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YANG Yu

CAS Key Laboratory of Regional Sustainable Development Modeling, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China; College of Resources and Environment, University of Chinese Academy of Sciences, Beijing 100049, China; Institute of Strategy Research for Guangdong, Hong Kong and Macao Greater Bay Area, Guangzhou 510070, China

See next page for additional authors

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Abstract

Urban agglomerations, including Beijing-Tianjin-Hebei, the Yangtze River Delta and the Pearl River Delta regions, are the large clusters both from population and economic perspectives and have the most active vitality of innovation. To be the worldclass urban agglomerations, population function regulation should highlight the roles of the carrying capacity of resources and the environment, allocation of public service resources, and the challenges of global competitions in the fields of economy and technology. We firstly review the classic theories. Then the distinct characters of population function regulation in urban agglomerations are figured out. Accordingly, the basic laws of population function regulation in urban agglomerations are put forward. In addition, the differentiated strategies are introduced to optimize the population functions in Beijing-Tianjin-Hebei, the Yangtze River Delta and the Pearl River Delta regions. Our policy implications aim to promote evolution of urban agglomerations with a more advanced and healthier process, especially during the 14th Five-Year Plan period.

Keywords

urban agglomeration; world-class; population function; Beijing-Tianjin-Hebei region; the Yangtze River Delta region; the Pearl River Delta region; spatial optimization

Authors

YANG Yu, QI Wei, MA Li, and LIU Yi

Corresponding Author(s)

YANG Yu 1,2,3*

1 CAS Key Laboratory of Regional Sustainable Development Modeling, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China

2 College of Resources and Environment, University of Chinese Academy of Sciences, Beijing 100049, China

3 Institute of Strategy Research for Guangdong, Hong Kong and Macao Greater Bay Area, Guangzhou 510070, China

YANG Yu Ph.D., Professor of CAS Key Laboratory of Regional Sustainable Development Modeling, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences (CAS); Specially-appointed Professor of the Institute of Strategy Research for Guangdong, Hong Kong and Macao Greater Bay Area, member of Youth Innovation Promotion Association of CAS.His research area covers regional studies and energy geopolitics.He has been the PI and the key member of more than 40 projects and published more than 100 papers. E-mail:yanyu@igsnrr.ac.cn Citation: YANG Yu, QI Wei, MA Li, LIU Yi. Spatial Optimization Strategies of Population Function in China's World-class Urban Agglomerations During 14th Five-Year Plan Period [J]. Bulletin of Chinese Academy of Sciences, 2020 (7): 835–843.

Spatial Optimization Strategies of Population Function in China's World-class Urban Agglomerations During 14th Five-Year Plan Period

YANG Yu^{1,2,3}, QI Wei^{1,2}, MA Li^{1,2}, LIU Yi^{1,2,3}

1. CAS Key Laboratory of Regional Sustainable Development Modeling, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China;

2. College of Resources and Environment, University of Chinese Academy of Sciences, Beijing 100049, China;

3. Institute of Strategy Research for Guangdong, Hong Kong and Macao Greater Bay Area, Guangzhou 510070, China

Abstract: Urban agglomerations, including Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta regions, are the large clusters both from population and economic perspectives and have the most active vitality of innovation. If world-class urban agglomerations are to be built, population function regulation should highlight the roles of the carrying capacity of resources and the environment, allocation of public service resources, and the challenges of global competitions in the fields of economy and technology. We firstly review the classic theories. Then the distinct characters of population development in China's urban agglomerations are figured out. Accordingly, the basic laws of population function regulation in urban agglomerations are put forward. In addition, the differentiated strategies are introduced to optimize the population functions in Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta regions. Our policy implications aim to promote the evolution of urban agglomerations with a more advanced and healthier process, especially during the 14th Five-Year Plan period. **DOI:** 10.16418/j.issn.1000-3045.20200419001-en

Keywords: urban agglomeration; world-class; population function; Beijing-Tianjin-Hebei region; the Yangtze River Delta region; the Pearl River Delta region; spatial optimization

