

## Commentary

## Innovating for Health in China's Greater Bay Area

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### The Success of World Metropolitan and Bay Areas

The Tokyo Bay Area, the New York Metropolitan Area, and the San Francisco Bay Area are leading regions for science and technology. They share an economic transformation from industrial or manufacturing bases to predominantly service-based economies with this sector contributing 75% of their gross domestic product (GDP) in 2020. Technology companies in these locations accounted for 60% of the revenue of the top 100 global tech companies in 2018 (1). The success of these locations stems from the convergence of academia, technology giants, government support, and a high density of investors, as well as innovative entrepreneurs (2).

### GBA as Innovation Hub in 14th Five-Year Plan

Since the Qing Dynasty when Guangzhou was the only port open to foreign commerce, Southern China's Pearl River Delta has traded on its international connections. Beginning in the 1980s, Pearl River Delta (PRD) cities transformed into a global manufacturing center, driving urbanization and producing 24.8% of China's exports (3). Today, the region is home to more than 86 million people and has a GDP in excess of 1,600 billion USD (4). In 2019, the Chinese Central Government adopted the Greater Bay Area (GBA) policy, wrapping together 9 cities plus 2 special administrative regions in the PRD, with a vision for the region to become a leader in healthcare technology (healthtech) (5).

The GBA has been officially recognized for its potential to achieve the sci-tech self-reliance and self-strengthening strategy as detailed in the outline of the 14th Five-Year Plan (2021–2025) for National Economic and Social Development and Vision 2035 (6). Under the plan, Guangzhou, Shenzhen, and Hong Kong will connect as one of two technology corridors in the GBA (Figure 1). This corridor boasts 80 universities, mega ports and technology giants, and will

house the world's second-largest biotech fundraising hub.

Elsewhere in China, the Beijing-Tianjin-Hebei region (Jing-Jin-Ji) and the Yangtze River Delta (YRD) are also positioned to become world-class mega city clusters. These regions possess 11,153 tech scalars, according to a 2021 report, second to the USA which has 30,007 tech scalars (7). However, pursuing innovation in life sciences and developing health-tech, which is not simply information technology as applied to the health arena, requires an ecosystem supported by basic science research alongside incubators to nurture new discoveries to translate these for clinical and public health applications. Thus, investing in technology infrastructure is neither sustainable nor efficient if the three regions are in competition for talent and supply chains, particularly if the ultimate goal is global competitiveness.

### Healthtech Clustering

Healthtech dominates technology investment thanks to breakthrough discoveries in sequencing and synthesis and advancements in artificial intelligence (AI) and super-computing data analytics. Clustering of such technologies enables cross-fertilization among technology giants, multinational pharmaceutical companies, start-ups, and researchers to develop solutions that attract venture capital firms to invest. This is exemplified by the Boston area, where 120 biomedical firms sit within a 1.5-kilometer radius. These companies regularly partner with the academic powerhouses of Harvard University and the Massachusetts Institute of Technology to translate innovations (7–8).

In recent years, start-ups have harnessed artificial intelligence, big data, precision medicine, gene editing, and biomanufacturing to build services or products (9–10). In view of the complexity of these innovations, world-class technology hubs are opting to specialize in either biotech, biopharma, medical devices, or digital health. It is therefore crucial for China to create defined roles for each city cluster to avoid duplication and maximize global competitiveness.



FIGURE 1. Guangzhou-Shenzhen-Hong Kong and Guangzhou-Zhuhai-Macao technology corridor.

## “Coopetition” and Role Delineation Among China’s Mega City Clusters

By comparing the three mega city clusters in Figure 2, it is clear that all 3 clusters have heavily invested across multiple healthtech fields. This uncoordinated approach risks competition for resources and calls for the development of collaborative platforms across academia and services.

This comparison found the YRD region possesses the strongest technology infrastructure for developing biopharma, medical devices, therapeutic diagnostics, and biotech. In 2020, more than 60% of Shanghai’s healthcare investment focused on biopharma, while Anhui Province accounted for over 50% of China’s device funding.

Jing-Jin-Ji is in the leading position for big data analytics and diagnostic tools, with investment in related technologies accounting for 67% of Beijing’s healthcare funding. Biopharma investment secured 26% of that funding, followed by devices at 7% (11).

