



中国环境与发展国际合作委员会
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on Environment and Development

Accelerating Green Urbanization in China Based on Eco-Civilization

—Interim Report of "Green Urbanization Strategy and
Pathways towards Regional Integrated Development" SPS



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Executive Summary

(Interim report, please do not quote)

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The city in the modern sense is based on the industrialization model formed after the industrial revolution. The agglomeration process of population and economic activities in the urban, i.e., urbanization, has greatly accelerated the process of industrialization. Human society has thus formed a modern social structure based on industrial civilization and the basic urban-rural economic geograph of “urban-industry and rural-agriculture”. The existing urbanization model, in terms of economic content carried by the city and the specific organizational form of the city itself, is largely based on the logic of traditional industrialization. Though this development model has brought tremendous progress to mankind, it has also brought about serious unsustainable problems.

Since modern economic activities mainly occur in cities, most of the environmental problems originate from cities. People naturally treat green urbanization as a city issue rather than a development issue, and the discussions thus focus on how to green the existing cities. However, the logical starting point to think about the issue of green urbanization shall start from why the city emerge, rather than discussing in the given cities. The urban environmental problem is fundamentally an issue of development model, not just a city issue. When the content and methods of economic development, as the basis of urbanization, face profound transformation because they are not sustainable, the corresponding urbanization model will inevitably undergo a profound transformation.

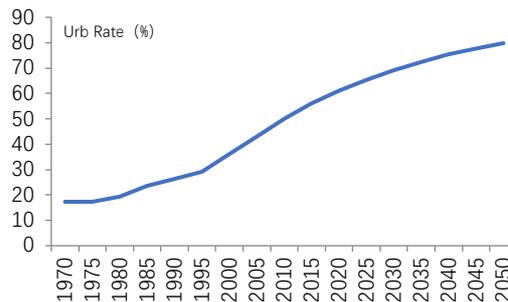
This means that the existing urbanization pattern formed in the traditional industrialization model needs to be reshaped on the basis of ecological civilization, so as to promote China's economic transformation and high-quality development through green urbanization. This SPS aims to fundamentally investigate the internal mechanism behind the urbanization, and proposes a strategy and pathway based on ecological civilization to reshaping China's urbanization.

I. Why Redefine Urbanization?

1.1 Two basic tasks of green urbanization in China

An important driving force for the rapid development of China's economy is the rapid urbanization. In 1949, only 10.6% of China's population lived in cities. In 2017, China's urbanization level reached 58.5% (NBS, 2017). According to the experience of industrialized countries, it is estimated that by 2035, about 70% of China's population will live in urban areas. In 2050, this proportion will rise to around 80% (Figure 1). This means that China's urbanization level still has more than 20 percentage points to increase, and the newly added urban population is about 300 million people, close to the entire population of the United States today.

Figure 1 Rapid Growth of Urbanization in China 1970-2050



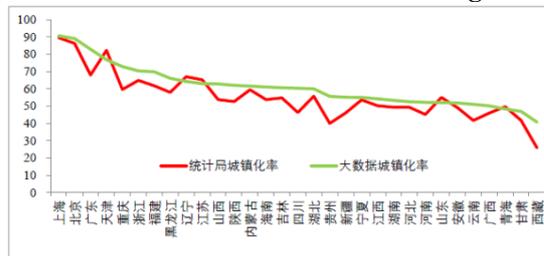
Date Sources: DRC Green Team

Therefore, China's green urbanization faces two basic tasks: first, how the 300 million people be urbanized in a green way; second, how the existing cities formed in the era of traditional industrialization become sustainable through green transformation that injects vigor into the economy.

1.2 China's urbanization has entered a new stage

First, the actual level of urbanization in China is higher than that of statistics. The urban area is defined as an area with a population density of more than 1,000 people per square kilometer. According to a study of DRC Big Data Lab for Macroeconomy with Baidu HUIYAN Population Big Data, China's actual urbanization level in 2015 was 62.2%, 6.1 percentage points higher than the traditional statistics (Chen and Shi, 2019).