Urban agglomeration bespeaks the highest degrees of openness and economic vitality and the strongest innovation. If China's high-quality development is to be secured and regional governance is to be modernized, China's urban agglomerations must develop in a sound manner ^[1,2]. The National Major Function Oriented Zoning, Outline of the 13th Five-Year Plan for the National Economic and Social Development, and National New Urbanization Plan (2014–2020) of China all put forward plans and schemes for the construction of different types of urban agglomerations, regional urbanization, and population regulation providing top-level design and targeted guidance for the healthy development of urban agglomerations. During the 13th Five-Year Plan period, urban agglomerations, as the main players of China's new type of urbanization, attracted a large rural population to cities. In 2019, the urbanization level of China's permanent residents exceeded 60%. Urban agglomeration has evolved from "the pursuit of scale" to "the enhancement of function." Over years, urban agglomerations have failed to completely address the severe problems of population aging, urban residency of transient population, cross-border talent pooling, industrial transformation and upgrade, ecological environmental protection [3-5]. If world-class urban agglomerations are to be built, population function regulation should highlight the roles of the carrying capacity of resources and the environment, allocation of public service resources, and the challenges of global competitions in the fields of economy and technology, especially during the 14th Five-Year Plan period.

Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta regions, as the most developed urban agglomerations in China, lead the country in institutional innovation, scientific and technological advance, industrial upgrade, and green development [6,7]. In terms of scale, these three major urban agglomerations can be called world-class big cities. However, in terms of comprehensive competitiveness and the competition for and allocation of global high-quality resources, these three urban agglomerations fall much behind the Atlantic coastal urban agglomeration in northeastern United States, the Pacific coastal urban agglomeration in Japan, and the urban agglomeration in northwestern Europe. To grow into world-class urban agglomerations in terms of both scale and function during the 14th Five-Year Plan period, Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta urban agglomerations should work hard to address the following

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problems: how to enhance the industrial and economic functions and improve the resource allocations of high-end manufacturing and economy based on knowledge innovation in the global value chain; how to strengthen innovative and cultural environment, enhance talent magnetizing effect on the global scale, and update technological research and development capacities so as to sharpen the overall competitiveness of the country in the global innovation network; how to better coordinate the functions between cities within an urban agglomeration, promote optimal distribution of various factors within the region to plan the layout of population, industries, and public services in an orderly manner so that people can be content with their life and develop a sense of fulfillment toward their career.

In essence, addressing problems common to all urban agglomerations or the ones specific to the Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta regions in their aspiration for becoming world-class urban agglomerations calls for improving the existing functions and aligning population function with the status of a world-class urban agglomeration. Only after population function corresponding to the status of a world-class urban agglomeration is established can industrial development, scientific and technological innovation, and talent pooling work together to jointly promote the development of urban agglomerations. We firstly review the classic theories. Then the distinct characters of population development in China's urban agglomerations are figured out. Accordingly, the basic laws of population function regulation in urban agglomerations are put forward. In addition, the differentiated strategies are introduced to optimize the population functions in Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta regions. Our policy implications aim to promote the evolution of urban agglomerations with a more advanced and healthier process, especially during the 14th Five-Year Plan period.

1 Theories and evolution of spatial optimization of population functions of urban agglomerations

In nature, the population function regulation of urban agglomerations is to align the population size, structure, and function with the scale, structure, spatial organization, and functional structure of urban agglomerations in the process of population agglomeration and population flow (Figure 1). In this process, the fundamental geographical propositions comprise the geographical spatial variation of population size, structure, function, and their dynamic mechanism. Such variation and dynamic mechanisms are time-phased and spatially differentiated due to the different development stages and geographical distribution of influencing factors.



Figure 1 Aligning population function with urban agglomeration function and corresponding shaping

The focus of population research on urban agglomerations has shifted from rural-urban migration to city-to-city migration. The classic Zelinsky's hypothesis of the mobility transition provides theoretical support for the geographical spatial changes in population size and structure during the transition period ^[8]. As social development further advances, the rural-urban migration has shown a downward trend, while the city-to-city migration, intra-city migration, and circular flow show an upward trend but with a reduced increasing rate. Zipf's law is applied to reveal the rank-size theoretical relationship. Cities scoring high in both rank and size are characterized by population agglomeration^[9]. Urban agglomerations, characterized by a cluster of cities, are where most megacities, metropolises, and big cities of a country leading in rank and size concentrate. At first, rural-urban migration was the primary driving force of urbanization. These cities ranking top became the chief destinations of migrant population. As urbanization furthers, urban agglomerations will be densely populated, featuring high degree of urbanization and frequent city-to-city migration.