Global technology giants Tencent, Huawei, and BGI are headquartered in Shenzhen in the GBA, attracting tech talent and investors. Neighboring Guangzhou boasts over 10,000 high-tech start-ups and

is a major regional healthcare center with 70 tertiary hospitals (12–13). Beyond Hong Kong’s role as a global financial center, it boasts two world-class medical schools, a fully-funded public hospital system, and an internationally-recognized specialist training system for over 60 medical sub-specialties. Moreover, the territory’s infectious disease and public health researchers stand at the forefront of COVID-19 research, while 23 local scientists ranked in the top 1% for citations in their fields in 2021. By building on these strengths, the GBA can excel by leveraging its IT capabilities to develop digital health services alongside a focus on biotech research.

## Enhance Competitiveness

The 14th 5-Year Plan synergizes each mega-city cluster, but more centralized planning is required to define each region’s focus and to formulate a cooperative competitive strategy. For the GBA, it can utilize its existing strengths to build data platforms in collaboration with other mega city clusters. Sharing health data to develop big data applications is beneficial for public health systems and potentially lucrative for entrepreneurs. In addition, Hong Kong’s clinical trial data are nationally and internationally

	Jing-Jin-Ji	YRD	GBA
<b>Demographics</b>			
Population (Million)	113	235	86
Average GDP per person (RMB per year)	78,000	110,000	124,000
<b>Technology infrastructure</b>			
Double first-class universities	40	35	5
Number of top-class tertiary hospitals	174	201	100
Proportion of IT Companies in China (%)	32.5	24.8	14.5
Fund raising for healthtech (2018–20) (Billion USD)	3.7	13	2.8
<b>Healthtec companies / services</b>			
Biopharma companies	168	256	85
Biotech R&D services	134	280	63
Therapeutic diagnostic companies	46	192	40
Medical device companies	2,709	7,344	3,747
Digital health IT companies	34	22	8

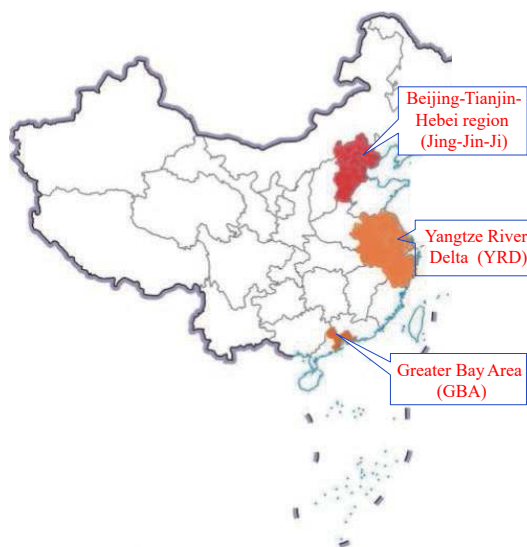


FIGURE 2. Comparison of Three Mega-city Clusters in Healthtech Development (4,7,11–19).

accredited, positioning the territory as a guide and resource for the two other city clusters to enhance competitiveness. Against this cooperative backdrop, the GBA can narrow its healthtech focus and partner with national and international counterparts to compete against global technology hubs.