Figure 2 Comparison of Provincial Urbanization Level: Big data-based and Statistics



数据来源: 课题组计算。

图2 城镇化率省际对比: 大数据测算与统计数据

Source: Chen and Shi, 2019

Note: red line represents statistics urbanization level of each province, green line represents level measured with big data.

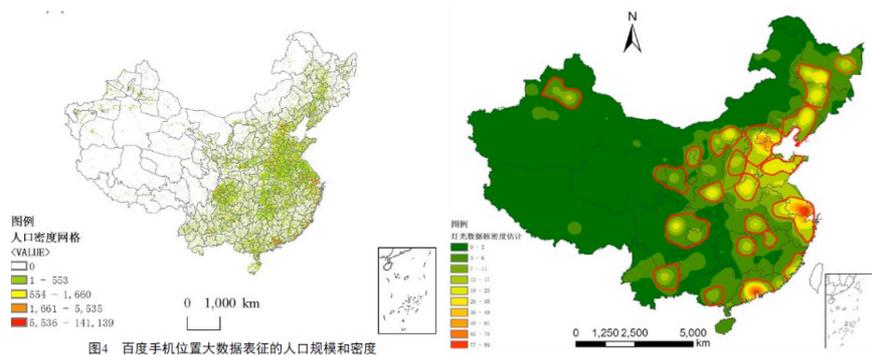
Second, overall, China's cities have entered a high-quality development stage from

quantity expansion. The economic development and population in some cities started to show an inverted U-shaped relationship (Chen and Wei, 2019). Over the past two years, the net inflow of daily migrants in some of China's most attractive cities has not changed significantly. The resident population in a few megacities has declined. As the regional economy becomes more balanced, an increasing number of people tend to return to their hometown to work or start a business.

Third, the spatial pattern of the city is undergoing major changes: the rise of urban clusters and metropolitan areas will dominate the future economic development in China. According to the calculations of the SPS team, the proportion of GDP, population and land area in 2017 in China's 20 urban clusters accounted for 90.87%, 73.63% and 32.67% of the nation, respectively. Lan Zongmin (2019)'s research, based on Baidu migration data, mobile phone density data and nighttime lighting data, showed that the divergence of urban clusters is obvious, and the spatial scope of the planned urban clusters is generally smaller than that measured with big data.

This means that in the future, the main spatial scope of green urbanization will occur mainly in the existing urban clusters and county level. At the same time, the content and form of urbanization are undergoing profound changes.

Figure 3 China's Urban Clusters identified with mobile phone, and night light data



Source : Lan Zongmin (2019) , Figure 4 & 6.

1.3 The basic characteristics and consequences of traditional urbanization

The urbanization established in the traditional industrial era has two basic characteristics:

First, from the perspective of economic development, the function of the city is mainly to promote the production and consumption of industrial wealth, i.e. to promote the process of industrialization. Correspondingly, the function of urban infrastructure is also largely for facilitating the production of industrial products. More generally speaking, the economic development process based on traditional industrialization is a process of urbanization that transfers a large amount of agricultural labor to urban manufacturing, forming a pattern of urban-rural economic geography of "urban-

industry; rural-agriculture”.

Second, from the perspective of the organization of the city itself, it is mainly based on the centralized way of traditional industrialization logic. The city's design philosophy relies too much on industrial technology, rather than relying on ecological ideas to make nature work for the benefit of mankind. For example, heating, energy, construction, water treatment, etc., are often costly. If the natural forces are fully released, it will reduce the cost of the city and increase the efficiency of the city (see TNC, “Valuing Nature’s Role”).

This urbanization model, while greatly promoted industrialization, inevitably brings unsustainable consequences to the environment and the regional economy.

