has multiple campuses around the city; South China University of Technology Science Park supports startups in electronic information, advanced materials, biological engineering, and environmental protection.<sup>4</sup>

Zhuhai, Zhongshan, Foshan, and Dongguan are major manufacturing centers for lighting, appliances, industrial machinery, medical equipment, and other products.<sup>5</sup>

Deloitte highlights key challenges which must be addressed as the GBA plan goes forward, among them the need for more efficient regional intermodal freight connections and intercity passenger rail transport—the plan envisions the development of and upgrades to high-speed and intercity rail, roadways, and bridges connecting GBA cities to each other and to ports and airports—and a need to differentiate GBA cities by refining and clarifying the distinct strengths of each, notably in the shipping activities at their respective ports.

Guangdong, Hong Kong, and Macao have each designated a series of cooperation zones that will serve as proofs of concept for integration.

## Qianhai-Shenzhen-Hong Kong Modern Service Industry Cooperation Zone

Qianhai, launched in 2010 under China's Pilot Free Trade Zone initiative, is a 15 square kilometer (5.8 square mile) planned business and residential district on Shenzhen's man-made Qianhai Bay along the Pearl River. Its focus will be the long-term consolidation of regional business services in a modern hub for the PRD as Shenzhen and Hong Kong are integrated.

The Shenzhen municipal government's Qianhai Authority administers the zone, which in addition to low overall labor costs offers a wide range of business subsidies and tax incentives, particularly targeting technically advanced service companies, logistics enterprises, educators and researchers, and foreigners with special skills.<sup>6</sup> Additionally, Qianhai and the neighboring Shekou area of Shenzhen have relaxed *hukou* household registration restrictions for skilled professionals and their families relocating from Hong Kong and Macao, granting easier access to housing, medical care, and education for young children.<sup>7</sup>

Development of Qianhai is phased across 22 "units" defined by rail and other public transport stations. Each unit will feature residences, commercial space, and amenities designed for livability and shorter commutes, often by foot or bicycle. Three broad "areas" fronting the bay facing west—Guiwan, Qianwan, and Mawan—will



Qianhai-Shenzhen-Hong Kong Modern Service Industry Cooperation Zone

Source: Charlie Fong on Wikimedia Commons



respectively emphasize finance, trade, and other business services; technology and information services; and logistics, aviation, and supply chain services. More than 40 projects are currently underway.<sup>8</sup>

A planned development area of 26 million square meters—70% for office and commercial uses—is designed to make Qianhai the world's fourth largest core business district behind London, Tokyo, and Manhattan, according to Cushman & Wakefield.<sup>9</sup>

Qianhai ranks second to Shanghai among China's free trade zones in terms of foreign investment, with US\$4.1 billion in 2019. The zone boasted nearly 12,000 Hong Kong-funded enterprises as of June 2020 with a combined registered market capitalization of 1.31 trillion yuan (US\$194.2 billion). More than 200 Hong Kong-funded startups have been incubated at the Qianhai Shenzhen-Hong Kong Youth Innovation and Entrepreneur Hub (E-hub). Seven of 11 Guangdong-Hong Kong-Macao foreign joint venture law firms are based in Qianhai, where Hong Kong law has been applied in more than 600 commercial disputes.<sup>10</sup>

Financial and logistics firms are the primary early movers. The free trade area now also hosts fintech startups such as WeBank, China's first internet-only private bank, and 11 unicorn enterprises such as logistics services provider YH Global. Nearly 600 institutional innovations in trade and investment facilitation, financial market opening, fintech, and the rule-of-law framework implemented in Qianhai have been extended throughout Shenzhen and promoted both nationwide and in Guangdong Province.<sup>11</sup> Of 58,000 patent applications submitted by Qianhai enterprises, 25,000 (44%) have been approved by China National Intellectual Property Administration. Among the top patent filers are fintechs WeBank and OneConnect Financial Technology, along with communications equipment makers Shenzhen TCL New Technology Co. and Shenzhen TCL Digital Technology Co. and transportation equipment supplier CIMC.<sup>12</sup>

## Guangzhou-Nansha New Area and Free Trade Zone

Nansha's primary asset within the GBA is its geographic location at the tip of the Pearl River estuary in the epicenter of the region.<sup>13</sup> Only 38 and 41 nautical miles

away from Hong Kong and Macao respectively, it is positioned as a gateway to sea-based trade.<sup>14</sup>

With a population of 796,000, Nansha's GDP exceeded 168 billion yuan (US\$23.8 billion) in 2019, up 10.5% from the previous year. Among its three GDP components, services doubled while manufacturing increased by more than two-thirds but from a higher base. The Nansha Terminal of Guangzhou's Port handled nearly 17 million containers, a 7% increase. Real estate investment grew by 25%, largely due to the district's growing population.<sup>15</sup>

Nansha was designated as a New Area for targeted economic development in 2012 and as a free trade zone in 2015. Its total area of 803 square kilometers (310 square miles)—of which 60 square kilometers compose the free trade zone—has evolved as a center for modern financial and logistics services, largely in support of trade and of advanced manufacturing in the automotive, shipbuilding, marine engineering, transportation equipment, and nuclear power sectors.

The district boasts GAC Group, a maker of internal combustion and electric vehicles and a joint venture partner in building Honda, Toyota, Fiat Chrysler, and Mitsubishi vehicles in China.<sup>16</sup> Its GAC Nio New Energy Automotive Technology Co. joint venture with Shanghai-based electric vehicle maker Nio<sup>17</sup> does joint R&D for intelligent connected vehicles and produces an electric SUV for the China market. Another major company, drug wholesaler Guangzhou Pharmaceuticals Corp., is one of China's largest pharmaceutical groups.<sup>18</sup> China Railway Engineering Corp. has partnered with German firm Herrenknecht since 2010 to manufacture and deploy shield tunnel boring equipment for both the 18-line Guangzhou Metro rail system and the 300-mile-per-hour Guangzhou-Shenzhen-Hong Kong Express Rail Link.<sup>19</sup> Dongfang Electric Corp. and Vallourec Group are major global suppliers of nuclear power plant equipment.<sup>20</sup>

Nansha Terminal, the only deepwater container terminal on the western side of the PRD, has 16 berths and total container throughput capacity equivalent to 16 million 20-foot containers.<sup>21</sup> Its Shazai Island automobile receiving terminal is China's largest. Guangzhou Shipyard International, China's third largest shipbuilding and repair facility, moved in 2017 to a new 618 acre site at Nansha's Longxue Island, where it has two dry docks

for 300,000 ton very large crude carriers and supporting cranes and slipways.<sup>22</sup>

At the end of 2019, Nansha was home to more than 6,500 financial services firms, including 11 larger licensed financial institutions, reflecting Nansha's changing strategic direction under the Greater Bay Area initiative. Large employers include Big Four accounting firms Deloitte, KPMG, EY, and PwC; professional services company Accenture; investment research/analysis firm Morningstar; banking businesses China CITIC Bank, BMO Financial, and Wells Fargo; insurer Aon; and advisory firm BDO.<sup>23</sup>

Of the more than 400 technology firms in the district, 44% have invested in R&D facilities that account for 3.5% of revenue generated by the sector.<sup>24</sup> Top firms include Tencent, Huawei Technologies, IBM, Oracle, Ericsson-Worldwide, Nvidia, SAP, Microsoft, Nokia, Apple, Dell, Intel, Uber, Qualcomm, and Amazon.<sup>25</sup>

Aggressive business attraction incentives include targeted subsidies and tax benefits for headquarters and other facilities, for new projects from overseas, for financial and other service companies from Hong Kong or overseas, for logistics firms, for advanced manufacturing, and for the construction and operation of R&D facilities. Other incentives target startups with the promise of venture investment and offer housing support for individuals with advanced degrees.<sup>26</sup>

Nansha aims to grow as a startup incubator through preferential policies for the technology and services sectors and targeted subsidies to attract entrepreneurs: up to 100,000 yuan (~US\$15,000) for individuals and up to 5 million yuan (~US\$750,000) for companies. Nansha Innovation Valley, a collection of incubators, is geared toward recruiting companies and people from Hong Kong. The Xiangjiang Unicorn Field, an incubator established in 2017 by Microsoft and Guangzhou-based developer Heungkong Group, focuses primarily on artificial intelligence, helping to launch high-profile companies such as iFlytek, Pony.ai and CloudWalk Technology. The 70-acre, 20 billion yuan Guangdong Valley Medical Park (GDVM) in Nansha is a venture-funded incubator/accelerator and business park that targets the medical equipment and biomedicine sectors.<sup>27</sup> In 2019, the Hong Kong University of Science and Technology (HKUST) broke ground on a new

Guangzhou campus in Nansha to facilitate Hong Kong-mainland research collaboration, talent attraction and retention, and student exchanges.<sup>28</sup>

## **Zhuhai-Hengqin Free Trade Zone**

Zhuhai, located at the mouth of the PRD, on the western side next to Macao, is one of China's original four Special Economic Zones designated in 1980, with 690 kilometers (429 miles) of coastline and 262 islands, nearly two-thirds of them of significant size. It serves in particular as a major port, with three land ports—Gongbei, Hengqin, and Zhuhai-Macao Cross-Border Industrial Zone—and five waterway ports—Jiuzhou, Wan Chai Ferry Pier, Zhuhai, Doumen, and Wanshan.

The Guangdong provincial government projects that Zhuhai, with a current population of 2.44 million and growing steadily, will be a city of 5 million by 2030. In the Chinese Cities of Opportunity 2020 report on 42 cities, PwC and the China Development Research Foundation ranked Zhuhai #7 for Sustainable Development, mainly due to water resources and population mobility. Other rankings put Zhuhai in the top 10 for number of patents granted and in the top 5 for public investment in healthcare, public safety, emergency management; and access to greenspace.<sup>29</sup>

Hengqin Island, a 106 square kilometer district in southeastern Zhuhai, is separated from Macao by a narrow 187 meter (200 yard) wide waterway and is only 34 nautical miles from Hong Kong. Declared a New Area in 2011, Hengqin is seen under the Greater Bay Area plan as both a center for finance, logistics, and cross-border e-commerce and an ecotourism, leisure/hospitality, education, Chinese medicine/healthcare, and cultural destination that builds on Macao's visitor offerings with non-gaming, family-friendly activities.

The island is a designated free trade zone (FTZ). Its more developed northeast section, facing Macao, includes the Shizimen Central Business District, the Hengqin campus of the University of Macao, the Guangdong-Macao Traditional Chinese Medicine Science and Technology Industrial Park (GMTCM Park), and a yachting industry demonstration base and marina.<sup>30</sup> The remainder of Hengqin is largely recreational and open space, including the Chimelong Ocean Kingdom theme park and resort, which attracts more than 8 million visitors

annually. In the first two years after receiving the FTZ designation in 2014, Hengqin property prices doubled, with most of the buyers from Macao—a trend that has accelerated since more detailed plans for the island under the GBA were unveiled.<sup>31</sup>

As of August 2020, some 3,000 Macao-funded enterprises were operating in Hengqin New Area, with combined registered capital of 85 billion yuan (US\$12 billion), accounting for nearly 60% of foreign-funded enterprises. More than 800 of these enterprises, valued at nearly 10 billion yuan, registered in 2020 alone. At that time, 95 Hong Kong and Macao enterprises had established cross-border offices in Hengqin; four more had obtained business licenses to operate in Hengqin with Macao qualifications.<sup>32</sup>

Various construction projects have been announced for Hengqin since 2018, including three tunnels and the first phase of Hengqin Science City, a live-work community focused on emerging industries that include artificial intelligence, cloud computing, and big data analytics. Phase 1 includes owned and rental housing, hotels, retail, public services, and kindergartens and is scheduled for completion in 2021. Phase 2 will include a set of live-work clusters—Bio-Medical Valley, Intelligence Ecology Valley, and Science Innovation Valley—with a focus on “going global” via the Belt and

Road Initiative, for a total of more than 720,000 square meters (178 acres) of developed space.<sup>33</sup> Tourist-related projects on the drawing board include a second ocean park resort area and a Macao future center.<sup>34</sup>

Since 2011, China's State Council has authorized preferential policies for Hengqin which are even more favorable than in Special Economic Zones, reflecting the priority placed on both accelerating development of Hengqin's New Area and integrating Macao under “One Country, Two Systems.” These policies include streamlined customs clearances, special tax benefits, wage subsidies and housing allowances for high-end talent, incentives for cross-border business development between Hengqin and Macao, and support for an Industrial Park of Cooperation between Guangdong and Macao that together would create “a special zone within special zones.” Entities in Hengqin have the ability to choose Hong Kong as an arbitration venue for property rights disputes.

This pairing of capabilities—Shenzhen and Hong Kong via Qianhai and Macao with Zhuhai through the Hengqin Free Trade Zone, with both tied to Nansha's and Guangzhou's significant industrial and technology base through the PRD's transportation infrastructure—is designed to stimulate the development of a world-class city cluster, as well as to anchor southern China in the Belt and Road Initiative.



Crossroads greenspace in Zhuhai

Source: Popolon on Wikimedia Commons

INSIGHT

## Belt and Road: China's Frontier Strategy

The Greater Bay Area (GBA) plan is an integral component of the Belt and Road Initiative (BRI), an infrastructure financing and development program launched by China's government in 2013.

Leveraging its foreign exchange reserves with investments from other participating countries, the goal is an integrated cross-border supply chain network and customs area that (1) promotes economic development in emerging markets in Eurasia, the Middle East, and Africa and ultimately connects to Europe, tying those economies more closely to China's, and (2) advances China's economic and security goals in a region expected to see significant economic growth throughout the 21st century.

By May 2020, China had signed 200 cooperation agreements with 138 countries and 30 international organizations under the BRI, plus another 17 free trade agreements with 25 countries. China's goods trade with BRI countries reached US\$1.9 trillion for 2019.<sup>35</sup> Cumulative Chinese outbound direct investment in BRI countries through December 2020 totaled

US\$770 billion,<sup>36</sup> primarily in transportation, energy, and communications infrastructure and in strategically located economic zones. Projects include ports in Pakistan and Greece, railway networks in Southeast Asia, hydropower plants in Tajikistan and Uganda,<sup>37</sup> and economic zones in Egypt and Kazakhstan.<sup>38</sup> The China-Europe Railway Express freight service, a joint venture between Germany's Deutsche Bahn, Russia's RZHD and the China State Railway Group,<sup>39</sup> has completed 30,000 trips<sup>40</sup> since its launch in 2011 and has become a vital BRI component.<sup>41</sup>

The GBA, especially with the full integration of Hong Kong and Macao, figures prominently in the next phase of Belt and Road, as China looks to raise outside investment and manage BRI project spending in multiple currencies. Hong Kong's project financing, foreign exchange, legal, and advisory expertise are seen as avenues to attract and structure new global investment. The conditions governing project financing have emerged as major issues in the BRI, as some recipient countries have balked at loan terms, potential debt exposure, and financing-related project delays.



## Connecting the Dots

### Transportation Infrastructure

A multifaceted "urban track + intercity track + expressway" transportation network is under construction—branching out from Hong Kong, Guangzhou, and Zhuhai—which is intended to connect GBA cities and, from there, link the region to the rest of China. Among its key nodes are bridge, land, and rail links:<sup>42</sup>

■ The Hong Kong-Zhuhai-Macao Bridge (HZMB), a project entailing three bridge segments, two artificial islands, and a 6.7 kilometer (4.2 mile) subsea tunnel, opened in 2018. It has brought travel time between the three cities within the "one-hour living circle" planned for all of the GBA. The HZMB connects with the three major expressways west of the Pearl River—the Jian-Zhu expressway from Zhuhai and

Jiangmen, Guang-Zhu West Expressway from Zhuhai to Zhongshan and Wuzhou to the west, and Jing-Zhu Expressway to Guangzhou and Beijing beyond.

■ The Hong Kong Airport Authority is planning to build a bonded bridge connecting the HZMB's Hong Kong portal to the restricted area of Hong Kong's airport and an inter-modal transfer terminal that will allow passengers to travel between the airport and Macao via the bridge. Both facilities are slated for completion in 2022. At that point, passengers will be able to clear customs and immigration at Zhuhai or Macao, check their baggage, and proceed directly to their gates. Similar check-in and customs services are already available to passengers using Hong Kong airport's Sky Pier ferry service to Macao and other Pearl River Delta cities.<sup>43</sup>

- The Shenzhen-Zhongshan Bridge, scheduled for completion in 2024, will cross the Pearl River from Shenzhen Bao'an International Airport to the city of Zhongshan.
- A rail link from Shenzhen to Jiangmen, a key GBA project that also connects to Shenzhen Airport and Dongguan, is scheduled to begin operation in 2025.
- Launched in 2018, a new high-speed rail service runs 30 trains daily, connecting Hong Kong with Shenzhen in 23 minutes and with Guangzhou in 48 minutes.
- The 13 kilometer (8 mile) Nansha Bridge over the Pearl River opened in 2019, connecting Guangzhou to Dongguan and easing congestion on the Humen Bridge.
- The Liantang/Heung Yuen Wai Boundary Control Point, the seventh land crossing between Hong Kong and Shenzhen, will support more efficient cross-border movement for passengers and vehicles.
- An extension of the Guangzhou-Zhuhai Intercity Railway from Gongbei to Hengqin and Hengqin to Zhuhai airport, completed in August 2020, connects with Macao's light rail system, resulting in a 30-minute trip between Gongbei in southern Zhuhai and Macao and Hengqin.

## Talent and Science

In addition to physical infrastructure connections, Guangdong must work out with Hong Kong and Macao clearance processes, passport processing, foreign exchange provisions, and *hukou* mobility to enable a freer flow of talent and capital among the cities. Meeting these requirements places a premium on inter-governmental coordination.

Specific measures are being put into place as part of the economic development incentive packages offered by Nansha/Guangzhou, Qianhai/Shenzhen and Hengqin/Zhuhai. In 2019, the Chinese government transferred jurisdiction to Macao for the main Hengqin border checkpoint leading into Macao via the Lotus Bridge, a second bridge between the Hengqin checkpoint and the Hengqin campus of the University of Macao, and a future site connecting Macao's light rapid transit system and Chinese high-speed rail

service.<sup>44</sup> The new boundary agreement facilitates movement of University of Macao students and tourists visiting Macao and Hengqin. A visa-free regime is reportedly under consideration.

