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Typical Study on Sustainable Development in Relative Poverty Areas and Policy Outlook of China

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Abstract

Based on the systematic review of the research progress on China's relative poverty, this study discussed the distribution characteristics of the relative poverty areas (RPAs), the basis of regional function types, and proposed the policy recommendations. There are three main periods concerning sustainable development research on RPAs: (1) The concept of "relative poverty" was adopted for the first time to carry out scientific research on regional sustainable development. (2) It supported the RPAs to become an important type of the area to promote sustainable development policies in underdeveloped areas in China. (3) It deployed a protracted battle in advance to support the development of RPAs before the comprehensive accomplishment of anti-poverty. The change characteristics of the RPAs and the regional function types indicated that the scale of the relative poverty population in China has remained at around 200 million for a long time, and the pattern of concentrated distribution has not changed. Meanwhile, taking ecological service function as the main regional function types, areas with and lack of development conditions coexist in the RPAs constrained by the natural carrying capacity. Policy recommendations are proposed to promote the simultaneous realization of modernization in the RPAs on a higher stage as follows. From a global perspective, the optimization regulation and spatial governance of the Man-Land system should be carried out to stabilize the national defense, ecological, food, energy, and social security. For regions with development potential, the comparative advantages of the resources and ecology should be transformed into economic advantages through mechanism innovation, thereby solving the intergenerational transfer under "path dependence" and the interregional exfoliation under the "Matthew effect". For regions lack of development conditions, natural carrying capacity should be steadily unloaded, the mountain, forest, farmland, lake, and grassland should be conserved systematically, and the equalization level of basic public services should be improved comprehensively.

Keywords

relative poverty areas (RPAs); sustainable development; natural carrying capacity; major function zoning; regional coordination

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Typical Study on Sustainable Development in Relative Poverty Areas and Policy Outlook of China

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Abstract: On the basis of the systematic review of the research progress on China's relative poverty, this study discussed the distribution characteristics of the relative poverty areas (RPAs) and the basis of regional function types and proposed the policy recommendations. There are three main periods concerning sustainable development research on RPAs: (1) The concept of "relative poverty" was adopted for the first time to carry out scientific research on regional sustainable development. (2) It supported the RPAs to become an important type of area to promote sustainable development policies in underdeveloped areas in China. (3) It deployed a protracted battle in advance to support the development of RPAs before the comprehensive accomplishment of anti-poverty. The change characteristics of the RPAs and the regional function types indicated that the scale of the relative poverty population in China has remained at around 200 million for a long time, and the pattern of concentrated distribution has not changed. Meanwhile, taking ecological service function as the main regional function types, areas with and those lacking development conditions coexist in the RPAs constrained by the natural carrying capacity. Policy recommendations are proposed to promote the simultaneous realization of modernization in the RPAs on a higher stage as follows. From a global perspective, the optimization regulation and spatial governance of the Man–Land system should be carried out to stabilize the national defense, ecological, food, energy, and social security. For regions with development potential, the comparative advantages of the resources and ecology should be transformed into economic advantages through mechanism innovation, thereby solving the intergenerational transfer under "path dependence" and the interregional exfoliation under the "Matthew effect." For regions lacking development conditions, natural carrying capacity should be steadily unloaded; mountains, rivers, forests, farmlands, lakes, and grasslands should be conserved systematically; the equalization level of basic public services should be improved comprehensively. **DOI:** 10.16418/j.issn.1000-3045.20201008001-en

Keywords: relative poverty areas (RPAs); sustainable development; natural carrying capacity; major function zoning; regional coordination

Promoting the coordinated development between regions has always been an important work of government management, public management and governance, and spatial governance in various countries. The strategy and policy orientation for promoting the coordinated development of regions can be divided into narrow sense and broad sense. ① The narrow sense: Generally speaking, the narrow connotation of promoting the coordinated development of regions in various countries refers to narrowing the gap of economic development between regions. At the development stage with per capita gross domestic product (GDP) close to 10,000 US dollars and urbanization level lower than 60% before the economic development reaches the level of moderately developed countries, the gap of domestic interregional economic development continues to widen. Countries generally focus on maximizing the development efficiency of the

whole nation at the cost of reducing the fairness and balance of regional economic development^[1,2]. Therefore, after entering the new stage of modernization, narrowing the gap in the level of regional economic development has not only been taken as a strategic goal of national development but also a way to drive the sustainable and healthy development of the national economy. In particular, it has become an important way to foster a new development paradigm featuring "dual circulations," with domestic circulation as the mainstay and domestic and international circulations reinforcing each other. ② The broad sense: The broad connotation of promoting the coordinated development of regions incorporates the concept of modern scientific development. While narrowing the gap of interregional economic development, regional economic development should be consistent with natural conditions and the major function on the basis of

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regional comparative advantages should be given full play under the national unified pattern to realize the fairness or balance of basic public services or comprehensive people's livelihood and well-being.