As the function of urban agglomerations upgrades, more and more theories have shifted their attention from the scale effect of "population" to the functional structure of "talents." The dual labor market theory distinguishes the main labor force from the secondary labor force. It holds that educated population constitutes the main labor force that tends to flock to modern prosperous cities. At the same time, low-skilled jobs in cities are mainly taken up by migrant population. The labor force, regardless of high-skilled or low-skilled, all floods to cities^[10]. According to the new geography of jobs, owing to globalization and technological advance, the spatial transfer and agglomeration of knowledge-intensive industries has created a "snowball" effect of spatial agglomeration of high-skilled talents, attracting a large number of international and domestic talents and promoting lasting economic prosperity and population-scale expansion. On the other hand, the development of innovation-free cities is lackluster and even shrinking ^[11]. Urban agglomerations are more than a cluster of cities for people to settle down. They are important vehicles of global economic and technological competition. They shall serve as the driver of science and technology development. Their function shall evolve from population aggregation to talent pooling. In the era of globalization, on top of being the hub of domestic talents, urban agglomerations should be the magnet to international talents, making them live and work in content there.

The recent theory of spatial optimization of population function of urban agglomerations focuses on the carrying capacity. Space is not homogeneous. Whether the spatial changes in population size, structure, and function match the spatial attributes of nature and human geography is an important factor in scientific spatial optimization of population function. 1) Paying attention to the carrying capacity of resources and environment, emphasizing the harmony of urban development with water resources, land resources, atmospheric environment, etc., and promoting the sustainability of urbanization development. The Major Function Oriented Zoning (MFOZ) theory points out the difference in population concentration between different function-oriented zones ^[12–14]. In practice, the National Population Development Plan (2016-2030) clearly proposes to formulate and improve population policies supporting MFOZ. Pertinent theories on the carrying capacity of resources and environment in urban agglomerations have been put forward one after another ^[15]. It is believed that, in light of different types of carrying capacity of urban resources and environment and major function-oriented zones, it is necessary to promote the orderly agglomeration and distribution of population along with industry among different cities within an urban agglomeration. 2 Highlighting the carrying capacity of social public service resources, and emphasizing that urban development must value soft environment such as education, medical care, and elderly care to promote the high-quality development of urbanization. The uncertain geographic context problem (UGCoP) further introduces the dynamic spatial-temporal characteristics of resident behaviors and points out that areal units possibly able to divide individual behaviors deviate from the true geographic context^[16]. Urban agglomerations are not assembled by cities isolated from each other. With the frequent spatial-temporal city-to-city people exchanges, cities shall make joint efforts to mutually promote the integration of public service resources and share relevant achievements so as to meet people's increasing need for a better life and public services that are provided for the elderly, international immigrants, and floating population.

2 Characteristics and problems of spatial optimization of population function of urban agglomerations in China

2.1 High population density in urban agglomerations and the overall expanding trend of population size

Urban agglomerations are densely populated. Spurred by National Major Function Oriented Zoning, Outline of the 13th Five-Year Plan for the National Economic and Social Development, National New Urbanization Plan (2014–2020) of China, urban agglomerations are to improve structural function of central cities and coordinate big, medium-sized, and small cities through spatial optimization and sound population concentration. Of the permanent population calculated from the 1% population sample survey in 2015, as of 2015, a total of 1.014 billion people in China lived in urban agglomerations, accounting for 75% of the national population (Figure 2). Of them, Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta urban agglomerations are the largest, with population totaling 321 million, accounting for 23.43% of the overall national population. They are the three urban agglomerations with the highest population density, the largest migrant population, and the most frequent people-to-people exchanges in China. From 2010 to 2015, the total population of urban agglomerations showed positive growth, and their population size showed a trend of expansion. The population share of Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta urban agglomerations has been on sustainable rise (Figure 3), while that of other urban agglomerations has been on decline to various degrees. It is still obvious that population floods to the Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta regions. In the future, the optimization and regulation of Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta urban agglomerations will face the dual pressures and challenges of the overall increase in population and the optimization of the population function within the urban agglomerations.

