Chapter 1
Overview of the Fundamental Connotation and Strategic Position of China's Urban Agglomerations

Urban agglomeration is a highly integrated and urbanized cluster of cities. Via extensive literature research and quantitative analysis, this work combs through 120 years of studies and research on the connotation of urban agglomeration and how urban agglomeration's spatial extents are defined, then proposed 10 definition criteria based on the review. In this study, we regard the formation of urban agglomerations is a process during which the relationships among cities shift from mainly competition to both competition and cooperation. Cities within the urban agglomerations experience an intensive integration and urbanization process. Via the analysis of the domestic and international strategic positions of urban agglomeration, this study concludes that urban agglomeration development has been raised to a national strategic position. Specifically, a series of national government documents produced from national conferences, such as the Central Urbanization Work Conference, the Central City Work Conference, and the *National New Urbanization Plan (2014–2020)* during the 12th Five-Year Plan (2011–2015), all for the first time regards urban agglomerations as the primary carriers for China's New Urbanization development strategy. Recently, the trend is carried over in the State Council of the People's Republic of China issued the 13th Five-Year Plan (2016–2020) as urban agglomerations are again mentioned as the primary carrier for China's New Urbanization development strategy. In the meantime, urban agglomerations also serve as important new territorial units for China to participate in global competition and division of labor and shoulder an unprecedented responsibility to accommodate the shift of global economic gravity center and be the primary stages for China's international integration and development strategy. Our study strongly suggests that the global urban agglomeration development has steadily entered a "China Era" during the 21st century.

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1.1 Defining Urban Agglomerations

The study starts with an extensive literature review and analysis for the past 120 years. As of the writing of this book, our search produces 83,332 (among them, 32,231 are from international sources, and 51,101 are from Chinese sources) results that are related with urban agglomeration or relevant concepts. By combing through these literature, we attempt to reconstruct the historical evolutionary trajectory of the concept of urban agglomeration, so that we are able to define as scientifically as possible the concept of urban agglomeration and its spatial extent.

1.1.1 Scientifically Defining Urban Agglomerations

1. **One hundred years of urban agglomeration evolution**

As early as 1898, the British urban scholar, pioneer of modern urban planning and social activist Ebenezer Howard proposed the concept of the "town cluster" in his book *Garden Cities of Tomorrow*. This concept deviated from the then popular spatial focus on cities themselves. Howard attempted to study as an integrated entity the spatial organization and internal dynamics between cities and their surrounding countryside. In his vision of the urbanized landscape, the urban form is not only the areas occupied by cities but also an area comprising several peripheral Garden Cities integrated with a Central City. This concept eventually evolved into the early forms of the "Garden City" model of urban agglomeration [1].

In 1915, the British sociologist and humanist urban planner Patrick Geddes published his *Cities in Evolution*, based on his research on cities in the United Kingdom. Geddes was among the first scholars to employ a comprehensive regionalization approach to exploring the internal dynamics of cities and the process of urbanization. He observed the co-existence of urban sprawl and the over-concentration of both cities and industrial and economic activities. Geddes further argued that urban sprawl was a result of over-separation between cities and their suburban areas, whereas over-concentration was a result of the concentrated locations' having apparent resource advantages (such as coal) and transportation conveniences (such as intersections among railways, highways, and waterways). Geddes regarded such a concentration of urbanization and collective human activities as a new form of population development. He predicted that this conurbation/urban cluster would be the future trend of urbanization development. In his analyses, he also identified seven concentrated urban areas and one London urban cluster in the United Kingdom. During this same period, newly emerging urban clusters could be identified in the Greater Paris region of France, the Berlin-Ruhr region of Germany, the Pittsburgh-Chicago region of the United States and the Greater New York region of the United States [2].

In 1918, the Finnish urban scholar E. Saarinen proposed the theory of organic decentralization, which regarded cities as "organic entities", in his work The City-Its Growth, Its Decay, Its Future. Saarinen suggested that the development of cities

should follow the order from chaotic concentration to ordered decentralization. The Greater Helsinki Master Plan was based on this theory. Similar master plans started to appear in various countries, suggesting that studies on urban clusters were attracting increasing attention [3].

In 1920, scholars in the Soviet Union also proposed a variety of concepts to describe the clustering of cities that was similar to urban agglomeration. These concepts included the urban economic zone, the economic city, and the planned area. Scholars such as Bogelade also studied the urbanization and clustering process in Ukraine. These researchers proposed a set of indicators, including the minimum amount of population in the central city, the minimum number of peripheral residential locations, and the distance from the central city to the edge of the cluster, to identify spatial extension and forms of urban agglomerations [4].

In 1931, Fawcett (1932) argued that a conurbation, as proposed by Geddes (1915), is a place of continuous urban areas that are not separated by rural lands. The British Census Bureau coined the expression "Aggregates of Local Authority Area", which defined urban agglomeration/conurbation. This concept was very similar to the "Metropolitan Regions", as in the US census, "urban area", as in New Zealand, and "population agglomérée", as in France. All of these terms referred to a concentration of urbanized areas that had a higher concentration of population, urban functions and urban landscape [5].

In 1933, the German geographer W. Christaller proposed the Central Place Theory, which for the first time systematically defined the spatial organization and structure of a conurbation/urban agglomeration. This theory not only established the foundation for urban studies but also evolved to be the fundamental theory for regional development and analysis [3].

In 1939, M. Jefferson and G. K. Zipf studied the scale and spatial distribution of urban agglomerations. Zipf was also the first to introduce the gravity model to spatially analyze interactions among different urban agglomerations [3]. In 1942, R. Vinning further discussed the rationales of urban clusters/agglomerations.

In 1957, the geographer Gottmann published his study Megalopolis: The Urbanization of the Northeastern Seaboard of the United States, based on his work on urban areas and their spatial expansions in the United States. The term "megalopolis" was coined and clearly articulated. Gottmann further argued that the future direction of urbanization was the development and formation of megalopolises that gradually merged with nearby urban regions. Gottmann was regarded as the primary contributor to the study of urban agglomerations. Specifically, in his book, Gottmann clearly articulated that the cities in the Northeastern US were conveniently developed along major highways, railways and other main transportation lines. These cities were often highly connected, with a much higher concentration of complete industrial chains. Gottmann used the Greek term "megalopolis", which means large urban nation, to describe the BosWash corridor, which included the largest cities of Boston, New York, Providence, Hartford, New Haven, Philadelphia, Baltimore and Washington, Gottmann further proposed that a megalopolis must satisfy the following conditions: ① a megalopolis should have densely distributed cities that

maintain close socioeconomic connections with their peripheral regions; ② a megalopolis should have at least 25 million people with a population density of 250 people/km^2 or more; ③ a megalopolis should have a highly developed and efficient urban infrastructure (especially transportation and communication systems) so that the core cities are inherently interconnected; ④ a megalopolis should be one of the central regions of the nation and serve as an international node. In other words, a megalopolis is an enormous agglomerated urban area with a clear hierarchy centered on multiple cores (large cities) that are geographically close to one another and socioeconomically interconnected. From this study onward, research investigations on megalopolis/conurbation/urban agglomeration have attracted increased scholarly attention [6–12].

In 1964, based on Rostow's theory of economic development stages, Friedman developed a model that described economic development and its corresponding spatial manifestation. The model was well suited to investigating different stages and processes of urban agglomeration development [13].

In 1968, a Swedish scholar, Hagerstrand, proposed the modern spatial expansion theory, which lent power to an understanding of the spatial expansion process of urban agglomerations [14]. Two years later, the Greek scholar Doxiadis predicted that all urban areas would eventually evolve into a huge "ecumenopolis" [15].

In China in 1980, Song also proposed the concept of the "city-region" in his Research Method on Regional Economic-Geographic Foundation of City Development [16]. Conceptually, a city-region is an economic region with multiple economic centers. Subsequently, Zhou proposed the Metropolitan Inter-locking Region (MIR) concept, which was similar to the concept of a megalopolis. Zhou noted that the MIR was a large, integrated, urban-rural region with multiple core cities, had strong socioeconomic connectivity between the cores and peripheries, and was often located along one or more major transportation corridors [17]. McGee proposed another similar concept, the desakota (desa means rural region and kotameans cities), following his study on the urbanization of developing nations in Southeastern Asia [18]. Lynch constructed the concept of the dispersed metropolis [19]. In 1983, Zhang introduced Gottmann's work with the term "metropolis" in the Chinese context and formally set the theme and context for urban agglomeration studies in China [20]. All of these concepts closely followed Gottmann's megalopolis design from a theoretical perspective, though they were derived from a variety of different geographical/regional settings. The growth in various versions of the megalopolis concept clearly reveals a trend in the spatial organization and structures of urbanization toward more concentrated, highly connected, and larger-scaled urban forms.

Rondinelli summarized 7 types of connections within city-regions [21]. McLaughlin stressed the importance of rational planning for the sustainable and balanced development of megalopolises. The United Nations' Center for Human Cluster coined the term "urban agglomeration" to summarize all concepts that originated from, or were similar to, Gottmann's megalopolis and noted that the development of economic globalization and information technology had greatly promoted the formation of various urban agglomerations. This article follows the UN's convention and

uses urban agglomeration to represent this emerging spatial organization of clusters of cities [22].

Friedman investigated in detail the hierarchy and network within any urban system. Multinational corporations often design their longitudinal division of production areas based on the hierarchical structure of urban systems [23]. In 1989, McGee and Ginsburg et al. further explored the desakota concept based on their studies on Southeastern Asian countries. Although both desakota and megalopolis refer to a form of urban clusters, desakota, according to the study by McGee and colleagues, specifically refers to an integrated urban-rural region that contains two or more core cities linked with highly developed transportation systems and all the peripheral regions that are commutable within the same day [24, 25]. Dong applied similar concepts in Initial Exploration of China's Urbanization and defined the term urban agglomeration as follows: an "urban agglomeration, or urban cluster region, is a clustered urban system with different hierarchies and types of cities that often appear in highly developed, commercialized and urbanized regions [26]."

In 1991, Pyrgiotis, Kunzmann and Wegener studied the networked urban system under economic globalization and regional integration. They contended that the megalopolis was a product of spatial industrial integration and would evolve to be the core for the global economy [27, 28].

In 1992, Cui, in his Studies on China's Urban Development, proposed that "an urban agglomeration is essentially different from regular clusters of densely populated urban regions. Urban agglomerations are an ordered urban system evolved along industrialization and city-centered regional development. Cities within an urban agglomeration are ordered and have clear hierarchy and division of functions. Clusters of densely populated urban regions are often not related with industrialization. The interactions among various cities are often spontaneous, not ordered, and lack inherent connectivity." Cui further proposed the three stages of urban agglomeration development, namely, the city-region stage, the urban cluster stage and the megalopolis stage [29]. Yao et al., in their book *China's Urban Agglomeration*, defined urban agglomeration as an "aggregate" of cities within certain geographic areas. These cities often vary in size, function and characteristics. There are one or two large cities acting as the core and connecting to the other peripheral cities via highly developed transportation and information networks to form an integrated "aggregate", or urban agglomeration [30].

In 1995, Tomita extended Gottmann's megalopolis and further proposed that the cities' servicing radii should define the border of a megalopolis after extensive planning and field work. According to this definition, not only cities but also rural areas were part of the megalopolis [31].

In 1997, Kipnis further advanced the concept of megalopolis, stating that urban agglomerations were supposed to be the primary cores for post-industrialization, post-modernization development and lifestyles. Urban agglomerations also provide the most encouraging regional environment for innovation and entrepreneurship [32]. Qi and Duan noted that, in recent decades, urbanization showed a clear spatial clustering trend. Therefore, adequately understanding urbanization and urban development requires more attention to this emerging urban spatial form instead of individual

cities. This city-region spatial form of urbanization focuses more on the financial, material and information flows within the larger spatial extent and the impact that such flows have on the spatial organization and hierarchical structures of urban systems. Based on the strength of interaction, the authors proposed a three-layer, semi-concentric structure for the urban agglomeration (using the Shanghai urban agglomeration as a case study in their research) [33].

In 1999, Gu et al. provided an alternative definition for urban agglomeration. They specifically advocated for the term "agglomeration," in that the cluster of cities within a certain area is often centered on one or two large/super cities (population over 5 million) but is hierarchically interconnected via a highly developed and comprehensive modern transportation and information network. An urban agglomeration is often characterized by its dynamic development process, hierarchical network-like spatial structure, continuity and openness, and strong attraction, clustering, expansion and radiation among the cities within the region [34]. Wu also provided a similar definition and clearly stated that an urban agglomeration is a "complete (in terms of function, spatial structure, interconnectivity, etc.) urban regional organization [35]."

In 2000, Hu et al. distinguished urban cluster and urban agglomeration in their study on the spatial clustering and expansion of China's coastal concentrated urban areas. They argued that an urban cluster stresses the interaction and integration among urban and rural regions, whereas an urban agglomeration is more of a union and integration of cities [36].

Portnov and Erell also suggested that an urban agglomeration refers to interconnected cities that are within a commutable distance from one or two large/core cities. These large, or core, cities are densely populated and highly urbanized [37]. Scott proposed the "global city-region" concept. He discussed the developmental trend, theories and policies of global city-regions, and applied the concept to the study of the economic development dynamics of cities in the Americas and Asia. He found that such global city-regions were similar to urban agglomerations, though they aimed at the economic and developmental dynamics at the global level [38].

Wang investigated the developmental trajectory of various urban forms and suggested that urban spatial forms often follow a path from individual cities to metropolitan areas, urban clusters, urban agglomerations, greater metropolitan areas, MIRs, and eventually a megalopolis. He coined the term "metropolitanization" to describe this process [39]. Subsequently, Fang et al. provided another definition for urban agglomeration from a more quantitative perspective. Their research suggested that an urban agglomeration is centered on one large city, with 3 or more metropolitan areas or large cities as the foundation. The cities and in-between areas are closely interconnected via a highly developed transportation and telecommunication infrastructure, which forms a spatially compact, economically related, and regionally integrated urban entity. In a series of works, Fang and his colleagues contended that urban agglomerations are very different from the simple clustering of similar administrative units. Instead, the urban agglomeration is an emerging urban spatial form that is driven by concentrated industries and populations, a highly connected transportation network, an enhanced central city and favorable regional incentive policies [40–47].

Urban agglomerations are evidently a product of the late stages of metropolitan development. In 2015, Fang further developed his understanding of urban agglomeration and argued that urban agglomeration enables the integration of industrial distribution, infrastructure construction, regional market establishment, urban and rural planning and build-up, environmental protection and ecological construction, and social development and social security systems. Therefore, an urban agglomeration is both an economic and an interest community [48]. It also synchronizes master planning, industrial chains, urban and rural planning, transportation networks, information sharing, financial concentration, marketization, science and technological development, environmental protection and remediation, and ecological construction among all of the entities within the spatial extent of the agglomeration. Similarly, Ni also defined an urban agglomeration as an area of concentrated population and economic activities that are closely connected via a convenient transportation network and other infrastructures [49].

Teaford suggested that the interconnectivity among various cities was increasing dramatically due to highly developed social productivity and a market economy. Such increased interconnectivity blurred the boundaries between cities and peripheral regions. This interconnectivity also made traditional city boundaries, often imposed by administrative needs, essentially obsolete. Within such regions, traditional means of describing the differences among cities and rural areas, or the concentration of cities within the region, fall short of fully appreciating the newly emerged urban spatial form. New theories for studying and better understanding this new urban spatial form require further development [50].

The above review examines over 100 years of scholarly research and the evolution of the concept of urban agglomeration. The previously reviewed studies illustrate that various terms have been used for "urban agglomeration" by scholars at different stages of socioeconomic and human development. These terms include urban regions, urban clusters, urban and township cluster, township agglomeration, clustered cities, concentrated urban areas, metropolitan areas, urban economic zones, expanded metropolitan areas, urban-rural integrated regions, metropolitan regions, mega metropolitan regions, megalopolis, MIRs, new urban cluster belt, city assembly, city-region organization, city community, and others (Table 1.1).