According to the universal law of economic development in various countries across the world, the reason that leads to the uncoordinated development and widening gap of economic development level between regions, or the factor that contributes greatly to the gap in economic development level between regions is as below: the regions with development priorities have witnessed rapid but unconventional development, namely "some regions become prosperous first." Compared with other countries, apart from the great gap contribution of the regions with development priorities, there are other reasons including the wide distribution of relative poverty areas (RPAs) and a high population proportion in RPAs. As a result, the gap in the level of regional economic development in China is large among countries in the same development stage. The per capita economic income in most countries shows a normal distribution curve. The proportion of the population within the range of 20% above or below the per capita income can generally reach more than 80%, and the proportions of relative poverty population below 75% of the average income or relative rich population above 175% of the average income are very small^[3,4]. This is not the case in China. Even if the number of absolute poverty population continues to decrease with the change of standards at various stages of development, the proportion of relative poverty population in China is still stable. In the past 40 years, the absolute number of relative poverty population is between 200 million and 300 million. The proportion of absolute poverty population among the relative poverty population keeps changing. The relative poverty population is roughly equal to the absolute poverty population in size in the early years, and the absolute poverty population is gradually reduced at present. Obviously, studying relative poverty can create long-lasting value, which has not only the important academic value for revealing the characteristics and principles of population poverty and the coordinated development of regions but also the important policy value for the country to formulate strategies for the coordinated development of regions at different development stages.

In China, Fan Jie's research team (hereinafter referred to as "Fan Jie's team") of the Key Laboratory of Regional Sustainable Development Modeling, Chinese Academy of Sciences (CAS) was the first to study the sustainable development of RPAs in China. In 2004–2005, when they undertook the topic 5 of the scientific and technological research program "Research and Demonstration of Key Technologies for Regional Sustainable Development," i.e., "Research on the Mode and Policy of Sustainable Development in Underdeveloped Areas," they introduced the concept of "relative poverty" for the first time and carried out exploratory research. In 2004, Fan Jie's team and relevant national departments jointly carried out the preliminary research project

of the "11th Five-Year Plan"—"Research on Coordinated Development of Regional Economy with Resources and Environment in Underdeveloped Areas of China." Using the concept of RPAs, Fan Jie's team conducted policy research on the classification of poverty alleviation and the promotion of sustainable development in underdeveloped areas in China and provided scientific evidence for the formulation of the "11th Five-Year Plan." In May 2011, the national department in charge of poverty alleviation invited Fan Jie and Xu Yong from the Institute of Geographic Sciences and Natural Resources Research, CAS, to determine the geographical scope of contiguous areas of dire poverty. With the results of major function zoning and the research achievements of RPAs as well as the distribution of absolute poverty provided by relevant departments, they made substantive contributions to determining 14 contiguous areas of dire poverty. In 2015, on the basis of the research on the changes in RPAs and the corresponding causes over the past 10 years, Fan Jie's team submitted a report of policy research to relevant departments, i.e., *Further Improvement of the Delineation of Contiguous Areas of Dire Poverty and Targeted Poverty Alleviation Methods and the Implementation of Differentiated Poverty Alleviation Policies According to Geographical Types*. Relevant departments attached great importance to the concept of RPAs and the characteristics of relative poverty in China, which has enabled China to start making a forward-looking plan on how to deal with relative poverty after 2020 even before the final victory in the battle against poverty and the complete and overall settlement of absolute poverty in China.

From the introduction of the concept of relative poverty, the initiation of China's research on relative poverty, to the demarcation of contiguous areas of dire poverty and China's forward-looking policy response to RPAs, the achievements of Fan Jie's team have made academic and practical contributions to the research on relative poverty. On the basis of a systematic review of the research progress of Fan Jie's team on relative poverty in China, this paper focuses on the distribution characteristics of the RPAs, the basis of regional function types, and the policy recommendations. It provides a reference and basis for China to deal with the relative poverty problem scientifically in the complete victory in the fight against poverty and open a new stage of modernization.