2.2 Structural problems such as aging population, floating population, and talents pose new challenges to the population function regulation of urban agglomerations

The mismatch between urban agglomeration function and population structure is intensified, mainly manifested in the functions of aging population, floating population, and talents.



Figure 2 Density of permanent population in China and the regional population distribution of urban agglomerations (2015)

Data from Hong Kong, Macao, and Taiwan are missing.



Figure 3 Changes in the annual average growth rate of regional permanent population in China's urban agglomerations (2015)

(1) Urban agglomerations face a prominent problem of population aging. According to the international standard, once the population aged above 65 accounts for 7% of the total population, population aging has become a social problem. Such rate in China reached 10.47%, according to the data from the 1% population sample survey in 2015 above. Specifically, such rate in the Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta regions amounted to 10.28%, 12.54%, and 6.32%, respectively (Figure 4). These three urban agglomerations face the challenging problems of providing for the aged and maintaining innovation vitality.

(2) The problem of the floating population is prominent. The net population migration rate of the core cities of the urban agglomeration is still significantly higher than those of other cities. The household registration threshold in Beijing, Shanghai, Guangzhou, and Shenzhen is still rather high. The proportions of permanent population in the Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta regions are generally higher than those of the registered population. These urban agglomerations are still under the pressure of addressing problems of urban residency and the integration of public service facilities ^[17,18] (Figure 5).

(3) Talent structure has become an important factor affecting the function regulation of urban population. Urban agglomeration has become the first choice for domestic talents. In 2015, the proportions of permanent population with college education or above in Beijing-Tianjin-Hebei, the Yangtze River Delta, and Pearl River Delta reached 17.11%, 18.11%, and 15.80% respectively, all being significantly higher than the national average (Figure 4). With regard to international talents, in 2015 the number of overseas experts working in Beijing-Tianjin-Hebei, the Yangtze River Delta regions reached 96,400, 240,600, and 129,900, respectively (statistics based on provincial unit). However, compared with the Atlantic coastal urban agglomeration in northeastern United States, the urban

agglomeration in San Francisco Bay area of the United States, the Pacific coastal urban agglomeration in Japan, and the urban agglomeration in northwestern Europe, Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta urban agglomerations show significantly small reserve and proportion of international talents. According to the Global Talent Competitiveness Index (GTCI) Report 2020, only a few cities in mainland of China, such as Beijing, Shanghai, Hangzhou, Nanjing, Shenzhen, and Guangzhou, were ranked top 100, far lower than other core cities in world-class urban agglomerations. Talent function is an important part of the population function regulation of urban agglomerations in the new era. Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta urban agglomerations should not only lead the promotion of domestic human capital, but also attract international talents to enhance global innovation and scientific and technological competitiveness.



Figure 4 Population aging (a) and talent (b) structures of Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta regions



Figure 5 Net population migration rate of China's urban agglomerations in 2015

2.3 Industrial transformation and upgrade and competition in scientific and technological innovation pose new challenges to the optimization of population function within urban agglomerations

Since the reform and opening up, the "world factory" effect has promoted the drastic "population-industry" agglomeration of cities in coastal areas. In the process, industries are appealing to talents, talents are promoting the