First, serious environmental consequences, including air pollution, water pollution, noise pollution, solid waste pollution, etc. The cause behind this is that the traditional industrialization model centered on the production and consumption of material wealth must be based on material consumerism (e.g. encouraging overconsumption, planned obsolescence, instant products, etc.), resulting in “excessive resource use, severe environmental damage, high carbon emissions”. If the economic growth still heavily depends on the material wealth, the urbanization based on this will inevitably become a major source of environmental problems.

Second, transforming agriculture into industrialized and chemical agriculture with the logic of urban industrialization has brought about serious rural ecological and environmental consequences, including environmental pollution (industrial pollution, chemical agriculture, aquaculture pollution, domestic pollution), ecological consequences caused by overmining, ecological chain destruction, monoculture and chemical agriculture.

Third, the consequences of urban-rural and regional imbalance. In the process of industrialization and urbanization, the population will migrate from rural areas with no industrial advantages to urban or coastal areas, which will bring irreversible impact to the former and inevitably lead to urban-rural and regional disparities.

Fourth, social and cultural costs. On the one hand, it is difficult for big cities to provide people affordable housing, education, and medical care. High income and low wellbeing has become a prominent problem. At the same time, it is difficult for migrant workers to be truly integrated into the city. On the other hand, urban and rural problems have become two sides of one coin. The original rural social fabric has been impacted by large-scale urbanization. The problem of “agriculture, rural areas and farmers” has become a serious problem, and a large number of hollow villages, left-behind children and etc. have appeared. To this end, the 19th National Congress of the Communist Party of China has made "rural revitalization" a major strategy.

As the basis of the traditional urbanization model, the traditional growth model has significantly enhanced human well-being, while also affecting people's well-being through two channels. First, ecological damage and environmental pollution will reduce people's quality of life and well-being. Environmental problems such as air pollution, food safety, water contamination, noise, extreme weather, and biodiversity loss have penetrated into all aspects of people's lives, seriously affecting people's

quality of life, health and safety (for example, Zheng et al, 2018; Yang and Zhang, 2015). Second, economic growth centered on production and consumption of material wealth has failed to simultaneously improve people's quality of life and happiness. Numerous studies have shown that in many countries, including China, the economic development under the traditional industrialization model does not continue to improve the level of happiness as people think (eg Easterlin, et al., 2012; Ng, 2003; Scitovsky, 1992; Jackson, 2016; Skidelsky and Skidelsky, 2012). When the basic material needs are met, the further expansion of material wealth, although it will bring bright GDP figures, will have little effect on improving people's wellbeing.

In short, the traditional industrialization model, which is the basis of the existing urbanization, has brought about high material productivity, but it is unsustainable with high-cost. Since the high cost is not reflected in the internal cost of enterprises, but reflected as social costs, hidden costs, long-term costs and opportunity costs, it is easy to be ignored. At the same time, the wellbeing this growth model brings is also relatively low, while improving well-being is the ultimate purpose of economic growth. With the transformation of this unsustainable growth model to sustainability, the corresponding urbanization model must also be redefined on the basis of ecological civilization.

II. Green Urbanization: An Analytical Framework

2.1 Why city

Thinking about green transformation of urbanization must begin with the logic why there is a city. Before answering this question, we must first understand the mechanism of economic growth and how urbanization promote economic growth.

The spring of economic growth is the improvement of the division of labor, and the division of labor is limited by the extent of market (Smith, 1776). There is a trade-off here, that is, a higher specialization and division of labor mean higher productivity, but the division of labor necessarily requires trade, which incurs transaction costs. If the transaction costs are too high to exceed the benefits of specialization and the division of labor, it would be difficult for the division of labor to occur and for the economy to grow (Yang, 2001; Bettencourt, 2014).