Although there are some similarities among these definitions, an agreed-upon definition for urban agglomeration is hardly within reach. Summarizing the previously reviewed definitions and descriptions, this study proposes that urban agglomerations can generally be defined and described from six specific perspectives. First, from an ecological perspective, the urban agglomeration results from the evolution of urban spatial forms. The development of urban agglomerations is a self-organizing process, and the external morphology of the urban agglomeration is the product of a symbiotic growth among all elements. Second, from a statistical/quantitative perspective, a specific spatial size is identified first and its properties analyzed. Identifying criteria include the population density, urban/township functions, and continuity of the spatial landscape. If these quantities meet the criteria, an urban agglomeration is identified. Third, an urban agglomeration is defined based on functional interconnectivity and accessibility. Functional interconnectivity is mainly defined based on

Table 1.1 General views of urban agglomeration studies and corresponding representative scholars from 1898 to 2015

Year	Basic opinions of urban agglomeration definition	Representative scholars
1898	Equivalent to town cluster	Ebenezer Howard
1915	Equivalent to conurbation	Patrick Geddes
1918	Is an urban organism	E. Saarinen
1920	Is an urban economic zone	Bograd
1931	Is a concentrated urban area, and aggregates of Local administrative areas	Fawcett
1933	Is a city cluster	W. Christaller
1939	Is a city cluster	M. Jefferson
1942	Is an aggregate of cities	R. Vining
1957	Megalopolis (clusters of megacities)	J. Gottmann
1964	Megalopolis is the newly evolved urban forms	J. Friedman
1968	Is urban expansion area	T. Hagerstrand
1970	Equivalent to Ecumenopolis	C. A. Doxiadis
1980	Is a multi-economic-center urban area	J. Song
1980	Equivalent to Metropolitan Inter-locking Region, MIR	Y. Zhou
1980	Equivalent to Desakota (integrated urban-rural area)	T. G. McGee
1980	Equivalent to Dispersed Metropolis	K. Lynch
1983	Equivalent to Metropolis Belt	H. Yu and Y. Ning
1985	Megalopolis and integrated core-peripherals	D. A. Rondinelli
1985	Comprehensive and integrated urban spatial organization	J. B. Mclaughlin
1986	Fundamental spatial units for transnational companies' longitudinal division of labor	J. Friedman
1989	New form of integrated urban-rural (Desakota) combination	T. G. McGee
1989	A concentrated urban area with clear systematic hierarchy	L. Dong
1991	Metropolitan belt	N. Pyrgiotis and K. R. Kunzmann
1992	Systematic hierarchical combination	G. Cui
1992	Integrated urban cluster	S. Yao
1995	Metropolitan belt	K. Tomita
1997	A spatial manifestation of regional post-industrialization and post-modernization production and life styles	Kipnis

(continued)

Table 1.1 (continued)

Year	Basic opinions of urban agglomeration definition	Representative scholars
1997	Integrated groups of cities	K. Qi and J. Duan
1999	Integrated cluster of cities	C. Gu
1999	A new regional integrated form	Q. Wu
2000	Concentrated city and township area	X. Hu
2001	Urbanized areas that are within daily commutable radius	Portnov and Erell
2001	Global city-region	A. J. Scott
2002	Result from rapid urbanization and mid-point to megalopolis	X. Wang
2005	Highly integrated groups of cities, and a new economic unit for global division of labor	C. Fang
2007	A concentrated region of population and economy	P. Ni
2015	Highly integrated groups of cities that share common interest and fate	C. Fang

the "urban field" and "urban functional economic zones" concepts, such as the commuting rate and urbanization rate of the peripheral regions within the agglomeration. Accessibility is a basically spatial term that defines the maximum reachable areas within an agglomeration. Normally, the maximum reachable areas should be within daily commutes. Fourth, an urban agglomeration is identified if certain minimum population counts of the core city/cities are reached. Fifth, an urban agglomeration is defined if specific minimum population and residential locations in the peripheral areas are reached. Sixth, an urban agglomeration is identified if the distance from the core city/cities to the most peripheral areas (another form of "urban field") meets certain criteria, such as a four-hour commuting distance.

Undoubtedly, the above definitions and descriptions of an urban agglomeration point to the essence of the concept and will most likely be useful for deriving a scientific definition. On the other hand, all of these definitions and descriptions reference the urban agglomeration based on the metropolitan area, with one or two cores, and multiple peripheral cities and townships that are closely associated economically, socially, or both. The various terms for the urban agglomeration reflect either the original spatial form of urban agglomerations (such as urban clusters) or a formation of a truly evolved and integrated new urban spatial organization. As Friedman notes, in a globalizing era, the importance (hence, identification) of urban agglomerations does not necessarily depend on their population size but more on their ability to participate in global socioeconomic activities and to possess, process, and allocate capital and information [23]. All things considered, the organizational structure of future urban agglomerations will be based on hierarchical transportation and ecological networks. Their purposes are centered on the coordinated development of

the population, resources, environments, societies and economies of the individual cities within. Urban agglomerations can be treated as semi-organic systems that both attract and diffuse capital and information, thus having potential for development and expansion [51].

2. **Understanding urban agglomeration: high level integration and conurbation**

The above literature review has revealed that the understanding of urban agglomeration still differs depending on the scholar's foci and perspectives. In spite of those differences, many studies also agree that urban agglomeration won't happen unless a few fundamental conditions are met. These include that there must be at least 3 large-sized cities, at least 1 super city with over 10 million permanent residents or 1 megacity with over 5 million permanent residents as the core and driving engine. Cities must be connected with highly convenient transportation and communication infrastructure networks, have strong economic and technological connections and similar cultural values, and exhibit great potential of integration and conurbation development. The regions where urban agglomerations might arise must be at relatively high levels of industrialization and urbanization, and high levels of metropolitan development. Based on these consensus, we attempt to provide a working definition of urban agglomeration as follows.

Urban agglomeration refers to a specific region in which there is one super city (more than 10 million permanent residents) or megacity (over 5 million permanent residents), at least 3 metropolis or large cities as the fundamental nodal points. The urban agglomeration region must possess highly developed transportation and telecommunication infrastructure networks, and is spatially compact, economically closely integrated, and socioeconomically highly urbanized and integrated. Urban agglomeration is a natural stage of urban development and urbanization when cities within the specific regions start to cooperate instead of merely compete with one another to cope with increasing "urban diseases." When the core, the peripherals, and all of the in-between areas start to share joined master plans, industrial chains, urban and rural development, transportation networks, information flows, financial organizations, marketization, science and technology development, environmental protection and remediation, and ecological construction, the region will evolve into an integrated community of economies, interests and common fates with integrated regional industrial distribution, infrastructure construction, regional market establishment, urban and rural planning and construction, environmental protection and ecological construction, and social development and basic public services. This is when we will call the region has developed into an urban agglomeration (Fig. 1.1).

3. **Conurbation: from competition to competition embedded with collaboration: ten communities**

Urban agglomeration is a natural stage of urbanization and urban development. This is especially true since at certain development stages many cities are suffering from ever-increasing "urban diseases" and oftentimes cities are not able to entirely cope with these problems by themselves. Cooperation and integration among cities that

Fig. 1.1 Basic connotation of urban agglomeration

are geographically close and share similar problems become a plausible solution. Under such scenarios, urban agglomerations emerge as specific cross-administrative-border geographies that have ten "shares" guided by both market mechanisms and governmental regulations, namely, the shares of master plans, industrial chains, urban and rural planning, transportation network, information, finance, markets, science and technology development, pollution treatment and ecological constructions. With the "ten shares", urban agglomerations are communities of economy, interests, environmental protection and responsibilities.

(1) Community of plans-share of master plans

Urban agglomeration as a community of plans refers to both the planning and implementing stages of master plans for cities within the agglomeration. A scientific, well-created urban agglomeration plan will be the most important wealth for health and sustainable development of urban agglomerations. It also serves as the key for cities within the urban agglomeration to shift from chaotic competition to orderly competition and collaboration with one another. When drawing up the master plan for urban agglomeration, it is imperative to balance off the different interests of all the participating cities. As a community, within the urban agglomeration, the various cities will be mutually complementary, benefit-sharing, problems-co-solving, and responsibility-sharing. This requires the cities within the urban agglomeration

follow coherent regulations and rules of the planning agencies at higher-level with the long-term strategic development as the goal. In so doing, cities will focus on their comparative advantages, participate in a structured and effective division of labor, avoid potential weakness, and most importantly, share the same goal and understanding of long-term development. Only with such a unified understanding and actions will a well-created scientific urban agglomeration master plan and various specific plans be generated and implemented without issue. More importantly, these planning documents will also serve as the master guidance and action programs for urban agglomerations at larger spatial scale.

(2) Community of economy-share of industrial chains

Economic development plans for urban agglomerations require the plans follow the principles of "unified planning, unified policies, unified division of labor, unified industrial chain, unified layout, unified construction and unified markets" instead of the traditional, individual development pattern that is restricted by administrative boundaries. Urban agglomerations will evolve to be the community of economy, interests and fate for all the cities within. The industrial systems within urban agglomerations emphasizes that each city develops their own specialized functions based on their comparative advantages so that to deepen the division of labor, optimize the industrial structure, extend the industrial chain, and expedite the construction of industrial agglomerations. Industrial agglomerations within urban agglomerations will serve as the advanced manufacturing bases and modern serves bases for China to participate in global competition and cooperation.

(3) Community of urban and rural areas-share of urban and rural planning

Urban agglomeration is not just an integrated entity that includes only cities, but also rural areas in between cities. The development and prosperity of urban agglomerations involve more than just urban development, but also the prosperity and development of rural areas. As a matter of fact, urban agglomeration is an integrated geography that centered on a few large cities, but integrate and encompass all the in-between rural areas. The success of urban agglomeration development involves both the success of urban and rural development. An urban agglomeration that only sees rapid development of cities at the expense of rural regions will eventually suffer from such imbalanced development pattern and can't be sustainable. This is because for any region, cities and rural areas are closely related, mutually supportive, and inherently integrated entities. "Urban diseases" and "rural diseases" often appear hand in hand. The development and maturation of urban agglomeration is a process to solve both "diseases" and promote healthy development for both urban and rural area, and eventually achieve the goal of highly integrated regional development.

(4) Community of transportation-share of transportation network

Share of transportation network aims to build a comprehensive and intelligent transportation network within the urban agglomeration that enables rapid passenger transportation and intelligent cargo transportation. The goals for the transportation network is to achieve integrated road network, unified toll system, and standardized

traffic control systems. The comprehensive and intelligent transportation network within the urban agglomerations will include intra-city rapid rail transportation system, inter-city high-speed rail system, and circular or radiating highway network system. Transportation within urban agglomeration will be highly-efficient, high speed, and convenient. With the support of such transportation network, regions within urban agglomeration can then be finely divided to half-hour economic circle, one-hour economic circle and two-hour economic circle based on accessibility.

(5) Community of information-share of information

Share of information within urban agglomeration requires the construction of high-speed and high-capacity information network that is shared within the entire urban agglomeration with standard management and pricing. In addition, efficient information sharing also requires the integration of the local telephone network within urban agglomeration and build interchangeable intranet and internet within the agglomeration. The goal is to build an information system that covers the widest possible area, has the most possible functions, and involves the largest possible customers. Moreover, share of information within the urban agglomeration also requires pricing strategies within the urban agglomeration follow unified standards to maximize the share of information.

(6) Community of finance-share of finance

To build the community of finance within the urban agglomeration, it requires the construction of a secure, highly-efficient, and unified financial network system that is centered on the People's Bank of China (as the network processing center and security verification center), with other commercial banks as network processing centers and nodes. Within the network, the central bank and various commercial banks and other financial institutions will be integrated and connected. They will share the same communication portals and network firewall system. Within the urban agglomeration, we shall propose the financial cards to facilitate the share of finance within urban agglomeration so that residents within the urban agglomeration can withdraw and deposit their funds across banks and financial systems. Eventually, within the urban agglomeration there will be integrated electronic taxing system, bank loan system and interchangeable billing systems.

(7) Community of market-share of market

Share of market within urban agglomeration requires unified construction of markets and standardized market operation to create a unified, open, fully functional, orderly competitive, prosperous and active regional market system. The standards for entering and exiting markets shall be shared within the urban agglomeration, and open to all the cities within. Trading within the urban agglomeration shall be highly free of any administrative or other barriers to ensure fair and integrated regional market.

(8) Community of innovation-share of science and technological development

Innovation is probably the most important action for prosperous and sustainable urban agglomeration development. To build the urban agglomeration to be a community of innovation requires each city within the urban agglomeration to utilize

fully their own educational advantages. It is imperative to integrate various science and technological innovation resources to create an urban agglomeration-oriented regional innovation system. The key for constructing urban agglomeration to be a community of innovation is to construct innovative cities and innovative regions, to create multi-level innovative networks and innovative platforms to promote innovation at the highest level. The community of innovation will eventually include the community of research and development, education, science and technology services, independent innovation, and transformation of scientific and technological achievements.

(9) Community of environmental protection-share of pollution treatment

Urban agglomeration is undoubtedly a typical complex comprehensive urban and rural ecological system. Environmental problems such as air, water and solid waste pollution are agglomeration-wide problems that can hardly be handled efficiently (or at all) by a single city. Instead, collaboration and share of pollution treatment strategies are the most likely strategy to deal with such issues. This hence requires the establishment of comprehensive pollution treatment leagues and environmental protection leagues that involves all cities and regions within. Specifically, this involves comprehensive cross-watershed polluted water treatment, comprehensive cross-region polluted air treatment and protection, and comprehensive regional solid waste treatment and protection. It is imperative to rationally distribute large-scale waste-water treatment facilities, landfill facilities and other such facilities to enable shared treatment of polluted air and water.

(10) Community of ecology-share of ecological construction

Urban agglomeration needs to be treated as an integrated ecological system. This requires comprehensive and cross-administrative borders exploration and ecological construction of the mountains, plateau, hilly regions, plains, basins, and watersheds within the urban agglomeration. Urban agglomeration will serve as the geography for integrated ecological construction based on ecological functional regionalization and development priority zoning requirements. The goal is to promote shared "blue sky, clean water, and beautiful natural environments."

4. **Integration: from competition to competition embedded with collaboration: six integrations**

What characterizes urban agglomeration the most is high level of regional integration. High level of regional integration is not only the goal of urban agglomeration development, but also the clear sign that urban agglomerations have reached a mature level. Specifically, there are six integrations that characterize a highly developed urban agglomeration, namely, integration of regional industrial development and distribution, integration of infrastructure construction, integration of regional market construction, integration of urban and rural planning and development, integration of environmental protection and ecological construction, and integration of social development and basic public services.

(1) Integration of industrial development and distribution within urban agglomeration

Industrial development is the foundation of urban agglomeration development. Without highly developed industries' support, it is hardly possible to form a functional urban agglomeration. To encourage the formation of a highly developed industrial system within the urban agglomeration, it is imperative to understand the advantages and disadvantages of various regions and cities within the agglomeration. Cities need to participate in the division of labor in a much larger regional area (the agglomeration and even beyond) instead of its immediate neighborhood. In so doing, each city needs to identify its own industrial and functional strength, and its development stage, so that they can properly set their own development goals and directions, promote the development of their characteristic industries and economies, build special industrial chains and industrial clusters, form special industrial agglomerations, and integrated modern industrial system. Such integrated modern industrial system includes modern agricultural industrial system, modern manufacturing industrial system, and modern service industrial system. Only with the formation of such integrated modern industrial system, will resources and production factors within the urban agglomeration flow rationally and allocate optimally. Urban agglomeration's industrial competitiveness and regional creativity can then continue to progress.

To create such integrated modern industrial system within the urban agglomeration, it is necessary to build the industrial chains that are not restricted by administrative boundaries, expedite the construction of industrial agglomerations, and fully promote the construction of advanced manufacturing and modern service industrial bases that facilitate resource saving and low cost. These bases include regional agricultural industrial bases, high-quality agricultural products processing bases, special industrial bases, regional trade logistics bases, regional ecotourism bases, regional technology innovation bases and regional resource supply bases, and the like. The goal is to form an integrated modern industrial system with rational structure, clear division of labor, distinctive features, efficient operation and rational layout.

(2) Integration of infrastructure constructions within urban agglomeration

The integration of infrastructure constructions within urban agglomeration is an important foundation for integration of industries, markets and urban and rural regions within the urban agglomeration. To achieve such integration, it is necessary to promote cooperation and coordination among major infrastructure constructions, such as regional transportation system, communication system, water conservation system, and eco-environmental protection system. The key is to ensure comprehensive planning, rational distribution, synchronous construction, and synthetic use of these infrastructure systems, so that the infrastructure systems can be shared and connected among different administrative units, and maximize the use efficiency and economic scale.

To promote the integration of infrastructure constructions within urban agglomeration, we need to ensure that the infrastructure construction and urban spatial structure development are well coordinated. We also need to construct infrastructure

network system that satisfies the comprehensive development of the urban agglomeration. The integration of infrastructure system construction will enable the formation of high-speed, networked, intelligent comprehensive transportation network system, the development of reliable, secure, and economical electricity production and supply network system, the emergence of digital, broad-band, comprehensive information infrastructure network, and the appearance of complete flood control, waterlogging, drought mitigation and water supply infrastructure network. The integrated infrastructure systems are the fundamental guarantee for socioeconomic sustainable development of urban agglomeration.

(3) Integration of regional markets within the urban agglomeration

The essence in promoting the integration of urban agglomeration's regional markets are to follow the principles of "market guidance, enterprise leading, government coordinating, resources sharing, market interacting, interests sharing, comprehensive planning, focused development and gradual promotion." It is imperative to gradually break down the barriers within regional markets and build an integrated reginal market that satisfies the regional demands based on local industrial development and consumption, has multiple layered market networks, and allows market factors to flow freely. The key is to jointly support the establishment of regional wholesale markets, specialized markets and production factors markets. By encouraging the large-scale commerce and trade enterprises to work together, the urban agglomerations aim to establish cross-regional integrated commerce and trade groups that integrate sales, distribution, exhibition, wholesale and retail businesses, promotes the integration of commerce and trade, and accelerate the construction of a modern logistics system. In the construction of regional markets, it is imperative to focus on the integration of commodity markets in urban agglomerations, the integration of financial markets, the integration of talent and labor markets, the integration of technology markets and the integration of market management.

(4) Integration of urban and rural coordination and construction within the urban agglomeration

The integrated coordination and construction of urban and rural areas is one of the core contents of urban agglomeration construction. With the acceleration of economic globalization and regional economic integration and transformation of economic organization modes, a new regional development model and space combination form are required to improve the core competitiveness of urban agglomeration. The aim of the integrated coordination and construction of urban and rural areas lies in the establishment of a new development platform and coordination mechanisms, the dilution of the sense of administrative divisions, the strengthening of economic and technical links between urban and rural area, the development of a highly integrated economy and market, the promotion of rational flow of production factors between urban and rural areas, the improvement of socioeconomic efficiency, the coordination of the development relationship between urban and rural areas, the rational promotion of the construction and sharing of cross-regional infrastructure,

and the establishment of a scientific and rational urban and rural integrated development framework. This research puts forward the comprehensive thought and mode of urban and rural overall development, and puts forward the spatial structure, circle structure, scale structure, functional structure and the path of urban and rural coordinated development. Through the integration of urban and rural areas, the goals are to gradually narrow the gap between urban and rural development and weaken the legacy urban-rural two-tiered economic structure. In so doing, it will not only improve the core competitiveness of urban agglomerations, but also build a new socialist countryside.