1 Research progress of sustainable development in RPAs

Synchronized with the formation of the sustainable development concept in the 1960s–1970s, the theory of regional development also began to develop during this period, and its focus expanded from regional economic growth to seeking changes in social and economic structure and improving people's living conditions on the basis of the growth. Therefore, the research on poverty has expanded from the causes of income poverty and labor poverty and the solution

ways of “industrialization only” and “capitalization only” to a broader aspect of “rights poverty” and “capacity poverty.” The approaches to poverty alleviation also extend to how to ensure that the poverty population possesses material and social resources and how to enable them to use these resources to achieve their life goals. The real incorporation of poverty research in the framework of sustainable development research begins with people’s scientific understanding of the relationship among population, resources and environment, and poverty. In particular, the analysis framework of farmer’s sustainable livelihood established from a micro perspective comprehensively explains the major relevant issues such as the causes of poverty, the solution to poverty, the pauperization process and its effect and impact. Referring to the UN criteria of relative poverty, the micro model of sustainable livelihood is developed to the macro analysis framework of sustainable development in underdeveloped areas—RPAs. The poverty types are divided according to the regional poverty factors to discuss the classified solution to poverty alleviation. Then, through follow-up research for 20 consecutive years, the changing process of relative poverty is revealed to identify the poverty alleviation effect and its impact on the natural ecological environment and social progress, which thus provides scientific evidence for the formulation of the national long-term strategy of poverty alleviation and the implementation of poverty alleviation policy.

1.1 Introducing the concept of “relative poverty” for the first time to scientific and technological key projects of regional sustainable development

As early as the “10th Five-Year Plan” period (2001–2005), in order to further consolidate the scientific basis of strategic decision-making of China’s sustainable development and promote the local implementation of sustainable development strategy and capacity building, the Ministry of Science and Technology of China launched the scientific and technological research project “Research and Demonstration of Key Technologies for Regional Sustainable Development” (2004–2005). In this project, Fan Jie’s team is responsible for topic 5, i.e., “Research on the Mode and Policy of Sustainable Development in Underdeveloped Areas.” In the project proposal, Fan Jie’s team clearly pointed out that underdeveloped area is an important type of regional development in China. With a wide distribution nationwide, China’s underdeveloped areas account for a high proportion in terms of population in the country. Because there are usually abundant ecological resources important to the whole country, the contradiction between natural foundation and human development is sharp. Thus, sustainable development in underdeveloped areas will play a key role in China’s goal of building a moderately prosperous society in all respects on schedule and effective implementation of the national strategic policy of sustainable development. Meanwhile, sustainable development in China’s underdeveloped areas will be inevitably

influenced by globalization due to the increasing attention to China’s development from the whole world. Therefore, from the perspective of research, the concept of “relative poverty” is put forward as the target for studying underdeveloped areas in China, which is comparable with international research methods and convenient for continuous research on poverty in a long historical period.

The research contents are divided into four parts: ① Judging the current situation of sustainable development in underdeveloped areas of China and the effect of current policies. ② Dividing and analyzing the region types of sustainable development in underdeveloped areas in China. ③ Developing a sustainable development model that meets the current requirements of underdeveloped areas in China. ④ Devising policy system to promote sustainable development in underdeveloped areas.

A comprehensive study revealed that county-level administrative regions with per capita income lower than 60% of the national average level were defined as RPAs (a total of 795 in China) in 2000. According to six major limiting factors, i.e., heat, water, transportation, food, capital, and ecology, the RPAs in China can be divided into 3 primary areas and 11 secondary areas (Table 1 and Figure 1).