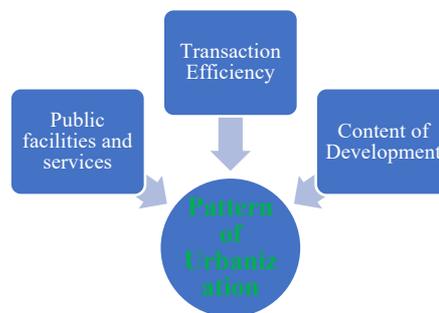
Therefore, how to increase transaction efficiency becomes the key to promoting economic growth. Urbanization is crucial for increasing transaction efficiency. In addition to the improvement of (i) hardware infrastructure such as road transportation and communication and (ii) the soft aspects of institution and mechanism design (including effective government, property rights system, enterprise system, patent system, etc.), the geographic agglomeration of economic activities in urban areas, i.e. urbanization, plays crucial role in increasing transaction efficiency.

As an industrial chain is concentrated in the city, it is easier to develop division of labor and collaboration than being scattered in the rural area, thus driving economic growth. The other benefits of the city include: First, the agglomeration of the population in the city can expand the market, which creates conditions for the increase of the division of labor. Second, the centralization of urban facilitates the provision of infrastructure and

government public services. The concentration of public facilities such as water, electricity, gas, and communications would, compared to decentralized provisions, greatly improve the efficiency of use and reduce construction costs. Third, the concentration of population in cities facilitates the exchange of ideas and is conducive to the creation and diffusion of innovation and new knowledge. In addition to the perspective of division of labor, there are many other lines in urban research (Yang, 1991; Yang and Rice, 1994; Henderson, 1974; Fujita, 1989; Fujita and Krugman, 1995).

Therefore, there are three key factors determining the urbanization model: The first is the change in transaction efficiency; the second is the change in the provision of public facilities and public services; the third is the change in the content of development, i.e. the content of production, consumption, and trading. Among them, the economic foundation of green urbanization is the transition of the development content from the industrial wealth characterized by “high resource consumption, high environmental damage, high carbon emissions” to the high-quality emerging economies that rely more on intangible resources such as knowledge, ecological services and culture. When the three defining factors undergo profound changes, the requirements for spatial agglomeration of economic development will change, and the content and forms of urbanization will also change accordingly. A core objective of this research is to investigate the changes of these defining factors in the digital and green development era and its implications on China's urbanization, and how the government should formulate corresponding green urbanization strategies.

Figure 4 Three Defining Factors of Urbanization:An Analytical Framework



Source: made by author

2. The emergence of urban clusters

Now that the agglomeration of population and economic activity is so important to the economic growth, according to this logic, shall all the population gather in a super-large city? The answer is no. Driven by market forces, a hierarchical structure of large, medium and small cities will be formed, and then several central cities will be formed in different regions, which together constitute several urban clusters and metropolitan areas.

Why is there a hierarchy of large, medium and small cities? Although big cities improve productivity, they also have disadvantages, including high prices and various “urban diseases” in terms of urban pollution, traffic congestion, high housing prices, crime, high mental stress, etc.. Therefore, the real utility in big cities is not as high as their

nominal income suggests. For example, a 10,000 yuan income in a big city does not mean that its real utility is twice that of a small city of 5,000 yuan, because a large part of the income is used to pay for various costs including transport, high rents and so on. If taking non-monetary factors such as pollution and pressure into account, the real utility of big cities and small cities should be quite similar. This is why, under the market force, different people will choose different cities to work and live, thus forming a hierarchical structure of large, medium and small cities (Yang and Rice, 1994).

How does the urban clusters appear then? The reason is that different regions forming their center cities can minimize the spatial cost of the overall economy. In particular, a vast country with dense population like China will certainly form a number of regional center cities and metropolitan areas, and within each of them will form a hierarchical structure of the city. The phenomenon that a large part of a country's population is concentrated in a mega city is more likely to occur in territorially small countries. The total transaction costs of population to agglomerate in different central cities are often lower than that of all population to agglomerate in a single large city. In addition to cost, how cities are geographically distributed also depends on the benefits of agglomeration to production, which is affected by land area, population size and initial distribution, industrial structure, natural endowments, transportation, climate, culture, institution, and etc. Such factors affect the cost and benefits of agglomeration, and thus affect the geographical pattern of urbanization.