(5) Integration of environmental protection and ecological progress within urban agglomeration

According to the basic law of coordinated development of regional economy and environment, every doubling of economic volume will cause 2.5–3.5 times pressure on the ecological environment, and 5–7 times pressure if it is quadrupled. Under the precondition of maintaining current eco-environmental pressure and quality, for the economy to quadruple, the resource consumption per unit economic output will need to increase 7–10 times, this will undoubtedly further increase the pressure on urban agglomeration's resource and eco-environment. How to coordinate the relationship between regional economic development and the protection of ecological environments, ensure the sustainable and stable development of the urban agglomeration's economy, and gradually improve the quality of ecological environment, are the fundamental guarantee for the construction and sustainable development of urban agglomerations. This will require us to build a green ecological industry system of urban agglomerations, vigorously develop green ecological industries such as ecological agriculture, ecological industry, ecological information industry, eco-tourism and ecological services, to promote the ecology quality of urban agglomeration, the ecological development of national economy and the ecology progress of economic and social activities. In so doing, we aim to build a stable, reliable, and modern ecological security system of urban agglomerations, with the characteristics of circular economy, competitive and reasonable social and economic structure system, harmonious coexistence of human and nature, and ecological and cultural development. The ultimate goal is the construction of resource-saving and environmentally friendly urban agglomerations.

The integration of environmental protection and ecological progress includes the integrated construction of ecological functional areas, eco-sensitive areas, ecological demonstration zones and environmental pollution control. Among them, the ecological demonstration zones include both the ecological cities, eco-urban areas, ecological towns, eco-industrial parks, ecological communities and ecological residences, ecological homeland constructions, and ecological agriculture demonstration areas, eco-industry demonstration areas, eco-tourism demonstration areas, environmental protection industry demonstration areas and the construction of circular economy demonstration areas.

(6) Integration of social development and basic public services within urban agglomeration

The integration of social development and basic public services is an important aspect to promote the construction of urban agglomeration. The social development of urban agglomerations and the construction of basic public services should be guided by the concept of scientific development, and must be synchronized with economic development, and implemented in an effort to achieve moderate advance. The keys for integrated social development and basic public services in urban agglomeration include the establishment of a highly integrated basic education system and scientific and technological innovation system, the construction of urban agglomeration emergency response system, the promotion of social development and basic public services equalization, the construction of unified urban and rural basic public service system, social security system, labor and employment security system, medical and health security system, social assistance security system, residents health security system and public safety guarantee system.

5. **Urban agglomeration is not town agglomeration**

When defining and identifying urban agglomerations, it is important to differentiate urban agglomeration and town agglomeration. The two concepts are often mixed up in official documents and some scholarly studies. For better development of urban agglomerations, it is critical to understand the difference between the two in terms of group structure, number of cities, scale of development, competitiveness, interaction among cities, spatial distribution and development prospective (Table 1.2). Specifically, the cluster structure of an urban agglomeration requires a hierarchical structure with large, medium, and small-sized cities and towns, whereas a town agglomeration is essentially a cluster of small towns that does not necessarily have any meaningful hierarchical structure. The scales of development for an urban agglomeration must meet strict population and economic requirements, whereas a town agglomeration is formed when three or more small towns are economically and technologically related. The total number of urban agglomerations, by definition, will gradually shrink due to expansion and the merging of different urban agglomerations within or across national boundaries. The number of town agglomerations, however, will increase, which is a result of strengthening the integration of regional economies and urban-rural development. Urban agglomerations strive for national and international competitiveness. These are the core growth poles of a nation. Conversely, town agglomerations focus on regional or even sub-regional competitiveness and might not necessarily serve as growth poles. Apparently, an urban agglomeration also contains multiple town agglomerations. By definition, urban agglomerations can only appear in nations with a sufficient level of economic development and population size, whereas town agglomerations can literally be observed anywhere. Although the differences between these two concepts are salient, it is worth noting that both spatial organizations are important spatial forms for new types of urbanization in the 21st century that focus on economic structure adjustment and rapid population urbanization, especially for developing nations such as China.

Table 1.2 Difference between urban agglomeration and town agglomeration

Items	Urban agglomeration	Town agglomeration
Structure	A group of cities consisting of three or more super-large, mega-large, medium and small-sized cities and numerous small towns	A group of towns consisting of three or more small towns
Total population	More than 20 million people	
Urbanization rate	More than 60%	
Proportion of non-agricultural industries	More than 70%	
Dependence on foreign trade	More than 30%	
Urban primacy index	More than 45%	
Quantitative change	Reduction	Increasement
Relationship	An urban agglomeration can contain several town agglomerations	Town agglomeration cannot contain urban agglomeration
Spatial distribution	Located in a few countries and regions	Located in most countries and regions
Competitiveness	Strong national and international competitiveness	Regional competitiveness
National function	National economic core regions and main urbanization regions	National main urbanization regions
Open function	Connection between China and the world	
Internationalization function	Play important roles in shifting the global economic center of gravity to China	

1.1.2 Spatially Defining Urban Agglomeration

It is clear now that urban agglomeration is an open and complex giant system, which has the characteristics of boundary ambiguity, staged and fuzzy radiating ranges. It is very difficult to identify and define the spatial extent of urban agglomeration. On the other hand, scholars still attempt to provide some workable identification and definition strategies from different aspects and angles. Specifically, the spatial extent of urban agglomeration is studied by means of urban field and gravitation model, spatial field hinterland method, fault point method, night light identification method, urban economic regionalization method and administrative division method.

1. **The spatial extent of urban agglomeration in the past one hundred years**

In 1910, the United States Census Bureau coined the concept of a Metropolitan District (MD). An MD must have at least one core city with more than 200,000 people. The population density of the smallest administrative unit within a 10 km

(about 6 miles) radius from the core city must be between 150 and 200 people per square mile [52].

In 1957, when Gottmann presented his concept of the megalopolis, he also provided the following five criteria for such a megalopolis: ① there will be densely clustered cities within the megalopolis; ② there will be a few metropolitan areas that are socioeconomically related to their peripherals; ③ there will be a convenient transportation network among the core metropolitan areas to enable seamless interconnectivity; ④ the total population will be greater than 2.5 million people; ⑤ it will serve as an international exchange hub. Based on these five criteria, Gottmann identified six urban agglomerations globally [53]. They were the Bos-Wash Urban Agglomeration in the Northeastern US, the Great Lakes Urban Agglomeration in the Midwestern US, the Pacific Coast Urban Agglomeration in Japan, the European Northwestern Urban Agglomeration, the Greater London Agglomeration and the Yangtze River Delta Urban Agglomeration centered on Shanghai.

In 1960, the Japan Department of Administrative Management proposed a quantitative definition for the "Greater Metropolitan Belt" concept. Within a "Greater Metropolitan Belt", the core city is either designated by the government or has more than 1 million people. In addition, there are peripheral cities that have at least 500,000 people, in which more than 15% of the total population of any peripherals commute to the core. Freight traffic among the "Greater Metropolitan Belt" will be below 25% of the total freight traffic [54].

In 1990, the United States revised the MD to the Metropolitan Area (MA). The revision suggests that, for any MA, there will be an urbanized location with no less than 50,000 people as the core. The county within which the city is located is the central county. Other counties within the MA must meet the following requirements: the non-agricultural population must be more than 75%; the population density must be over 50 people per square mile; decennial population growth must be greater than 15%; at least 15% of non-agricultural workers commute to the central county; or the mutual commuting ratio must be over 20% [52].

Zhou and Shi also proposed a five-criterion standard for the MIRs (another variation on urban agglomerations) based on their intensive studies of Chinese cities and metropolitan areas. First, there must be 2 or more core cities with populations of over 1 million. One of the cores must have the main characteristics of a global city. Second, the MIRs must have a highly advanced and developed seaport. This criterion includes an annual cargo throughput of over 100 million tons and an airport with multiple regular international airline operations. Third, the MIRs possesses convenient transportation corridors with multiple transportation modes. Cities and the transportation corridors are conveniently connected via land transportation. Fourth, the MIRs also includes large numbers of medium and small-sized cities that are connected to the cores via transportation corridors and networks. The total population will be greater than 25 million, with a population density of over 700 people per square kilometer. Fifth, there is clear socioeconomic integration among the cores, peripheral cities and in-between rural areas [55].

On the other hand, in their book, *China's Urban Agglomeration*, Yao et al. proposed a ten-criterion standard approach to judge whether a specific cluster of cities

could be identified as an urban agglomeration. This approach includes the following: ① the total population must be 15–30 million; ② there are at least two large cities (with a population of more than 1 million); ③ the urban population must be over 35% of the total; ④ the non-agricultural population must be greater than 40% of the total; ⑤ the non-agricultural population of any areas within the agglomeration must be over 55% of their respective intersected provinces; ⑥ there must be a complete five-hierarchical urban system structure (megacity, large city, medium-sized city, small city and township); ⑦ the railway density must be between 250 and 350 km/10,000 km^2, and the road density must be between 2,000 and 2,500 km/10,000 km^2; ⑧ the total retail sales of social consumer goods of any areas within the agglomeration must be above 45% of their respective intersected provinces; ⑨ the number of migrants of any areas within the agglomeration must be over 65% of their respective intersected provinces; ⑩ the total industrial outputs of any areas within the agglomeration must be greater than 70% of their respective intersected provinces [56].

Miao and Wang also proposed a six-criterion standard to define urban agglomerations from a functional perspective for China's urban systems. These criteria include the following: ① there must be at least one large city with over 2 million people, one prefecture or above administrative-level city, or two cities with over 1 million people each; ② the commuting time from the core to the periphery must be under 4 h; ③ the total area will be at least 20,000 km^2; ④ there must be at least 5 formally established municipalities (from an administrative perspective); ⑤ all of the counties that are under the same prefecture's administration will be counted for census purposes; ⑥ regions or areas that are commonly recognized as urban agglomerations by the government or the scholarly community [57].

Fang and Fang et al. summarized multiple definitions based on previous studies' classifications of metropolitan areas, metropolitan belts, urban agglomerations and MIRs. As a result, Fang and Fang et al. further proposed a nine-criterion standard for defining urban agglomerations. These criteria include the following: ① there will be at least 3 large cities or metropolitan areas but no more than 20, with at least one core city with over 1 million urban residents; ② the total population of an urban agglomeration will be no less than 20 million, with at least a 50% non-agricultural population; ③ the per capita GDP of an urban agglomeration will be higher than 3,000 $, with a highly developed industrialization level (in the mature stage); ④ the urban agglomeration's economic density must be more than 5 million RMB/km^2, with over 30% of its economy based on exports;⑤ the urban agglomeration must have a highly developed comprehensive transportation network, with a 250–350 km/10,000 km^2 railway density and a 2,000–2,500 km/10,000 km^2 road density; ⑥ the regional urbanization level within the urban agglomeration will be greater than 50%; ⑦ the GDP centrality of the core cities must be above 45% and radiate across provincial boundaries; ⑧ at least 15% of the peripheral population must commute to the core city/cities; ⑨ there will be three concentric peripheral regions that are defined by the public transportation total travel time. These three concentric peripheral regions include the immediate peripheral or half-hour peripheral, with a 10-min public transportation frequency and an approximately 30-min traveling time, the medium peripheral, with a 20-min public transportation frequency and an approximately 1-h traveling

time, and the outer peripheral, with a 30-min public transportation frequency and an approximately 2-h traveling time [58, 59].

Ning proposed another six-criterion standard for urban agglomerations in China. First, counties (primarily rural regions) are the fundamental building units for urban agglomerations. Their census coverages will be included in the urban agglomeration. Second, there must be two core cities with over 1 million people, and one of them must have over 2 million people and serve as the growth pole of the urban agglomeration. Third, the total population must be over 10 million. Fourth, the urban agglomeration must have a high level of urbanization. Fifth, there must be (a) convenient transportation corridor(s) that closely link(s) the core(s) and the peripherals to form an integrated socioeconomic community. Sixth, the areas within the urban agglomeration must have strong historical connections and, hence, a sense of integration and common regional identity [60].

Based on Ning's review, in the US, the Metropolitan Institute of the Virginia Institute of Technology proposed a ten-criterion standard for urban agglomerations in the US. Ning summarized and condensed the 10 criteria to 7 standards. First, there must be at least two metropolitan areas, with these areas being interlocking and continuously located. Second, the population will reach 10 million by 2040. Third, the areas within the urban agglomeration must have a unique historical, cultural and cognitive common identity. Fourth, the areas share roughly similar natural landscapes. Fifth, the metropolitan areas and cities are linked by major highways or interstates. Sixth, there are noticeable urban networks of cargo and service flows. Seventh, counties are the fundamental building blocks for urban agglomerations. The Metropolitan Institute projected that there will be 10 urban agglomerations by 2050 with a population of more than 10 million each in the US [61].

2. **Comparative analysis of the four expansions of urban agglomeration's spatial extent**

The evolution of an urban agglomeration under the current driving forces of economic globalization, informatization, new industrialization, fast transportation, policy support and the knowledge economy theoretically follows a spatiotemporal path from cluster of cities to metropolitan areas, metropolitan area belts, large metropolitan belts, and a megalopolis (MIRs) (Fig. 1.2). Such a path is a clear representation of the gradient evolution and multi-layer structure of urban agglomerations. The characteristics of each expansion are summarized in Table 1.3. Evidently, each expansion enables the urban agglomerations to become increasingly radiating regional, national, and eventually international growth centers. Urban agglomerations then evolve to be the core regions that lead the national and global economic development and urbanization development, and the main carriers for global economic transitions.

3. **Qualitative criteria defining the spatial extent of urban agglomeration**

Overall, it is very complicated to recognize the spatial extent of such special and dynamically changing regions such as urban agglomeration. It is worth bearing in mind that no matter what identification standards and methods we use to identify urban agglomerations' spatial extent, strictly speaking, it will only be a relative

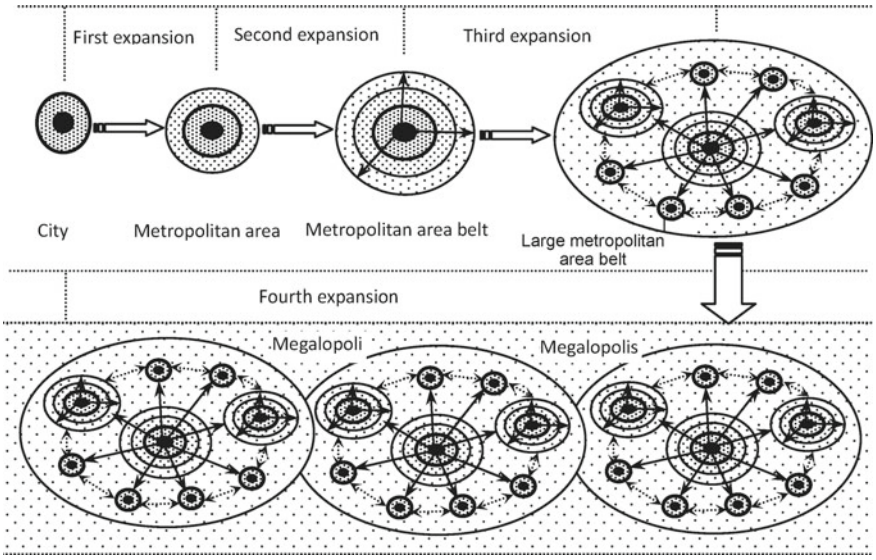


Fig. 1.2 The four expansion stages of urban agglomeration development

identification. This is because the radiating ranges of urban agglomerations are constantly changing, it is impossible, and not scientifically sound to draw absolute and clear boundaries. On the other hand, for effective studying urban agglomeration and policy implementation, it is necessary to have certain standards that facilitate the identification of urban agglomerations.

From the literature review of more than 100 years' study of urban agglomerations' spatial extents and the four-stage expansion process of urban agglomeration, we put forward the following basic identification criteria from the qualitative point of view:

(1) There must be a considerable number of cities and population within urban agglomeration

In almost all urban agglomerations related studies, the first criterion is that urban agglomerations are always centered on one or more large cities with high urbanization level, attracting a certain population and industry, forming a continuous urbanized area with a certain population size, population density and number of cities [61, 62]. For example, the Northeastern United States urban agglomerations are centered on New York, Chicago and other world cities. The United States West Coast Urban Agglomerations are centered on Los Angeles, Seattle and other industrial and commercial cities. Japan's East Sea Urban Agglomerations are centered on Tokyo, Osaka, Nagoya and other world cities and mega-cities. China's Yangtze River Delta Urban Agglomeration is centered on Shanghai [62]. At the same time, scholars believe that a certain population size is also one of the important connotations of urban agglomeration. For example, Papaioannou argues that the real metropolitan belt should be

Table 1.3 Comparison among the four stages of urban agglomerations

Name	City	First expansion	Second expansion	Third expansion	Fourth expansion
		Metropolitan area	Metropolitan area belt	Large metropolitan area belt	Megalopolis
Spatial scope	Small	Sub-regional	Regional	Cross-regional	National/international
Radius	Municipal	Metropolitan	Inter-metropolitan	Sub-national	National/international
Number of cities	1	1	1	Three or more	3 cores with multiple peripherals
Population	5-10 million	5-10 million	10-15 million	More than 20 million	More than 30 million
Spatial structure	1 city	1 city and its immediate peripherals	1 city and influencing peripherals	3 or more cities and their peripherals	At least 2 large metropolitan area belts and all the cities
Transportation network	Inner city network, weak inter-city connectivity	Stronger inter-city connectivity	Complete inter-city connectivity	Complete inter-metropolitan connectivity	Extensive connectivity within and among metropolitan areas
Industrial integration	Very weak inter-city integration	Weak inter-city integration	Some inter-city integration	Strong inter-city integration	Fully integrated industrial systems
Regional structure	Single core	Single core layered structure	Single core radiating layered structure	Single or multi-core axis-layered network structure	Multi-core nebula highly interconnected network structure
Expansion mode	Point expansion	Point-circle expansion	Point-axis expansion	Axis-belt expansion	Beaded network radiating expansion
Development stages	Infancy stage	Initial stage	Medium stage	Mature stage	Ultimate stage
Function	Municipal growth center	Sub-regional growth center	Regional growth center	National growth center	International growth center

between 35–250 million [63]. Gottmann insists that 25 million is the lower limit of population size in metropolitan areas [64].