In 2018, Hong Kong's Customs and Excise Department reached agreement with Mainland, Guangdong, and Macao Customs for a Single E-Lock Scheme (SELS) to expedite cross-border freight traffic. SELS creates a "green lane" for certified shipments using electronic locks and GPS technology, with only a single joint inspection required across 52 GBA clearance points.<sup>45</sup> Three-fifths of Hong Kong and Macao passport holders exiting or leaving Hong Kong at 14 city locations currently use e-channel terminals, automated kiosks which make facial recognition comparisons with passports.

In 2018, nearly 1.8 million skilled workers from outside Guangdong received permanent residency status in the province. Guangzhou extends *hukou* privileges to holders of bachelor's degrees who are under 40 years of age; Shenzhen extends the same privileges to all college graduates. The two cities alone accounted for just over 900,000 new permanent residents—half of the annual total for the province—in 2018. Zhuhai, Huizhou, Jiangmen, and Zhaoqing have gradually relaxed *hukou* policies for skilled workers, beginning with elimination of minimum annual social security contributions required of those with residency outside the province.<sup>46</sup> In 2019, China's National Development and Reform Commission (NDRC) lifted *hukou* restrictions for all cities with urban populations of 1–3 million and eased restrictions in cities of 3–5 million for "floating" migrant workers with rural *hukou* residing in those cities for five years, and for technicians, college and vocational school graduates, and people who have obtained overseas degrees.<sup>47</sup>

Major investments are also being made in the region's research and scientific infrastructure. These include in Hong Kong two key research clusters at the Hong Kong Science Park: Health@InnoHK, which focuses on healthcare technologies, and AIR@InnoHK, which focuses on artificial intelligence and robotics technologies. Both are designed to enable top-tier technology companies and institutions from around the world to set up R&D in Hong Kong. As discussed later in this report, Hong Kong is working with Shenzhen to link the Hong Kong-Shenzhen Innovation and Technology

Park on the Hong Kong-Shenzhen border with the Shenzhen Innovation and Technology Zone that is immediately adjacent.

The Guangzhou AI and Digital Economy Pilot Zone will encompass 81 square kilometers. Building on the Guangdong AI and Digital Economy Lab and the Zhongshan University Innovation Platform, the zone is planned as an innovation and demonstration area for internet and cloud computing, big data, and AI-integrated industry, and includes housing, education, and healthcare incentives to attract high-level talent.

Shenzhen is developing the Shenzhen High-Tech Core Zone, Robotic Town, and a national bioindustry base. At the national level, the Chinese Academy of Sciences also plans to establish a Greater Bay Area academician alliance in Hong Kong to promote cooperation and exchanges between scientists of both the Chinese Academy of Sciences and the Chinese Academy of Engineering, bringing prominent scientists to the region to advise on technological development.<sup>48</sup>

### Global Bay Area Connections

China is counting on a fully integrated, coordinated Greater Bay Area to eventually take its place among other preeminent regional technology and innovation clusters worldwide, by linking public and private

research assets with advanced manufacturing capability, capital, entrepreneurial talent, and green, livable cities to create a uniquely Chinese innovation environment. For this reason, Chinese planners often measure progress in the GBA against other global “Bay Areas” (selected coastal metropolitan areas) from which China’s Greater Bay Area can learn and with which it could connect more deeply in the future. The three non-Chinese regions most often referenced are the San Francisco Bay Area, the New York Metropolitan Area, and the Tokyo Bay Area.

Challenges that these and other “Bay Areas” are seen to share include inter-jurisdictional coordination and alignment, connective infrastructure, and development of the human and scientific capital needed to build dynamic, innovation-led economies. Ultimately, China’s goal is to connect global Bay Areas to each other through trade, investment, research, and talent, with the GBA in southern China at the core. Underlying differences—most notably scale and systemic differences between jurisdictions where policy is determined by the central government versus more diffuse political structures—suggest that the global Bay Area to Bay Area connection isn’t straightforward or assured. But viewed through the lens of trade and investment, deep patterns of cooperation already exist between these global regions.

### The World’s Major Bay Areas: Statistical Breakdown (2020)

	Guangdong-Hong Kong-Macao GBA	San Francisco Bay Area	New York Metropolitan Area	Tokyo Bay Area
Land area (square kilometers)	56,098	17,887	21,479	36,898
Population (millions)	86.17	7.74 <sup>3</sup>	19.22 <sup>3</sup>	44.34
GDP <sup>1</sup> (US\$ billions <sup>2</sup> )	1,679.3 <sup>3</sup>	995.1 <sup>3</sup>	1,861.2 <sup>3</sup>	1,991.6 <sup>4</sup>
Real GDP growth (%)	4.4 <sup>3</sup>	4.0 <sup>3</sup>	1.2 <sup>3</sup>	1.4 <sup>4</sup>
Per-capita GDP (US\$)	23,116 <sup>3</sup>	128,573 <sup>3</sup>	96,853 <sup>3</sup>	45,084 <sup>4</sup>
Air passenger throughput (million passenger-times)	101.5	25.8	40.8	40.8
Air cargo and airmail throughput (million tonnes)	7.66	1.06	1.78	2.72
Port container throughput (million TEUs)	81.63	2.46	7.59	8.36 <sup>3</sup>
GDP share of tertiary industry (%)	66.1	75.0* <sup>3</sup>	82.4* <sup>3</sup>	75.9 <sup>4</sup>

**Notes:** 1 At current market prices; 2 Converted with the yearly average exchange rates; 3 2019 figure; 4 2018 figure; \*estimated figure. The San Francisco Bay Area covers nine counties bordering the San Francisco Bay. The New York Metropolitan Area covers the three cities of New York, Newark and Jersey and 25 surrounding counties. The Tokyo Bay Area covers Tokyo and its seven surrounding prefectures. Source: Government statistical departments in the relevant jurisdictions, HKTDC.



## Hong Kong and Macao: One Country, Two Systems 2.0

To understand the importance of and the potential roles played by Hong Kong and Macao in the GBA, it is necessary to understand their positions under the “One Country, Two Systems” model as Special Administrative Regions (SARs) of China.

The “One Country, Two Systems” principle grew out of negotiations between the United Kingdom and China, launched in 1982 and concluded in 1984, to manage the return of Hong Kong to Chinese rule following the expiration in 1997 of long-term leases for Kowloon and the New Territories. Macao, leased by Portugal from China in 1557, was later recognized as a Portuguese territory in 1887 but returned under a 1987 Sino-Portuguese Joint Declaration, with the transfer taking effect in 1999.

China saw economic benefits in retaining the existing free market and relatively effective governing structures of Hong Kong and Macao under Chinese rule as offshore entrepôts which would continue to attract international investment and visitor revenues.

### Hong Kong

The Sino-British Joint Declaration eventually signed in December 1984 for the return of Hong Kong provided for a 50-year transition period following the 1997 handover. During that time, Hong Kong is considered a Special Administrative Region—“Hong Kong, China”—which

retains its own free market economy, English common law framework, and government which administers public finances. Hong Kong has its own freely traded currency and a separate Hong Kong Special Administrative Region (HKSAR) passport regime. Its official languages are English and Chinese (the Basic Law only specifies Chinese for written language, which is shared by different dialects including Cantonese and Mandarin).

China has responsibility for foreign relations and the military defense of Hong Kong and exercises administrative oversight under the Basic Law, an effective Constitution stipulated in the Sino-British Joint Declaration. Hong Kong continues to participate separately in international bodies such as the World Trade Organization and Asia-Pacific Economic Cooperation (APEC) and in agreements such as the UN International Covenant on Civil and Political Rights.

Today, Hong Kong positions itself as an Asia-Pacific headquarters and business services and innovation center, with emphases in finance; trade and logistics; legal, accounting, consulting, and other professional services; media and advertising; and fashion and design. Two key trade-related advantages it offers are (1) renminbi convertibility in cross-border financing and transaction settlement and (2) commercial arbitration of cross-border disputes for overseas companies doing business with China. Its independent judiciary, under the English common law system, offers rule of law assurance

in contracts, intellectual property protection, and commercial dispute settlement.

At the time of the 1997 handover, Hong Kong's deepwater port traded places each year with Singapore as the world's largest; both have since been eclipsed by Shanghai and Shenzhen. Chek Lap Kok (Hong Kong International) Airport (HKIA) was surpassed in 2019 in passenger traffic by Guangzhou's Baiyun International Airport, with 73.4 million passengers versus Hong Kong's 71.5 million passengers; Hong Kong's air cargo volumes, however, substantially exceed those of Baiyun with 4.8 million tons of freight versus 1.9 million tons, and HKIA remains the world's largest air freight hub. A US\$8 billion expansion underway in Baiyun will add fourth and fifth runways along with a third terminal by 2022 to accommodate 120 million passengers by 2030. In the meantime, a third runway at HKIA is scheduled for completion in 2023, increasing the airport's capacity to 100 million passengers, with a high percentage of them international.<sup>1</sup>

## **The Financial Services Sector**

Hong Kong remains Asia's leading financial center. The financial sector—banking, insurance, and financial services—accounts for 21% of the city's GDP of US\$351 billion (at an exchange rate of US\$7.8 per HK\$) in 2019, up from 13% in 2004.<sup>2</sup> As of the end of 2020, the sector employed 239,000 persons, or around 9% of total employment in Hong Kong.<sup>3</sup> At more than US\$312,000 annually,<sup>4</sup> its value-added per capita is high. The territory's some 160 licensed banks earn about 90% of revenues in the banking sector.<sup>5</sup> Hong Kong is also the world's sixth largest holder of cross-border bank claims and liabilities<sup>6</sup> and its fourth largest forex trading center.<sup>7</sup> Most of the Hong Kong SAR's some 1,900 asset managers<sup>8</sup> are global; half of their assets by value are from the US, Europe, and Asia outside of China.<sup>9</sup> In the insurance space, life insurance underwriting and non-life insurance underwriting accounted for 89% and 8% of receipts and income, respectively, with the remaining 3% in non-bank leasing and credit, investment and holding companies trusts and funds, and ancillary non-lending services such as fund management.<sup>10</sup>

Since 2000, the Hong Kong Special Administrative Region (HKSAR) has grown nine-fold to join the top

five global sites for initial public offerings, currency trades, and interest rate derivatives transactions.<sup>11</sup> HKEX (the Hong Kong stock exchange including both the Main Board and the Growth Enterprise Market) ranks fifth worldwide in market capitalization behind NYSE (New York Stock Exchange), Nasdaq, Shanghai Stock Exchange, and Japan Exchange Group, and ahead of London Stock Exchange Group.<sup>12</sup> Hong Kong also excels at services such as private banking, life insurance, and fintech. Its Stock Connect platform enables cross-border securities trading with mainland exchanges and accounts for 17% of share trading in Hong Kong;<sup>13</sup> Chinese companies listing in other overseas locations often rely on Hong Kong legal, accounting, and advisory firms to structure their offerings. While Shanghai and Shenzhen have grown steadily with largely mainland business, they are disadvantaged in areas like disclosure standards, ease of cross-border capital flows, and low customer or transaction volume in areas such as currency trading and interest-rate derivatives activity.

Boosting Hong Kong's status as a financial center for the Greater Bay Area, the recently launched Wealth Connect program (which is distinct from the Stock Connect and Bond Connect programs that enable cross-border trading with the Shanghai and Shenzhen exchanges) now aims to enable cross-border financial products and wealth management services between Hong Kong and Macao and residents in nine cities in Guangdong. Access to services is available without needing to physically cross a border, requiring instead only an account with an authorized bank or fund house. The initiative represents a partial relaxation of capital controls within the GBA, bolstering Hong Kong's role as an offshore yuan center.<sup>14</sup>

On the regulatory side, the Hong Kong Monetary Authority and the Hong Kong Securities and Futures Commission are highly regarded for their standards and enforcement. The 1992 United States–Hong Kong Policy Act recognizes HKSAR as a separate customs jurisdiction and assures currency convertibility. Separate agreements provide for reciprocal regulatory treatment regarding securities, derivatives, and foreign exchange settlement transactions. Hong Kong has been a leading offshore dollar funding center, supported by approximately US\$440 billion in reserves: its dollar has been pegged to the US dollar since 1983. US dollar-denominated



transactions account for 97% of foreign-exchange deals, 58% of cross-border loans and other bank instruments, 43% of cross-border derivatives and 37% of deposits. Dollar cross-border claims total a combined US\$4 trillion.<sup>15</sup>

The above figures reflect a US\$10 trillion market in cross-border share trading, bank loans to Belt and Road projects, IPOs, derivatives, and investment and private banking services that together make Hong Kong the world's third largest financial hub. Shanghai and Shenzhen have gradually expanded their market shares of domestic Chinese listings, particularly for smaller and medium-sized companies, but major Chinese players continue to favor Hong Kong. Local companies now make up 24% of the Hong Kong Stock Exchange versus 69% in 2000, as the share of mainland firms has grown from 31% to 73%, with nine of China's top 10 most valuable companies listed in Hong Kong, among them Tencent and Ping An Insurance.<sup>16</sup> Even with the value of transactions growing in rival financial centers such as Shenzhen and Shanghai, Hong Kong also remains the preferred venue of the international financial community due to its common law legal system, which other Chinese cities cannot replicate, and continued capital controls on the yuan, which isn't freely traded on the mainland. This positions Hong Kong as a key site for secondary listings and IPOs from ASEAN countries (80

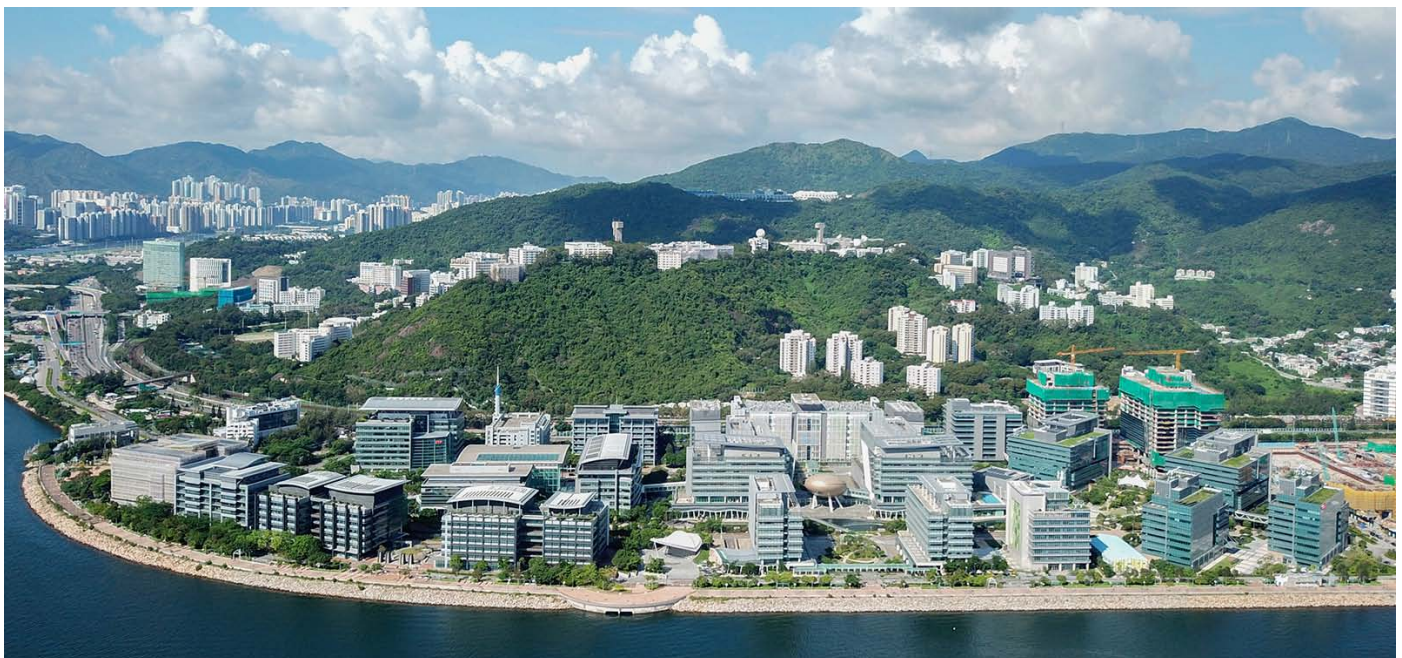
have launched IPOs there since 2010) and as an outlet for Hong Kong and other GBA growth companies that are looking to internationalize.<sup>17</sup>

### R&D and Innovation Infrastructure

Looking beyond finance, the city's educational and research base is highly regarded. Hong Kong has several universities that are high in global rankings, such as the University of Hong Kong, the Chinese University of Hong Kong, Hong Kong University of Science and Technology, City University of Hong Kong, and Hong Kong Polytechnic University.<sup>18</sup>

Perhaps because of the strength of its financial services and real estate sectors and the generous salaries they offer, Hong Kong was slow to leverage the strength of its universities to support technological development and entrepreneur-led startups. A range of initiatives is now making up for lost time.

The Hong Kong Science & Technology Parks Corporation (HKSTP), a public-private research and innovation entity, offers companies and entrepreneurs research, product development, and go-to-market support locally and overseas, primarily in artificial intelligence and robotics, biomedicine, data analytics, smart city solutions, and fintech.



Hong Kong Science Park

Source: Wpcpey on Wikimedia Commons

HKSTP administers the Hong Kong Science Park incubator and the Global Acceleration Academy, which connect startups with established companies and supports innovation clusters in biomedical technology, electronics, green technology, information and communications technology, and materials/precision engineering. HKSTP connects a community of 13,000 members, including 890 companies, 720 graduate alumni, and 1,000-plus investors, and has deployed some HK\$250 million (US\$32 million) together with 22 co-investors since 2015 in early-stage deep technology startups through its HKSTP Ventures fund.<sup>19</sup> Portfolio companies include two unicorns: education, healthcare, smart city, and security AI developer SenseTime and on-demand/same-day delivery technology firm Lalamove.