III. The future urbanization model in China

3.1 The defining factors of urbanization pattern are profoundly changing

As human society enters the digital & green era from the traditional industrial era, the three key factors that determine the urbanization model are undergoing dramatic changes. These changes are particularly dramatic in China. This means that China's future urbanization model will undergo profound changes.

First, the dramatic increase in transaction efficiency. With the advents of internet, the digital age and the rapid transportation system, the traditional concept of space and time is undergoing major changes. Many economic activities do not necessarily have to rely on the large-scale physical concentration of production factors and markets as in the industrial era, and no longer have to be undertaken in the city or at a fixed location.

Second, changes in technologies have made it possible for some of the public facilities and services that originally relied on concentration to be provided in a decentralized manner. For example, heating, sewage treatment, distributed energy, garbage disposal, etc., can be transferred from centralized supply to distributed supply in many cases. This means that in some small towns and villages, high-quality living can be achieved at low cost. In the digital age, many government services are also accessible through digital platforms.

Third, and more importantly, the development content changes. As discussed above, the traditional industrialization model will inevitably lead to an unsustainable environment. One of the important tasks of green urbanization is to change the content of supply. Among them, an increasing demand for the emerging services that meet people's expectation for a better life is the direction of green development and is the

new economic foundation of green urbanization. Although urban agglomeration is still very important, much of the new content no longer requires physical concentration as it once did. In particular, countryside and small towns excel in good environment and culture. As a result, many new economic activities may emerge in the countryside, and the urban-rural relationship will be redefined.

3.2 The implications of green urbanization

It is important to point out that although the above changes of three key factors have made many economic activities less dependent on the physical concentration of production factors as in the past, this does not necessarily mean “the decline of the city”, nor does it mean that a large number of economic activities will leave the city. It means the traditional urban and rural concepts need to be redefined through which new sources of economic growth would be emerging.

-- **The profound change of economic activities carried by the city.** People's demands for good life is not just for material wealth. As demands upgrade, the content of economic development expands from traditional material wealth to emerging services. Many economic activities that did not exist under the traditional development will appear. For example, the big population of the existing cities could be an advantage for developing cultural creative and experience economy, thus transforming the development content; in addition to produce agricultural products, the rural area could also be a new type of geospatial space that can accommodate many new economic activities, including economies of experience, ecological tourism, education, health, etc.

-- **The change of city's own organization and geospatial layout.** For example, the way of urban life will change a lot; the centralized energy supply may be partially replaced by distributed supply, and urban infrastructure will be based more on ecological principles.

The above changes have double effects of increasing agglomeration or decentralization of economic activities. Whether the urban will become more agglomerated or decentralized depends on which effect of the above three defining factors become dominant.

As for the trend of spatial distribution of urbanization in the future, it seems that a consensus is yet to be reached in the academic community. There are two different foresights about future urban forms. One is support for the decentralization trend. Henderson et al. (Baum-Snow, et al., 2017) shows evidence that Chinese cities are experiencing a decentralization trend with the emergence of high-speed rails. One is that the Internet and convenient transportation will accelerate the concentration of population to large cities, such as Glaeser (2011). These two different conclusions may be due to different urban theories and different definitions. Therefore, it would be more effective to measure the real situation of urbanization through big data on population and economic activities distribution than traditional statistical data.