(2) Urban agglomerations have closely related socioeconomic connections as their core social status

Urban agglomerations exhibit not only the spatial continuity as suggested by traditional theories, but also the strong relationship between the central city and the nodal axis (flow of people, logistics, capital and information) based on the economic and social ties [65]. Only with large amount and very frequent rate of a variety of such "flows" among the cities, increasingly closely related socioeconomic ties, and networked functions, will the urbanized areas that are characterized by a number of large cities maintaining a strong interaction and close social and economic relations with the surrounding areas be regarded as urban agglomeration.

(3) Urban agglomerations have rational cities structure based on comprehensive functions

In addition to one or more large-scale, economically developed and radiation-driven larger cities, there will be a series of second or third level medium or small-sized cities, as well as numerous small towns in an urban agglomeration [66]. Boston, for example, is an intellectual, technological, ideological and political center of the Boston Urban Agglomeration; New York City is the center of commerce and finance of the New York Urban Agglomeration; Philadelphia is a manufacturing center of the Philadelphia Urban Agglomeration; Baltimore is an important seaport city and center of the Baltimore-Washington Urban Agglomeration. Within these Urban Agglomerations, there is a very clear functional structure [67]. At the same time, different cities within the urban agglomerations are separated from one another in the physical space, and their production, life and ecological spatial patterns are relatively reasonable.

(4) Urban agglomerations must have strong driving forces of formation and development

Through the research and analysis of the Arab countries, Vaidyanathan suggests that urban agglomerations in countries based on the petroleum economy are developing faster; urban agglomerations in countries with greater land pressure are developing slower. Population size and the net population mobility rate have important impacts on the development of urban agglomeration [68]. Scott believes that economic globalization is the fundamental driving force of global urban-regional formation [69]. Glazer and his colleagues investigate the importance of consumption diversity in the formation of urban agglomeration [70]. Webster and others think that urban agglomerations grow spontaneously in the institution network of government and market economy to reduce transaction costs [71]. Msatsumoto believes that air flow is the main driving force for the formation of international air port city agglomeration [72]. Bertinelli and Black believe that the essence of urban agglomeration is the concentration of production, consumption and trading activities between cities. On the one

hand, such concentration provides the markets for mutual demands among manufacturers, which is conducive to the production of specialized manufacturers; on the other hand, it also facilitates people's consumption and manufacturers' trade, which is conducive to the transfer of information and exchange of knowledge and experience. Based on this argument, they suggest that the division of labor, specialization economy, transaction efficiency and diversification of consumption preferences are the primary driving forces for the formation of urban agglomerations [73]. The study of Mata and other research show that the decrease of rural income opportunity, the increase of product market potential, the improvement of the quality of labor force and the lower transportation cost of cities will significantly promote urban growth and the formation of urban agglomerations [74].

(5) Urban agglomerations have similar natural, cultural and historical environments

The power of regional cultural identity is an important driving force to promote the formation and development of urban agglomerations and enhance their competitiveness. In addition to geographical location, the formation and development of Chinese urban agglomerations is one of the important reasons for the similarity of regional cultures and historical cultures. The similar cultural heritage, historical origins and customs of the neighboring cities are the lasting impetus to strengthen the cohesion of urban agglomeration and enhance the competitiveness. For instance, the South of Yangtze River Culture is the driving force of the Yangtze River Delta Urban Agglomeration; Yan Zhao Culture is the driving force for Beijing-Tianjin-Hebei Urban Agglomeration; Lingnan Culture is the driving force for the Pearl River Delta Urban Agglomeration; Hunan-Xiangjiang Culture is the driving force for the Changsha-Zhuzhou-Xiangtan Urban Agglomeration; the Chu Culture is the driving force for the Wuhan Urban Agglomeration; Bashu Culture is the driving force for the Chengdu-Chongqing Urban Agglomeration; Qin Culture and Han and Tang Culture are the driving force of the Guanzhong Urban Agglomeration; the Song and Central Plains culture is the driving force for the Central Plains Urban Agglomeration; and the Qilu Culture is the driving force for the Shandong Peninsula Urban Agglomeration. The unique cultural heritage of each urban agglomeration has become the direct driving force for the sustainable development of urban agglomeration, and also the important foundation of forming characteristic industry, characteristic superiority and characteristic status of urban agglomerations. The promotion of cultural power is the soft power of urban agglomeration construction and competition.

4. **Quantitative criteria defining the spatial extent of urban agglomeration**

After comprehensive analysis of the studies on the identifying indicators and criteria of urban area, metropolitan areas, urban agglomeration, and the megalopolis, and considering the relevant authoritative indicators and standards, we develop the standards to define urban agglomeration in China based on the full consideration of China's urbanization development stage, China's urbanization in the era of economic globalization and its importance in the international arena, and the government-dominated characteristics urban agglomeration development in China. In particular, it is believed that when a densely populated urban area expands to more than 3 cities;

the total population is more than 20 million (of which the core city has more than 5 million); per capita GDP is more than 10,000 US dollars; the level of urbanization is greater than 60%; the non-agricultural industry ratio is more than 70% (in the middle and late stages of industrialization and urbanization); core city GDP is greater than 45%; economic extroversion is greater than 30%; economic density is greater than 15 million RMB Yuan/km^2; each city regional cultural identity is greater than 70%; within the region it can form half an hour, 1 h and 2 h of economic circle. These criteria can serve as the basic standards of defining urban agglomeration in the densely populated area, which can then be purposefully built as urban agglomeration.

Furthermore, we summarize the 10 quantitative criteria of identifying the spatial extent of China's urban agglomerations as follows.

(1) There are no less than 3 metropolitan areas or large cities in urban agglomerations, which at least 1 is a super-city (the urban permanent population is larger than 10 million) or a megacity (the urban permanent population is between 5 and 10 million).
(2) The total population in urban agglomerations is more than 20 million people.
(3) The level of urbanization in the urban agglomeration is greater than 60%.
(4) Urban agglomeration's per capita GDP is more than 10,000 US dollars; industrialization level is relatively high, generally in the latter stages of the industrialization.
(5) The economic density of urban agglomeration is greater than 15 million RMB Yuan/km^2.
(6) There is a highly developed integrated transport corridor and the half-hour, 1-h and 2-h economic circle within the urban agglomeration.
(7) The production ratio of non-agricultural industry in urban agglomerations exceeds 70%.
(8) The core city of urban agglomeration has more than 45% of its total GDP, which also serves the function as trans-provincial cities.
(9) The economic extroversion of the urban agglomeration is greater than 30%, which bears the function of the world economic center.
(10) The regional cultural identity of cities in urban agglomerations is more than 70%; cities within the urban agglomeration have similar natural and humanistic geographical environment and regional cultural environment.

On the whole, it is a very complicated problem to accurately identify the spatial extent of such a special, dynamic, and constantly changing region as urban agglomerations. Strictly speaking, no matter what identification criteria and methods, we must realize the spatial extent of an urban agglomeration is relative, an absolute clear line is not possible, nor is it necessary. On the other hand, it is necessary to study the identification of the spatial extent of urban agglomerations, because it is of great significance to determine the relatively definite range for the socioeconomic development and master planning of urban agglomerations.

In view of the current "entering the agglomeration" fervency and "agglomeration dominates" ideology in the formation and development of China's urban agglomeration, in order to avoid blindly developing land without proper planning, seeking

only large and big development, following the trend without considering the reality, destructive enthusiasm, unnecessary comparisons, and even the pure pursuit of political achievements in the construction of urban agglomeration, it is necessary to standardize the classification and identification criteria of the spatial extent of China's urban agglomerations. It is suggested that the departments concerned should organize and compile the planning norms of China's urban agglomerations based on the actual situation of China. It is imperative to define the criteria and methods of identifying urban agglomerations, to use the same standards to measure urban agglomerations of different sizes and space extents, and ensure the healthy, orderly and sustainable development of urban agglomerations.

1.2 Urban Agglomeration: Elevated to National Strategic Development Status

During the 12th Five-Year Plan period, at the end of 2013, the first meeting of the Central Urbanization Work Conference was held; and at the end of 2015, the Central City Conference was held. During the conferences, the CPC Central Committee document for the first time proposed that urban agglomerations will serve as the main body to promote the country's new urbanization. The State Council also issued a number of documents and came to the same conclusion. These documents reflect the fact that the development of urban agglomeration has elevated to the national strategic status.

1.2.1 A Series of the Central Committee of the Communist Party of China's (CPC) Documents Recognizes Urban Agglomeration as the Main Body for Promoting the China's New Urbanization Strategy

The CPC's 18th National Congress Report (2012), the Central Urbanization Work Conference, the Central City Work Conference, the Central Economic Work Conference and the National New Urbanization Plan issued by the Central Committee of CPC (2014–2020) have all suggested that urban agglomerations in China will serve as the main body to promote the country's new urbanization.

1. **The CPC's 18th National Congress Report regards urban agglomerations as new growth poles**

The CPC's 17th National Congress Report (issued in October 2007) pointed out that China will take the Chinese characteristic urbanization road, focus on enhancing comprehensive carrying capacity, use large cities as the foundation to form large

urban agglomeration with strong radiating functions and cultivate the new economic growth poles.

Five years later, in September 2012, the CPC's 18th National Congress Report continued to point out that China will continue to implement the overall strategy of regional development, scientifically plan the scale and layout of urban agglomerations, enhance the industrial development, public services, employment, and population agglomeration functions of small and medium-sized cities and towns. In addition, China will strive to accelerate the reform of the household registration system, orderly promote the transfer of agricultural population to urban citizens and strive to achieve full coverage of urban basic public services over the permanent population.

2. **The Central Urbanization Work Conference recognizes for the first time urban agglomeration as the main body of promoting New Urbanization**

In December 2013, the Central Urbanization Conference for the first time proposed the six tasks of developing the new urbanization, the fourth task of which was to optimize the layout and form of urbanization. It first proposed that urban agglomeration will serve as the main body of promoting the new urbanization and proposed to continue to optimize the construction of the three major national urban agglomerations (Beijing-Tianjin-Hebei region, the Yangtze River Delta and the Pearl River Delta Urban Agglomerations) to build a world class urban agglomeration with strong international competitiveness. In the central, western and northeastern regions, China will depend on market forces and national planning guidance to gradually develop a number of urban agglomerations to serve as the driving forces for the development of the central and western, and northeastern regions.

3. **The Central City Work Conference recognizes for the first time the urban agglomeration as the primary form of promoting New Urbanization**

The Central City Work Conference held on December 20, 2015 was a landmark since 37 years ago, and under rapid urbanization in China. The meeting required that China's urbanization development shall comprehensively implement the guidelines of the CPC's 18th National Congress Report, and its Third, Fourth and Fifth Central Plenary Sessions. Urbanization development shall follow Deng Xiaoping's Theory, the Important Thoughts of "Three Represents", and the Scientific Outlook on Development as important guidance, to vigorously implement the development ideologies of innovation, coordination, green, open and sharing, and adhere to the principles of people-oriented development, scientific development, reform and innovation, and law-abiding. In so doing, the new urbanization development will be able to transform urban development modes, improve urban governance system, upgrade urban governance capacity, focus on solving urban diseases and other outstanding issues, continuously improve urban environmental quality, people's quality of life, urban competitiveness, and construct a harmonious, livable, vibrant, and diversified modern city. The goal is to improve the level of new urbanization and take an urban development path with Chinese characteristics. On the basis of *National Priority Development Zone Plan*, *National New Urbanization Plan (2014–2020)*, combined

with the pursuit of the Belt and Road Initiative, Beijing-Tianjin-Hebei coordinated development, the Yangtze River Economic Belt construction strategy, China's urban development will have a clear spatial pattern and functional positioning. Moreover, the conference further pointed out that we should take the urban agglomeration as the main form, and scientifically plan the layout of the city space to achieve compact, intensive and efficient green development. It is imperative to improve Eastern China's urban agglomerations, cultivate and develop a group of urban agglomerations and regional central cities in the central and western regions, and promote the linkage development of the frontier cities and port cities, so that the central and western regions can share the results of urbanization.

4. **The Central Economic Work Conference continuously promotes rational distribution of urban agglomerations in China**

Urban agglomeration has been promoted to serve as the main space form of urbanization after ten consecutive years as proposed in the 11th Five-Year Plan and the 12th Five-Year Plan, the Central Economic Work Conference held in 2012 also proposed to promote urban agglomeration development according to the national Development Priority Zone Planning, and to guide the development of urban agglomeration scientifically. The Central Economic Work Conference held in December 2013 put forward to build a scientific and rational urban pattern with rationally distributed large and medium-sized cities and small towns to form an integrated urban agglomeration. Each urban agglomeration will strive to have closely linked regional economic development and industrial layout, and a development pattern and rate that are within its resources and environmental carrying capacity.

5. **The National New Urbanization Plan (2014–2020) issued by the Central Committee of CPC regards urban agglomeration as the main body of promoting China's New Urbanization and mentions the term "urban agglomeration" 50 times**

On March 12, 2014, the Central Committee and the State Council [2014 #4] issued the *Notice on the Central Committee and the State Council's Issuance of National New Urbanization Plan (2014–2020)*. The Notice specifically pointed out that China's New Urbanization is centered on the urbanization of people. It will promote the orderly transfer of agricultural population to urban population, and construct the urban agglomerations based on coordinated development of large and medium-sized cities and small towns. In addition, China's new urbanization will strive to enhance the sustainable development of cities with the support of comprehensive understanding of local carrying capacity. The new urbanization will release the development potential of urbanization through reform of institutional mechanism. The path of China's new urbanization is designed to be people-oriented, four-modernization synchronized, spatial layout optimized, ecological progress civilized, and cultural inherited with Chinese characteristics. In accordance with the principles of coordinated planning, rational distribution, rational division of labor and cooperation, and getting larger cities to help smaller ones, we intend to construct urban agglomeration

with high efficiency, large radiation effect, excellent urban system and complementary functions. Urban agglomerations will then become important platforms to support the national economic growth, promote regional coordinated development and participate in international competition and cooperation. Urban agglomerations in Eastern China, such as Beijing-Tianjin-Hebei region, Yangtze River Delta and Pearl River Delta shall optimize and enhance their current development modes, aiming at becoming world-class urban agglomerations. In Central and Western China, we need to cultivate and develop urban agglomerations such as Chongqing-Chengdu, Central Plains, the middle reaches of the Yangtze River, Harbin-Changchun, to promote balanced national land development and leading growth poles of regional economic development. More importantly, it is imperative to establish the coordination mechanism of urban agglomeration development, to formulate and implement urban agglomeration planning. The central government is responsible for the planning and organization of urban agglomerations across provincial administrative districts, and provincial governments are responsible for the planning and organization of urban agglomerations in their own districts.

In the *National New Urbanization Plan (2014–2020)*, the term "urban agglomeration" has been mentioned 50 times in a key work search. The sheer amount of mentioning is a clear indication that China has regarded urban agglomeration as a crucial spatial form for implementing China's new urbanization.

6. **The Recommendations for the 13th Five-Year Plan for Economic and Social Development initiated in the Fifth Plenary Session of the CPC's 18th Central Committee proposes to construct eight large urban agglomerations**

In the Fifth Plenary Session of the CPC's 18th Central Committee held on October 29, 2015, *The Proposal of the Central Committee of the Communist Party of China on the Formulation of the Thirteenth Five-Year Plan for Economic and Social Development* was adopted unanimously. Part III of the Proposal (adherence to innovative development, efforts to improve the quality and efficiency of development) recommended to expand regional development space, form the horizontal and vertical economic belts based on the overall strategy of regional development, the pursuit of the Belt and Road Initiative, Beijing-Tianjin-Hebei coordinated development, and the Yangtze River Economic Belt lead development. It further proposes to allow the urban agglomerations to play a radiation-driven role. In this guideline, it is imperative to optimize the development of Beijing-Tianjin-Hebei, Yangtze River Delta, Pearl River Delta Urban Agglomerations, and further cultivate the Northeast, the Central Plains, the Middle Reaches of the Yangtze River, Chengdu-Chongqing Region, and the Central Shaanxi Plain Urban Agglomerations.