Another government-owned digital tech hub, Cyberport, focuses on AI, big data, blockchain, fintech, smart living, digital entertainment, and cybersecurity, with an eye toward transforming Hong Kong into a smart city. Through its technology center, fintech hub, incubator and accelerator programs, and micro and macro seed to Series A funds and market development program, Cyberport provides some 1,500 entrepreneurs with mentoring, investor matching, co-working space, production facilities, and support for youth entrepreneurship and the formation of cross-border strategic partnerships.<sup>20</sup> In 2018–19, more than 350 participants and 170 companies took part in the Cyberport Digital Tech Internship Program (CDTIP); the Fintech Career Accelerator Scheme (FCAS) placed university students as interns at banks, stored value facility operators, and the Hong Kong Monetary Authority (HKMA). Another 130 incubator participants, out of 600 applicants, received up to HK\$500,000 to develop their technology ideas.<sup>21</sup>

Other initiatives to support startups and technology innovation<sup>22</sup> include the following:

- The Innovation and Technology Fund (ITF), which aims to increase value-added activity and competitiveness in the economy, supports industry-oriented projects with the potential for commercialization and seed projects that are more exploratory in nature.
- The Research Talent Hub (under the umbrella of the ITF) funds companies and organizations undertaking R&D projects supported by the Fund, tenants of

the Hong Kong Science & Technology Parks and Cyberport, and technology companies conducting or planning to conduct R&D in Hong Kong to enable them to hire research talent. As of January 2021, more than HK\$2 billion has been provided in support of 6,000 researchers.<sup>23</sup>

- The Public Sector Trial Scheme (PSTS), also under the Fund, helps local technology companies commercialize their research through the production of prototypes and the conducting of public sector trials.
- The Innovation and Technology Support Programme (ITSP) supports applied R&D projects undertaken by R&D Centers and designated local public research institutes, with a view to transferring the research results to local industries.
- The HK\$2 billion Re-Industrialization Funding Scheme subsidizes manufacturers on a matching basis to set up new smart production lines in Hong Kong.<sup>24</sup>
- The Partnership Research Programme supports applied R&D projects undertaken by research centers and designated public research institutes in collaboration with private companies.
- The Technology Start-up Support Scheme for Universities (TSSSU) provides funding to six universities to support teams starting technology businesses or commercializing their research.
- The STEM Internship Scheme arranges short-term innovation and technology internships for students in STEM programs at local universities. Launched in 2020 as a pilot, the scheme has benefitted more than 1,000 students to date.<sup>25</sup>
- The IT Innovation Lab in secondary schools program, through grants of up to HK\$1 million, provides secondary schools with opportunities to explore the applications of IT through extracurricular activities.<sup>26</sup>
- Two new centers were recently established at the Science Park to internationally attract universities, organizations, and business entities to set up R&D labs: Health@InnoHK, which focuses on healthcare technologies, and AIR@InnoHK, which focuses on artificial intelligence and robotics.
- The Smart City Blueprint for Hong Kong 2.0 includes more than 130 city initiatives.<sup>27</sup>

Two initiatives specifically focus on cross-border research cooperation in the Greater Bay Area:

- The Guangdong-Hong Kong Technology Cooperation Funding Scheme (TCFS) supports R&D among universities, research institutes, and technology enterprises in Hong Kong and Guangdong/Shenzhen. Selection for funding requires the approval of the relevant authorities in both Hong Kong and Guangdong/Shenzhen.<sup>28</sup>
- The Mainland-Hong Kong Joint Funding Scheme (MHKJFS) supports collaborative R&D projects among universities, research institutes, and technology enterprises in Hong Kong and mainland China.<sup>29</sup>

## Synergies with the Mainland

Synergies exist for Hong Kong and the mainland. While China sees a future for the renminbi as a global currency, it is proceeding with caution. Beijing first began easing restrictions on the yuan in 2004, when it allowed Hong Kong banks to accept yuan deposits and to pay remittances. In 2009, it permitted worldwide use of the yuan to settle trade, extending that permission in 2010 to bonds, insurance policies, and mutual funds. Yuan deposits in Hong Kong peaked in December 2014 at just over 1 trillion yuan (US\$140.1 billion), according to the Hong Kong Monetary Authority.<sup>30</sup> With deposits of about 644 billion yuan in mid 2019,<sup>31</sup> Hong Kong is the largest offshore renminbi market, making up 43% of its total and surpassing London (22%) and Singapore (16%).<sup>32</sup>

Finally, Hong Kong's role as a global business center is supported by the world's most business-friendly tax system, ahead of Qatar and the United Arab Emirates, according to the World Bank and PwC. A vibrant property market and high land and development costs deliver sufficient revenues from stamp duties (taxes on the sale of properties) and from city land sales and leases to keep other taxes low. Personal income tax, called a salary tax, is applied at graduated rates from 2% to 17% based on income to anyone residing in Hong Kong for 60 days or more. The marginal corporate tax rate is 16.5%. Hong Kong has no capital gains, withholding, estate, dividend, sales, or value-added taxes and no tax on interest. Property and landowners pay a standard 15% rate on rental income. In 2017, the government established a two-tier business tax

structure, which cut taxes in half on profits up to HK\$2 million (US\$255,000), to better compete with Singapore. Under the Basic Law, Hong Kong is a separate tax jurisdiction that does not have to share revenues with the mainland.<sup>33</sup>

At present, Hong Kong continues to offer the best of both worlds in connecting China with the rest of the world: a convenient "offshore" global clearinghouse for cross-border capital and investment flows; a laboratory for studying, testing, and refining convertibility across China over time; and a reassuring pathway into China for overseas investors. The territory's professional and business services sector is positioned to support overseas companies entering the China market in terms of introductions, contracts, banking and accounting, regulatory compliance and product standards, translation services, product and packaging design, market research, and advertising/public relations support. Conversely, it acts as a go-between offering similar services to Chinese state-owned and private companies "going out" to global markets.

It had been widely assumed outside of China in 1997 that Hong Kong's gateway role would remain unchallenged for at least the five-decade transition period, and that it would, over that time, exert a westernizing influence on China's economy. But in the 2000s, China's thinking had begun to change, driven by a mix of externalities that revealed vulnerabilities from globalization—the Asian financial crisis, the SARS pandemic, the 1999 tech asset bubble—but also a growing confidence about its strategic position and the strength of its economy. Admission to the World Trade Organization in 2001 produced an explosion of trade and manufacturing investment. Massive foreign exchange reserves were plowed back into infrastructure and urban modernization in what would become by 2010 the world's second largest economy.

China exited the global financial crisis faster than many countries, supported by a 4 trillion yuan (US\$570 billion) domestic stimulus program.<sup>34</sup> Increasingly assertive global policies collided, however, with an intensifying post-recession competition for global influence and resources, exacerbated in the 2016–2020 period by worsening relations with the US. Policies in Beijing shifted toward a more competitive and internally driven

approach aimed at projecting economic influence externally and increasing competitiveness and technological self-sufficiency domestically.

Against this backdrop, the reunification of Hong Kong began to take on new significance, not just as a gateway to attract traditional inward investment, but also as a two-way portal to leverage China's own economic assets, accelerate innovation, showcase its achievements under "socialist modernization," and deepen its global economic ties. The Fifth Plenum of the Chinese Communist Party Central Committee in 2015 prioritized a greater role for Hong Kong in China's economic development and opening to the outside world. Neither the central government in Beijing nor the Basic Law spells out what will happen to Hong Kong's administration after 2047, but economic integration is already underway under the Greater Bay Area plan.

That process presents an important opportunity for Hong Kong to leverage its key assets—an open economy, rule of law, and strength as a global financial and business service center—to more deeply participate in and contribute to China's economic growth, preserving its pivotal role as a key intermediary in China's economic relations with the world. It is also a two-edged sword, reflected in a broader concern within the Hong Kong business community regarding competition from Shenzhen to lure financial, trade, logistics, and business services firms away from Hong Kong as the GBA evolves.

While it is easier for overseas businesses to go directly to China than in the past, Hong Kong's common law system and its positioning as a global business center—in contrast to the more domestic orientation of Shenzhen, Guangzhou, and other GBA cities—bring a distinct value to the GBA that distinguishes it from other Chinese regions. The GBA therefore provides a pathway through which Hong Kong is seeking to ensure its continued relevance as its relationship with the mainland and China's economy evolves. With the maturing of the GBA as an economic region, Hong Kong's leaders see the SAR's participation as a key factor that will define its economic future.

## Macao

Macao presents a very different picture from Hong Kong when it comes to reunification under "One Country, Two Systems."

The Macao SAR, with a population of 620,000, has its own distinct government, legal system, and economic structure, including a separate currency, the Macanese pataca (MOP). Its chief-executive is chosen by a 400-person committee of politicians and business leaders approved by Beijing.<sup>35</sup>

Macao has thrived as both a regional and global visitor destination supported primarily by legal gambling. With a tax rate of 38–39% on gross gaming revenue (GGR), its government generated more than 85% of its total tax revenue from the casino industry in 2019. GGR has been more than US\$10 billion per year since 2006 and reached a record high of US\$45 billion in 2013, with the government receiving approximately US\$17.5 billion in gaming tax revenue that year.<sup>36</sup> The gaming industry was hit hard by the COVID-19 pandemic, generating GGR of only US\$7.56 billion in 2020, down 79.3% from the US\$36.6 billion produced in 2019 and the lowest annual GGR since 2006.<sup>37</sup>

Macao ranks 12th in the world for per capita GDP, at US\$55,110, but is the world's highest when adjusted for purchasing power parity (PPP), at US\$123,965 according to Trading Economics.<sup>38</sup> Under the territory's Wealth Partaking Scheme established in 2008, permanent residents each receive an annual cash payment of MOP\$10,000 (US\$1,252) from casino revenues; non-permanent residents receive MOP\$6,000. The government has also provided tax, stamp duty, and fee waivers; utility and small business subsidies; and paid job training and other support during the COVID-19 crisis.<sup>39</sup>

Nearly half of the current population in Macao came as immigrants from China, generally embracing the notion of Chinese rule. Beijing, for its part, plans to open a yuan-denominated stock exchange and renminbi clearance center in Macao.<sup>40</sup>

## The Potential of GBA Integration

To understand the full economic contribution that an integrated, connected Pearl River Delta region brings to China, it is important to understand the ways in which such a region could as a whole be greater than the current sum of its parts.

First, the GBA brings together “One Country, Two Systems” (the Hong Kong and Macao SARs) and three customs zones (Nansha, Qianhai/Shekou, and Hengqin) within Guangdong Province, providing a more balanced allocation of services, technology, manufacturing, and resources than in the other proposed Chinese “Bay Areas” and broad international connections through its harbors and airports, sophisticated logistics, currency convertibility, and investment and trading capabilities.

In particular, Hong Kong, Shenzhen, and Guangzhou are positioned to leverage and coordinate existing competitive advantages to more precisely allocate and focus resources in manufacturing, technology, research, finance, logistics, and business support services in furtherance of China’s long-term strategic and economic initiatives:

- *Belt and Road Initiative*—projecting China’s “socialism with Chinese characteristics” model and its industrial, construction engineering, and planning capacity to emerging markets with better targeted, more diversely financed infrastructure, energy, supply chain, and other projects.

- *Made in China 2025*—helping domestic industries modernize, commercialize research, and cultivate and attract talent.
- *Regional Economic Development*—serving as an economic multiplier to spread employment, business growth, and procurement opportunities inland, reducing wealth inequality between coastal and inland areas.
- *Opening Up*—facilitating two-way flows of technology, business, and investment; leveraging China’s trade and investment promotion, diplomatic, institutional, and academic assets abroad; and building a showcase for Chinese technology, infrastructure, economic development, and urban planning to attract increased talent, investment, and innovation.

At present, the Pearl River Delta cluster of cities together accounts for roughly 9% of China’s GDP, versus a 20% share of GDP for the Northeastern US Atlantic Coast city cluster and 72% for the Japan Pacific Coast city cluster, suggesting room for both growth and added value through integration and better coordination. From the standpoint of innovation and technology development, the region’s base is already strong. Guangdong-based companies hold more than half of Chinese computing and telecommunications patents and nearly a quarter of patents for electrical machinery

and equipment manufacturing.<sup>1</sup> The GBA accounted for 33 of the 218 unicorns (startups valued at US\$1 billion or more) listed in Hurun Research Institute's 2019 Greater China Unicorn Index. More than half of the 33 are from Shenzhen, with nine from Guangzhou and five from Hong Kong.<sup>2</sup>

Artificial intelligence industries in Guangdong had a combined value of 26 billion yuan in 2017, a third of the national total. In its 2018 development plan, the Guangdong Science and Technology Department forecasted a continuing expansion, driving related industries like robotics and smart equipment.<sup>3</sup> Among core cities, **Guangzhou's** municipal government has signed cooperation agreements with Tencent for smart city development;<sup>4</sup> iFLYTECH for smart consultation, diagnostic, appointment, and payment services at Guangdong Second Provincial General Hospital;<sup>5</sup> and Huawei for a Baiyun District R&D hub focused on smart vehicles, cloud computing, and Internet of Things.<sup>6</sup>

**Shenzhen's** economic development has passed through several phases starting with basic manufacturing and processing, moving on to high tech industries, and now to emerging industries. In this latest phase, innovation is being prioritized with emphasis on the digital economy and the digitalization of advanced manufacturing. The city is working with Tencent's AI Lab to develop overall AI capabilities in healthcare, communications, fintech, and robotics. SenseTime and City University of Hong Kong have collaborated on the development of facial recognition technology, while Hong Kong University of Science and Technology has partnered with Tencent to establish the WeChat-HKUST Joint Laboratory on Artificial Intelligence Technology.<sup>7</sup>

Sometimes referred to as the "Silicon Valley of China," Shenzhen was ranked by the Global Innovation Index as the second most technologically innovative economy in the world in 2018. It is also China's leading source of patent production: 228,600 patents were produced in 2018, led by technology companies headquartered in the city such as Tencent, Huawei, BYD Co. Ltd., drone company DJI, and Beijing Genomics. With a frontier mentality—not unlike Silicon Valley's—which traces to its roots as China's first Special Economic Zone (SEZ), Shenzhen has become a magnet for entrepreneurs from across China.<sup>8</sup>

**Foshan**, with some 9.5 million residents, is the fourth largest Guangdong city, behind Guangzhou, Shenzhen, and Dongguan, and the third to join the province's "trillion GDP club." With a strong manufacturing base and a robust private sector of around 700,000 enterprises according to PwC, Foshan has been given latitude and encouragement to pursue "comprehensive reforms" alongside its basic mission of modernizing and differentiating its manufacturing capability, including "construction of a high-end service demonstration zone" to attract finance, industrial design, and trade services, plus an "intellectual property center" linked with Hong Kong and Singapore to develop a stronger IP regime for the region.<sup>9</sup>

Foshan is a central GBA transportation hub linking Hong Kong, Guangzhou, Shenzhen, and China's interior, prioritizing smart manufacturing in sectors such as vehicles, machinery, and appliances, along with building materials, optoelectronics, energy conservation, environmental protection, biomedicine, and medical devices. Its five districts have considerable overlap in terms of key industries, mainly serving the supplier networks of large companies in the Pearl River Delta and elsewhere in China. Each district is attempting to differentiate itself in new economy verticals, from automotive in Cancheng and Sanshui, to intelligent manufacturing and robotics in Shunde, to hydrogen energy in Nanhai, and tourism in Gaoming with its nearly 60% forest coverage.

**Dongguan**, slightly larger in population than Foshan, is best known to the outside world as a major manufacturing center. Over time, the city has absorbed much of the manufacturing formerly done in Shenzhen as that city has shifted the focus of its economy toward higher levels of technology. Core industries include electronics, garments and shoes, electronic manufacturing tools, food and beverages, and paper products. Dongguan is currently home to one-fifth of the world's smartphone production. Huawei's decision to locate its R&D activities in the Songshan Lake Industrial Park has in turn attracted companies like Guangdong Oppo Mobile Telecommunications, Vivo Communications Technology, and DJI. The Hong Kong and Macao Youth Innovation and Entrepreneurship Base, located in the Park, offers subsidies and incubator services to attract entrepreneurs.<sup>10</sup> Expecting 20%

population growth in the next decade, Dongguan is increasing its focus on sustainable growth and planning.

In furtherance of the GBA, Dongguan's Binhai District will be the site of a Greater Bay Area University. Much of the East Industrial Park District will be dedicated to regional transportation construction and showcasing best practices for integration of industry and urbanization; Shiuxiang New Town District in the northwest will feature financial, professional, exhibition, and creative services. More broadly, Dongguan has identified five emerging industries as priorities over 2018–2025, by which time the city aims to reach its target for R&D spending totaling 3% of GDP. Priority fields include new-generation information technology (AI, big data, 5G); high-end equipment manufacturing (robotics); new materials; new energy (EVs, fuel cells, batteries); and life sciences (biomedicine, medical devices).<sup>11</sup>

**Zhuhai** is led by heavy industry, which accounts for two-thirds of industrial output, but biomedicine and appliances—and to a lesser extent precision machinery—have seen high growth. The opening of the Hong Kong-Zhuhai-Macao Bridge has expanded opportunities in tourism, trade, and exhibition and support services, mainly linked to ongoing integration with Macao. Zhuhai had 43 million visitors in 2018. A 66-acre Zhuhai International Convention & Exhibition Center, including offices, theaters, and a concert hall, is in Phase 2 development.<sup>12</sup>

Zhuhai is positioning itself as a regional medical and healthcare center with the Traditional Chinese Medicine Science and Technology Industrial Park of Cooperation between Guangdong and Macao and the Zhuhai Western Medicine Center. Its Hengqin Free Trade Zone has placed increasing emphasis on facilitating regional e-commerce. Cross-border finance, in part to support Macao in diversifying its economy, is also a priority. In early 2019, Zhuhai claimed more than 3,000 venture capital firms and 1,600 private equity funds registered with the Asset Management Association of China, with combined assets of around 500 billion yuan (US\$76 billion). Zhuhai, like the Qianhai district in Shenzhen, participates in the Qualified Foreign Limited Partner program, enabling investors to pool foreign and renminbi assets.<sup>13</sup>

**Zhongshan**, located north of Guangzhou with 4.42 million residents, is a city with a strong traditional manufacturing base of more than 3,400 large manufacturers of household appliances, building materials, furniture, food and beverages, and textiles and apparel, and it has both affordable housing and available land for development. Zhongshan has been slow to attract investment and to move its economy into higher value-added activity. In 2019, high value-added business activity slowed, with a number of Hong Kong, Macao, and Taiwan businesses leaving the city, replaced by state-owned or state-held mainland firms.<sup>14</sup>

Zhongshan has since committed 22 billion yuan to investment in new 5G wireless, data center, and industrial internet infrastructure in the run-up to the planned 2024 opening of a Shenzhen-Zhongshan water crossing which is expected to jumpstart growth in new industries such as AI, new materials and energy, smart home solutions, and cloud computing. Planned development going forward includes the Zhongshan Cuiheng Science City project, a new Xiangshan University of Science and Technology in cooperation with the Macao University of Science and Technology, and the Shenzhen-Zhongshan Industry Development Corridor.<sup>15</sup>

To the extent that GBA cities are able to build regional specializations that differentiate them, upgrade transportation and communications infrastructure, and harmonize regulations and processes to streamline the movement of people, goods, services, and capital throughout the region, it could then be possible, for example, for

- Hong Kong banks, insurers, and asset managers to easily serve and connect international and mainland clients and undertake joint initiatives and service offerings with Shenzhen partners;
- Hong Kong, Shenzhen, and Guangzhou universities, research laboratories, and incubators to collaborate more easily with each other and with overseas institutions under common framework agreements and standards;
- frictionless cross-border movement of people, goods, and services between Macao and Hengqin to facilitate commercial transactions, commuting, and a seamless visitor experience; and

■ node cities like Foshan, Dongguan, and Zhongshan to individually or together form global test beds for electrical equipment and machinery, smart home and lighting products, pharmaceuticals, electric vehicles, and robotics, accessing capital and business support to reach new markets and customers.