For China's future urbanization strategy, it is very important to clarify the relationship between city size and economic development. Though city scale is emphasized in many literature, in the theory of economic growth, population size is not always conducive to economic growth. For example, in Solow's growth theory (1956), endogenous growth

theory, and Lewis' surplus labor theory, population size has a negative, positive, or neutral effect on economic growth. The new economic geography, represented by Krugman (1991); Krugman and Fujita (1995), emphasizes the benefits of population size for economic growth. However, as Young (1928) pointed out, the "extent of market" emphasized in Smith's theorem is not "mass production" and population size. Yongsheng Zhang and Xueyan Zhao (2003) show that the economies of scale in the Fujita-Krugman urbanization model are not in line with reality. Some empirical studies that emphasized the size of the city show there is a strong correlation between the size and per capita GDP. However, the conclusion may not be so simple, because large cities have large market size and higher level of division of labor, and their nominal GDP is usually higher than that of small and medium-sized cities, but the GDP of large cities contains more transaction costs including commuting costs, high house prices, congestion, etc., the net utility is not necessarily higher. In reality, we can find a large number of examples of "small but advanced cities", and "large scale but poor cities". In Europe, more than half of the population lives in small and medium-sized cities with a population of 5,000-100,000 (EC, 2011). At the same time, the size of the urban population is not equal to prosperity. 22 out of the 29 megacities in the world with more than 10 million people are in Africa, Asia and Latin America, and these super-large cities have not prospered. In China, the development of many cities no longer depends on population growth, and there is an inverted U-shaped relationship between population and urban economic growth (Zhuo Xian, 2019).

IV. The strategic choice of China's green urbanization

The overall idea: reshaping China's urbanization based on ecological civilization and no longer relying on quantitative urban expansion, and making green urbanization a driver for green transformation of Chinese economy towards high-quality development. Green urbanization strategy should be an important part of the 14th Five Year Plan.

4.1 Three major components of green urbanization

Component 1: Reshaping the existing cities, that is, transforming cities according to the requirements of new production and lifestyle in the digital green era

The first is to promote green new economy. The advantages of the existing cities for green transformation lie in demand and supply. In terms of market demand, the existing population size provides huge market for the new service economy; on the supply side, relying on its intangible endowments such as high-quality talents, urban culture and history, a large number of experience economy and creative economy could be formed. At the same time, it is of great potential to upgrade the traditional sectors by applying new business model and Internet technologies, and China has lots of successful cases, including transformation of old neighborhoods, old industrial parks and old malls into creative and experience economic zones, and successful transformation of resource-exhausted cities.

The second is the green transformation of urban infrastructure. Renovating existing urban infrastructure based on the concept of ecological civilization will reduce urban costs and improve efficiency. For example, research by The Natural Conservancy shows that by valuing the role of nature, it can bring better results, "when ecosystem

functions and services are included in a cost-benefit analysis, hybrid infrastructure-combining nature and nature-based infrastructure with gray infrastructure- can provide the most cost-effective protection from sea-level rise, storm surges, and coastal flooding. All-gray flood protection can cost more and miss opportunities for generating additional economic benefits and ecosystem services, such as recreation, carbon capture, and habitat" (TNC, "Urban Coastal Resilience: Valuing Nature's Role").

Component 2: New urbanization, that is, urbanizing new population in a green way.

In the future, the 300 million people shall be urbanized in a new green concept and model. A large number of these people will be transferred to existing towns, while some will be urbanized locally in the county area to form new characteristic towns. The future between cities and villages is more of a difference in physical form than the difference between modernity and economic development level. Due to the new opportunities in the countryside and the substantial improvement in the quality of rural life, a large number of new "urban and rural amphibious population" is likely to emerge. The traditional statistical definition of urbanization also need to be changed accordingly.

There are many good cases and studies on this regard in China. For example, the Rocky Mountain Institute are promoting "near-zero emission demonstration zone" in some parts of China. It is based on the concept of integrated governance, while promoting economic growth, minimizing pollution, garbage and carbon dioxide emissions. The demonstration takes an integrated concept to solve environmental problems, through considering the protection of air, water, soil and ecosystem as a whole. It provides an integrated solution from the ecosystem, production process, full value chain, etc.