1.2.2 Many Documents Issued by the State Council also Propose that Urban Agglomeration Will Serve as the Main Body of Promoting the National New Urbanization Strategy

In the past six years, the State Council has separately promulgated a series of documents, including the national *Twelfth Five Year Plan Outline*, the national *Thirteenth Five Year Plan Outline*, the *State Council's Guidance on the Development of the Yangtze River Economic Zone as the Golden Waterway*, the *Promotion of the Silk Road Economic Zone and the Vision and Action of the Maritime Silk Road in the 21st Century*, and the *State Council's Views on Vigorously Implementing the Strategy of Promoting the Rise of the Central Region*. There are more than 300 times that the development and construction of urban agglomeration has been mentioned and detailed. Under such premise, the central government issued and implemented a series of national-level guidance documents, including the *Beijing-Tianjin-Hebei Coordinated Development Plan, the Middle Reaches of the Yangtze River Urban Agglomeration Development Plan*, *Harbin-Changchun Urban Agglomeration Development Plan* and other urban agglomerations plan related national documents.

1. **The 12th Five-Year Plan proposes urban agglomeration as the main body for promoting New Urbanization**

The national 11th Five-Year Plan has proposed to take urban agglomeration as the main form of promoting urbanization, gradually form an highly efficient, coordinated, and sustainable urbanization spatial pattern with the coastal areas and Harbin-Beijing-Guangzhou Railway surrounding areas as the longitudinal axes, the Yangtze River and the Longhai Railway surrounding areas as the horizontal axes, several major urban agglomerations as the main body, other cities and small towns along with permanent arable land and ecological functional areas dotted in-between. After that, the 12th Five-Year Plan further made clear that we need to promote the coordinated regional development, actively and steadily promote urbanization, adhere to the urbanization pathway with Chinese characteristics, scientifically develop urbanization plan, and promote healthy urbanization development. The primary tasks are to complete and improve the layouts and forms of the cities to promote coordinated development among large, medium and small-sized cities and townships. Construction of urban agglomerations must follow the general principles of overall plan, reasonable layout, improved function, with large cities helping smaller ones; and follow the objective laws of urban development with large cities as the foundation, small and medium-sized cities as the focal points, to gradually form urban agglomerations with strong radiating effects. It is also imperative to scientifically plan the various urban functions and industrial layouts, to relieve the pressure in the central urban area, to strengthen the industrial function of small cities, to strengthen the public service and housing functions of small towns, and to promote the integration and network development of the transportation, communication, power supply, water supply and drainage in the all the cities [3].

2. **The Outline of the 13th Five-Year Plan for the Economic and Social Development of the People's Republic of China issued by the State Council proposes to construct 19 urban agglomerations**

On March 17th, 2016, the 12th session of the National People's Congress (NPC) voted to approve "*The Outline of the 13th Five-Year Plan for Economic and Social Development of the People's Republic of China*". In the eighth chapter of the outline, "Promoting the New Urbanization", it clearly puts forward that China's new urbanization is people-oriented urbanization, with urban agglomeration as the main form, urban comprehensive carrying capacity as the pillar, and institutional innovation as the guarantee. The goals of China's New Urbanization are to accelerate the development of urbanization, promote the construction quality of China's new socialist countryside, strive to narrow the gaps between urban and rural development, and promote the integration of urban and rural areas. In the 8th Article, Chapter 33, Section 1, the Outline further puts forward speeding up the development of urban agglomeration, optimizing and promoting the development of urban agglomerations in the eastern Region. In particular, it proposes to build the Beijing-Tianjin-Hebei, Yangtze River Delta, Pearl River Delta regions into world-class urban agglomerations. The Shandong Peninsula and the Western Coast of the Taiwan Strait Urban Agglomerations will focus on promoting their openness and competitiveness. It also proposes to cultivate the urban agglomerations in the Central and Western China, vigorously develop urban agglomerations in the Greater Northeastern China, Central Plains, the Middle Reaches of Yangtze River Area, Chengdu-Chongqing Area, Central Shaanxi Plain Area, and scientifically plan and guide the development of urban agglomerations in the Beibu (Guangxi) Gulf, Central Shanxi Province, Hohhot-Baotou-Ordos-Yulin (Inner Mongolia and Shaanxi Province), Central Guizhou Province, Central Yunnan Province, Lanzhou-Xining (Gansu and Qinghai Provinces), Areas in Ningxia along the Yellow River, and the Northern Slope of the Tianshan Mountains (Xinjiang). The immediate goals for developing these urban agglomerations in the Central and Western China are to create regional economic growth poles to support regional economic development. In addition, with similar goals in mind, the Outline also proposes to promote semi-urban agglomerations in Xizang (Tibet) that centered on Lhasa, and in Southern Xinjiang centered on Kashi. The Outline suggests that we should establish and improve the coordination mechanism of urban agglomeration development, promote the coordinated linkage and interaction of industrial division of labor, infrastructure, ecological protection and environmental management, to realize the integrated and efficient development of urban agglomerations. The term urban agglomeration was mentioned 14 times in the Outline.

3. **The State Council's Guidance of Relying on the Golden Waterway to Promote the Development of Yangtze River Economic Belt clearly proposes the construction of six large urban agglomerations along the Yangtze River**

In September 2014, the State Council issued a State Document (2014 #39) titled "*The Guiding Opinions of the State Council on the Development of the Yangtze River Economic Zone supported by the Golden Waterway*" (the Guiding Opinions for short)

which clearly proposes to promote the people-oriented new urbanization according to the ideas of agglomeration along the River, group development, interactive cooperation and development within the limits of local conditions. It is imperative to optimize the layout and form of urbanization, strengthen the cities' ability of sustainable development, and innovate the system mechanism of urbanization development to comprehensively improve the quality of urbanization in the Yangtze River Economic Belt. The term urban agglomeration was mentioned 40 times in the Guiding Opinions.

In the 24th Article, the Guiding Opinions clearly proposes to optimize the pattern of urbanization along the River. Such an optimized pattern takes the Yangtze River Integrated transport channels as the axis, the Yangtze River Delta, the Middle Reaches of the Yangtze River, and Chengdu-Chongqing as the three major cross-regional urban agglomerations, with the Central Guizhou and Central Yunnan regions as the two regional urban agglomerations, integrating all the cities within the region to create a large group of urban agglomerations that promote cooperation and efficient division of labor among and within urban agglomerations, strengthen the infrastructure construction and interaction, optimize the spatial layout and promote urbanization and industrialization. The goal is to build a population concentrated, highly compact and efficient, green and low-carbon world class urban agglomeration or group of urban agglomerations.

In the 25th Article, the Guiding Opinions proposes to enhance the international competitiveness of the Yangtze River Delta Urban Agglomeration which aims to promote the integration of the Yangtze River Delta to create a world-class urban agglomeration.

In the 26th Article, the Guiding Opinions suggests the development of urban agglomeration in the Middle Reaches of the Yangtze River. Specifically, it is imperative to strengthen the urban central functions of Wuhan, Changsha and Nanchang, promote the complementarity of resources among the three city groups, the industrial division of labor and cooperation, and the interaction and cooperation among the cities to make the Middle Reaches of the Yangtze River the core growth pole, resource-conserving, environment-friendly model of Central China. Specifically, we will aim to optimize and promote the radiation-driven functions of Wuhan Urban Agglomeration, implement the national innovation pilot projects in Wuhan City, construct the modern service industrial center in Central China, speed up the construction of Changsha-Zhuzhou-Xiangtan Urban Agglomeration, and promote the urbanization level of the central cities in Xiangjiang New District and Northern and Southern Hunan Province. In addition, we will also aim to cultivate and strengthen the development of Poyang Lake Urban Agglomeration, promote the urbanization belt integrating Nanchang, Jiujiang and Western Jiangxi Province, and construct the Poyang Lake and Dongting Lake Ecological Economic Zones.

In the 27th Article, the Guiding Opinions proposes to promote the integrative development of Chengdu-Chongqing Urban Agglomeration. The central idea is to promote Chongqing, Chengdu's urban central functions and their internationalization level, let this "double-engine" drive and support resources integration and development, make the Chengdu-Chongqing Urban Agglomeration the modern industrial

base, an important economic center of Western China, the pioneer open-up region of the Yangtze River Upstream Area, an inland open-up experimental zone, and integrated planning demonstration zone of urban and rural development.

In the 28th Article, the Guiding Opinions promotes the development of regional urban agglomerations in Central Guizhou and Central Yunnan. It proposes to strengthen Guiyang's industry supporting and factor concentration functions, focus on the construction of Zunyi-Guiyang-Anshun economic belt, promote Guian New District to become an inland open economy demonstration area, important energy and resources deep processing center, and special light industry and national cultural tourism base, promote the construction of Big Data application service base, and create the economic growth pole of Western China and pioneer ecological progress construction zone. In addition, it also proposes to promote Kunming's urban central function serving Southeast Asia and South Asia, focus on the construction of the Qujing-Kunming-Chuxiong and Yuxi-Kunming-Wuding development axes, impel the development of Central Yunnan Industrial agglomeration area, construct the deep processing base of special resources and the cultural tourist base, build a core area of an important opening-up region in the Southwestern China and a unique highland livable urban agglomeration.

In the 30th Article, the Guiding Opinions places emphasis on strengthening the urban agglomeration transportation network construction. Specifically, In the Yangtze River Delta Urban Agglomeration, the goal is to build an inter-urban "multi-triangular and radial" transportation network that centered on Shanghai, with Nanjing, Hangzhou, Hefei as the sub-center. In the Middle Reaches of the Yangtze River Urban Agglomeration, the goal is to build a "triangular and radial" transportation network that centered on Wuhan, Changsha and Nanchang. In the Chengdu-Chongqing Urban Agglomeration, the goal is to build a central "axis and radial" inter-city transportation network centered on Chongqing and Chengdu. Among all the inter-city transportation networks, the ultimate goals are to make sure that the maximum transportation time among central cities, and central cities to sub-centers and other cities will be no more than 2 h. Additionally, by constructing the inter-city transportation network in Central Guizhou and Central Yunnan areas, we will also be able to create a two-hour maximum transportation network among all the cities in these regions as well.

4. **The State Council's the Promotion of the Silk Road Economic Zone and the Vison and Action of the Maritime Silk Road in the 21st Century proposes to construct eight urban agglomerations along the Silk Road Economic Belt**

On March 28, 2015, in the sixth section of *Promotion of the Silk Road Economic Zone and the Vison and Action of the Maritime Silk Road in the 21st Century*, permitted by the State Council, and jointly published by the National Development and Reform Commission, the Ministry of Foreign Affairs and the Ministry of Commerce, it suggests that the coastal China and Hong Kong, Macau, and Taiwan shall take advantage of the high openness, strong economy, and powerful radiation-driven roles of the Yangtze River Delta, the Pearl River Delta, the Western Coast of the Taiwan Strait, and the Bohai Rim Economic Zone, to speed up the construction of

China (Shanghai) Free Trade Pilot Zone and support Fujian Province's construction of the core region of the 21st Century Maritime Silk Road. The inland regions, on the other hand, shall take advantage of its geographic vastness, rich human capital, relatively developed industrial foundations, relying on key regions such as the Middle Reaches of Yangtze River Urban Agglomeration, the Chengdu-Chongqing Urban Agglomeration, the Central Plains Urban Agglomeration, the Hohhot-Baotou-Ordos-Yulin Urban Agglomeration, and the Harbin-Changchun Urban Agglomeration, to promote regional interaction and collaboration, and industrial agglomerative development, and create a Western Chongqing Developing Supporting Zone, and inland Open Economic Zone centered on central cities like Chengdu, Zhengzhou, Wuhan, Changsha, Nanchang and Hefei.

5. **In the State Council's Report in 2014 on the Work of Government, it is mentioned that the government will strengthen the development potential of urban agglomerations in Central and Western China**

On March 5, 2014, in the third section, fifth bulletin of the Report on the Work of the Government, which was delivered by Premier Li Keqiang at the second conference of the 12th session of the National People's Congress, it clearly proposes that the promotion of people-oriented New Urbanization must have a complete mechanism for integrated urban and rural development. China's New Urbanization shall follow the central ideas of people-oriented, four-modernization synchronized, layout optimized, ecology progressive, and cultural inherited path. It is important that urbanization in China must follow the laws of urban development, develop at a steady pace and strive to improve urbanization quality. In the coming period, the focus shall be on solving the "Three one-hundred-million-people" problem, namely, facilitating the settlement of one hundred million agricultural population to the urban areas (especially in medium and small-sized cities and townships), transforming the shanty towns and villages-within-cities that house about one hundred million people, and locally urbanizing about one hundred million citizens in Central and Western China. It is also important to strengthen the support for New Urbanization development in central and Western China, improve the cities' industrial development and population retainment capacity, and promote local urbanization and employment of agricultural population. To achieve these goals, it is imperative to accelerate the construction of local infrastructure such as transportation, water conservancy, energy and municipal services, and strengthen the development potentials for cities and urban agglomerations in central and Western China. In Eastern China, optimizing the urban structure and further improving the quality of urbanization is of critical importance.

6. **The document Several Opinions of the State Council on Vigorous Implementation of the Strategy of Promoting the Rise of the Central Region proposes to construct six urban agglomerations in Central China**

In August 2012, the State Council issued a State Document (2012 #43) *The Several Opinions of the State Council on Vigorous Implementation the Strategy of Promoting the Rise of the Central Region* (the Document for short). In the third part the Document, it clearly puts forward to promote the development of key areas, expand their

economic development space. Specifically, the Document proposes to focus on the development of Taiyuan Urban Agglomeration, the Wanjiang City Belt, the Poyang Lake Eco-Economic Zone, the Central Plains Economic Zone, Wuhan City Circle, Chang(sha)-Zhu(zhou)-(Xiang)Tan Urban Agglomeration and other key areas. The goal is to form a core area that will support the rise of central China and become another important national economic growth pole. The strategy is to allow the urban agglomerations to drive regional economic development, support the provincial capitals and other central cities to improve their urban functions, enhance their urban development strength to nurture and strengthen the urban agglomerations' radiation-driven roles, and promote healthy urbanization development. Moreover, the Document suggests scientifically planning the function orientation and industrial layout of the cities within the urban agglomeration to promote the flow of elements and the functional connectivity among large, medium, small-sized cities and townships to realize coordinated development. The Document also emphasizes that we need to comprehensively strengthen the construction of urban public infrastructure, improve the function of comprehensive service and strengthen the carrying capacity of cities and towns. Specifically, we shall focus on promoting the construction of urban rapid rail transit network within Wuhan City Circle, Chang-Zhu-Tan Urban Agglomeration and Central Plains Urban Agglomeration; support the development of Zheng(zhou)-Bian (Kaifeng) New Districts; build an open economic development zone for the inland development; and construct a pilot area for the coordinated development of industrialization, urbanization and agricultural modernization. In addition, the Document also suggests that the adjustment of administrative divisions should be promoted according to the development needs of urban agglomeration.

7. **The State Council issued Planning Outline for Coordinated Development of Beijing, Tianjin and Hebei Region proposes to construct the Beijing-Tianjin-Hebei Urban Agglomeration to be a world-class super urban agglomeration**

On April 30, 2015, the Political Bureau of the CPC Central Committee meeting reviewed and passed the *Beijing-Tianjin-Hebei Coordinated Development Plan Outline* (the Outline for short). The Outline points out that the coordinated development of Beijing-Tianjin-Hebei is a major national strategy. The core of the Outline is to orderly smooth out Beijing's non-capital functions, adjust the economic structure and space structure, follow a new route of intensive development, explore the model of optimizing development in the densely populated areas, promote the coordinated development of the region, and form a new growing pole. We should adhere to the principles of cooperative development, breakthrough in key areas, deepening reform, and orderly advancement. We should strictly control the population size of Beijing by the combination of strictly controlling population increase and smoothing out the existing population. We need to focus on key breakthroughs in Beijing-Tianjin-Hebei's transportation integration, ecological environment protection, and industrial upgrading. We should vigorously promote innovation-driven development, strengthen resources and energy security capabilities, coordinate the development of social undertakings, and expand internal and external opening-ups.

In order to accelerate the integration of public services, we should speed up the system mechanism barriers, promote the integration of the factor market, carry out a few pilot demonstrations, and create a number of pilot experimenting platforms.

The *Beijing-Tianjin-Hebei Coordinated Development Plan Outline* includes a master plan, implementation rules and specific details. It has both the top-level design framework and the implementation of program rules and road map. The details include traffic integration rules, environmental protection integration rules and industrial integration rules. The *Beijing-Tianjin-Hebei Coordinated Development Plan Outline* is a national regional planning promoted vigorously by the highest decision-making level. It will bring huge investment. The Ministry of Finance estimates that the integration of Beijing-Tianjin-Hebei will invest 42 trillion RMB Yuan in the next six years. This will greatly change the industrial structure of Beijing-Tianjin-Hebei region. The relatively underdeveloped Hebei and Tianjin will undoubtedly have a huge space for development.

8. **The State Council issued Development Plan for Urban Agglomerations in the Middle Reach of Yangtze River proposes to construct the Middle Reach of Yangtze River Urban Agglomeration**

In order to vigorously promote the rise of the central region and accelerate the development of the Yangtze River basin into a new economic support zone, according to the guiding principle of "encouraging and supporting the strategic cooperation among Wuhan City Circle, Chang-Zhu-Tan Urban Agglomeration and the Poyang Lake Urban Agglomeration" proposed in the *State Council's Views on Vigorously Implementing and Promoting the Central Region's Rise* (National Development Document 2012 #43), demands from the *State Council's Guiding Opinions on the Development of the Yangtze River Economic Zone Relying on the Golden Waterway* (National Development Document 2014 #39), and the *National New Urbanization Plan (2014–2020)*, on April 6, 2015, the State Council issued a Reply (National Letter 2015 #62) *State Council's Reply to the Development Plan of the Middle Reaches of the Yangtze River* (the Development Plan for short). In the Reply, the State Council officially approved the promotion of developing urban agglomeration in the Middle Reaches of the Yangtze River. It further points out that the development is of great significance for promoting the development of the Yangtze River Economic Belt, speeding up the overall rise of the central region, exploring new ways of urbanization, and promoting regional integration. We need to put great efforts to build the Middle Reaches of Yangtze River urban agglomeration to be a significant support for the Yangtze River Economic Belt, new national economic growth pole, and the urban agglomeration with noticeable international influence. In the Development Plan, urban agglomeration has been mentioned for 240 times.