Table 1 Division of primary and secondary RPAs in China in 2000

Primary RPA (code)	Secondary RPA (code)
Qinghai-Tibetan Plateau alpine region (H)	Upper reaches of rivers in the northeastern margin of Qinghai-Tibetan Plateau (H1)
	Source region of rivers in the hinterland of Qinghai-Tibet Plateau (H2)
	Upper and middle reaches of Yarlung Zangbo River (H3)
Northern cold and arid region (N)	Greater Khingan Range–Changbai Mountains region (N1)
	Hilly-gully region of Loess Plateau (N2)
	Xinjiang region (N3)
Southern hilly region (S)	Low flood-prone region of Huang-Huai Plain (S1)
	Hilly and low mountainous region of Southeast China (S2)
	Qinling-Daba Mountains region (S3)
	Limestone mountainous region of southwest China (S4)
	Hengduan Mountains region and border areas in southern Yunnan (S5)

Combined with the analysis of sustainable development conditions and the micro research at farmer level in typical areas (Yan’an City in the hilly-gully region of Loess Plateau and Zhaotong City in the limestone mountainous region of southwest China), this paper puts forward the region models of sustainable development in underdeveloped areas in China, namely: ① the development model mainly with the ecological migration outside the region; ② the moderately concentrating development model focusing on ecological protection; ③ a regional model in which the government

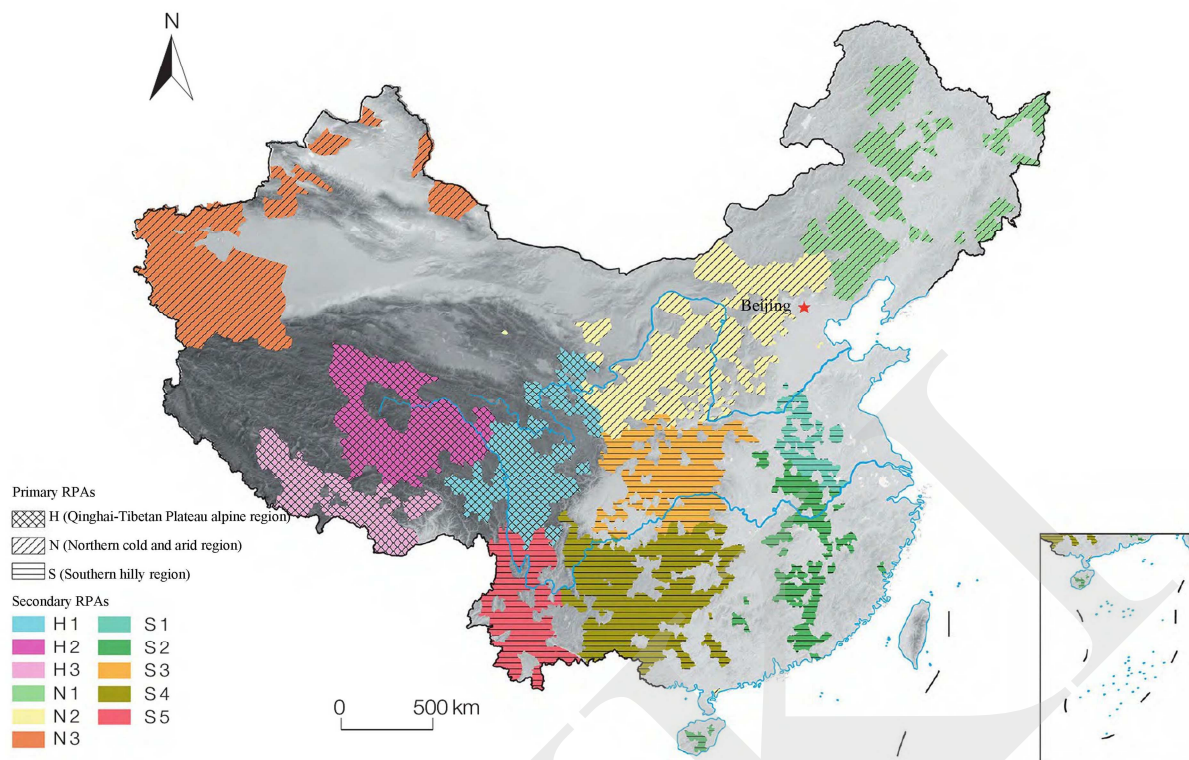


Figure 1 Distribution of RPA types in China in 2000

supports infrastructure construction to improve development conditions; ④ the development model combining the government support and the enhancement of self-development capacity.