upgrade of industries, and industries and cities are mutually reinforcing each other. This has given rise to large-scale urban agglomeration. Urban agglomerations no longer show hierarchical structures possessing distinct rank distribution with central cities as the core. Instead, they tend to be diversified. Different urban agglomerations have different feacities of Hebei Province tures. Most in the Beijing-Tianjin-Hebei urban agglomeration are still small and medium-sized. So, it displays a center-periphery hierarchical structure. Most cities in the Pearl River Delta have developed into megacities, metropolises, and big cities. So, the Pearl River Delta urban agglomeration exhibits the features of big cities dominated network. The Yangtze River Delta region has developed into an urban agglomeration in which large, medium-sized, and small cities are coordinated with each other. In 2019, the urbanization rate of China's permanent population exceeded 60%. The growth of urban population and the expansion of urban scale have slowed down. Urban agglomeration faces the challenging transition from scale increase to function optimization. 1 Influencing the labor structure by industrial transformation and upgrade. Foreign capital divestment, industrial transfer, and replacement of old growth drivers with new ones have posed challenges to the industrial transformation of traditional manufacturing cities. Technical workers in the manufacturing industry face the challenges of how to switch jobs or industries, seek employment, and settle down. 2 "Talent competition" in the era of scientific and technological innovation. Digital economy, smart manufacturing, and cutting-edge science and technology are important for improving the overall competitiveness of modern urban agglomerations. Urban agglomerations face the challenges of how to coordinate human capital strength between cities and how to improve scientific and technological innovation. ③ Intensified "city-to-city" population migration. As prioritized industries, employment opportunities, education, medical care, recreation, and sports resources converge in megacities, metropolises, and big cities, population migration from low-tier cities to high-tier cities is intensifying. It has become a challenge to coordinate the division of functions among large, mediumsized, and small cities and to improve the population attraction of medium-sized and small cities.

2.4 Progress in eco-environmental field and the appeal of living environment pose challenges to the orderly gathering and distribution of population function in urban agglomerations

For a long time, China's industrialization and urbanization have developed at the expense of resources and environment. In the new era, under the pressure of the promotion of progress in eco-environmental field and people's increasing demand for pleasant living environment, urban agglomerations have to, within their carrying capacity, re-organize and optimize their resources to create a quality living circle with

excellent public services for living and working. (1) Urban agglomerations' carrying capacity of resources and environment will not increase infinitely and background conditions are not homogeneous, making it rather difficult for urban agglomerations to infinitely expand their scale and member cities to cluster in a disorderly manner. For example, some member cities of the Beijing-Tianjin-Hebei urban agglomeration suffer from water shortage. And for another example, the bottleneck problem of land resources in Shenzhen City is still prominent. It has become a challenge to coordinate the population carrying capacity between different urban agglomerations and between different member cities of the same urban agglomeration and promote the orderly allocation and reorganization of trans-regional natural resources. 2 How to create a pleasant living environment and how to protect environment have still been serious problems to be tackled. The most typical example is how to deal with haze and how to dispose of solid waste. For example, many people in the Beijing-Tianjin-Hebei region are exposed to haze, and "cities besieged by solid waste" caused by urbanization can be observed. These problems have seriously affected the living environment and ecological environment protection and residents' health. How to improve the environmental governance level of urban agglomerations and form a reasonable layout suitable for living, travel, and industry in urban agglomerations is a serious challenge. ③ Urban residents have a growing need for the happiness from and satisfaction with living environment. Greenbelt, square, park, and suburban recreation sites are important open space to improve residents' physical and mental health. So, it is urgent to make joint efforts to improve the living environment within urban agglomerations and suburban environment at the urban juncture in an integrated manner and share achievements thus made.

3 Fundamental strategies of spatial optimization of population function of world-class urban agglomerations

During the 14th Five-Year Plan period, Beijing-Tianjin-Hebei, the Yangtze River Delta, and Pearl River Delta urban agglomerations will still maintain their population and economic magnetization. Speeding up the construction of world-class urban agglomerations and integrating into the world urban network at a higher level to link and regulate global resources are in line with China's national urbanization development strategy with urban agglomerations as the main formats and the objective laws of the development of urban agglomerations. World-class urban agglomerations are the hubs in the global city network. They are capable of allocating global resources for technology innovation, cultural communication, and development of modern economy. This calls for the function oriented restructuring of urban

agglomerations through functional relief and regional coordination. (1) Urban agglomerations should place central cities at the core. The construction of urban agglomerations should emphasize pooling high-caliber talents and shaping population functions matching world-class urban agglomerations. Urban agglomerations are expected to lead global technology innovation and cultural communication. (2) As urban agglomerations participate in global competition as a whole, they have to make sound allocation of population and industrial layout, shaping a city-region organizational pattern for the development of modern economy. Optimizing the population layout within urban agglomerations can lessen the "urban diseases" caused by excessive population concentration in megacities. Meanwhile, it is an essential approach to improve the level of population function of world-class urban agglomerations and the competitiveness of urban agglomerations' participating in global competition. 3 Spatial optimization of population function with global vision needs to consider differentiated needs of multiple types of the population of world-class urban agglomerations for urban space and urban function so as to improve the overall carrying capacity of urban agglomerations (Figure 6).