9. **The State Council approved Development Plan for the Harbin-Changchun Urban Agglomeration proposes the construction of Harbin-Changchun Urban Agglomeration**

On March 1, 2016, the State Council issued a reply (National Letter 2016 #43) to the *Development Plan of Harbin-Changchun Urban Agglomeration*. In the reply, the State Council put forward the construction of an urban agglomeration belt

with Harbin and Changchun as the core cities, Qiqihar, Daqing, Mudanjiang, Jilin, Yanji and Siping as the immediate second tier cities, radiating surrounding Jiamusi, Songyuan and other cities. It is thought that the development of Harbin-Changchun Urban Agglomeration will ultimately transform the development modes of the two provinces, better the urban governance systems, and improve the ability of urban governance. It is imperative to focus on improving the system mechanism, strengthening the structural reform, emphasizing on job creation and technological innovation, protecting and improving people's livelihood, coordinating the three structures of space, scale and industry, and scientifically planning the layout of urban space. Only in so doing will it be possible to realize the interconnection of infrastructure, coordinated industrial development, eco-environment construction, open cooperation and mutual benefit, and public service sharing. The construction of the Harbin-Changchun Urban Agglomeration will also be an attempt to explore the new urbanization pathways in the grain-producing areas. The goal is to constantly improve urban environmental quality, people's quality of life, urban competitiveness and level of new urbanization, and strive to build the Harbin-Changchun region to be a livable and green urban agglomeration with significant influence and competitiveness.

1.3 Significantly Promoted Global Strategic Position of China's Urban Agglomerations

While the national strategic position for the development of China's urban agglomeration has been improved, urban agglomeration, as a new regional unit of national participation in global competition and international division of labor, is shouldering the important historical mission of the shift of world economic center of gravity. Urban agglomerations are also becoming the main locales for the pursuit of the Belt and Road Initiative, and the key gateway for the world to enter China and China into the world. Apparently, the international strategic position of China's urban agglomeration development has been significantly improved.

1.3.1 China's Urban Agglomerations Are the Primary Locations for Global Urban Agglomeration Development in the 21st Century

1. **Urban agglomerations are the brand new territorial units for national participation of global competition and division of labor**

Urban agglomeration is an inevitable development stage once the development of state industrialization and urbanization enters a specific period, namely, when the country enters the middle and later periods of industrialization. Urban agglomeration has long been regarded by Western scholars as a "specific trait" of developed

countries. For the past more than 100 years (since the beginning of the 20th century), the average urbanization rate of the world reached 52%, while that in developed countries exceeded 80%. Under such a development status, in the highly urbanized and developed countries, a new urban clustering form-urban agglomeration, appears as a new regional unit specifically serving for national participation in global competition and international division of labor.

This is especially true when the 21st century became the economic globalization century. With the acceleration of economic globalization and the development of urbanization, the competition among cities is no longer only the competition of individual cities, but increasingly the competition of urban groups with core cities as the center. Urban agglomerations with big cities as their core have become a new city-region and spatial organization with global significance. Their development is profoundly affecting the international competitiveness of the countries. The strengthening of the trend of global economic integration signifies that the world's urban agglomerations are now re-participating in the division of labor, exchanging and collaborating in a new era of globalization. Only urban agglomerations have enough industrial agglomeration and economic scale to participate in the global urban competition and cooperation, to form strong united economic community and the fate community, and to be able to meet the challenges of globalization.

According to the United Nations' projections, by 2050, global urbanization rate will exceed 75%. Meanwhile, the world's largest 40 mega metropolitan areas, which occupy very small amount of areas on Earth, will gather 18% of the world's population, involve 66% of the global economic activities, and about 85% technological innovation. The latest report on the state of the world's cities points out that the mega metropolis of the world is increasingly converging on the larger "mega-metropolitan" and "mega-urban agglomerations". It can be seen that urban agglomeration, as a new regional unit of national participation in global competition and international division of labor, will decide the new pattern of the world political economy in the 21st century.

2. **The global urban agglomeration development enters a "China era"**

After more than 100 years of development, urban agglomerations, which were mainly distributed in Europe and the United States and other developed countries, have entered a mature development stage. Because most of these urban agglomerations face less pressure for their population from environment and eco-systems, there were relatively few development issues. Their primary concerns are the development of social and humanity issues (Table 1.4). On the contrary, the developing countries' urban agglomerations have much less time of development, most of them are in emerging and rapid growing stages. Their development often faces tremendous pressure from their ever-increasing population, decreasing resources and more limited ecological environments. There are comparatively more development problems than their developed counterparts. Their primary concerns are the coordination and sustainability between the socioeconomic development and their ecological environment. In this sense, since the world's center of economic activities has shifted to the Asia-Pacific region, the urban agglomerations that carry the world economic

Table 1.4 Comparative analysis of urban agglomerations between developed and developing countries

Comparison		Urban agglomerations in developed countries	Urban Agglomerations in developing countries
Region		Europe, North America, Asia	Asia
Similarity		1. Contribute the greatest to the world and the home country 2. Formation of highly integrated urban groups 3. Serve as the center of gravity for global economic transfer 4. Powerful suction effects (of capital and talents) 5. Centers for global capital and information	
Dissimilarity	Development period	110 years	30 years
	Development stages	Mature stage	Growing stage
	Development mechanism	Market-oriented	Government-led
	Development degree	High	Low
	Stability	High	Low
	Compactness	High	Low
	Global competition	Strong	Weak
	Resource and environment carrying capacity	High	Low
	Main driving force	Industrialization, urbanization	Globalization, Informationization, industrialization, culture
	Input-output efficiency	High	Low
	Development characteristics	Small quantity, slow concentration, fewer problems	Large quantity, fast concentration, many problems
	Pressure	Low resource and eco-environment pressure (fewer people, abundant resources, high quality eco-environment)	Great resource and eco-environment pressure (more people, scarce resources, destruction of eco-environment)
	Research methods	Dominated with humanities and social science research	Dominated with interdisciplinary research, extreme complexity

center also shift to the Asia-Pacific region, especially to China, which drastically boosts the development of China's urban agglomerations. Because of this transition, we can conclude that the development of global urban agglomeration has entered a China's era. China's urban agglomerations are the primary field for global urban agglomeration development, and likely concentrate the majority of issues that other global urban agglomerations seek to solve.

1.3.2 China's Urban Agglomerations Are Important Carriers for the Third Transition of Global Economic Gravity Centers

Over the past 100 years, a few globally influential and internationally competitive urban agglomerations emerged as the world economic centers of gravity have been gradually shifting from Europe to North American to Asia-Pacific. Evidence suggests that these urban agglomerations have played a major role in serving as the world economic center of gravity.

1. **The various transitions of global economic gravity center promote the formation of global urban agglomerations and elevate them to be the global development hubs**

Analyzing from the course of global economic development and the process of global urbanization development, the main intention of the developed countries to build urban agglomerations is to meet the needs of the changes of the world economic center of gravity and the multiple shifts of science and technology centers. Each shift of the economic center of gravity has brought about a large-scale industrialization and urbanization within the receiving region and has also facilitated the formation and development of world-class urban agglomerations (Table 1.5). Specifically, after the Industrial Revolution of the 18th century, Britain became the center of the world economic growth, which promoted the formation of London Urban Agglomeration based on the axis from London to Liverpool. The rise of the European continent in the 19th century makes Western Europe the center of world economic growth, which then facilitated the formation of the Greater Paris Urban Agglomeration in French and the Northwestern European Urban Agglomeration. At the beginning of the 20th Century, the world economic growth center shifted from Western Europe to North America, which promoted the formation of the North American Atlantic Rim (Boston-New York-Washington) Urban Agglomeration and the Great Lakes Urban Agglomeration. Entering the 21st century, the world economic growth shifted again to the Asia-Pacific region. The Tokyo-Osaka axis based Japanese Pacific Rim Urban Agglomeration emerged as a world class urban agglomeration. As the center of world economic development shifted again to China, the Yangtze River Delta Urban Agglomeration, the Pearl River Delta Urban Agglomeration, the Beijing-Tianjin-Hebei Urban Agglomeration and other world-class urban agglomerations

Table 1.5 World urban agglomerations formed as the shift of the world economic center of gravity

Shifts of the world economic center of gravity	Period	Pathway	Urban agglomerations formed
Origin	18th century	United Kingdom	Long Urban Agglomeration
First shift	19th century	From United Kingdom to Western Europe	Greater Paris Urban Agglomeration, Northwestern European Urban Agglomeration
Second shift	20th century	From Western Europe to Northern America	Atlantic Rim Urban Agglomeration, Great Lakes Urban Agglomeration
Third shift	21st century	From Northern America to Asia-Pacific	Japan's Pacific Rim Urban Agglomeration, China's Yangtze River Delta Urban Agglomeration, Pearl River Delta Urban Agglomeration, Beijing-Tianjin-Hebei Urban Agglomeration, Shandong Peninsula Urban Agglomeration, Central and Southern Liaoning Urban Agglomeration; The Middle Reaches of the Yangtze River Urban Agglomeration, Chengdu-Chongqing Urban Agglomerations, and other China's urban agglomerations

rapidly rise to serve as the main carrying bodies of the shift. It is evident that the formation and development of world-class urban agglomerations is not only the product of industrialized and urbanized development in developed countries, but also the result of the shifts of the centers of world economic development and science and technology advancement. Every such shift facilitates the formation of new urban agglomerations that serve the historical role for carrying such shift, and also the global hub for economic development, scientific advancement and technological innovation.

In the process of the shift of the world economic center of gravity, the typical urban agglomerations in developed countries have played the important functions of global and national hubs. They are often the national or intercontinental hubs and the political and economic centers for the world. These urban agglomerations usually serve

as foreign trade portals, modern industrial development locations, commercial and finance centers, and cultural centers. These areas are often the most developed and highly efficient regions of the host country and serve as "incubators" that facilitate the formation of new technologies and ideas. Urban agglomerations play a central dominant role in the economic development of the host country, neighboring regions and the world. For instance, the Atlantic Rim Urban Agglomeration of the Northeastern United States (the often-called Bos-Wash Region) is the most important industrial and business district in the United States. The core of the urban agglomeration is New York City, serving as the headquarter of the United Nations, including the five out of six major divisions of the United Nations. New York City is also called the "capital of banks" in the United States due to its concentration of financial institutions. Financial dynamics in New York dominate the financial, securities and foreign exchange markets in both the United States and the entire world. 30% of the 500 largest companies in the United States have their headquarters here, which project a decisive impact over the United States and even the world's economy. City of Washington (Washington D.C.) is the capital of the US and the only political center in the world that is dominated by primarily government administrative functions. Half of the urban population is employed as federal government officials and service personnel. Boston is a famous cultural center, and the microelectronics technology center next only to Silicon Valley in the United States. This shows that the urban agglomeration is shouldering the important functions of the central hub of the country and even the world. In addition, the Northeastern Atlantic Rim Urban Agglomeration and the Great Lakes Urban Agglomerations together constitute the manufacturing belt of Northern America. These two urban agglomerations concentrated more than 20 metropolitan areas with population over 1 million and over 70% of US's manufacturing industries. Additionally, the United Kingdom's London agglomerations gathers 70% of its population, 80% of its economic volume, and serves as UK's industry-intensive belt and the economic core area. Japan's Pacific Rim Urban Agglomeration has concentrated more than half of Japan's population and 2/3 of its industrial outputs and is the main body of Japan's economic and social development.

2. **As the carrier of the transition of the global economic gravity center, urban agglomerations have formed four highly internationalized systems**

Although constructing urban agglomerations in developed countries has its complexity and difficulty, it succeeds in building four systems with high degree of internationalization, namely, the urban hierarchical system, modern industrial system, international division of labor and cooperation system, and a highly developed infrastructure network system.

First, the highly internationalized urban hierarchical system. In general, the world urban agglomeration has a relatively complete size system. The size structure follows a rational pyramid-like hierarchy with a few large cities with full functions on top, and many smaller cities at various levels of the system providing corresponding functions. The various functions of the cities can spread to the whole system sequentially and orderly through the city network. Among them, the central city plays a central role in the formation and development of urban agglomeration, and it is the center

of gravity of population and industry agglomeration. The New York-centered urban agglomerations of the Northeastern Atlantic, the Tokyo-centered coastal agglomerations of Japan, the city of London-centered urban agglomerations are typical of this model. Urban agglomeration is a huge city group. An urban agglomeration not only has several large central cities, but also has a large number of small and medium-sized cities. For instance, in the Pacific Rim Urban Agglomerations of Japan, Tokyo is the core city with a population of more than ten million. Osaka, Nagoya and Yokohama have over 2 million people, of which Osaka is Japan's second largest economic center. In addition, the Yokohama industrial belt between Yokohama and Tokyo is Japan's largest industrial belt. Nagoya is Japan's fourth largest port with highly developed automobile industries and many small and medium-sized cities. Kobe, Kyoto, Chiba and other cities have over 1 million people. Among them, Kyoto has been the ancient capital of Japan, called the "West Capital". Kobe is the transportation portal of Western Japan. The outer port of Osaka's throughput capacity is the largest in Japan. Chiba is an important raw material input port. This urban agglomeration is composed of metropolis, large cities, medium-sized cities and small cities, which form a complete hierarchical urban system that provides full function of the entire spectrum of cities.

Second, the formation of a highly internationalized modern industrial system. The development process of an urban agglomeration is also a process of forming various industries of different sizes and characteristics based on the complete urban system. Again, for the Pacific Coastal Urban Agglomeration of Japan, we can see that each city undertakes different functional division according to its own foundation and characteristic. Because of such interconnected development, the urban agglomeration has a comprehensively functional and complete modern industrial system, including modern manufacturing system, modern agricultural system and modern service industry system.

Third, the formation of a highly internationalized global division of labor and cooperation. The essence of urban agglomeration is joint development (so 1 plus 1 is more than 2). Urban agglomeration's essence is its high integration with rational division of labor among its member cities. The economy of the world urban agglomeration is built on the basis of strict organization, division of labor and diversified and systematic industry development. This is the foundation that an urban agglomeration's comprehensive function of the whole region is much larger than the simple superposition of the individual cities' various functions. For instance, in the Atlantic coastal urban agglomeration of the Northeastern United States, New York City is the core of the urban agglomeration. It is the United States and even the world's financial center and dominates the world's financial, securities and foreign exchange markets. New York is also the location of the headquarters of the United States and international companies, as well as a top choice for various professional management agencies and service sectors. Philadelphia is the second largest city in the urban agglomeration and is the main oil refining center and steel and shipbuilding base of the east coast of the United States. Boston is a famous cultural center, the world-renowned Harvard University and MIT are here. The 128 Highway Ring Technology Park centered on Boston has formed a high-tech industrial group and is the center

of micro-electronic technology of the United States second only to Silicon. Washington is the capital of the United States and the political center. Within these urban agglomeration, there are many seaports. These seaports have reasonable division of labor in the development. The port of New York is a commercial port, dominated by container transport. The port of Philadelphia is mainly engaged in offshore cargo. The port of Baltimore serves mainly as a transit port for ore, coal and grains. The port of Boston is a commercial port of local products, while also serving as a sea harbor. From the analysis of the major cities and ports in this urban agglomeration, we can see that these cities have their own special functions with a reasonable international and domestic division of labor. They all have their own advantages in the industrial sector, but also closely linked with one another on the basis of the common market. The various factors of production in the urban agglomeration move freely to promote population and economic activities and form larger scale agglomeration. Each city vigorously develops their own advantageous industries on the basis of industrial and functional division of labor and cooperation so that they can form highly integrated economic relationship and greatly enhanced the urban agglomeration's international competition ability.

Fourth, the formation of a highly developed infrastructure network system. The developed transportation network facilities are the important support for the rapid development of urban agglomeration. The development of transportation network has great influence on the industrial spatial evolution of urban agglomeration. Most of the developed countries' urban agglomerations have a rather complete regional transportation infrastructure network composed of highways, high-speed railways, waterways, telecommunication lines, transportation pipelines, electricity network, water supply and drainage network systems. Taking the Pacific coastal urban agglomerations of Japan as an example, within the urban agglomeration, the expressway systems of Tokyo, Nagoya and Osaka-Kobe connect with the five main transportation lines of Japan, forming the National Expressway Network system. The region has the largest port group and aviation network in Japan, with high-speed Shinkansen and subways reaching almost every important area. The total length of rail transit lines in the urban agglomerations of London is about 3500 km, and the suburban railroad is 2300 km. London has also built 9 radial highways from London, and built a circular highway, linking the disparate ring-shaped highways, and formed a "one-ring nine-shot" highway network. It can be seen that the developed traffic network has made the multiple modern modes of transportation in the region form an integrated traffic corridor, which provides a strong support for spatial industrial integration within urban agglomeration.