Regional integration is gradual but moving forward. At the provincial, prefectural, and town levels, with central government support, policy makers are relaxing foreign and domestic (*hukou*) immigration and customs controls; harmonizing tax, trade, and investment policies; and standardizing licensing regimes and regulations. At a more granular level, cities are experimenting with cross-border small business permits, personal bank accounts in dual currencies, and driver's licenses. As trade and pandemic uncertainties subside, the process is expected to accelerate.

There are compelling economic growth and urban planning arguments behind China's GBA strategy. Better infrastructure and improved circulation of people, goods, and services furthers the cross-fertilization of ideas and collaboration. More broadly, cities can be paired to leverage their relative strengths and more efficiently utilize land and allocate resources.

At that point, the GBA may potentially become a laboratory and prototype for what China hopes to accomplish in its other Bay Areas. A centerpiece of that effort, with the unique challenges and opportunities it brings to bear, is the principle of "One Country, Two Systems" and, in particular, the Hong Kong Special Administrative Region.

## Hong Kong: Systemic Complementarity

For better or worse, Hong Kong's future role and its success as a partner within the GBA is intertwined with internal developments.

China's initial policy toward Hong Kong in the aftermath of the 1997 British transfer was one of cautious non-intervention, in accordance with the Basic Law. By 2003, however, the Hong Kong economy had been battered by the Asian financial crisis and the SARS virus, and a

Legislative Council attempt to adopt a national security law, as provided for in the Basic Law, was withdrawn after widespread public protests. In September 2004, a communiqué from the Fourth Plenum of the 16th Chinese Communist Party (CCP) Central Committee elevated the long-term prosperity and stability of Hong Kong as "a brand new subject."<sup>16</sup>

The 11th Five-Year Plan issued in 2006 broadly supported preserving Hong Kong's status as an international financial, trade, and logistics center. CCP Central Committee statements in 2013 and 2015 referred to a need to "broaden cooperation" among Hong Kong, Macao, and Taiwan, and to prioritizing a greater role for Hong Kong in China's economic development and opening up to the outside world.<sup>17</sup>

Since then, internal tensions in Hong Kong have increased, spurred by demands for greater autonomy in the SAR's governance, as witnessed by the 79-day "Occupy Central" protests, and the subsequent "Umbrella Movement."<sup>18</sup> In 2019, prolonged—and increasingly violent—protests were triggered by a proposed amendment to existing law that would have indirectly allowed Hong Kong to extradite fugitives to the mainland without a formal extradition treaty in place. The proposal was suspended and later withdrawn.<sup>19</sup>

## The National Security Law

As social and economic disruption continued, and with an apparent impasse between the protestors and the government, Beijing instituted a series of measures in 2020 that have significantly constrained dissent. At the center is the National Security Law enacted on June 30, 2020<sup>20</sup> that, among its provisions, gives partial responsibility for enforcement to a new mainland government security office in Hong Kong; allows cases that fall beyond the SAR government's authority to be tried on the mainland; gives Hong Kong's chief executive authority to appoint the judges that hear national security cases; and strengthens oversight of foreign non-governmental organizations and press organizations. The law's enactment and subsequent measures to rein in opposition lawmakers and their supporters have raised concerns regarding freedom of expression and assembly, the potential erosion of



judicial independence, risks for foreigners, and, by implication, risks to Hong Kong's reputation as an open global business center.<sup>21</sup>

Hong Kong's business community has been divided in its reaction. An American Chamber of Commerce in Hong Kong (AmCham) member survey in July 2020, after the National Security Law was published, showed 68% of 183 respondents—15% of AmCham's total membership—voicing increased concern over matters such as continued separation of powers and an independent judiciary, data security, the law's broad scope, and foreign government retaliation, although most respondents welcomed greater political and social stability. A third of the survey respondents maintain a headquarters presence in Hong Kong. Of those, nearly two-thirds said they had no plans to move capital, assets, or operations out of the city; two-thirds indicated a wait-and-see attitude about changes in business strategy; a quarter said they had or were preparing contingency plans.<sup>22</sup> Within Hong Kong's business community in general, there has been considerable support for the National Security Law as a step toward restoring stability and business certainty.

The US government responded to the National Security Law with the Hong Kong Autonomy Act (HKAA), which imposed sanctions on foreign entities and individuals who are found to be contributing to China's alleged failure to observe its international obligations regarding Hong Kong and on foreign financial institutions that are found to knowingly conduct "significant" transactions with persons in that group. Separately from the HKAA, the US also announced in late June 2020 that it would no longer treat exports to Hong Kong under the Commerce Department's export control regime more favorably than those to China, ending a longstanding licensing exception.<sup>23</sup>

Some foreign tech firms such as Google, Facebook, and Twitter could face difficult choices. Most have relied on Hong Kong as a safe haven to locate their server networks beyond the reach of Chinese surveillance or censorship. The National Security Law, according to some interpretations, may allow the government to demand user data from internet companies and to require the removal of content related to potential violations, even if it is posted from overseas.<sup>24</sup>

Companies that refuse to cooperate can face fines or imprisonment of their principals in Hong Kong.<sup>25</sup> Reportedly reflecting this concern in July 2020, TikTok, owned by Chinese technology company ByteDance, announced that it was leaving Hong Kong,<sup>26</sup> and Naver, Korea's largest internet portal, moved its overseas data backup center from Hong Kong to Singapore.<sup>27</sup> As of September 2020, Facebook, Google, Twitter, LinkedIn, Microsoft, messaging service Telegram, and other firms had suspended the processing of Hong Kong law enforcement agencies' requests for user data, pending further clarification and assurances regarding the law.<sup>28</sup> There is no indication to date that Hong Kong officials have sought data under its provisions.

The impact of the National Security Law on business activity will ultimately depend on how it is interpreted and enforced. It is likely, however, that for the foreseeable future the changed political environment in Hong Kong won't directly impact the operations of most foreign companies, Hong Kong's financial markets, or the integrity of commercial law or commercial arbitrations.

## Hong Kong and Shenzhen

The dynamic between Hong Kong and Shenzhen is another factor that will influence the long-term structure of the region and relationships between its leading centers. At some level, the cities are both collaborative and competitive. One concern in the Hong Kong business community involves competition from Qianhai (Shenzhen) to attract financial, trade, logistics, and business services firms away from Hong Kong as the GBA evolves. Shenzhen surpassed Hong Kong in terms of GDP in 2018 and ended 2019 posting an annual GDP of 2.7 trillion yuan (US\$400 billion) versus Hong Kong's HK\$2.9 trillion (US\$370 billion). The Chinese government's most recent Five-Year Plan, released in October 2020, refers to Shenzhen as a "core engine in the development of the Greater Bay Area" and "a model city that can represent a modernized and vibrant socialist country."<sup>29</sup>

The Port of Shenzhen—the world's third largest, behind Shanghai and Rotterdam, with 140 berths and annual container throughput of nearly 28 million 20-foot containers<sup>30</sup>—surpassed Hong Kong by volume in the early 2000s with China's entry to the WTO and rapid port development that attracted direct service.

The Shenzhen Stock Exchange (SZSE), with 2,300 listed companies and more than 11,000 listed securities, focuses primarily on small and mid-sized local or Chinese firms and a user base of individual retail investors, versus Hong Kong's global, institutional investor base and global listings. Listings on the ChiNext index, opened in 2009 to serve Shenzhen's growing base of technology companies, have surged due in part to secondary listings by Chinese-held Nasdaq companies fearing de-listing in the US over stricter US Treasury Department accounting scrutiny beginning in 2021. In an effort to compete for secondary listings business with Hong Kong and Shanghai, ChiNext streamlined its rules in August 2020 to simplify bringing initial public offerings to market.<sup>31</sup>

The question facing Hong Kong companies and residents is to what extent the increasing size and sophistication of Shenzhen's financial services, logistics, and technology sectors, along with government incentives to attract business and talent, could ultimately diminish Hong Kong's role within the GBA.

In a November 2020 public opinion survey of Hong Kong residents conducted by the Hong Kong Institute of Asia-Pacific Studies at the Chinese University of Hong Kong,<sup>32</sup> two-thirds of the 703 respondents did not believe that Shenzhen could replace Hong Kong as a global financial center, and 42% disagreed with the idea that Shenzhen has a competitive edge between the two cities. At the same time, however, just over half believed that going forward Hong Kong and Shenzhen are more likely to compete than cooperate, just under half believed cooperation would not be of great value to Hong Kong, and 31% did not favor enhanced cooperation, while 28% did.<sup>33</sup>

To date, the actual integration, relocation, and expansion of Hong Kong firms within the Greater Bay Area has been gradual. Nearly 12,000 Hong Kong-funded firms were registered in Qianhai as of August 2020, representing total registered capital of 1.3 trillion yuan (US\$200.4 billion). The just over US\$20 billion in Hong Kong funds deployed in the zone composes 89.9% of the total foreign capital used by the free trade area.<sup>34</sup> The registered companies appear to be a mix of smaller, local companies who see opportunities for cheap land/space and

early-mover advantage in a larger market, while major, global firms (mainly banks and consultancies) are establishing a toehold to hedge their bets but are hesitant to do more. So far, this has produced healthy company numbers in Qianhai, but less impressive levels of overall investment and only 50% occupancy. Some 200 Hong Kong startups have been incubated at the Qianhai Shenzhen-Hong Kong Youth Innovation and Entrepreneur Hub (eHub),<sup>35</sup> but larger and more established Hong Kong and overseas companies have so far only limited presences.<sup>36</sup>

Currently, Hong Kong's position as a global financial and business center, its strong university base, well-developed intellectual property law and enforcement, and common law system provide unique qualities that both contribute to and benefit from the GBA strategy. Much as Hong Kong's manufacturing moved to adjacent Guangdong Province in the past thirty years, creating a dynamic cross-border economy, the GBA's growing market for financial and other services suggests that opportunities from integration will accrue on both sides.

## Hong Kong's Role in the GBA

In the communiqué from its Fifth Plenum in October of 2020 the 19th Communist Party Central Committee called for "development of Hong Kong and Macao as international innovation and technology centers," with an emphasis on the term "international,"<sup>37</sup> and for "maintaining the long-term prosperity and stability of Hong Kong and Macao."<sup>38</sup>

In early November 2020, Hong Kong chief executive Carrie Lam led a cabinet-level delegation to Beijing, Guangzhou, and Shenzhen to present a set of plans and proposals for future Hong Kong development and integration into China's national development.<sup>39</sup> Afterward, in her November 25 policy address to the legislature, she committed to full implementation by year-end of 24 measures agreed to in principle by the central government and GBA regional authorities<sup>40</sup> for GBA integration and development relating to Hong Kong,<sup>41</sup> including

- support for young entrepreneurs;
- allowing use of Hong Kong-registered drugs and common medical devices in GBA healthcare

institutions, with an expedited registration/approval process for Hong Kong-registered traditional Chinese medicine products to be sold in the GBA;

- facilitation of Hong Kong private cars crossing the Hong Kong-Zhuhai-Macao Bridge (HZMB);
- establishing insurance after-sales service centers in GBA cities under the Closer Economic Partnership Arrangement (CEPA);
- joint development of the cross-border Shenzhen-Hong Kong Innovation and Technology Co-operation Zone, which comprises the Shenzhen Innovation and Technology Zone and the Hong Kong-Shenzhen Innovation and Technology Park, as

“one zone, two parks”;<sup>42</sup>

- consolidation of land boundary control points between Hong Kong and Shenzhen, extending operating hours and implementing a quota-free scheme for Hong Kong private cars entering Guangdong via the HZMB;
- support and assistance for universities in Hong Kong to provide education services in the GBA; and
- greater cross-border collaboration among business and trade associations to assist Hong Kong businesses in expanding their domestic sales channels and connecting with mainland e-commerce platforms.<sup>43</sup>



View from the Shenzhen Stock Exchange

Source: Ding Ding on Wikimedia Commons

The government's longer-term vision for Hong Kong is connected to the Lantau Tomorrow Vision, a 1,700 hectare (4,200 acre) HK\$500 billion (US\$64 billion) development project on a series of man-made islands off the eastern edge of Lantau Island, where Hong Kong International Airport and Hong Kong Disneyland are located. The project would create a third business district for the city plus 400,000 housing units—70% of them affordable public housing—to address a shortage. With development scheduled to start in 2025 and expected completion in 2032, Lantau Tomorrow will ultimately accommodate up to 1.1 million residents—a mix of new arrivals and existing residents. The project is considered critical to reducing current and future congestion in the city, while freeing land throughout the SAR for other uses.<sup>44</sup>

Public comment from the central government on Hong Kong's role in the GBA has been limited. In November 2020 remarks to a China Daily conference on the GBA,<sup>45</sup> Vice-Chairman of the National Committee of the Chinese People's Political Consultative Conference Leung Chun-ying echoed remarks by President Xi Jinping at an event a month earlier celebrating the 40th anniversary of the Shenzhen Special Economic Zone, calling for, among other things, "efforts to synergize economic rules and mechanisms in the Greater Bay Area, and wider exchanges and deeper integration among

young people in Guangdong, Hong Kong and Macao to strengthen their sense of belonging to the motherland."

Leung went on to suggest that an implementation plan for comprehensive reforms in Shenzhen over 2020–2025 provides a roadmap for integration. "Anyone who takes an interest in the future development of Hong Kong and therefore that of Shenzhen and the Greater Bay Area as a whole will be well advised to study in detail this implementation plan of Shenzhen," he said, calling for a three-pronged strategy "to prepare the way forward for Hong Kong in this exciting region," that includes

1. research providing full, current information on "the latest developments and policy promulgations" in all GBA cities and sectors "so that we can cast aside old impressions, outdated information and prejudices";
2. messaging to convey the findings "comprehensively, effectively and objectively" to all Hong Kong people; and
3. community engagement with schools, professional bodies, trades and industries, investment communities, and other stakeholders "to prompt the various sectors in Hong Kong into actions" and "to change mindsets and attitudes." He further tasked Hong Kong, as "the most international city" in the GBA, with engaging the international community in advancing the GBA message.

## Hong Kong, Guangdong, and the San Francisco Bay Area

### A Shared History With Unique Characteristics

As noted in previous Bay Area Council Economic Institute reports on the relationship between the San Francisco Bay Area and China, mutual ties are deep and are worth revisiting here, particularly with respect to Hong Kong and to Guangdong province.<sup>1</sup>

The first Chinese immigrants in California were two men and a woman, arriving on the brigantine *Eagle* on February 2, 1848, and brought over as servants for the family of a San Francisco merchant and importer from China. The following year, merchant ships calling at Canton brought news of gold discovered in California. Overpopulation and famine in China after the Taiping Rebellion prompted families to send young men abroad to earn money. Most of the arrivals were from rural areas in the Pearl River Delta of Guangdong Province. By 1860, an estimated 47,000 Chinese immigrants had arrived on the West Coast.

From the 1850s on, the Bay Area Chinese community was a significant contributor to local economies. The dozen or so square blocks that formed San Francisco's Chinatown spread out from the Long Wharf that linked the financial district and northern waterfront with its restaurants, residential hotels, and small factories. In

the 1870s, Chinese fishermen came to dominate the shrimping industry, with more than 20 camps along the southeast San Francisco waterfront and on the San Rafael estuary north of the city in a spot that is still called China Camp.

In the city, benevolent associations were formed representing immigrants from particular districts within Guangdong. These associations offered newcomers help with immigration and navigating local customs, arranged for housing, lent money to start businesses, settled disputes, and represented Chinese interests in countering discrimination. The related family associations known as the Chinese Six Companies remain large property and business owners in San Francisco's Chinatown today.<sup>2</sup>

By 1900, 45% percent of Chinese immigrants in the US resided in or near the Bay Area, primarily in Chinatowns in San Francisco, Oakland, San Jose, Sacramento, and Stockton.

When Chinatown in San Francisco was destroyed in the 1906 earthquake and fire, merchants Lew Hing and Look Tin-eli, along with the Six Companies and other associations, brokered a rebuilding effort with Irish contractors, providing business and jobs that eased tensions in the community. In 1907, Look established the Bank of Canton which, after its first year, was

servicing 100,000 overseas Chinese customers in the US and Mexico. In the decades that followed, Bay Area Chinatowns flourished, encompassing thousands of small businesses in communities with their own newspapers, telephone exchanges, banks, theaters and opera houses. From 1910 to 1940, the Angel Island immigration station in San Francisco Bay processed 175,000 Chinese immigrants, nearly all from Guangdong. For nearly a century, Cantonese was the principal dialect spoken by Chinese immigrants in the Bay Area.