(1) On the premise of sustained population agglomeration, efforts should be made to enhance the comprehensive population carrying capacity of world-class urban agglomerations. We should optimize population function during the increase in overall population in line with the objective law that population and economy tend to converge in advantageous regions. Endeavors should be made to innovate in the regional spatial organization of population function, construct livable towns or specialized core towns around the core circle of urban agglomerations. In this way, high-quality residential communities are established in the suburbs, which will render a poly-center megacity.

(2) The energy level of metropolises (central cities in urban agglomerations) is to be improved. By regulating the functions of metropolises and establishing corresponding policies for talents and land, the population relief of megacity can be updated. A metropolis should be a comprehensive hub centered on information and decision-making. Besides, it serves as a cultural window and a portal. It is concentrated on innovation, creation, and modern economy. Its core strategy is to set up a talent system with global vision so as to turn the metropolis into a working place and living community pooling high-end international talents and reaching the world's leading level. Non-core functions of megacities such as technology, industry, public services, and employment are planned and arranged to spread at the same pace to mediumsized cities. High-quality economic restructuring and spatial structure optimization of urban agglomerations are promoted through a high-quality employment structure. In this way, medium-sized cities gradually grow into the main vehicle of industrial coordination and regional coordination of urban agglomerations.

(3) Optimization and coordination of population function, industrial function, and urban function layout of urban agglomerations are promoted by taking multiple policies simultaneously. Through the spatial optimization of industrial functions within an urban agglomeration, the urban agglomeration can attract talents through thriving industries, and keep talents by employment security. Living environment should be homogeneous and has its own unique characteristics at the same time. Different towns should develop different appealing power to different types of talents so that industries are established where talents converge. On the basis of different concepts such as job-housing balance and "lifelong service," China will develop functional and attractive cities and towns to improve people's well-being in life. Efforts must be stepped up to establish an institutional system against population aging and a public service system provided for the aged with small and medium-sized cities as the main players to provide core services of social security, elderly service, health support, and a pleasant living environment. Aging people in megacities are encouraged to be relocated to small and mediumsized cities. Poly-center, pleasant towns with health and senior care functions, therefore, become an important part of urban agglomerations.



Figure 6 Regional reconstruction model of function oriented urban agglomerations

4 Regional strategies for the spatial optimization of population function of world-class urban agglomerations

The Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta urban agglomerations are clearly different from each other in dynamic mechanism of development, population layout and organization pattern, relations between member cities within the urban agglomerations, and regional integration. This is attributed to multiple factors such as natural geographical conditions, geographical location, economic policies, development inertia, regional culture, and development philosophy. These differences result in unique regional characteristics of Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta urban agglomerations respectively. Regarding their efforts to build themselves into a world-class urban agglomeration, they face different challenges and their progress varies. Their matching degree between population layout and urban functions varies. They are expected to implement targeted and differentiated strategies for optimizing population function and layout to grow themselves into unique, competitive, and strategically mutually complementary world-class urban agglomerations so that China's main formats of urbanization can evolve in a more advanced and healthier manner.

4.1 Beijing-Tianjin-Hebei urban agglomeration

The priorities are to enhance the core functions of Beijing as China's capital and vigorously promote the integration of Beijing, Tianjin, and Hebei. Population and employment are optimized and agglomerated through dislocation competition and differentiated development. Apart from the core functional area (Dongcheng District and Xicheng District), the core security area of capital function (within the Fourth Ring Road in Beijing) should be designated. Through indicators such as construction density, building height, and tenant density, the area will improve the living quality and raise the talent threshold in the core district, and strengthen the absorbing capacity of high-end talents and industries such as finance, culture, and scientific and technological innovation with Beijing, Tianjin, Zhangjiakou, Chengde, Baoding, and Langfang as the core cities. On the basis of policies such as administrative division adjustment and tax sharing, fast rail transit and collectivized public services serve as means of expediting the construction of the capital economic circle. In this process, land utilization planning, industrial allocation, and tax sharing are standardized to promote egalitarian access to public services. The areas around Beijing and Tianjin (such as Huailai and Chicheng in Zhangjiakou City; Fengning, Luanping, and Xinglong in Chengde City; Sanhe, Dachang, Xianghe, Yongqing, Gu'an, Zhuozhou, and Laishui in Langfang City) will promote differentiated high-grade and lowdensity characteristic towns, which will attract high-end industries and talents through unique research and development,