1.3.3 China's Urban Agglomerations Serve as the Gateways for the World Entering China and China Integrating with the Global Community

1. **China's urban agglomerations are the key gateways for the world entering China**

From analyzing the actual use of foreign capital with incomplete statistics, in 1980 the actual utilization of foreign capital in China's urban agglomerations were only 205 million US dollars. By 2000, it reached 46.487 billion US dollars; by 2010, it further increased to 94.486 billion US dollars; and by 2014 it reached 108.368 billion US dollars. The actual use of foreign capital in urban agglomerations accounted for 27.27% of the actual use of foreign capital in China in 1980. It increased to 78.32% in 2000, 86.83% in 2010, and 90.53% in 2014 (Table 1.6 and Fig. 1.3).

As can be seen clearly today, China's urban agglomerations have become key gateways and first place for all kinds of production factors (capital, resources, technology, manpower, etc.) to enter into China.

2. **China's urban agglomerations are the key windows for China integrating with the global community**

Based on available data, the total import and export of China's urban agglomerations in 1980 was 7.111 billion US dollars. It increased to 442.586 billion US dollars in 2000, to 2838.3 billion US dollars in 2010, and to 3885.453 billion US dollars in 2014. The proportion of China's urban agglomerations' total import and export in the nation was 18.64% in 1980, reached 93.32% in 2000, 95.44% in 2010, and 94.30% in 2014 (Table 1.5). Clearly, in China's all-round opening to the outside world today, China's urban agglomerations have become the country's key windows and priory exporting grounds for various production factors and products to the world, and the centers for the country's export-oriented enterprises concentrated, and the most developed areas of export-oriented economy.

1.3.4 China's Urban Agglomerations Are the Primary Locations Supporting the Pursuit of the Belt and Road Initiative

The Decision of the Central Committee of the CPC on the Overall Deepening of the Reform passed in the Third Plenary Session of the CPC's 18th Central Committee has clearly proposed to construct a new system of open economy, promote the Silk Road Economic Belt and the 21 Century Maritime Silk Road construction, and form a new all-round opening pattern. China then puts forward the construction of 20 urban agglomerations of different sizes, different scales, and different levels of development, including 8 urban agglomerations located on the Silk Road Economic Belt,

Table 1.6 Statistics on the increase of the total utilization of foreign capital and import and export in China's urban agglomerations, 1980–2014

Year	Gross regional product /(Current price, 100 million RMB Yuan)	Gross domestic product as a share of the country/%	Actual use of foreign capital/100 million US dollars	The actual use of foreign capital in the national share/%	Total imports and exports/100 million US dollars	Total import and export in the national share/%
1980	3,218.95	70.81	2.05	27.27	71.11	18.64
1985	6,550.20	72.65	22.46	47.19	432.36	62.12
1990	12,438.68	66.63	52.06	50.59	616.31	53.39
1995	43,459.61	71.49	355.00	73.75	1,921.55	68.41
2000	79,325.38	79.95	464.84	78.32	4,425.86	93.32
2001	86,615.85	78.99	400.81	80.69	5,007.16	98.25
2002	96,015.83	79.79	468.38	85.14	5,704.02	91.89
2003	119,513.47	87.99	459.40	81.83	7,860.50	92.37
2004	136,114.26	85.14	560.53	87.48	10,924.40	94.62
2005	160,985.05	80.81	524.75	82.24	13,774.27	96.87
2006	188,356.66	80.73	552.68	82.40	17,033.85	96.76
2007	225,708.97	80.69	636.86	81.30	20,962.79	96.31
2008	268,652.37	80.60	822.57	86.36	24,438.98	95.34
2009	299,891.12	82.09	811.02	88.34	21,124.49	95.69
2010	356,998.65	81.75	944.86	86.83	28,383.00	95.44
2011	427,819.21	82.05	984.15	83.62	34,600.96	95.01
2012	476,837.98	82.71	986.15	87.04	37,065.38	95.85
2013	523,398.92	83.08	1,030.83	86.83	39,302.98	94.47
2014	564,271.42	82.46	1,083.68	90.53	38,854.53	94.30

Data source Database of research team of Chinese Academy of Sciences, 2016

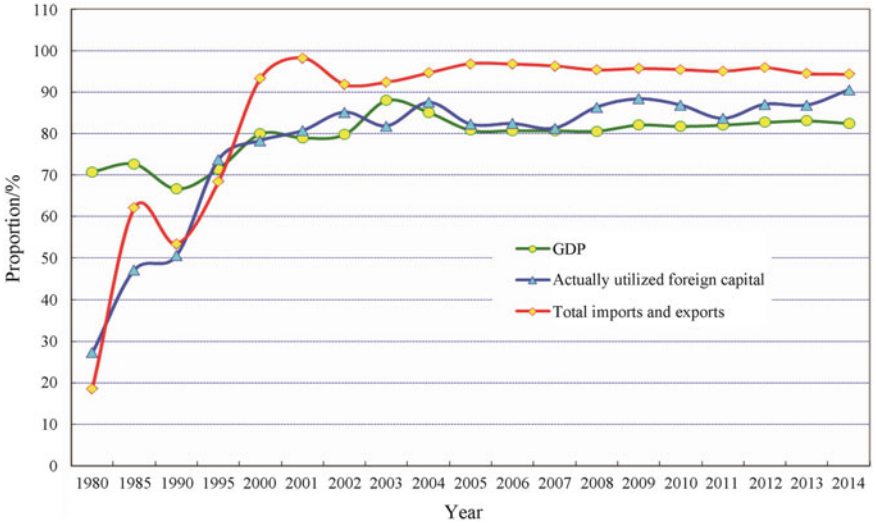


Fig. 1.3 Proportion of actually utilized foreign capital and total imports and exports in Chinese urban agglomerations

7 urban agglomerations located on the 21st Century Maritime Silk Road, totaling 15 urban agglomerations in the Belt and Road, which account for 75% of China's urban agglomerations. All 20 urban agglomerations will be supporting the pursuit of the Belt and Road Initiative and also covered by its development. These urban agglomerations shoulder the strategic mission of promoting the Initiative.

1. **The eight large urban agglomerations along the Silk Road Economic Belt are the main locations to construct the economic belt**

The Silk Economic Belt connects east to the Asia-Pacific Economic Circle, and west to the Western Europe Economic Circle. It is the world's longest and most promising international economic corridor. The construction of the Silk Road Economic Zone is a major strategic initiative of the Central Committee and the State Council of China for global and all-around opening-up. Based on *Visions and Actions of Promoting the Construction of the Silk Road Economic Belt and 21st Century Maritime Silk Road*, the Silk Road Economic Belt connects China with Central Asia, Russia, and Europe (to the Baltic Sea), and through Central Asia and West Asia to the Persian Gulf and the Mediterranean Sea; with Southeast Asia, South Asia, and the Indian Ocean. According to this international circle, the economic belt of the Silk Road has passed through the Northern Slope of the Tianshan Mountains Urban Agglomeration, the Lanzhou-Xining Urban Agglomerations, the Central Shaanxi Urban Agglomeration, the Chengdu-Chongqing Urban Agglomeration, the Central Yunnan Urban Agglomeration and the Central Guizhou Urban Agglomeration , which also radiates to drive

the Ningxia Yellow River Urban Agglomeration and Hohhot-Baotou-Ordos-Yulin Urban Agglomeration. The construction of these urban agglomerations will form a channel, a trade and logistics hub, and an important industry and a humanistic exchange base to connect with Central Asia, South Asia and Western Asia.

Analyzing from economic development perspective, the urban agglomerations on the Silk Road Economic Belt are the strategic support points of the sustainable development of the Silk Road Economic Belt. It is also China's regional units on the Silk Road Economic Belt taking part in the global competition and international division of labor. In addition, the 8 urban agglomerations are also key development zones and prioritized development zones of their respective provinces, which are the strategic key areas and core areas of economic development. These areas are densely populated areas of various production factors. The economic aggregates of these urban agglomerations account for 70–75% of the total economic volume of the respective provinces. They apparently dominate the socioeconomic development of China's segments on the Silk Road Economic Belt, and also dominate the regional development of Western China's economic development lifeline.

From the perspective of the development of new urbanization, the urban agglomerations of the Silk Road Economic Belt are the strategic locations of implementing the new urbanization strategies in China. Although the urbanization level of China's urban agglomerations in the Silk Road Economic Belt is lower than the national average by about 20%, they are still the future of the western region to promote the new urbanization development, and the main locations to absorb the large urbanized rural population in the future.

From the perspective of social and cultural development, the Silk Road Economic Belt urban agglomerations are China's culture exchanging centers on the Silk Road Economic Belt and the main locations for scientific and technological innovation and cultural heritage of Western China.

In the future, China will strive to build the Chengdu-Chongqing Urban Agglomeration into a national-level urban agglomeration of Southern China on the Silk Road Economic Belt. It will be the fifth national urban agglomeration that will promote the development of the western region. The Central Shaanxi Urban Agglomeration will become a strategic opening-up location of inland China on the Silk Road Economic Belt. It will also serve as an important advanced manufacturing and high-tech industrial base, the national important science and technology education, historical and cultural base of the Chinese civilization. The Lanzhou-Baiyin-Xining Urban Agglomeration will be an important strategic supporting point in the middle section of the Silk Road Economic Belt. The Northern Slope of the Tianshan Mountains Urban Agglomeration will be Western China's bridgehead of opening-up to the five countries in Central Asia. The Ningxia Yellow River Urban Agglomeration will be an important inland opening-up experiment development zone. The Central Guizhou Urban Agglomeration will be an important plateau-type urban agglomeration in the southern end of China.

2. **The seven large urban agglomerations along the Maritime Silk Road are the main locations to construct the 21st Century Maritime Silk Road Economic Belt**

Based on the areas defined in Promoting of the Silk Road Economic Zone and the Vision and Action of the Maritime Silk Road in the 21 Century, the 21st Century Maritime Silk Road of goes from the coastal ports in China through the South China Sea to both the South Pacific Ocean and the India Ocean to Europe. Based on this definition, from south to north China, there are seven urban agglomerations on the Maritime Silk Road, including Guangxi Beibu Gulf Urban Agglomeration, Pearl River Delta Urban Agglomeration, Western Coast of the Taiwan Strait Urban Agglomeration, the Yangtze River Delta Urban Agglomeration, the Shandong Peninsula Urban Agglomeration, Beijing-Tianjin-Hebei Urban Agglomeration, and Central and Southern Liaoning Urban Agglomeration. These urban agglomerations are also the China's coastal urban agglomerations, and the large strategic nodes on the main axis of China's coastal development. The future development will take advantage of the economic strength and international connections of the Yangtze River Delta, the Pearl River Delta, the Western Coast of the Taiwan Strait and the Bohai Rim Region to deepen the opening-up and reform process. For further development, it is imperative to innovate the mechanism of open economic system, increase the strength of scientific and technological innovation, form new strengths of participating and leading international cooperation and competition, and build the urban agglomerations into pioneers and main forces of the 21st Century Maritime Silk Road development.

1.4 Literature Analysis on the Progress of Urban Agglomeration Research in the Past Century

Using the method of bibliometrics and the key pathfinder algorithm of the Citespace software package, we searched through the Web of Science database and China National Knowledge Infrastructure (CNKI) database up until July 8, 2015 for urban agglomeration related research. Our search indicated that there were 83,332 studies that were relevant to urban agglomeration studies. Among them, 32,231 were from Web of Science (38.7%), and 51,101 were from CNKI (61.3%) (Fig. 1.4 and Table 1.7), suggesting that urban agglomeration studies had greatly attracted Chinese scholars' attention during the past century.

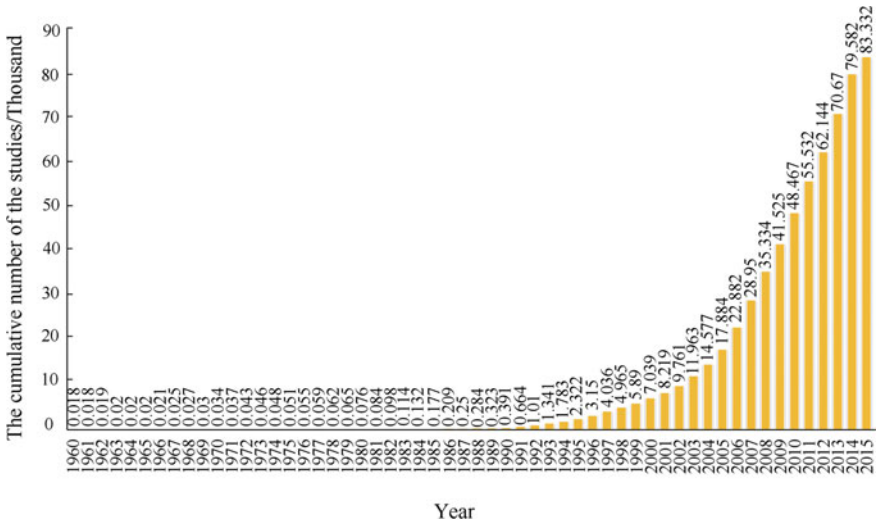


Fig. 1.4 Accumulative change trend of international and domestic literatures on urban agglomeration

1.4.1 Urban Agglomeration Studies in the World

1. **Studies of urban agglomeration boom after the 1990s**

Our search suggests that for international urban agglomeration studies, relevant works about urban agglomerations (Megalopolis/urban agglomeration/city group/city cluster) started around the 1920s. The research grows rapidly after the 1990s. Using key words Megalopolis/urban agglomeration/city group/city cluster, we are able to find 32,231 research papers from the Web of Science database (Fig. 1.5 and Table 1.7). Before 1990s, there were less than two studies per year. It increases dramatically after 1990s and reaches over 1,500 studies per year after 2000. Among them, there are 2,708 studies pertaining to China's urban agglomerations (key words are China/Chinese megalopolis/urban agglomeration/city group/city cluster), which was less than 20 prior to 1994, but increases rapidly (over 100 studies per year) especially after 2007's financial crisis.

2. **International urban agglomeration studies focus mainly on agglomeration, productivity, location, urbanization and China**

Through keyword search (of a 3-year window), we found that cities, clusters, growth, urbanization, China, cluster economy and productivity appear frequently, and are the main content of the relevant research. In addition, cluster, productivity, location, urbanization and China have a high central theme. In other words, in the relevant research, cities, clusters, growth, urbanization and China are widely accepted research foci.

Table 1.7 Statistics on the number of international literatures related to urban agglomeration (up until 2015-7-8)

Year	Non-Chinese studies	Increment of non-Chinese studies	Studies about China	Increment of studies about China	Chinese studies	Increment of Chinese studies	Total number of studies	Increment of total number of studies
1922	1	1	0	0	0	0	1	1
1923	1	0	0	0	0	0	1	0
1924	1	0	0	0	0	0	1	0
1925	1	0	0	0	0	0	1	0
1926	1	0	0	0	0	0	1	0
1927	1	0	0	0	0	0	1	0
1928	2	1	0	0	0	0	2	1
1929	2	0	0	0	0	0	2	0
1930	3	1	0	0	0	0	3	1
1931	3	0	0	0	0	0	3	0
1932	3	0	0	0	0	0	3	0
1933	3	0	0	0	0	0	3	0
1934	3	0	0	0	0	0	3	0
1935	5	2	0	0	0	0	5	2
1936	5	0	0	0	0	0	5	0
1937	5	0	0	0	0	0	5	0
1938	5	0	0	0	0	0	5	0
1939	5	0	0	0	0	0	5	0
1940	5	0	0	0	0	0	5	0
1941	6	1	0	0	0	0	6	1
1942	6	0	0	0	0	0	6	0
1943	7	1	0	0	0	0	7	1
1944	7	0	0	0	0	0	7	0
1945	8	1	0	0	0	0	8	1
1946	8	0	0	0	0	0	8	0
1947	8	0	0	0	0	0	8	0
1948	8	0	0	0	0	0	8	0
1949	8	0	0	0	0	0	8	0
1950	8	0	0	0	0	0	8	0
1951	9	1	0	0	0	0	9	1
1952	10	1	0	0	0	0	10	1
1953	12	2	0	0	0	0	12	2
1954	12	0	0	0	0	0	12	0

(continued)

Table 1.7 (continued)

Year	Non-Chinese studies	Increment of non-Chinese studies	Studies about China	Increment of studies about China	Chinese studies	Increment of Chinese studies	Total number of studies	Increment of total number of studies
1955	13	1	0	0	0	0	13	1
1956	13	0	0	0	0	0	13	0
1957	15	2	0	0	0	0	15	2
1958	16	1	0	0	0	0	16	1
1959	18	2	0	0	0	0	18	2
1960	18	0	0	0	0	0	18	0
1961	18	0	0	0	0	0	18	0
1962	19	1	0	0	0	0	19	1
1963	20	1	0	0	0	0	20	1
1964	20	0	0	0	0	0	20	0
1965	20	0	0	0	0	0	20	0
1966	21	1	0	0	0	0	21	1
1967	25	4	0	0	0	0	25	4
1968	27	2	0	0	0	0	27	2
1969	30	3	0	0	0	0	30	3
1970	34	4	0	0	0	0	34	4
1971	37	3	0	0	0	0	37	3
1972	43	6	0	0	0	0	43	6
1973	46	3	0	0	0	0	46	3
1974	48	2	0	0	0	0	48	2
1975	51	3	0	0	0	0	51	3
1976	55	4	0	0	0	0	55	4
1977	59	4	0	0	0	0	59	4
1978	62	3	0	0	0	0	62	3
1979	65	3	1	1	0	0	65	3
1980	72	7	1	0	4	4	76	11
1981	72	0	1	0	12	8	84	8
1982	78	6	2	1	20	8	98	14
1983	86	8	2	0	28	8	114	16
1984	92	6	2	0	40	12	132	18
1985	98	6	2	0	79	39	177	45
1986	103	5	2	0	106	27	209	32
1987	109	6	2	0	141	35	250	41
1988	111	2	2	0	173	32	284	34
1989	115	4	2	0	208	35	323	39

(continued)

Table 1.7 (continued)

Year	Non-Chinese studies	Increment of non-Chinese studies	Studies about China	Increment of studies about China	Chinese studies	Increment of Chinese studies	Total number of studies	Increment of total number of studies
1990	146	31	2	0	245	37	391	68
1991	387	241	6	4	277	32	664	273
1992	687	300	14	8	323	46	1,010	346
1993	977	290	14	0	364	41	1,341	331
1994	1,307	330	28	14	476	112	1,783	442
1995	1,671	364	40	12	651	175	2,322	539
1996	2,353	682	51	11	797	146	3,150	828
1997	3,082	729	76	25	954	157	4,036	886
1998	3,873	791	107	31	1,092	138	4,965	929
1999	4,634	761	128	21	1,256	164	5,890	925
2000	5,488	854	161	33	1,551	295	7,039	1,149
2001	6,309	821	190	29	1,910	359	8,219	1,180
2002	7,337	1,028	228	38	2,424	514	9,761	1,542
2003	8,417	1,080	275	47	3,546	1,122	11,963	2,202
2004	9,544	1,127	328	53	5,033	1,487	14,577	2,614
2005	10,804	1,260	390	62	7,080	2,047	17,884	3,307
2006	12,158	1,354	484	94	10,724	3,644	22,882	4,998
2007	13,845	1,687	608	124	15,105	4,381	28,950	6,068
2008	15,799	1,954	773	165	19,535	4,430	35,334	6,384
2009	18,046	2,247	996	223	23,479	3,944	41,525	6,191
2010	20,278	2,232	1,211	215	28,189	4,710	48,467	6,942
2011	22,739	2,461	1,428	217	32,793	4,604	55,532	7,065
2012	25,346	2,607	1,741	313	36,798	4,005	62,144	6,612
2013	28,134	2,788	2,115	374	42,536	5,738	70,670	8,526
2014	30,983	2,849	2,525	410	48,599	6,063	79,582	8,912
2015	32,231	1,248	2,708	183	51,101	2,502	83,332	3,750

Of all the studies, if classified by disciplines (with a 3-year window), environment and ecology, geography, business and economics, environmental studies, economics are the main research fields. Environmental science, environmental research, and environment and ecology are the core areas of related research, followed by engineering, water resources, meteorology and atmospheric science. It can be seen that the studies of urban agglomeration mainly come from environment, ecology and economics, and its core is environmental and ecological research.