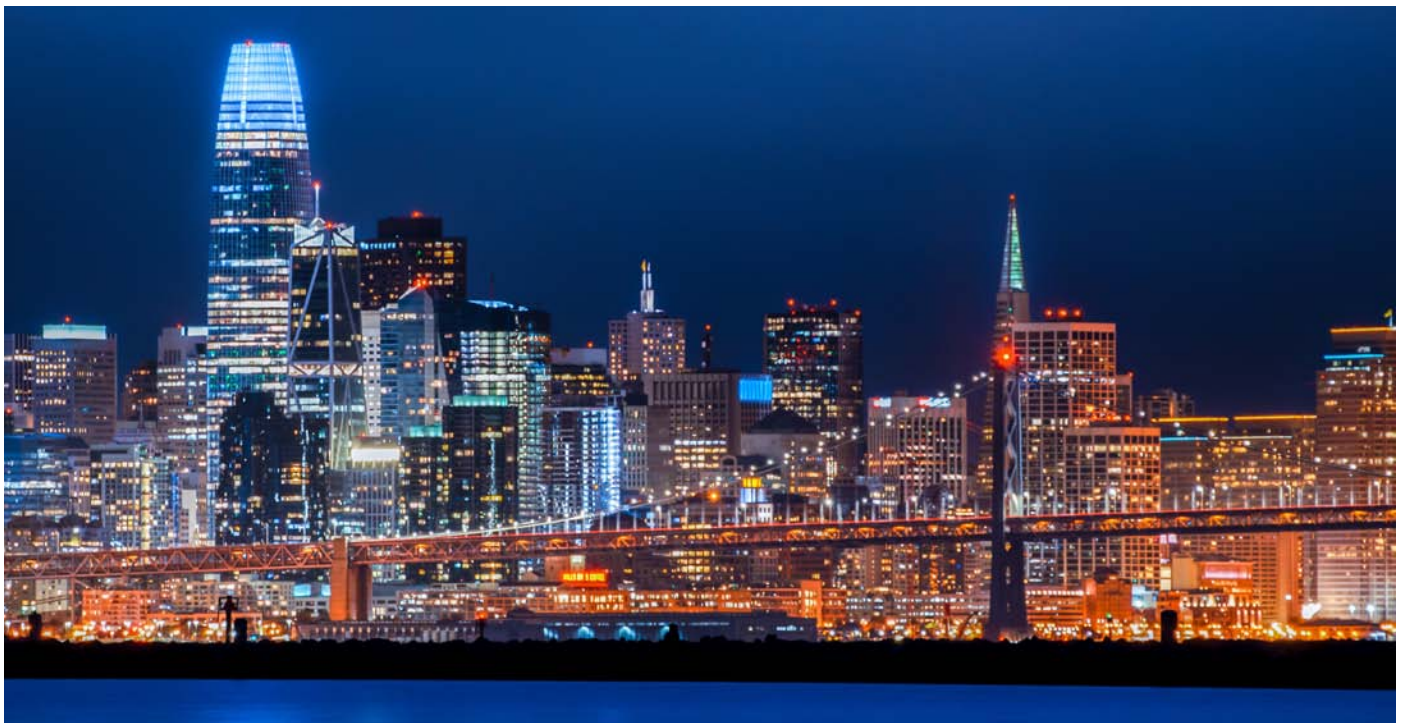
In the 10 years following the passage of the 1965 Immigration and Naturalization Act, which ended country quotas, the Chinese community in the US nearly doubled and included many skilled business owners and professionals from Hong Kong. Most of the newer immigrants assimilated to a greater degree than preceding generations, moving out into the region's residential neighborhoods, buying property, and branching into a wide range of businesses and professions. Immigration from China in the 1990s and 2000s diversified with an inflow of students from across China to Bay Area universities and later to Silicon Valley. San Francisco's and the Bay Area's Chinese population

continues, however, to be deeply rooted in Southern China and Guangdong Province.

## San Francisco–Hong Kong Parallels

Historical parallels can be found between San Francisco and Hong Kong in their unique paths to development, which speak to the role and influence each has in relation to its surrounding region:

- Both rose to global prominence in the mid-19th century as centers of trade and finance, with Hong Kong looking outward to Europe and the US, not inward to China, and San Francisco looking westward to Asia, not eastward to Europe.
- Both have prospered at the edges of their national borders, with open, globally oriented, market-based economies less tethered to the fortunes or priorities of their capitals.
- Both were shaped in their growth by small land area, water on all sides, and topography of steep hills



San Francisco

Source: Chris Briggs on Unsplash

offering scenic views, distinct districts, development constraints, and high land values.

- Both remain essential growth drivers for their respective regions.
- Both are early adopters of new ideas.
- Both have strong entrepreneurial, pro-democratic traditions that embrace risk, disruption, and creative freedom over technocratic efficiency.

Among the keys to Silicon Valley's success in its early days was a market-driven focus in commercializing research. Another was an openness to taking risks, failing, and adapting in a way that achieved results organically versus rigidly following a plan. A final advantage was cultural: the San Francisco Bay Area's diverse population, international focus, embrace of creative energy and expression, and openness to differing viewpoints easily drew global talent to its universities, laboratories, and companies. Successful entrepreneurs have often commented that the access to resources and the spirit of collaboration they found in Silicon Valley translated into an ease in starting and

succeeding in business that was not available in their home countries.

Hong Kong offers the same kind of cosmopolitan energy. But fully replicating these advantages in both letter and spirit under "One Country, Two Systems," and in a way that inspires global confidence, will require not only physical infrastructure and economic incentives, but a clear vision. This offers a wide field for dialogue between Hong Kong and the San Francisco Bay Area as the US and China seek ways in which they can continue to collaborate.

## Trade and Investment Profile

Trade data for Hong Kong and the San Francisco Bay Area reflects the volatility seen in US-China trade relations over the past three years, as merchandise trade has fallen through 2019 but service trade has grown.

US goods and services trade with Hong Kong totaled US\$61.3 billion in 2019, according to the Office of the US Trade Representative. That total included US\$45 billion in US exports to Hong Kong versus US\$16.3 billion in imports for a US\$28.7 billion surplus, making Hong



Hong Kong

Source: Jakob Ibron on Unsplash

Kong the single largest source of trade surplus among all US trade partners—a position maintained since 2000.<sup>3</sup> Merchandise trade was composed of US\$30.8 billion in exports versus US\$4.7 billion in imports, while services trade totaled US\$14.2 billion in exports against US\$11.6 billion in imports.<sup>4</sup> About 7% (US\$30 billion) of mainland exports to the US and around 9% (US\$11 billion) of mainland imports from the US were transshipped via Hong Kong.<sup>5</sup> US Census Bureau data<sup>6</sup> shows that exports from, and shipped through, the Bay Area in 2019 totaled more than US\$1.71 billion while imports totaled US\$236.8 million, for a Bay Area trade surplus of US\$1.48 billion.

Top US merchandise exports to Hong Kong included electrical and other machinery, diamonds, art and antiques, and aircraft. Agricultural exports, totaling US\$3.1 billion, included beef, tree nuts, poultry, fresh fruit, and prepared food. Leading imports were machinery, diamonds, toys, and sporting goods. Agricultural imports included snack foods, fresh vegetables, processed fruit and vegetables, wine and beer, and rice.<sup>7</sup> Hong Kong was the United States' third largest market for wine exports, fourth largest market for beef and beef products, and ninth largest market for agricultural and related products in 2019.<sup>8</sup>

In services, exports to Hong Kong were led by intellectual property involving industrial processes, transport, and financial services; imports were mainly in financial services, travel, and professional and management services.

Because of the way trade data is reported, there is no readily available merchandise or services trade data at the region-to-region level for Guangdong or GBA and the San Francisco Bay Area, nor for Hong Kong-Bay Area services trade.

## Hong Kong Trade

Since 1992, Hong Kong has benefited from its "special status" as a US trading partner, described in the run-up to the 1997 handover as "fully autonomous from the People's Republic of China" under the United States-Hong Kong Policy Act. Sections 102 and 103 of the Act designate the Hong Kong Special Administrative Region for separate treatment in areas such as import quotas, certificates of origin, and export control licensing.<sup>9</sup>

An executive order (EO 13936) signed by President Trump on July 14, 2020 revokes Hong Kong's preferential customs status,<sup>10</sup> as a response to China's enactment of the National Security Law. The order builds on the 2019 Hong Kong Human Rights and Democracy Act, which requires an annual State Department review and confirmation that China continues to uphold Hong Kong's autonomy as guaranteed by treaty and law. While Hong Kong-US trade is relatively small, the potential for being impacted by China-related sanctions or trade restrictions could potentially chill activities by companies using Hong Kong as a third country gateway to access the Chinese and US markets.

Two-thirds of total foreign direct investment into China, meanwhile, flows through Hong Kong, according to China's Ministry of Commerce,<sup>11</sup> presumably due to Hong Kong's safety and ease of currency convertibility. Chinese companies prefer Hong Kong for offshore IPO listings: in the absence of capital controls and with the Hong Kong dollar pegged to the US dollar, they have flexibility to redeploy the capital raised in foreign acquisitions. Chinese firms raised some US\$335 billion on the Stock Exchange of Hong Kong over 1997–2019.<sup>12</sup> Hong Kong is also the primary offshore location for Chinese companies in terms of raising capital through bank borrowing and corporate bond sales.

The impacts on Hong Kong from the recent actions by Washington remain unclear. While scrutiny of China's industrial, technology and trade policies will continue, the Biden administration is likely to take a more nuanced approach toward China than its predecessor, which could work to Hong Kong's benefit.

## Two-Way Foreign Direct Investment with the GBA

Robust foreign direct investment (FDI) flows in the past decade confirm the evolving roles of Hong Kong and Guangdong Province within the Greater Bay Area, with an emphasis on manufacturing and the digital transformation of industry on the mainland and a services and technology thrust for Hong Kong.<sup>13</sup>



## San Francisco Bay Area–Hong Kong Foreign Direct Investment

Year	Company/Location	Investment	Location	Notes
2020	Blume Global (Pleasanton)	HK regional office		Digital supply chain platform
	Sofi (SF)	Fintech acquisition		Acquired investing app 8 Securities
	Digital Realty Trust (SF)	Data center		Data center REIT
	InCloudCounsel (SF)	APAC regional office		Legal documentation software
2019	Cooley LLP (Palo Alto)	Office		Legal services
	Equinix	Data center expansions (2)		
	Ouster (SF)	HK office		Lidar sensors (mobility/robotics)
	Sequent Software (Sunnyvale)	HK office		E-payment software
	Barracuda Networks (Campbell)	HK regional HQ		Robotic process automation
2018	Hush Home (SF)	HK Office (home furnishings)		Duty & VAT-free logistics management
	Franklin Templeton (San Mateo)	Office		Private equity JV (Asia Alternatives)
	Via Licensing (SF)	Office		Patent licensing for China
2017	Flexport (SF)	Warehouse		Freight Consolidation
	Equinix (Redwood City)	5th HK data center		Financial services
	Facebook (Menlo Park)	Office expansion		Social media
	Google (Mountain View)	Data center zones (3)		Data localization
2016	Wearable IoT World (SF)	Accelerator		Partners: Radiant VC and Cyberport Management
	Presto Engineering (San Jose)	Logistics center		Chips/electronic components
	Flexport (SF)	HK Office		Customer logistics support
	Tesla (Palo Alto)	Service center		Automotive (EV)
2015	Oracle (Redwood City)	Sales staff expansion		Enterprise software
	Equinix (Redwood City)	Data center expansions (2)		Data center developer
	Berkeley Research Group	Office		Intl. Arbitration/Litigation
	ALOM (Fremont)	Asia-Pacific HQ		Supply chain management services
2014	8X8 Communications (San Jose)	Data center	Causeway Bay	Collaboration services platform
	LinkedIn (Sunnyvale)	Office	Causeway Bay	Social media (career)
	WordPress (SF)	Data Center	HK & Singapore	Web publishing
	Garage Technology Ventures	Office		Santa Clara VC
	Facebook (Menlo Park)	Office expansion		Social media
	Tesla (Palo Alto)	Service center		Automotive (EV)
	Twitter (SF)	Greater China office		Social media
	Exponent (Menlo Park)	East Asia tech support office		Engineering/Scientific consulting
2012	Digital Realty Trust (SF)	Data center	New Territories	Data center REIT
	LinkedIn (Sunnyvale)	Office		Social media
	Wells Fargo Bank (SF)	Staff expansion		Financial services

## San Francisco Bay Area–Guangdong Foreign Direct Investment

Year	Company/Location	Investment	Location	Notes
<b>2020</b>	Intel (Santa Clara)	Innovation Lab Innovation Lab	Shenzhen Guangzhou	JV with Ping An Technology
	Zido Freight (San Jose)	Office	Guangzhou	Digital freight broker services
	Pixelworks (San Jose)	Office	Shenzhen	Video/pixel processing
<b>2019</b>	Rimon (SF)	Office	Shenzhen	Legal services
	Silvaco (Santa Clara)	Sales office	Shenzhen	Semiconductor design
	Lime (SF)	Sales/support	Shenzhen	Hardware/software center
	Keysight Technologies (Santa Rosa)	5G test lab	Shenzhen	Joint project with Oppo
	Sequent Software (Santa Clara)	Office	Shenzhen	Digital payments/wallet
	Automation Anywhere (San Jose)	Sales/support	Shenzhen	Robotic Process Automation
	<b>2018</b>	Google	Office	Shenzhen
Royole Corporation (Fremont)		Mfg. Facility	Shenzhen	Flexible displays
Flexport (SF)		Warehouse	Shenzhen	Yantian Port, logistics
Silicon Valley Bank (Santa Clara)		Branch	Shenzhen	JV with Shanghai Pudong Development Bank
<b>2017</b>	Trifo (Santa Clara)	Office	Shenzhen	AI/home robotics
<b>2016</b>	Flexport (SF)	Office	Shenzhen	Logistics
	Apple (Cupertino)	R&D center	Shenzhen	University and manufacturing partners collaboration
	Snap (SF)	R&D center	Shenzhen	Camera terminal development–iOS/Android
	Google (Mountain View)	UX center	Shenzhen	
	Intel (Santa Clara)	Exhibit center	Shenzhen	
<b>2015</b>	Google (Mountain View)	UX center	Dongguan	Google Ads
<b>2014</b>	Intel (Santa Clara)	R&D center	Shenzhen	OEM/ODM/software collaboration
	Cypress Semiconductor (San Jose)	Office Manufacturing	Shenzhen Shenzhen	SRAM production
	Cloudera (Palo Alto)	Office	Guangzhou	Data management/software services
	UC Davis	Research center	Zhuhai	Food safety
<b>2013</b>	NeoPhotonics (San Jose)	Manufacturing	Dongguan	Optical transceiver modules
	Prologis (SF)	Logistics centers (2)	Dongguan	Partner with Deppon
<b>2012</b>	Equinix (Redwood City)	Data center	Guangzhou	

## Hong Kong–San Francisco Bay Area Foreign Direct Investment

Year	Company	Investment	Location	Notes
2018	SPI Energy	US office	Santa Clara	Green energy solutions
	SRE Group	Residences	San Francisco	20-story 75 Howard Street project
	Mujosh	Retail outlets (2)	SF/Pleasanton	Fashion eyewear
2017	Luk Fook Holdings	Retail outlet	SF Chinatown	Jewelry
	Lattice	Office	Silicon Valley	Fintech
2015	Geoswift	Office	Pleasanton	Sales, cross-border payments
	Nexusguard	Office	San Francisco	Global cloud security HQ
2014	Nova Founders Capital	Office	Silicon Valley	Global investment
	M Moser Associates	Office	San Francisco	Corporate interior design

## Guangdong – San Francisco Bay Area Foreign Direct Investment

Year	Company/Location	Investment	Location	Notes
2019	Deeproute (Shenzhen)	R&D center	Fremont	Autonomous vehicles
2018	Tencent Holdings (Shenzhen)	R&D center	Palo Alto	Games division expansion
2017	Guangzhou Automobile	R&D office	Silicon Valley	Automotive OEM
	Roadstar.ai (Shenzhen)	R&D center	Cupertino	Autonomous vehicle
	Midea Group (Foshan)	Tech center	San Jose	Consumer appliances AI solutions
	Tencent (Shenzhen)	Data centers (2)	Silicon Valley	Cloud services
2016	Ing Dan (Shenzhen)	UX center	Santa Clara	IoT innovation platform
2015	DJI (Shenzhen)	R&D center	Palo Alto	Drone design
2014	China Vanke (Shenzhen)	Residences	San Francisco	650 units, JV with Tishman-Speyer
2012	UC Mobile (Guangzhou)	Office	Silicon Valley	Mobile internet software



Guangzhou

Source: Sergei Gushev on Flickr

## Going Forward: Opportunities for Collaboration

There are many pieces—economic, public health, legal, and political—to the GBA puzzle: in particular, how its cities and SARs will connect with one another while at the same time differentiating themselves, and how the GBA as a whole will function in relation to outside partners. Time will tell whether, apart from investment in new infrastructure, the whole of the GBA will be more than the sum of its already considerable parts.

Whatever the answer to that question turns out to be, its size and the support being given to the GBA concept by China's central government suggest that the Pearl River Delta region's role as a driver of China's economy and a key node in the global economy will be strengthened. As the structural and policy challenges in the GBA are gradually overcome, significant opportunities exist for companies and institutions in the Silicon Valley/San Francisco Bay Area and the Guangdong-Hong Kong-Macao Greater Bay Area to leverage their strengths in key sectors. First steps might emphasize areas of cooperation which (1) pose relatively low intellectual property risk, (2) rely on or create open source technology that will be shared and/or made publicly available, and (3) produce innovation that yields significant, demonstrable social benefits in areas such as health, mobility, workplace safety, environmental protection, or improved quality of life.

The paths toward deeper engagement will not always be straightforward. Areas for cooperation will need to reflect

fields where the interests and assets are complementary, while recognizing tensions in US-China relations that will constrain cooperation in selected technology fields. Those constraints include heightened US controls on the export of advanced technologies with potential military applications, scrutiny in the US of inbound Chinese investment in companies across a wide range of advanced technologies, and US-imposed limits on the export to China of advanced semiconductors or of semiconductors produced by third parties using US software or equipment. Investment or research collaboration in designated fields such as AI or nanotechnology, which have been broadly identified by the US Commerce Department's Bureau of Export Administration and the Committee on Foreign Investment in the United States (CFIUS) as areas of concern, are likely to confront political sensitivities. Looking forward, the most promising sectors for developing closer ties between the two Bay Areas will be ones that can avoid those potential pitfalls while building on shared challenges and interests.