tourism, and recreation and maintain orderly and intensive housing market through relevant tax policies (such as high housing property tax). Restriction on household registration will be fully relaxed in cities of southern Hebei Province.

4.2 Yangtze River Delta urban agglomeration

The priorities are to improve the scale, structure, and functional layout of the urban agglomeration so as to address the problems of being "large, all-inclusive, and sporadic" and industrial isomorphism in cities and restructure the division of functions of the urban agglomeration. Steps are taken to strengthen the construction of metropolitan areas of Shanghai, Nanjing, Hangzhou, and Hefei. Through industrial transfer, this urban agglomeration will give priority to suburban and satellite towns in terms of the allocation of population, transportation infrastructure, and public resources, and promote the high-quality development of central cities and the relief of population functions. It is recommended that high-quality satellite towns and characteristic towns are built around metropolitan areas to pool high-caliber talents to promote unique R&D and plan industries. Industries are to be developed to pool more and better talents. Policies regarding taxation, household registration, education, and long-distance sharing of medical insurance should be issued and implemented to propel standardized industrial parks themed on manufacturing to transfer as a whole from inside the four metropolitan areas to cities outside. Vigorous joint efforts should be made to improve and govern infrastructure and public services and share relevant corresponding achievements so as to provide egalitarian access to public services within the metropolitan areas. Full urbanization should be realized within metropolitan areas. Market-driven allocation of land resources should be promoted. Taxation should serve as a tool to fully tap out the architecture building potential and utilization efficiency. Ecological space should be well preserved. Rural household registration should be completely abolished. Urban public services should cover all permanent population. Farmers and urban residents can gain equal access to opportunities and basic public services. Modern residency should be realized for migrating farmer population.

4.3 Pearl River Delta urban agglomeration

Guangzhou and Shenzhen will be built into hub cities of the global innovation network. More international top and high-caliber talents will be brought in while general labor import will be limited. The construction of Guangdong-Hong Kong-Macao talent cooperation demonstration zone is accelerated to promote cross-region, cross-industry, and cross-system flow of talents. Limitations on business start-up and house purchasing should be relaxed for high-caliber talents from international and domestic top universities and colleges as well as science and technology institutions. Infrastructure connectivity and public service sharing of Guangzhou and Shenzhen with Foshan, Dongguan, and Zhongshan should be strengthened. An integrated urban

circle with efficient commuting should be fostered to facilitate the living of cross-city commuters so as to attract and absorb the distribution of applied, skilled, and qualified labor from megacities. The landscape resources of mountain, sea, forest, and lake should be made full use of to build high-quality towns with health and senior care functions and those featuring elderly care in cities of Zhuhai, Zhaoqing, Jiangmen, and Huizhou. Industrial parks should be established for the elderly aged between 60 and 69 to seek re-employment. Embedded elderly care service centers should be set up to correspond to the aging population in Hong Kong, Guangzhou, Shenzhen, Dongguan, and Foshan. The northern part of Guangdong Province and the western bank of Guangdong, Hong Kong and Macao Greater Bay Area (GBA) will be built into landscape cities pleasant for living, travel, and recreation so as to improve the living quality of GBA residents.

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YANG Yu, corresponding author, PhD, Professor of CAS Key Laboratory of Regional Sustainable Development Modeling, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences (CAS); Specially-appointed Professor of the Institute of Strategy Research for Guangdong, Hong Kong and Macao Greater Bay Area, member of Youth Innovation Promotion Association of CAS. His research area covers regional studies and energy geopolitics. He has been the PI and the key member of more than 40 projects and published more than 100 papers. E-mail: yanyu@igsnrr.ac.cn