From citied journal distribution (with a 5-year window), we found that *Urban Studies*, *Journal of Urban Economy*, *American Economic Review*, *Regional Science and Urban Economics*, *Journal of Regional Science*, *Journal of Economic Geography* and *Journal of Political Economy* are the most frequently found periodicals in the field of related collaborative research. In the meantime, *Urban Studies* has the strongest centrality of the relevant research, followed by the *Journal of Economic Geography*,

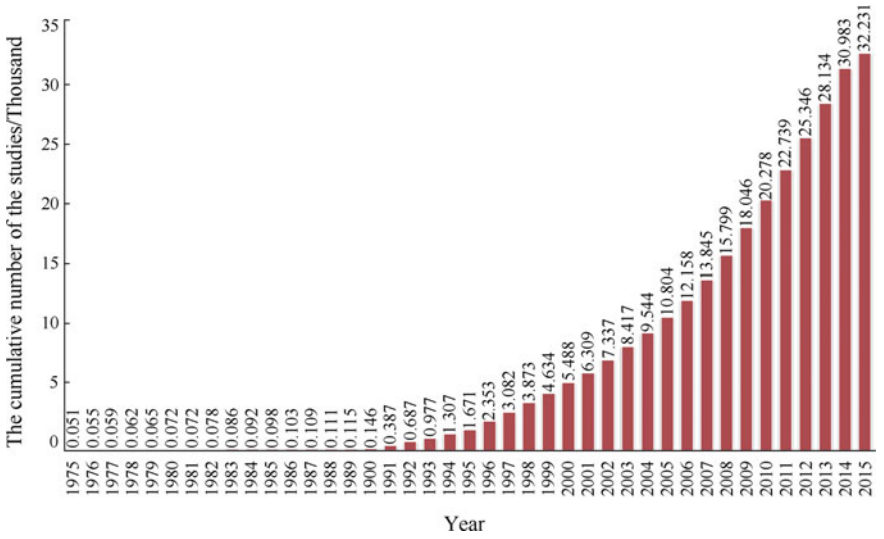


Fig. 1.5 Accumulative change trend of foreign language literatures on urban agglomeration

Journal of Regional Science and *Environment and Planning A*. In other words, *Urban Studies*, *Journal of Regional Science* and *Journal of Economic Geography* are the core periodicals that are widely concerned in the field of urban agglomeration research.

3. **China is the country that has the highest frequency of urban agglomeration studies, while the Chinese Academy of Sciences leads the study trend**

From the distribution of countries (with a 3-year window of search), China's circle node is significantly larger than that of other countries. China also has the highest frequency of cooperation, followed by the United States, the United Kingdom, Poland, Germany and France. It can be said that in the corresponding research of urban agglomerations, China is increasingly leading the studies.

From the distribution of research institutes (again with a 3-year window of search), the Chinese Academy of Sciences is the leading institutes in urban agglomeration studies, followed by Beijing Normal University, Nanjing University, Peking University, Russian Academy of Sciences, Zhejiang University, and Free University of Amsterdam. The University of California (Los Angeles), Chinese Academy of Sciences, Beijing Normal University, Peking University, Nanjing University, Zhejiang University, and the University of Aristotle have relatively strong importance in relevant fields. Among them, the Chinese Academy of Sciences, the University of London, the University of California, the French National Academy of Sciences and the Institute of London Political Economics dominate the study of urban agglomerations (megalopolis/urban agglomeration/city group). On the other hand, studies about China/Chinese megalopolis/urban agglomeration are dominated by the Chinese Academy of Sciences and the University of Chinese Academy of Sciences,

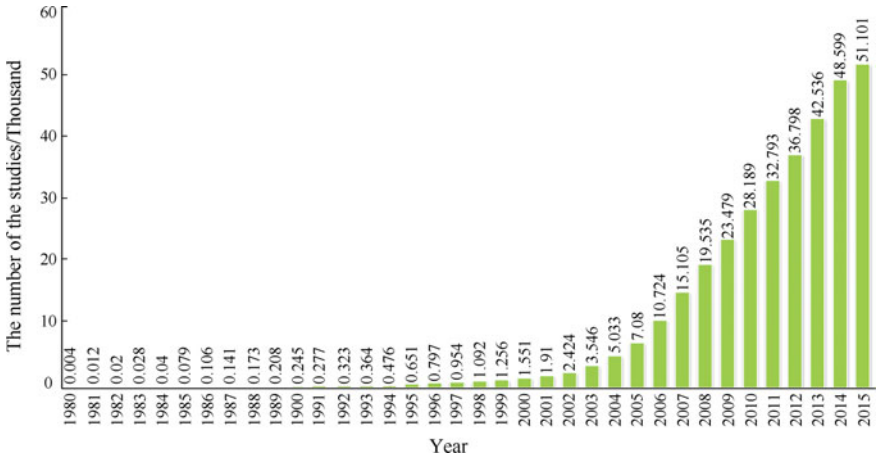


Fig. 1.6 Accumulative change trend of domestic literatures on urban agglomeration

Nanjing University, Beijing Normal University, Peking University and Zhejiang University.

From the distribution of research scholar (cited author) (with a 5-year window of search), Glaeser, Fujita, Duranton, Krugman, Storper, Florida and Combes are authors with highest total citations. Jaffe, Tian, Anas and Fujita are key experts in the field of related research. Among the Chinese urban agglomeration studies, C. L. Fang, Nakayama and J. Wang are the most important scholars.

1.4.2 Urban Agglomeration Studies in China

Using fuzzy search with the urban agglomeration and China's urban agglomeration as keywords, we obtained 51,101 research papers (Fig. 1.6), if using accurate search, we had 33,291 papers. Using keyword "Urban agglomeration", for the fuzzy search, we had 47,846 papers; accurate search yields 29,702 papers. Using "China's urban agglomeration" as a keyword in the fuzzy search, we had 367 papers; accurate search produces 365 papers.

In particular, in terms of the number of documents, the Chinese studies on urban agglomerations started to emerge after the 1980s, and the study of China's urban agglomerations started in the middle of 1990s. The number of both studies is increasing, especially after entering the 21st century. Relevant studies increase by 3000 papers per year and reached the peak in 2014. Specifically, studies of urban agglomerations, China's urban agglomeration increased gradually after the 8th Five-Year Plan, and rapidly during the 10th Five-Year Plan and 11th Five-Year Plan.

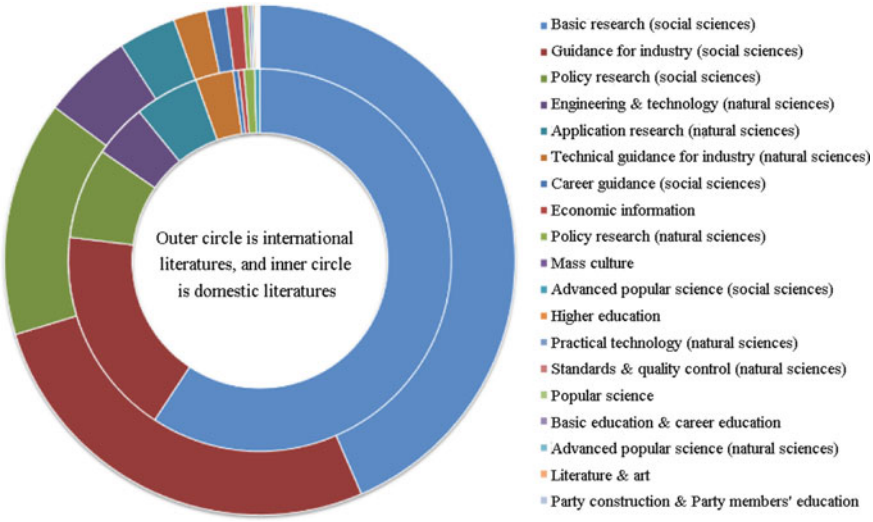


Fig. 1.7 Research hierarchy and structure of domestic literatures on urban agglomeration

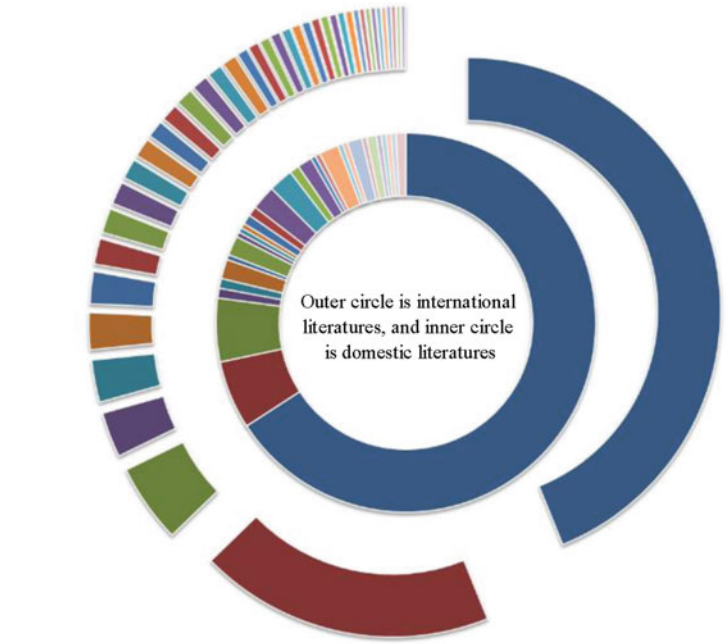
1. **China's urban agglomeration studies focus on policy research and sustainable development in the field of social sciences**

Judging from the fields of research, the majority of China's urban agglomerations studies focused on the basic research, industry guidance, policy research in the social science, and engineering technology, basic and applied basic research, and industry technical guidance in the field of natural science (Fig. 1.7).

For specific disciplines, the main subject areas of urban agglomeration studies in China concentrate on the aspects of macroeconomic management and sustainable development, economic system reform, construction science and engineering, transportation economy, agricultural economy, environmental science and resource utilization. Studies on China's urban agglomeration focus on macroeconomic management and sustainable development, economic restructuring, building science and engineering, sociology and statistics, culture, environmental science and resource use, natural geography and surveying, and road and waterway transport (Fig. 1.8).

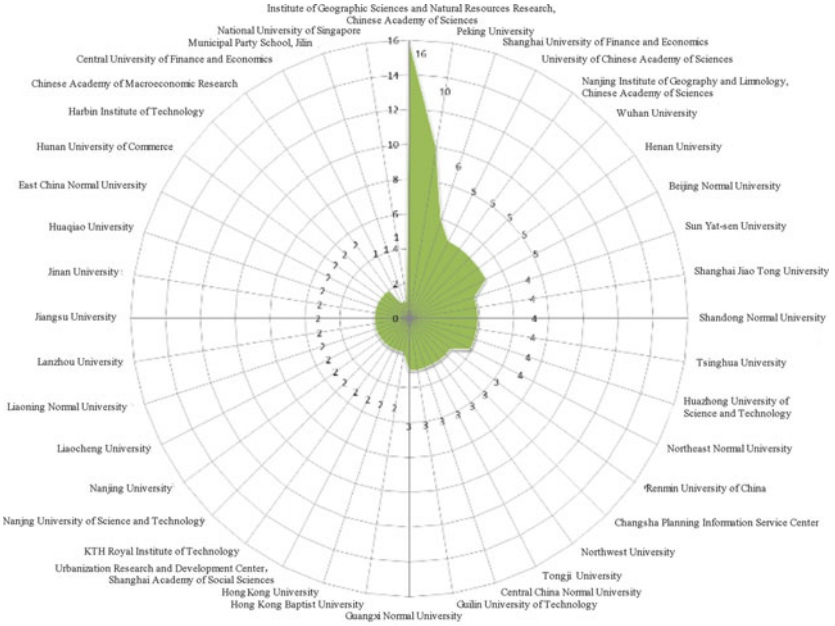
2. **Most of the scholars and research institutes of urban agglomerations are members of Chinese Academy of Sciences**

From the perspective of the research institutes, the Institute of Geographic Sciences and Natural Resources Research of the Chinese Academy of Sciences, Peking University, Shanghai University of Finance and Economics, Nanjing Institute of Geography and Limnology, Wuhan University, Henan University and Beijing Normal University (Fig. 1.9a) are the dominant players in urban agglomeration studies. Scholars

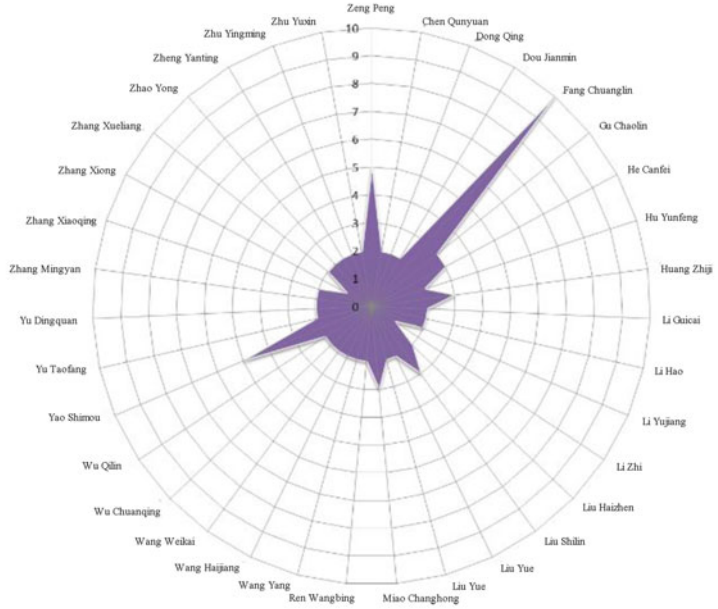


- Macroeconomic management & sustainability
- Building science & engineering
- Agricultural economy
- Industrial economy
- Road and water transport
- Railway transport
- Chinese & international politics
- Business economy
- Culture
- News & media
- Service economy
- Sports
- Demography & family planning
- Market research & information
- Economic theory & history of economic thought
- Higher education
- Water conservancy & hydropower engineering
- Forestry
- Vehicle industry
- Scientific research & management
- Automation technology
- Mathematics
- Economic statistics
- Computer software & applications
- Public security
- Economic restructuring
- Transportation economy
- Environmental science & resource utilization
- Tourism
- Investment
- Trade & economic
- Finance
- Sociology & statistics
- Information & postal economy
- Mathematics
- Administrative science & state administration
- Talent studies & labor science
- Resources science
- Political parties & mass organizations
- Geography
- Finance & taxation
- Cultural economy
- Physical geography & geodesy
- Education theory & management
- Vocational education
- Organic chemical
- Mining engineering
- Economic law
- Administrative law and local legislation
- Geology

Fig. 1.8 Subject areas and structure of domestic literatures on urban agglomeration



a. Major research institutions



b. Major researchers

Fig. 1.9 Major research institutions and researchers of China's urban agglomerations

with great contribution to urban agglomeration studies include Fang Chuanglin, Yao Shimou, Zeng Peng, Gu Chaolin, Miao Changhong, He Chanfei, etc. (Fig. 1.9b).

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