For more than four decades—dating back to the 1980s with the mainland and well before that for Hong Kong—the San Francisco Bay Area has been a focal point for commercial and government exchanges with China relating to culture, trade, finance, law, energy, the environment, healthcare, and technology. Bay Area universities have partnered with Chinese research laboratories, universities, companies, and governmental entities on joint research and pilot programs in

medicine, agriculture, energy, and urban planning. The Pearl River Delta has also served as a major manufacturing center for Bay Area companies such as Apple through its facility in Dongguan, and as a regional service center for Bay Area financial companies such as Wells Fargo through their Hong Kong offices. At the same time, GBA companies such as Shenzhen's Tencent and BYD have long maintained an investment and research presence in the San Francisco Bay Area. The success of that shared experience provides a foundation that can support expanded engagement going forward.

Broad fields in which collaboration opportunities stand out include climate change, the related fields of clean energy and energy efficiency, healthcare, electric and autonomous vehicles, biomedicine and pharmaceuticals, and fintech.

## Climate Change

### California

California began tracking greenhouse gas (GHG) emissions in 2000, adopting baselines, GHG reduction targets, and standards for reporting and verifying emissions. In 2006, the California Air Resources Board (CARB) began developing rules aimed at reducing statewide greenhouse gas emissions to 1990 levels by 2020 and to 40% below 1990 levels by 2030. An executive order, signed by Governor Edmund G. (Jerry) Brown Jr. in 2018, set a target of statewide carbon neutrality by 2045. These actions form the basis of California climate change policy.<sup>1</sup>

The California Climate Change Scoping Plan, updated at least every five years, lays out strategy and sets standards for meeting GHG emission reduction goals in clean energy and transportation, energy efficiency, land use, and agriculture and industry. CARB launched California's cap-and-trade program on January 1, 2013,<sup>2</sup> using the purchase at auction of emissions allowances by major emitters as an incentive to reduce their emissions. The program sets an annual declining cap on about 80% of statewide GHG emissions (covering 330.8 million metric tons of CO<sub>2</sub> in 2021)<sup>3</sup> and US\$12.5 billion in total auction proceeds revenue had been generated as of December 2019. The funds are invested by the state in programs that facilitate GHG emission reductions.<sup>4</sup>

California also has in place minimum targets and standards for utility purchases of energy from renewable sources, energy efficiency for buildings, the installation of solar power on new housing, and carbon content in fuels, as well as regulations and incentives for low-emission and zero-emission vehicles. These have in turn produced cutting-edge research and new industries supplying products, components, and services supporting emissions reduction.

### China

In an effort to reduce coal consumption and improve air quality in its large cities, China has led the world in production of solar photovoltaic cells since 2007 and in solar photovoltaic installed capacity since 2015.<sup>5</sup> It has moved to cap coal consumption (though in the future), to set targets for energy production from non-fossil fuels, to establish minimum price supports for renewable electricity generators, additionally requiring electricity grids to purchase power from the lowest-cost generators, and to adopt energy efficiency standards for vehicles, buildings, and equipment.<sup>6</sup>

In 2013, China established regional pilot cap-and-trade programs for Beijing, Chongqing, Shanghai, Tianjin, Guangdong, Hubei, and Shenzhen; Sichuan and Fujian provinces added their own pilot programs in 2016. A national system launched in 2017 covers power generation only. The market today encompasses 643 million metric tons of CO<sub>2</sub>, valued at approximately 13.8 billion yuan (US\$2 billion).<sup>7</sup> China has committed to a peak in its CO<sub>2</sub> emissions by 2030 and to achieve carbon neutrality by 2060.<sup>8</sup>

### Collaboration Opportunities

- Greenhouse gas (GHG) emissions reduction
- Shoreline resiliency design planning and engineering for sea level rise
- Storm and flood response
- Watershed management

Since 2013, California has assisted China on cap-and-trade through two-way delegations, conferences, and other exchanges. These have led to similar models for reporting, verification, compliance, and enforcement

through university collaboration (UC Berkeley, UCLA, Tsinghua University, and Wuhan University),<sup>9</sup> and involvement of state agencies such as the California Air Resources Board (CARB), the California Energy Commission (CEC), and the California Public Utilities Commission (CPUC).<sup>10</sup> Even without formal linkage of carbon markets, similar standards and regulations allow companies to trade credits and permit compliance bodies in both places to take complementary carbon pricing actions.

At the state/provincial level, the UC Berkeley-based California-China Climate Institute (CCCI) participated in two virtual conferences in 2020 involving Guangdong—the Understanding China Conference 2020 (Guangzhou) and the Shenzhen International Low Carbon City Forum—bringing together former California Governor Brown and Ministry of Ecology and Environment Special Adviser on Climate Change Affairs Xie Zhenhua, who leads the Institute of Climate Change and Sustainable Development at Tsinghua University. Representatives of CARB, Shenzhen, and Guangzhou municipal governments, China’s National Development and Reform Commission (NDRC), and the Chinese Academy of Sciences also took part.<sup>11</sup>

Sea level rise is a shared concern with great potential for collaboration. Research by UK-based global risk analysis consultancy Verisk Maplecroft suggests that sea level rise will affect more than 13% of rail assets in the Pearl River Delta and more than 12% of roads, with Guangzhou and Dongguan likely to be the hardest hit areas. Spring storms in 2014 flooded more than 100 factories and stores in both cities as urban development has encroached on tidelands that once acted as natural barriers.<sup>12</sup>

Tropical storms in 2008 and 2009 closed Yantian Port and Shenzhen Bao’an International Airport.<sup>13</sup> Research conducted by the City University of Hong Kong and the Chinese Academy of Sciences in 2015 predicts a 1.2 meter rise in sea levels by the end of the century if current trends continue, subjecting Hong Kong and Macao to increasing superstorms and flooding.<sup>14</sup>

A similar situation exists in the San Francisco Bay Area, where the San Francisco Bay Conservation and Development Commission (BCDC), the US Army Corps of Engineers, and local governments are engaged

in long-term planning for adaptation to sea level rise, a strategy that includes levee systems, wetlands restoration, and pilot programs to test novel design responses in varying geographical circumstances. Regional efforts also include the development of regulatory and policy mechanisms to support and coordinate local government efforts. To build consensus on the policy changes that will be needed going forward, planning includes active engagement with the region’s business, environmental, and social justice communities. These measures are growing in importance as high-value properties in Silicon Valley, much of which is below sea level, are under long-term threat and as high tides periodically overlap downtown San Francisco’s waterfront. As plans move toward implementation, new investment will be required, producing business opportunities for engineering, construction, and environmental businesses.

## Clean Energy

### California

Commercial and residential buildings account for approximately 25% of California’s GHG emissions through their use of electricity and natural gas for heating, cooling, cooking, lighting, and more. Since the 1970s, California has implemented leading-edge energy efficiency standards for new buildings. In 2007, California developed a Green Building Standard to meet emissions reduction goals. The California Green Building Standards Code, also referred to as CALGreen, took effect in 2009. The California Energy Commission develops building energy efficiency standards as a core element of CALGreen.<sup>15</sup>

State agencies and departments were required in 2012 to achieve 20% reductions in GHG emissions from the state’s buildings by 2020, with half of existing buildings to be zero net energy buildings by 2025,<sup>16</sup> and a subsequent plan requires doubling of energy efficiency in buildings by 2030, with enforcement mechanisms put in place that require electric utilities to compile and disclose building energy benchmarking data.<sup>17</sup>

A pair of California Public Utility Commission (CPUC) and California Energy Commission (CEC) programs, the Technology and Equipment for Clean Heating (TECH)

Initiative and the Building Initiative for Low-Emissions Development (BUILD) Program, help create a state market for energy-efficient space and water heating equipment. California's appliance and building energy efficiency standards have saved consumers an estimated US\$100 billion over 40 years. More recently, the state has adopted the nation's first standards requiring solar systems for newly-built homes.<sup>18</sup>

Transportation is the largest contributor to GHG emissions, accounting for 37% of the state's total in 2017.<sup>19</sup> A low-carbon fuel standard (LCFS), adopted in 2009 and amended in 2011, aims to improve vehicle technology, reduce fuel consumption, and increase transportation mobility options, beginning with targets and standards for use of cleaner fuels, measured against a carbon intensity (CI) benchmark that decreases in value each year. CI ratings below the benchmark translate into credits; those above the benchmark generate deficits.<sup>20</sup>

California has a program to set stricter standards for GHG and other pollutant emissions each year from 2012–2025. It reached agreement in 2019 with a number of major global automakers to adhere to state standards despite less strict federal standards.<sup>21</sup> By 2025, low-emission vehicle (LEV) cars must emit 75% less GHGs and 40% less other pollutants than 2012 models, and 22% of manufacturers' vehicles sold in California must be zero-emission vehicles (ZEVs)—fully electric, fuel cell or plug-in hybrid—under a credits system.<sup>22</sup>

## China

From 1995–2005, China's stock of commercial and residential buildings tripled, as more than 130 million people migrated from the countryside to cities in search of work, dramatically increasing energy use for heating, cooling, water heating, cooking, and other household functions. Building stock is expected to triple again by 2030, even as older buildings need replacing. Buildings account for an estimated 25% of energy use.

Demographics have made building efficiency a top priority. China's first building energy codes were written in the 1980s for new residential development in areas with particularly cold weather. China today has a broader interest in sustainability through cleaner energy sources and energy efficiency achieved through building

codes, appliance and building energy information labeling, and financial incentives to switch to energy-saving lighting, appliances, windows, and materials.<sup>23</sup>

In 2018, China announced a new energy vehicle (NEV) mandate modeled on California's ZEV program, with a target of 4.6 million electric vehicles on the road by 2020—as many as were on the roads worldwide in 2018—and 7 million on the road by 2025.<sup>24</sup>

## Collaboration Opportunities

- Cleaner energy sources and energy efficiency
- Zero-emission vehicles
- Smart grid/distributed energy
- Demand side management
- Green design
- Smart appliances and lighting

The Lawrence Berkeley National Laboratory (LBNL) China Energy Group, along with the CEC and the CPUC, have assisted the Chinese government at the national, provincial, and municipal levels with energy efficiency and conservation measures on both the supply and demand sides. LBNL's China Energy Group is the US lead for the US-China Clean Energy Research Center for Buildings Energy Efficiency (CERC-BEE) project, initiated in 2009 by US President Barack Obama and then Chinese President Hu Jintao. The project's focus is on high-visibility, R&D-oriented, cost-shared technology subprojects with worldwide applicability.<sup>25</sup> These include five demonstration projects across China: a green building design in Zhuhai, with China Shuifa Singyes Energy; a near-zero emission building in Jianlin, with the China Academy of Building Research (CABR); a Hebei Wuhan photovoltaic-integrated applied science demonstration park, with Wuhan Rixin Technology Co.; a cold climate ultra-low energy consumption project in Jilin, also with CABR; and the low-energy consumption Chongqing-Jinxi Cultural Center.<sup>26</sup>

Through the China-US ZEV Policy Lab at UC Davis, CARB and UC Davis have collaborated with Chinese automotive and battery manufacturers on deployment of zero-emission vehicles. The lab is a unique partnership established in 2014 between the UC Davis Institute



of Transportation Studies and the China Automotive Technology and Research Center (CATARC).<sup>27</sup>

California signed a memorandum of understanding (MOU) with Guangdong Province in 2013, renewed in 2015,<sup>28</sup> to exchange information about greenhouse gas reduction commitments and actions and to discuss specific activities, initiatives, and best practices in emerging areas such as system planning and operations, energy efficiency, and distributed generation. Led by the CEC, the clean energy policy and best practices partnership resulting from the MOU includes the California Environmental Protection Agency (Cal-EPA), CARB, China's National Development and Reform Commission, San Francisco-based consultancy Energy and Environmental Economics, Inc., and the Rhodium Group, a global research and analytics firm.<sup>29</sup>

In June 2019, the first annual Energy Internet Innovation and Entrepreneurship Summit, held in the Tianfu New Area outside Chengdu in Sichuan Province, brought together companies, government representatives, researchers, and startups to discuss the "energy internet" integrating energy and information technology. CEC chair David Hochschild attended, as did Yinong Zhao, deputy director of the Department of Power at China's National Energy Administration. More than two dozen startups displayed and demonstrated their technologies at the summit, ten of them from California. The group met with grid operators State Grid in Beijing and China Southern Power Grid in Guangzhou to learn how they handle vehicle charging networks.<sup>30</sup>

The conference coincided with the opening of Tsinghua University's Energy Internet Innovation and Entrepreneurship Center, a newly built research facility and co-working space equipped with a live power grid simulation testing system. Operated in partnership with the Oakland-based cleantech accelerator New Energy Nexus (NEN), the Center also serves as a launch pad for energy startups looking to do business in China.<sup>31</sup> NEN's energy storage and mobility program oversees the CalCharge energy storage consortium, an association of startups, companies, research labs, and other partners in the electric vehicle, grid, and consumer electronics markets.<sup>32</sup>

Later in 2019, NEN hosted a Chinese energy industry delegation for a Bay Area clean energy tour to explore

both collaboration opportunities in energy storage and efficiency, port electrification, electric trucks, and other technologies, and the potential for public-private partnerships. Visiting companies included Hong Kong green energy supplier GCL Poly, energy storage system supplier Chengdu Tecloman Energy Storage Technology, and solar inverter manufacturer GoodWe.<sup>33</sup>

## Healthcare

Global health is a potential field for US-China collaboration. US and Chinese epidemiologists, researchers, and companies communicated and worked together closely during the COVID-19 crisis, exchanging information and researching vaccines and treatments. Observers expect global health challenges, including the possibility of future pandemics, to grow, which calls for stronger US and Chinese leadership and joint efforts across government, universities and business.

Both countries also face the challenge of aging societies and the attendant issues of rising costs and shortages of trained workers to either provide assisted living services or, alternatively, to allow the elderly to remain in their own homes longer. Technology has opened up new possibilities in home care, mobility, and healthcare.

China is a case in point. A 2015 UN World Health Organization (WHO) report revealed a rapidly aging population, driven by a convergence of rising life expectancy (from 45 years in 1950 to 75 years today, reaching 80 years by 2050) and declining fertility and birth rates, in part a residual effect of the One Child Policy in effect from 1979–2015, but also urbanization of the workforce and more women working. The share of China's population over the age of 60 is projected to more than double between 2010 and 2040, from 12.4% (168 million people) to 28% (402 million people). The number of people in China 80 years or older is expected to grow nearly fourfold between 2013 and 2050, from 23 million to more than 90 million people. Half of the 60+ population of 202 million in 2013 suffered from at least one chronic illness such as heart disease, cancer, stroke, arthritis, or dementia; 80% of deaths among the elderly are from chronic conditions.<sup>34</sup>

The extended family living under one roof, which has traditionally provided a social safety net in caring for

aging generations and children, has receded with education, job migration, and technology. Since 1930, average household size in China has fallen from five to three, and the average number of generations living together has declined from three to one.<sup>35</sup> With fertility rates at 1.7 children per household, below population replacement levels, China's total population is expected to peak at 1.4 billion around 2025, and then begin a steady decline, accelerating aging trends.<sup>36</sup>

Similar trends appear in the US, which experienced a "baby boom" in the years following World War II from 1946 to 1964. From that point, birth rates began to decline—with the advent of contraception, an overall decline in marriages with couples waiting longer to marry, and more women entering the workforce—to around 1.7 children per woman today, which is below the 2.1 rate needed to exactly replace a generation.<sup>37</sup> As more baby boomers reach retirement age, the US Census Bureau projects that by 2035, 77 million Americans will be 65 years or over, exceeding the 76.5 million who are 18 years or under. By 2060, a quarter of the population will be 65+; the number of Americans 85 or older will triple from 2018 levels.<sup>38</sup>

Impacts can already be seen in the increased demand and worker shortages in healthcare, in-home caregiving, and assisted living facilities, and worries about the Social Security system have increased. Currently, there are about 3.5 working-age adults for every older person eligible for Social Security benefits, but that number is expected to fall to 2.5 by 2060.<sup>39</sup>

## Collaboration Opportunities

- Home Robotics
- Telemedicine
- Medical Equipment
- Wearable Devices

Nursing homes in China are turning to AI and robotics to address worker shortages and rising costs. The technology can take many forms, from an interactive screen and game-like software guiding rehabilitation exercises, to bed sensors, to service robots reminding patients to take their medicines.<sup>40</sup> Small robotic personal assistants such as iPal, developed by Nanjing-based

AvatarMind, and P-care, developed by Zhongrui Funing Robotics Co. of Shenyang, can make simple conversation, sing opera, and offer weather reports and medicine reminders, as well as offer physical support in getting up, serving food and drinks, and measuring vital signs.<sup>41</sup>

During the COVID-19 crisis, short-staffed hospitals used service robots to clean, take temperatures, and deliver food with minimal contact. Yao Li, a biomedical and robotics engineer at Stanford Robotics Laboratory in California and founder of Borns Medical Robotics based in Chengdu with an R&D lab in Silicon Valley, says robots are a growing option to provide nursing, rehabilitation, and assistance with minimally invasive surgery in a country with only two doctors per 1,000 patients. Smaller companies are entering the market; Cobot, based in Wuhan, makes easy-to-use operating systems for relatively affordable multi-purpose service robots that can be used by hospitals to deliver food and medicines.<sup>42</sup>

One promising collaborative model can be found in a training program partnership between UC Berkeley's Center for Information Technology Research in the Interest of Society (CITRIS) and First Affiliated Hospital (China's premier academic medical center) at Sun Yat-sen University in Guangzhou. The partnership focuses on joint efforts to address the most pressing challenges in global health and has been successful in creating a model for joint China/US research that avoids political sensitivities concerning data security by avoiding data transfers. The collaboration particularly focuses on training programs in health informatics, digital health, and surgical robotics. Activity in 2020 was virtual due to COVID-19 restrictions, but future plans include in-person exchanges and activity across a broad range of disciplines.<sup>43</sup>

## Electric and Autonomous Vehicles

Electric and autonomous vehicles have the promise to both address the needs of aging populations and reduce greenhouse gas emissions.