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## REFERENCES

1. CBRE. Programing Asia Pacific Cities as Global Tech Hub. 2019. [https://www.cbre.com/-/media/images/asia-pacific/2019/Tech-Clusters/Featured-Articles/Feature\\_article\\_Winning\\_the\\_race\\_of\\_tech\\_talent\\_v2.pdf](https://www.cbre.com/-/media/images/asia-pacific/2019/Tech-Clusters/Featured-Articles/Feature_article_Winning_the_race_of_tech_talent_v2.pdf). [2021-12-1].
2. DBS Vickers Securities. Greater Bay Area: In-depth Study. [https://www.dbs.com.sg/vickers/en/research/featured/190515\\_insights\\_greater\\_bay\\_area.page](https://www.dbs.com.sg/vickers/en/research/featured/190515_insights_greater_bay_area.page). [2021-12-1].
3. The Hong Kong Trade Development Council. PRD Economic Profile. <https://research.hktdc.com/en/data-and-profiles/mcpc/provinces/guangdong/pearl-river-delta>. [2021-12-1].
4. China.org.cn. China's three major megalopolises compared. [http://www.china.org.cn/china/2019-12/30/content\\_75563387.htm](http://www.china.org.cn/china/2019-12/30/content_75563387.htm). [2021-12-1].
5. The Central People's Government of the People's Republic of China. The Fourteenth Five-Year Plan for the National Economic and Social Development of the People's Republic of China and the Outline of the Long-term Goals for 2035. [http://www.gov.cn/xinwen/2021-03/13/content\\_5592681.htm](http://www.gov.cn/xinwen/2021-03/13/content_5592681.htm). [2021-12-1]. (In Chinese).
6. Hong Kong Special Administrative Government. Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area. [https://www.bayarea.gov.hk/filemanager/tc/share/pdf/Outline\\_Development\\_Plan.pdf](https://www.bayarea.gov.hk/filemanager/tc/share/pdf/Outline_Development_Plan.pdf). [2021-12-1]. (In Chinese).
7. CrunchBase. Tech Scaleup Silicon Valley-2021 Report. Mind the Bridge; 2021. <https://mindthebridge.com/tech-scaleup-silicon-valley-2021-report/>
8. Ledford H. Start-ups fight for a place in Boston's biotech hub. *Nature* 2015;522(7555):138 – 9. <http://dx.doi.org/10.1038/522138a>.
9. Ledford H. Biotech boom prompts fears of bust. *Nature* 2013;500(7464):513. <http://dx.doi.org/10.1038/500513a>.
10. StartUs Insight. Disrupting Biotechnology: Breakdown On Startup Driven Innovation. <https://www.startup-insights.com/innovators-guide/disrupting-biotechnology-breakdown-startup-driven-innovation/>. [2021-12-1].
11. Silicon Valley Bank. China in the Global Healthcare Ecosystem Strong Venture Growth Drives Innovation. 2020. <https://www.svb.com/globalassets/library/managedassets/pdfs/china-global-healthcare-report-2020.pdf>. [2021-12-1].
12. Greater Bay Area. GBA Cities. <https://www.bayarea.gov.hk/en/about/the-cities.html>. [2021-12-1].
13. Statista. Number of unicorn companies in China as of April 2021, by industry. <https://www.statista.com/statistics/897674/china-unicorn-company-distribution-by-sector/>. [2021-12-1].
14. Zhang KR, Liu WY. The current status, trend, and development strategies of chinese biopharmaceutical industry with a challenging perspective. *SAGE Open* 2020;10(1):1 – 16. <http://dx.doi.org/10.1177/2158244020901529>.
15. Tencent. The development status of the medical device industry in the Beijing-Tianjin-Hebei urban agglomeration. <https://new.qq.com/omn/20200907/20200907A05NBM00.html?pc>. [2021-12-1] (In Chinese).
16. China Internet Medical Channel. Scale of medical device industry in Yangtze River delta 2020. <http://med.china.com.cn/content/pid/268820/tid/1026/iswap/1>. [2021-12-1]. (In Chinese).
17. Forward Business and Intelligence Co., Ltd. Medical Device Industry in Guangdong Province 2020. <https://bg.qianzhan.com/trends/detail/506/201013-c579144d.html>. [2021-12-1]. (In Chinese).
18. Chinese Biotech Database. Life Sciences Map of China Mainland. <http://www.biotechgate.com/cn/portal/map.php>. [2021-12-1].
19. AmCham Shanghai: L.E.K. GPS Healthcare Quarterly: Innovation in China, "Made in China 2025" and Implications for Healthcare MNCs. [https://www.lek.com/sites/default/files/insights/pdf-attachments/Chinas-Healthcare-Innovation-by-Made-in-China-2025-and-Implications-for-MNCs\\_JUL06.pdf](https://www.lek.com/sites/default/files/insights/pdf-attachments/Chinas-Healthcare-Innovation-by-Made-in-China-2025-and-Implications-for-MNCs_JUL06.pdf). [2021-12-1].