1.2 Supporting the RPAs to become an important area type to promote sustainable development policies in underdeveloped areas in China

The change in the concept of poverty alleviation has a great impact on formulating strategies of poverty alleviation and implementing regional policies. In the 21st century, China's concept of poverty alleviation has undergone significant changes in three aspects: ① The human-centered development concept replaces the material-centered growth concept. ② The development has expanded from focusing on progress and improvement to concentrating on the problems and costs caused by development. ③ The concept changes from emulating the European and American models to pursuing independent development, particularly focusing on model innovation of poverty alleviation with Chinese characteristics. These changes in development concepts have raised the support against relative poverty to the comprehensive research of sustainable development in RPAs. Before devising the "11th Five-Year Plan," the relevant national departments set up a preliminary research project, in which Fan Jie's team cooperates with the team of national departments to carry out the "Research on the Mode and Policy of Sustainable Development

in Underdeveloped Areas," which provides the evidence for the country to make the "11th Five-Year Plan" and formulate major policies of poverty alleviation. Fan Jie's team takes RPAs as the research object and focuses on the evolution of the pattern of RPAs. By analyzing changes, the team explains the variations of poverty factors, evaluates the effects of poverty alleviation policies, and puts forward future policy frameworks and strategic suggestions.

The spatial pattern of RPAs in China shows an obvious variation trend: concentrating from the rural low-income groups to the remote central and western areas with poor traffic, including the boundary regions in central and west China, remote plateaus, as well as mountainous areas, grasslands, and deserts with traffic inconvenience, and showing the characteristics of "more in the west and less in the east, more in the south and less in the north." The rural poverty population is concentrated in middle and western mountainous areas where the ecological environment is fragile and the contradiction between human and land is prominent. The proportion of ethnic minority areas in underdeveloped areas in China has increased. The reasons for this trend are as follows: ① Natural conditions and geographical location play fundamental roles. ② In the early stage of reform and opening up, the process of opening up and marketization from coastal region to inland enhanced this trend. ③ Backward culture and lack of knowledge make underdeveloped areas at a disadvantage in every round of

regional competition. This distribution trend will inevitably make the natural environment of the remaining poverty population worse and worse, restrict the migration of the population in poverty-stricken areas, and bring great challenges for the formation of an independent economic development capacity in these areas. Therefore, the government should make major institutional breakthroughs and innovations and formulate suitable strategies and policies of poverty alleviation for the RPAs in China. On the basis of the comprehensive and systematic evaluation of the changes and effects of poverty alleviation policies in China and other countries, the requirements of building a moderately prosperous society in all respects at that time, the intermediate outcomes of the classified evaluation of underdeveloped areas in the national key scientific and technological projects at that time, this paper evaluates the vulnerability of ecological environment and the socio-economic constraints of 11 secondary RPAs and integrates them into evaluation results of comprehensive potential (Figure 2). The results show that there are many limiting factors in Qinghai-Tibetan Plateau alpine region. The comprehensive indexes of the three secondary RPAs are all higher than 3.

On this basis, this paper puts forward the strategic points of supporting RPAs in China during the “11th Five-Year Plan” and a longer period of time: ① development of “bringing people prosperity” with the goal of improving people’s living standards; ② coordinated development of economy with ecology and society (culture); ③ emphasizing synchronous “two-way” opening both internally and externally; ④ gradually increasing investment in underdeveloped areas and improving the capital usage efficiency; ⑤ promoting the development of human resources in poverty-stricken areas. Then, the strategic tasks of each area are specifically put forward and implemented in 3 primary RPAs and 11 secondary RPAs.