The San Francisco Bay Area and China are both leaders in this field. China is the leading producer of electric vehicles (EVs) and is also a leader in the lithium-ion battery technology powering EVs, smartphones, and other electronic devices.<sup>44</sup>

In its New Energy Vehicle (NEV) mandate policy finalized in late 2017, China specified a NEV credit target of 12% in 2020. The annual NEV credits percentage targets are not targets for NEV sales; instead, they are annual mandatory targets for credits to be acquired for production or importing of enough new energy passenger cars by auto companies with annual production or import volume of at least 30,000 conventional passenger cars.<sup>45</sup> The rules of the credit system are complex, but China's local automakers immediately started expanding NEV capacity, with some going far beyond the minimum threshold. Foreign-invested automakers responded more slowly but have also begun to achieve more widespread compliance.<sup>46</sup>

China's government has also supported the growth of the NEV sector through a decade-long national subsidy program,<sup>47</sup> mostly aimed at reducing costs for NEV buyers through mechanisms such as rebates and exemption from sales taxes.<sup>48</sup> Subsidies for buyers were scheduled to expire at the end of 2020 but the government extended them through 2022, largely as a

COVID-19 stimulus measure. Subsidies will be lowered each year, limited to the first 2 million NEVs sold annually from 2020 to 2022, and will not be available for luxury cars.<sup>49</sup> US electric vehicle maker Tesla, which started delivering cars from its wholly-owned Shanghai plant in December 2019, responded by cutting the starting price for its China-made Model 3 sedans by 10% to maintain the model's eligibility for the buyer subsidies.<sup>50</sup> Despite a national production glut, Tesla has enjoyed solid demand in China.<sup>51</sup>

Currently, NEVs make up only 5% of China's new car market, but the government has set a goal requiring that all new cars sold in the country after 2035 be new energy vehicles, with 50% of new cars sold being either electric, plug-in hybrid, or fuel cell vehicles, and 50% being conventional hybrids. In addition, China plans to gradually eliminate non-hybrid gas-powered vehicles, with the goal that 75% of gasoline cars will be hybrids by 2030, 100% of them will be hybrids by 2035, and manufacturing of non-hybrid gas-powered vehicles will have ended by 2035.<sup>52</sup>



BYD electric taxi in Shenzhen

Source: Brūke Osteuropa on Wikimedia Commons

Another government target is for half of all new cars sold in China to have partial self-driving technology by 2025.<sup>53</sup> AutoX, a Shenzhen-based autonomous vehicle company backed by Alibaba, is testing 100 self-driving robotaxis across Chinese cities, with 25 fully autonomous vehicles in Shenzhen and a pilot self-driving taxi service in Shanghai, and the company has a permit to test driverless cars without a safety driver in San Jose, California.<sup>54</sup> Meanwhile, Didi Chuxing began offering free rides in robotaxis in a designated test area of Shanghai in June 2020, Baidu launched a robotaxi service in Beijing a few months later,<sup>55</sup> and WeRide celebrated the one-year-of-operation anniversary of its robotaxi service in Guangzhou with the announcement in November 2020 that it had completed a total of 147,128 trips for more than 60,000 passengers, including loyal riders who use the service at least once a week.<sup>56</sup>

## Collaboration Opportunities

- Autonomous and electric vehicle research
- Pilot program testing and deployment

There are already significant collaborative ties between the Bay Area and China in this sector, which could be built on further. In California, Didi Chuxing has opened its Didi Labs innovation center in Mountain View<sup>57</sup> to develop safety and security solutions, AI-driven trip optimization, computer vision, natural language processing, voice recognition, and HD mapping. Baidu has built the 200-person Apollo project computing unit in Silicon Valley, partnering with vision and robotics startup XPerception, chipmaker Nvidia Corp., and lidar light-sensing technology firm Velodyne to develop its Apollo self-driving software and systems. Tencent Holdings invested US\$1.8 billion in Tesla in 2017 and later teamed with Baidu to fund autonomous EV maker Nio, based in Shanghai and San Jose.<sup>58</sup>

According to CB Insights Research Briefs reporting, Apple, Alphabet's Waymo, and General Motors' GM Cruise have the top three AV fleets testing in California; BMW is working with Intel Corp.'s Mobileye unit in Mountain View; and Ford, GM, and Volkswagen also have programs.<sup>59</sup>

In the area of mass transit, state-owned China Railway Rolling Stock Corp. (CRRC) unveiled a trackless,

rubber-tired, zero-emission, partially autonomous rail transit (ART) vehicle that can carry 300–500 passengers in three articulated cars, moving along a sensor guided track at speeds up to 43 miles per hour. Trains are fully electric, charging at each station, and can be rerouted around traffic on wheels in the event of an accident or congestion. ART service began commercial operation in 2019 in Zhuzhou and Yibin.<sup>60</sup>

## Biomedicine and Pharmaceuticals

In the December 2020 Bloomberg Health-Efficiency Index ranking of the most efficient healthcare systems in the COVID-19 era, Hong Kong ranks #2 with an overall score of 64.89, second only to Singapore's score of 67.79.<sup>61</sup> Hong Kong's world-class healthcare is delivered by both public and private providers, with the public system funded primarily out of general tax revenues and focused on inpatient services, while the private system emphasizes ambulatory care and outpatient services. The Hospital Authority (HA) manages 43 public hospitals and institutions, plus 49 specialized outpatient clinics, and 73 general outpatient clinics. The private healthcare sector complements the public sector through operations of 80 registered clinics and 13 private hospitals that provide inpatient as well as general and specialized outpatient services.

In 2018–19, Hong Kong's health expenditures were split with 51.3% going for public care and 48.7% going for private care,<sup>62</sup> although two-thirds of outpatient care is delivered by private hospitals and clinics. HKSAR's Food and Health Bureau (FHB) estimates made in 2008 calculated an expected average annual healthcare total expenditure growth rate of 1.5% from 2004 through 2033, which would account for 27% of total government spending in 2033.<sup>63</sup>

Among GBA cities, Hong Kong is an innovation leader in the healthcare field, including bio-pharma research and development. Its strong medical research base through the FHB hospitals, university research labs, and the Hong Kong Science Park translate into significant export opportunities—from basic medical and hospital supplies to orthopedic devices and pharmaceuticals,

precision and remote surgery, DNA-based diagnostics, and tissue-engineered organs.<sup>64</sup>

The Hong Kong Science Park and the numerous facilities it houses are part of the innovation and technology ecosystem fostered by the Hong Kong Science & Technology Parks Corporation (HKSTP), which has targeted biomedical technology as one of five key technology clusters, with an emphasis on commercializing research. The Science Park's Biomedical Technology Cluster, with about 150 companies and startups as of year end 2020<sup>65</sup>—up from 124 in March 2019<sup>66</sup>—is a key driver of the biotechnology scene.<sup>67</sup> The biotech cluster is supported at the Science Park by the Biomedical Technology Support Centre, a facility that provides affordable tools and technical services to support research in the areas of therapeutics, diagnostics, and medical devices. A Healthcare Devices Innovation Hub launched at the Science Park in 2018 provides onestop services assistance for startups and SMEs in support of device innovation.

The Science Park has attracted world-class biomedical company tenants like Taiwan molecular diagnostics firm ACT Genomics; Menlo Park-based cancer screening test developer Grail, through its HK\$8 billion (US\$1 billion) merger with Hong Kong diagnostics startup Cirina; and Stockholm's medical school and research center Karolinska Institutet, which in 2016 set up in the park its first overseas offshoot, the Ming Wai Lau Centre for Reparative Medicine.

For its part, the Hong Kong government has funded more than 600 biotechnology research projects through the Innovation and Technology Fund (ITF), making grants with a combined value of HK\$1,303 million (US\$168 million) as of the end of 2020.<sup>68</sup> Project areas include stem cell therapy, molecular diagnostics, modernization of traditional Chinese medicine, and biopharmaceutical manufacturing.<sup>69</sup>

Government initiatives have dramatically improved the environment for biomedical entrepreneurs since 2017, but the turnaround for life sciences remains a work in progress. Among the challenges ahead are to attract mainland and foreign companies, which now make up less than a third of Science Park tenants, attract more

private capital for R&D—90% of current R&D spending in Hong Kong is by the government and R&D still accounts for less than 1% of GDP—and grow seed and early-stage startup funding.<sup>70</sup>

HKEX (Hong Kong Exchanges and Clearing Limited) has eased listing eligibility rules for pre-revenue, pre-profit startups that produce pharmaceuticals, biologics, or medical devices (including diagnostics),<sup>71</sup> enabling 21 such biotech companies to list on the Hong Kong stock exchange and raise HK\$53.6 billion (US\$6.92 billion) through IPOs as of September 2020.<sup>72</sup> JPMorgan estimates that Hong Kong could host 70% of pre-revenue biotechnology IPOs and secondary listings in 2021.<sup>73</sup>

Hong Kong manufacturers are known for producing goods to supplied product specifications and designs as original equipment manufacturers (OEMs) and are highly regarded for their protection of intellectual property (IP) and sensitive technology. In recent years, they have increasingly moved up the value chain to handle product design, engineering, modeling, tooling, and quality control, often under international certifications. Many have inhouse R&D departments to develop products marketed under their own brands.<sup>74</sup>

Hong Kong's research and financing capabilities complement the advanced, cost-effective manufacturing capacity elsewhere in the GBA cities of Guangdong, as well as a broader range of clinical trial resources. Recent policy improvements, such as cross-border fast-track customs-clearance measures to promote the flow of scientific research samples, lab reagents, and genetic resources within the GBA, will expand the potential for collaboration.

On the other side of the equation, HKSAR's sophisticated research networks, its internationally certified laboratories and production facilities, and its global standing with regard to finance, commercial arbitration, and intellectual property protection all support its role as a potential GBA safe harbor for cutting edge research which can be affordably commercialized for developed and emerging markets.

Hong Kong enjoys a particular advantage in clinical medical research. Clinical trial data from Hong Kong, for example, is recognized for drug registration purposes

by various drug regulatory bodies such as the US Food and Drug Administration, the EU's European Medicines Agency (EMA), and China's National Medical Products Administration (NMPA). This has enabled multinational pharmaceutical companies to collaborate with the medical schools of the University of Hong Kong and the Chinese University of Hong Kong. A number of Hong Kong hospitals, including Prince of Wales Hospital, Queen Mary Hospital, Hong Kong Eye Hospital and Hong Kong Sanatorium & Hospital, have passed the NMPA's review and/or evaluation and can now accept the commissioning of drug registration applicants to carry out clinical trials.

Consultations between the Hong Kong Trade and Development Council (HKTDC) and Guangdong biomedicine companies in 2019 suggested numerous ways in which Hong Kong could provide a link between the mainland and foreign firms to bring research, production, design, and support services together in a global collaboration:<sup>75</sup>

- Leverage Hong Kong research institutions' access to talent and new diagnostics and treatment technologies with mainland production capability and patient market expertise to improve product offerings in the China market.
- Access Hong Kong hospital and patient resources, including new technologies, to advance clinical trials more quickly at lower cost.
- Assist mainland enterprises in understanding overseas requirements for pharmaceutical products and treatment technologies and in applying for clinical trial authorizations and related treatment and pharmaceutical certifications and approvals from foreign regulatory authorities, which are necessary as Chinese firms "go out."
- Provide access to non-traditional financing sources such as angel and venture capital investment for small and medium-sized biomedical enterprises and startups and to support financial, marketing, and other services through the R&D, clinical trial, certification application, and product launch stages.

The objective, then, is for Hong Kong to act in an intermediary role, helping mainland GBA companies—whether in technology or manufacturing—to raise

their game to "go out" as global competitors, while also helping them to connect and partner with foreign multinationals or specialty biomedicine companies to deliver advanced technology and services to the China Asia-Pacific region and emerging markets.

With China aiming for technology self-sufficiency, Hong Kong sees an opportunity to demonstrate its unique value under "One Country, Two Systems" via the GBA and, in the process, gain an edge against competitors like Singapore in areas such as biomedicine and pharmaceuticals. A massive Hong Kong Science & Technology Parks Corporation (HKSTP) expansion project, the Hong Kong-Shenzhen Innovation and Technology Park, has emerged as a symbol of future "One Country Two Systems" cooperation.<sup>76</sup> The new technology park is to be built on an 87 hectare (215 acre) site known as the Lok Ma Chau Loop which was previously part of the Shenzhen area but became accessible only from Hong Kong when the Shenzhen River was straightened in 1997 to improve its flow. The resulting long-running border dispute has been settled by Hong Kong's and Shenzhen's agreement to build the park "to support the development of high technology and innovation."<sup>77</sup>

Hong Kong has earmarked HK\$20 billion (US\$2.58 billion) for the first phase of its development of the new innovation and technology park.<sup>78</sup> Its phase 1 portion of the site is expected to be available for development in 2021, with build-out to be completed in 2023. When fully built out, the Hong Kong-Shenzhen Innovation and Technology Park will be four times the size of the current Hong Kong Science Park, providing needed space for R&D and incubator development in new priority technologies, among them biomedicine.<sup>79</sup>

In all, Hong Kong is expected to assume a key role in supporting GBA cities through R&D cooperation and by offering advanced biomedical services, in part addressing knowledge disparities between the mainland and overseas countries in areas like genetics or diagnostics.

Guangdong, meanwhile, is taking steps to strengthen its pharmaceuticals manufacturing sector. The central and provincial governments are making cancer and rare disease treatments more affordable with tax breaks, providing R&D incentives, streamlining application processes, lowering costs for active ingredients, encouraging economies of scale through restructuring,

recruiting global talent with expertise in accreditation, and attracting foreign R&D investment to spur innovation.<sup>80</sup>

A 2019 Guangdong Province Department of Industry and Information Technology directive to accelerate biomedicine development calls for<sup>81</sup>

- support for industry giants and innovation-led enterprises in the province and increased scale for small and micro pharmaceutical and medical equipment enterprises;
- targeted growth in “key products” such as cardiovascular drugs, anti-cancer drugs, anti-diabetic drugs, bio-preparations, biomedical diagnostics, medical equipment, and medical imaging, as well as accelerated industrialization of new traditional Chinese medicines (TCMs);
- building Guangzhou, Shenzhen, Foshan, Zhongshan, Zhuhai, and Dongguan into a core biomedicine cluster; and
- establishing new production bases for Chinese medicinal herbs and herbal medicine in short supply, encouraging growing and breeding of authentic Lingnan medicinal herbs, and integrating the production and processing of Chinese herbal compounds.

Guangdong is home to a portfolio of companies and academic research institutions with strengths in biomedicine, genetic diagnostic reagents, medical equipment, and modern applications for TCMs,<sup>82</sup> including the following.

### Educational Institutions

Zhongshan University  
Chinese Academy of Sciences and its Guangzhou Institute of Biomedicine and Health  
Jinan University and its National Engineering Research Center for Genetic Medicine  
Nanhai Marine Biotechnology National Engineering Research Center

### Domestic Companies

Guangzhou Pharmaceuticals  
Guangzhou Baiyunshan Pharmaceutical

China Resources Sanjiu  
Xiangxue Pharmaceutical  
BGI Group  
Mindray Bio-Medical Electronics  
Shenzhen Hepalink Pharmaceutical  
Livzon Pharmaceutical Group  
Kangmei Pharmaceutical  
United Laboratories  
Consun Pharmaceutical  
Shenzhen Neptunus Bioengineering  
Sinopharm Group Dezhong (Foshan) Pharmaceutical  
Guangdong Yifang Pharmaceutical

### Clusters

Guangzhou Science City  
Guangzhou International Biological Island  
Jinwan Biomedicine Base  
Hengqin Pilot Free Trade Zone  
Guangdong Pharmaceutical University (Shunde) Science Park  
Guangdong (Nanhai) Biomedical Industrial Base

### Collaboration Opportunities

- Diagnostics and therapeutics
- Clinical trials and compliance
- Cancer/chronic disease/Alzheimers research
- Medical data analytics
- Personalized medicine
- Patient monitoring/wearables

Collaboration with the San Francisco Bay Area, whether through investments or partnerships, is not new. Shenzhen medical imaging, patient monitoring, and diagnostics equipment manufacturer Mindray acquired Mountain View next-generation ultrasound imaging company Zonare Medical Systems in 2013,<sup>83</sup> and its San Jose innovation center has driven technology improvements such as its AI-enabled ME8 laptop portable point-of-care ultrasound unit.<sup>84</sup>

Hong Kong has had significant biomedical research relationships with the Bay Area for nearly two decades. UC San Francisco, for example, has had extensive faculty and student exchanges with Hong Kong University and has co-hosted and participated in conferences on synthetic biology and the targeting of genetic abnormalities in cancer cells.<sup>85</sup> In 2005, UC Berkeley received a US\$40 million grant from the Li Ka Shing Foundation (the philanthropic organization of Hong Kong entrepreneur Li Ka-shing) to establish a research center focused on new scientific fields including stem cell biology and brain imaging.<sup>86</sup> The Foundation also awarded US\$2 million to UCSF in 2013 for its precision medicine initiative,<sup>87</sup> followed by a US\$3 million planning grant to Stanford University in 2014 to study how advanced analytics can be deployed with hospital and patient data to speed drug discovery, improve personalized treatment, and lower costs.<sup>88</sup>

The Paul F. Glenn Center for the Biology of Aging at Stanford University School of Medicine reciprocated in 2019, joining the Hong Kong University of Science and Technology (HKUST), Boston Children's Hospital, Harvard Medical School Teaching Hospital, and University College of London to establish a Center for Neurodegenerative Diseases within the Hong Kong Science Park.<sup>89</sup> The Center will be part of a Hong Kong SAR innovation promotion program and will focus on research toward developing diagnostics and therapeutics for Alzheimer's Disease.<sup>90</sup>

## Financial Technology (Fintech)

Hong Kong's expertise and reputation as an open, rules-based regional and global financial center linking China, its financial institutions, and its companies to the rest of the world suggest a unique role for financial technology going forward. This is particularly the case as both Hong Kong and the mainland pursue strategies to move up the value chain through innovation, a process that demands new, more agile and efficient financing models.

In Hong Kong, fintech began with the Octopus card, a reusable stored value card officially launched in September 1997 to pay for transit, parking, grocery shopping, and other services. But it was not until 2016 that a special government-appointed Steering Group

on Financial Technologies reported its findings<sup>91</sup> on the broader potential for fintech and recommended a promotion strategy of government facilitation and public outreach to attract talent and investment.