Component 3: A new definition of the countryside

The city and the countryside are two sides of one coin. When the content and mode of economic development change, the definition of the village and the urban-rural relationship will change accordingly. Under the traditional concept of development, development is a process in which agricultural labor is massively transferred to cities for manufacturing on a large scale, namely industrialization and urbanization, while agriculture and rural areas are restructured from the perspective of industrialization, becoming a base of labor, food and raw materials for urban industries. The mode of agriculture production is also transformed into monoculture and chemical agriculture in accordance with the logic of industrialization, which brings serious ecological and environmental consequences. This traditional rural definition from the perspective of industrialization not only limits the economic development potential of the rural areas, but also sacrifices many valuable rural culture and ecological resources. In fact, the countryside is a versatile new geospatial space that can accommodate a large number of new economic activities. In this regard, China also has many successful cases. For example, the DRC Green Team helps underdeveloped regions achieve leapfrog development through green transformation under the framework of "redefining countryside".

4.2 Two strategic focuses of green urbanization: green urban clusters + county level urbanization

The two strategic focuses of China's green urbanization are: First, the green transformation of urban clusters and metropolitan areas. Second, the county level urbanization. The reasons are following.

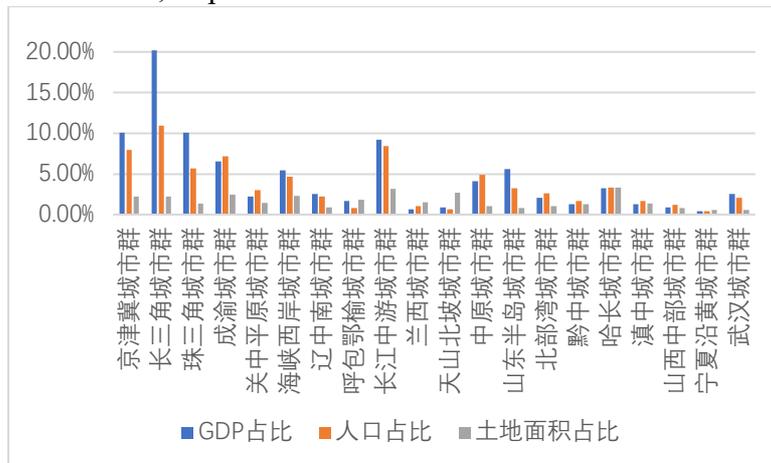
First, the economy and population of the 20 urban clusters currently accounts for an absolute proportion in the country. In 2017, China's 20 urban clusters accounted for 90.87%, 73.63% and 32.67% of the national GDP, population and land area, respectively. It can be said that the achievement of green transformation of urban clusters basically means the achievement of green urban across the country.

Table 1 Share of GDP, Population and Land Area of 20 Urban Clusters in China

	GDP (100million)	Population (ten thousand)	Land Area (Seq kilometer)
20 Urban clusters (A)	743771	102351	3147710
National 2017 (B)	818461	139008	9634057
Share (A/B)	90.87%	73.63%	32.67%

Source: made by author according to statistics

Figure 5: Share of GDP, Population and Land Area of each Urban Cluster in China



Source: made by author according to statistics

Second, since the urban clusters include three major components of green urbanization, namely existing cities, population to be urbanized, and rural areas, it can take both advantages of the urban and rural areas. Focusing on the city clusters and metropolitan areas, it can activate both advantages of urban and rural areas and potential market. Based on their ecological resources, villages located in urban clusters and metropolitan areas could provide new green supplies to the surrounding cities.

Third, revitalizing the county economy is a major task of rural revitalization in China. In addition to moving to the capital city of the county, a large number of people will be urbanized in the form of characteristic towns, so as to take both advantages of the urban and rural areas.

(drafted by Yongsheng Zhang)