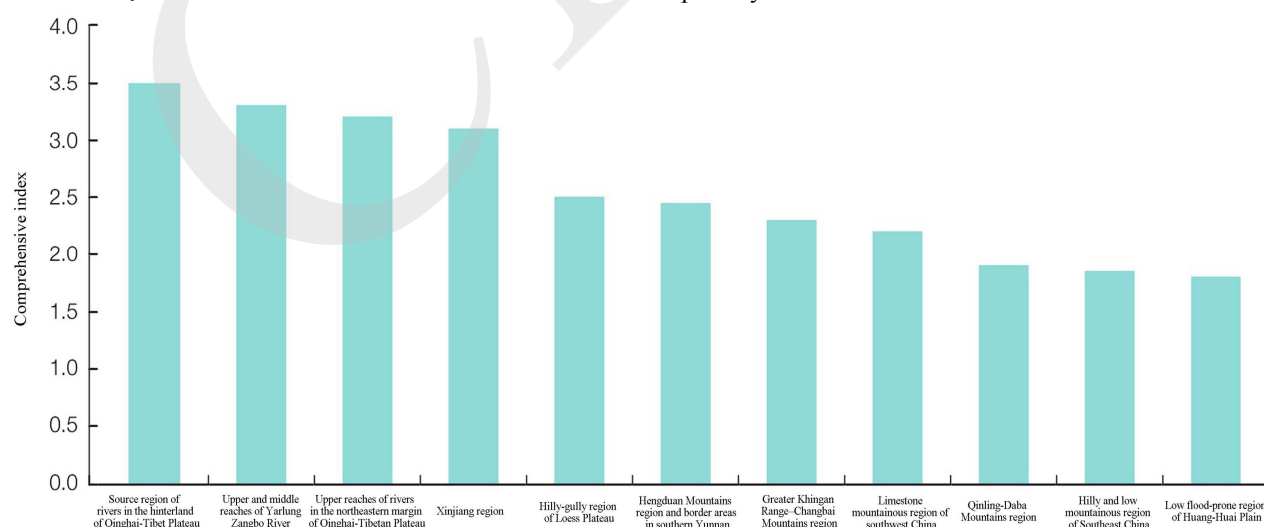


Figure 2 Comprehensive evaluation results of the limiting levels of 11 secondary RPAs in China in 2000

1.3 Providing a scientific basis for the protracted battle to support the development of RPAs before the comprehensive accomplishment of anti-poverty

In the two years around 2015, the CAS organized the key project research of “Regional Development Gap in China: Evaluation and Regulation,” which was jointly completed by Fan Jie’s team and the affiliated units of the CAS in Xinjiang, Chengdu, Changchun, and Nanjing. At that time, China simultaneously conducted two models of contiguous poverty alleviation and targeted poverty alleviation. How to integrate these two models and how to establish a long-term mechanism of poverty alleviation in the long run became the focus of national policy. At the request of the relevant departments of the CPC Central Committee, according to the carrying capacity of resources and environment and the comprehensive potential of regional development, the types of RPAs are divided; the reform of poverty alleviation system and mechanism is carried out; the research on differentiated and targeted poverty alleviation policies is conducted in different poverty-stricken areas.

According to the research, ① the relative poverty population in China will remain at around 200 million for a long time, which is comparable to the absolute poverty population in 1978; ② the goal of poverty alleviation in China has changed from solving the problem of food and clothing for poor people and families to promoting regional development in underdeveloped areas; ③ poverty-stricken areas in China are concentrated in the transition zone of three-step terrain, southern Xinjiang, and Qinghai-Tibet Plateau (Figure 3) and this basic distribution pattern has not changed for a long time. Therefore, the government should formulate differentiated regional strategies of poverty alleviation according to the comprehensive carrying capacity and development potential of poverty-stricken areas.

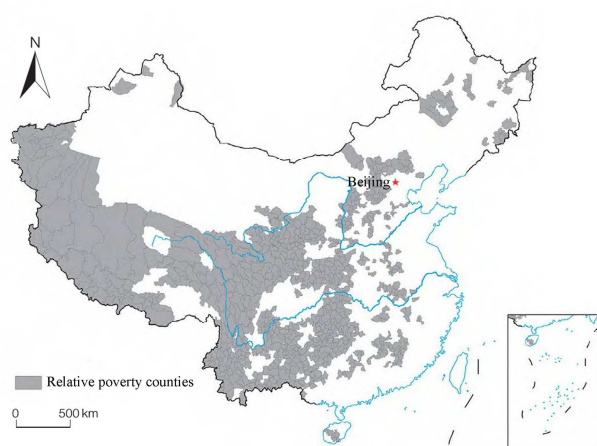


Figure 3 Distribution of RPAs in China in 2010

The research indicates that there are different regional types of RPAs in China, including those with development conditions and those lacking development conditions. Among them, 115 counties can be clearly defined as regions lacking development conditions, with a population size of about 20 million; while 235 counties are classified as RPAs with development conditions, possessing a total population of about 90 million. On this basis, the following policy suggestions are proposed:

(1) For poverty-stricken areas with development conditions, efforts should be concentrated in institutional innovation and the transformation from resource advantages to economic advantages, including ① on the basis of confirming the rights of natural assets, creating a stable income channel for the poverty population through shareholder-becoming and dividend-sharing mode; ② incorporating ecological products into the economic accounting system under the framework of ecological civilization and developing ecological protection and construction into the pillar industries in poverty-stricken areas and the main income source of the poverty population; ③ taking poverty alleviation through science and technology as the fundamental way to drive the leapfrogging development of poverty-stricken areas through scientific and technological innovation and building a green economic system with local characteristics; ④ exploring reasonable path of city-industry integration and urban-rural integration in poverty-stricken areas and constructing a characteristic model of new urbanization in poverty-stricken areas.