Hong Kong fintech start-ups raised US\$1.1 billion in private capital from 2014–2018 and in 2019 alone, according to Accenture, raised a further US\$376 million, double the total raised and a 32% jump in the number of deals compared to 2018. Fintech adoption in Hong Kong grew from 32% in 2017 to 67% in 2019.<sup>92</sup> In 2020, fintech market activity in Hong Kong totaled US\$18 billion, more than US\$16 billion of that in digital payments and the rest in personal finance and alternative lending or finance. Statista forecasts the total to grow to US\$31 billion in 2024.<sup>93</sup>

Fintech uses digital technology to “focus on very specific customer propositions (which may be neglected by incumbent financial services companies) and offer an efficient and compelling user experience that often cuts across traditional business models,” according to a 2017 Hong Kong Financial Services Development Council (FSDC) report on the industry.<sup>94</sup> Fintech companies, typically startups, tend to be asset-light, low-margin and unhampered by legacy technologies and processes. They are able to scale by exploiting inefficiencies and regulatory gaps to address underserved, high-demand market segments outside standard industry compliance constraints.

Main segments of fintech include

- finance (peer-to-peer lending, investment advisory services, trading, insurance);
- payments and settlement;
- data (analytics, monetization and cybersecurity); and
- customer interface (smartphone, social media and other internet).

Regulatory compliance technology and blockchain distributed ledger applications interact across all of the above segments.

FSDC has highlighted the need for Hong Kong to develop a fintech sector on par with its mainstream finance sector, and to compete on its strengths—rule of law, a robust professional services infrastructure, deep and



sophisticated capital markets, intellectual property and data security safeguards, access to the mainland and its east-west networks and connections—with other Asian centers such as Shenzhen, Shanghai, Singapore, Sydney, and Seoul. Logical target markets are firms serving both the local market and the Asia-Pacific region via Hong Kong; firms offering B2B services which help financial incumbents meet regional needs; mainland fintech, IT, and e-commerce companies with regional and/or international ambitions; and foreign providers looking for a secure base from which to serve the mainland market.

FSDC has identified five key segments which play to the above strengths while also taking into account competitive obstacles such as a relatively small local market, already heavily served mainland and B2C markets, and a challenging regulatory structure designed around traditional finance. The five elements are

1. cybersecurity;
2. payments and securities settlement;
3. digital ID and know-your customer (KYC) utility;
4. wealthtech and insuretech, specifically data analytics, automation and AI; and
5. regtech.

Each of these segments avoids a major market challenge: mainland China's crowded B2C fintech market, where an EY survey found that 87% of mainland respondents already use one or more fintech services and nearly 100% are well aware of online apps such as Ant Financial and WeChat. Small and mid-sized businesses also use the same or similar apps for payments, borrowing, and investments.<sup>95</sup> This in turn suggests a value proposition in the B2B space as a bridge between large overseas companies accessing the China market and emerging Chinese national champions "going out."

InvestHK reports more than 600 fintech firms active in Hong Kong in 2020. Of that total, two-thirds are focused on B2B activities, 46% are at least three years old, 41% are scaleups at Series A stage or higher, and 56% have HKSAR or mainland founders. Three of Hong Kong's eight homegrown unicorns are in fintech. Fintech adoption among the city's 160-plus banks is 86%. The fastest growing fintech segments are regtech

and blockchain applications, followed by insuretech, wealthtech and digital assets.<sup>96</sup>

Government has played a central role in development of Hong Kong's fintech sector. Beginning in 2016, the Ministry of Finance established a dedicated fintech team within InvestHK; increased incubator support for fintech startups at Cyberport; dedicated platforms at the financial regulators, including the Hong Kong Monetary Authority (HKMA), the Securities and Futures Commission (SFC), and the Insurance Authority, to engage more directly with the fintech community; created a cybersecurity program; and began to explore the potential of blockchain technology for financial services.

HKMA established a Fintech Facilitation Office and soon after created a Fintech Supervisory Sandbox, granting incumbent banks limited regulatory flexibility to explore fintech solutions and opportunities outside the legacy regulatory framework. HKMA and the Applied Science and Technology Research Institute (ASTRI), with its private sector and university ties, developed a FinTech Innovation Hub; HKMA also initiated research into digital currency.

Early funding came from existing sources—the Innovation and Technology Fund (ITF), the Innovation and Technology Venture Fund, and the Cyberport Macro Fund, a combined pool of HK\$5 billion, with the added potential for 40% matching industry contributions to ITF supported projects. For R&D, ITF's Enterprise Support Scheme offers matching funds up to HK\$10 million. In 2017, HKMA launched the Faster Payments System (FPS) for making cross-bank and e-wallet Hong Kong dollar and renminbi payments quickly.<sup>97</sup>

## Fintech Positioning Strategy

Specific initiatives and priorities reflect service needs in the local Hong Kong market, Hong Kong's role within the GBA and the Belt and Road Initiative, and HKSAR's unique capability to serve as a bridge connecting the mainland with overseas markets.

## Virtual Banking

In 2017, HKMA launched a set of seven initiatives to upgrade the banking system to accommodate smart

banking; among them are full connectivity of digital retail payments through the Faster Payment System, development of an open API framework, cross-border cooperation in fintech with the GBA and Singapore, and the introduction of virtual banking in Hong Kong.

The first regulations for digital banking were enacted in 2000 and updated in 2012 but did not include a licensing scheme.<sup>98</sup> Eight virtual banks have been licensed since the revised Guideline on Authorization of Virtual Banks was issued on May 30, 2018.<sup>99</sup> Most are joint ventures involving major financial and technology firms.<sup>100</sup>

Bank	Ownership/Joint Venture Partners
1. Airstar Bank	Xiaomi / AMTD Group
2. Ant Bank	Ant Financial
3. Fusion Bank	Tencent Holdings / ICBC / HKEX / Hillhouse Capital / Perfect Ridge Limited
4. Livi Bank Limited	BOC Hong Kong (Bank of China) / Jingdong Digits (JD) / Jardine Matheson Group
5. Mox Bank Limited	Standard Chartered / Hong Kong Telecom / PCCW / Trip.com Group
6. Ping An OneConnect Bank	Ping An Bank / Tradelink Electronic Commerce
7. WeLab Bank	Founders: Simon Loong, Kelly Wong, Frances Kang, and Aananth Solaiyappan
8. ZA Bank Limited	ZhongAn Online P&C Insurance Co. Ltd. / Sinolink Group

Since the eight banks were licensed in 2019, the group as a whole has attracted nearly 300,000 retail customers and more than US\$1 billion in deposits, in part by offering faster loan turnaround times, cash rebates and high promotional interest rates—up to 6.8%—on qualifying deposits.<sup>101</sup> Virtual banks also deploy technologies ranging from data analytics and machine learning to open APIs and robotic process automation to simplify, make affordable, and personalize services and the user experience.<sup>102</sup> The strategy is to quickly gain local market share and eventually scale into the GBA and an underserved Southeast Asia market.

COVID-19 was a major disruptor across Hong Kong's financial sector in 2020, but also accelerated the build-out and acceptance of fintech. Regulators such as HKMA and the Insurance Authority have developed guidelines to further encourage digital services.

### Green Finance

The World Economic Forum has defined green finance as any structured financial activity, product, or service that is created to ensure a better environmental outcome. It can include loans, debt mechanisms such as bonds and securities, or other investments used to encourage the development of green projects, minimize the climate impact of more traditional projects, or achieve a combination of both.<sup>103</sup> Funding sources typically include banking, microcredit, insurance, and direct or portfolio investment, often with public funding in support of specific policy goals and/or to mitigate risk.

The primary vehicle currently used in green finance is the green bond, issued by companies, institutions, funds or government entities. As of 2019, the global green bond market was valued at around US\$203 billion, according to Statista. The US is the leading issuing country for green bonds totaling US\$51.5 billion, followed by China (US\$31.5 billion), France (US\$30 billion) and Germany (US\$18.5 billion).<sup>104</sup> Central banks have been active buyers of green bonds, not just for the positive climate benefits but to accelerate economic growth from decarbonization.

China puts a US\$1 trillion price tag on meeting its goals for a green economy, of which the government is only able to cover about 15%, increasing the need for private and overseas investment as well as technological know-how. In 2015, the Chinese government launched the U.S.-China Building Energy Efficiency and Green Development Fund—now the U.S.-China Green Fund—in partnership with the Paulson Institute, to promote sustainable development and create a channel for US technologies to commercialize in China.

Green finance was included in the 13th Five-Year Plan (2016–2020), rules were set out for issuing green bonds and, in 2016, China led in establishing the G20 Green Finance Study Group (GFSC), co-chaired by the People's Bank of China and the Bank of England and administered by the UN Environmental Program (UNEP).

Green development was highlighted by four Chinese ministries in 2017 as a key component of the Belt and Road Initiative.<sup>105</sup>

This puts Hong Kong in an enviable position in terms of green finance, given its role as an Asia-Pacific financial center, a “One Country, Two Systems” member of the GBA, and an open-market gateway to the Belt and Road network.

In 2018, the government obtained Legislative Council approval to launch a green bond issuance program with a borrowing ceiling of HK\$100 billion.<sup>106</sup> In May 2020, the government and financial regulators also established the Green and Sustainable Finance Cross-Agency Steering Group, to provide strategic direction and co-ordinate regulatory and market development efforts, previously a responsibility of HKMA.<sup>107</sup>

The Green Bond Grant Scheme was launched in June 2018 to subsidize eligible green bond issuers in obtaining certification under the Hong Kong Quality Assurance Agency’s Green Finance Certification Scheme. From the private sector, the Hong Kong Green Finance Association brought market practitioners and business development professionals to promote Hong Kong as a green finance capital.<sup>108</sup> Finally, HKEX (the Hong Kong stock exchange) launched in December 2020 the Sustainable and Green Exchange (STAGE), a first-of-its-kind Asia data and information hub for sustainable and green finance investment.<sup>109</sup>

In 2017, the first full year of the green bond program, US\$2.3 billion in bonds were arranged and issued in Hong Kong, mainly by local enterprises, according to the Bank of China (Hong Kong), Ltd.<sup>110</sup> In 2019, the annual total was US\$10 billion, with 79% of issues originating on the mainland. The cumulative total for all green bonds arranged and issued in Hong Kong over 2016–2019 was US\$26 billion, of which US\$7.1 billion were Hong Kong-originated. Four out of five issues were denominated in US dollars, with 13% in Hong Kong dollars and 6% in Chinese yuan. Financial institutions originated nearly half of the bonds, with corporate issuers accounting for 36%.<sup>111</sup>

Guangdong-based entities issued US\$2.9 billion in green bonds in 2019, including Bank of China (Macao), Zhuhai

Da Heng Qin Investment, Industrial and Commercial Bank of China, and Agricultural Development Bank of China (ADBC). Green bonds from Greater Bay Area issuers totaled US\$6.4 billion in 2019.<sup>112</sup> In September 2020, the Hong Kong Green Finance Association (HKGFA) teamed with counterpart associations in Guangzhou, Shenzhen and Macao to establish the Greater Bay Area Green Finance Alliance (GBA-GFA). The partnership will host research projects and incubate green investment projects in five key areas: supply chain, solid waste disposal, green buildings, blockchain solar project funding, and carbon trading.<sup>113</sup>

In announcing the 2020–2021 HKSAR budget, Financial Secretary Paul Chan said Hong Kong planned to issue HK\$66 billion (US\$8.5 billion) of its own green bonds over five years.<sup>114</sup> And in January 2021, the Hong Kong Monetary Authority announced a US\$2.5 billion green bond issue, the first 30-year sovereign offering by an Asian government. The issue was fully subscribed a day later.<sup>115</sup>

## **The View from Silicon Valley**

Fintech launched early in the US in the wake of the housing and financial crisis, as traditional lending and retail banking services froze up. Over 2009–2014, according to Silicon Valley Bank, 10% of all venture capital (VC) spending was invested in fintech companies, which accounted for 20% of unicorns (startups reaching valuations of US\$1 billion or more) during that period. As recently as 2014, 80% of VC fintech investment was in lending and payments; the future was seen to lie with insurance, healthcare, B2B payments, and cross-border remittances.<sup>116</sup>

Not surprisingly, San Francisco and New York have dominated the US fintech sector due to their prominence as coastal financial centers and their respective proximities to Silicon Valley and Wall Street. Silicon Valley held a clear early lead position based on a post-recession model of using technology to offer more convenient, efficient financial services at lower incremental cost to a wider customer base that included smaller retail and business customers. An emerging market of younger consumers, in particular, turned to easy-to-use-from-anywhere fintech options like San Francisco-based mobile banking app Chime;

credit monitoring and financial management service Credit Karma; auto insurer for low-mileage drivers MetroMile; and credit card debt pay-off organizer Tally.<sup>117</sup>

### Collaboration Opportunities

- Payments and securities settlement
- Digital ID and authentication and KYC utility
- AI for credit and risk evaluation, roboadvice
- Regtech

San Francisco Bay Area fintech firms have been most successful in the B2C market segment, as disruptors of traditional financial services, taking advantage of venture, angel, private equity, and other sources of capital to achieve scale online and serve a new generation of customers. The largest have partnered with financial incumbents but stopped short of acquisition.

At the same time, the Bay Area has long been a major global financial center with an established track record in banking; insurance; foreign exchange, securities, and bond trading; structured derivatives; venture capital; and private equity. Its firms have been early adopters of technology to make transactions faster and more efficient, improve transparency and regulatory compliance, automate back office processes for greater efficiency, offer a simple, frictionless customer experience, and more accurately price creditworthiness and risk.

As natural partners for cooperation in developing technologies and services, Hong Kong and the San Francisco Bay Area are well positioned to create and support financial links between the GBA, China as a whole, and overseas economies. Together they are positioned to facilitate two-way, multi-currency trade and investment flows in and out of the GBA, assist mainland banks with risk assessment to more effectively leverage available capital, and manage investment risk through innovative insurance, green finance, and other mechanisms.

## Targeted Service Sector Opportunities

Beyond the above sector-specific opportunities, there is broad scope for R&D collaboration, particularly in the creation of joint IP, and for further engagement with the Greater Bay Area's extensive industrial chains. Targeted opportunities exist in a range of activities, including

- development of a green finance reform and innovation platform in Guangzhou;
- establishment of a regional futures exchange for carbon emissions;
- collaboration with Shenzhen to develop an insurance innovation pilot zone;
- engagement with Hong Kong, Macao, and Guangdong insurance institutions to develop cross-border motor vehicle insurance, cross-border medical insurance products, and services for cross-border customers such as underwriting, investigation and claims settlement;
- deepening of cross-regional venture capital ties; and
- strengthening of entrepreneurial development through programs that connect innovative startup companies and founders to partners and opportunities in both regions.



## Conclusion

Looking forward, the concentration of manufacturing capacity in China's Greater Bay Area—with its vast network of producers and suppliers—will ensure the GBA's central role in global manufacturing chains for the foreseeable future. Some international businesses will look to reduce their reliance on China for production in critical technologies and to avoid future trade disputes by shifting production to locations such as Southeast Asia, India, or Mexico. Others will shift in search of lower costs. But the depth and diversity of Guangdong's manufacturing base will be difficult to replicate quickly elsewhere, ensuring the GBA's continued role as a platform serving markets both inside and outside of China.

Similarly, Shenzhen will continue to grow as a Chinese technology center, based on its concentration of leading technology companies and its appeal to entrepreneurs from across China. As manufacturing activity has shifted in recent years to other cities in Guangdong Province, Shenzhen has consolidated its position as a technology hub with a nearby integrated manufacturing base, something not easily replicated elsewhere. Shenzhen and Guangzhou also provide a potential platform for startups from Hong Kong and the US to apply and commercialize their R&D and scale production for Chinese markets.

Hong Kong plays a unique role in this regional complex, distinguishing the Greater Bay Area from other "Bay Areas" in China. Its distinct contribution is its system of common law, the transparency of its adjudicatory

systems, well-established rules and administration for intellectual property protection, open flows of information, and a cosmopolitan environment that is attractive for foreign businesses and executives. As the language used by Hong Kong's legal system is English, Hong Kong jurisdiction eliminates the need for translation, making it particularly conducive as a locus for commercial transactions.

While the application of the new National Security Law raises significant issues regarding Hong Kong's long-term future, its core assets as a business center are unlikely to be impacted in the near term. China will also continue to see value in Hong Kong's role as an intermediary supporting the global flow of capital. What remains to be seen is whether China's tighter political embrace will allow Hong Kong's open economy and transparent processes, which are key to the HKSAR's unique role in the GBA, to continue to thrive.

For the present, Hong Kong brings to the GBA a financial services and capital markets sector that will be pivotal for the region, even with growth in Shenzhen. The quality of its universities and R&D base also stands out as a basis for growth. Its science park facing Shenzhen offers a distinctive platform to leverage research and commercialization assets across the region. With its compact geography and effective administration, Hong Kong also offers an attractive test bed for new technologies developed within the GBA and by international partners. And for all the growth that

the cities in Guangdong Province have experienced, they remain essentially Chinese, with a relatively small international presence and few overseas entrepreneurs, given their size. This speaks to another Hong Kong asset: its continuing role as a global business center facing China but also attracting Asia-Pacific headquarters and expatriate executives.

Within the Greater Bay Area's structure, Hong Kong can therefore play a connecting role to the world similar to the role played by the city of San Francisco in the Silicon Valley/San Francisco Bay Area. While San Francisco is an important technology center for the internet media, design, and life sciences sectors, the region's leading hardware and software companies are based primarily in Silicon Valley to the south. Silicon Valley's position in the San Francisco Bay Area is roughly analogous to Shenzhen's in China's Greater Bay Area. San Francisco, however, plays a distinctive role in the region as a cosmopolitan center, as a global connector through San Francisco International Airport (which carries more than 90% of the region's

international air traffic), as a home for the US or West Coast headquarters of leading international companies and institutions, and as the region's leading financial and business services center and its primary destination for hospitality and tourism.

China's Greater Bay Area—essentially the Pearl River Delta region that has played a historic role in China's commercial opening to the world since the mid-1800s—is a work in progress. Efforts are underway to tie the region more closely together in a way that integrates and leverages its assets, anchoring the Belt and Road plan in the East and embedding the region more deeply into China and the global business map. This requires its constituent parts to overcome jurisdictional and systemic differences and implement multidimensional investment in infrastructure to increase capacity in fields ranging from science and services to the improved mobility of people and goods. In the end, whether or not China's Greater Bay Area consolidates as a fully integrated regional economy, this investment may be its most enduring legacy.

## Notes

### Executive Summary

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## CHAPTER 1

# China's Trade Portal and Laboratory for Innovation

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## CHAPTER 2

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## CHAPTER 3 The Potential of GBA Integration

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## CHAPTER 4

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## CHAPTER 5

# Going Forward: Opportunities for Collaboration

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