(2) For poverty-stricken areas lacking development conditions, the basic public services and ecological quality should be improved while unloading the natural carrying capacity, including ① with the enhancement of migration

ability and employability as the orientation, strengthening the professional skills training and basic education for teenagers in poverty-stricken areas; ② adopting the means of “moderate concentration + mobile service” and “fixed facilities + personnel rotation” to improve the quality of people’s livelihood; ③ taking the lead in implementing the new mechanism of ecological compensation to individuals and exploring new ways of resource development and utilization under the condition of ecological carrying capacity.

2 Recent changes and distribution characteristics in RPAs

According to the national poverty alleviation standard CNY 2300 (constant price in 2010), i.e., the per capita annual net income in rural areas, determined in 2011, the absolute poverty population in China was reduced from 98.99 million at the end of 2012 to 5.51 million at the end of 2019, and the incidence of absolute poverty also dropped from 10.2% to 0.6%, with the number of poverty population declining by more than 10 million every year for seven consecutive years^[5]. Obviously, the anti-poverty cause in China has made a historic breakthrough since the implementation of the strategy of targeted poverty alleviation. However, this achievement does not mean the end of the poverty problem in China and the protracted battle against poverty which focuses on solving relative poverty will continue in the future.

2.1 Population size: around 200 million for a long time

The problems of food and clothing and absolute poverty can be usually addressed within a certain period of time while fighting against relative poverty is a long-term, arduous and complicated task^[6,7]. The standard of RPAs put forward by EU, namely lower than 75% of the per capita national income, is slightly adjusted, and the per capita annual net income of farmers (adjusted to the per capita annual disposable income of rural permanent residents after 2013) is regarded as the benchmark value to delimit RPAs^[8]. The division results of RPAs from 2000 to 2018 show that the population size of RPAs in China will remain at around 200 million for a long time. The total resident population in RPAs was 258 million, 235 million, and 187 million respectively in 2000, 2010, and 2018.^① The proportion of the middle and western areas is about 90%, respectively accounting for 89.83%, 90.25%, and 88.40% of the total relative poverty population in the three years (Table 2). Gansu, Guizhou, Yunnan, Shaanxi, and Shanxi not only have a high incidence of relative poverty (the proportion of the population in RPAs to the total population is greater than 30%) but also have a large population scale of the relative poverty (greater than 10 million). In addition, the in-

① Due to the availability of data on the per capita disposable income of rural permanent residents in counties in 2018, the relative poverty counties of Heilongjiang, Hunan, and Shaanxi are divided by data in 2016, and those of Sichuan, Qinghai, Xinjiang, and Tibet are divided by data in 2017.

cidence of relative poverty in western regions such as Qinghai, Tibet, Ningxia, and Xinjiang is also above 30% (Figure 4).

2.2 Temporal-spatial characteristics: unchanged basic pattern of concentrating distribution

Since 2000, the basic distribution pattern of relative poverty counties has not changed, i.e., concentrated spatial distribution and stable spatial structure (Figure 5). Although the number of relative poverty counties reduced from 799 in 2000 (Figure 5a) to 610 in 2018 (Figure 5b), the spatial distribution of the relative poverty counties showed high stability. According to the changes of relative poverty counties^②: ① there were 471 relative poverty counties of stable type in China, accounting for 77.21% of the total number of relative poverty counties in 2018, and they were distributed contiguously in mountainous and hilly landform areas, such as the mountainous area at the south foot of Greater Khingan Range, Yanshan–Taihang Mountains region, Qinling–Daba Mountains region, the Yunnan–Guizhou Plateau region, and remote stone mountains in northwest China. ② There were

108 new relative poverty counties, accounting for 17.7% of the total number of relative poverty counties, which were scattered around relative poverty counties of the stable type. ③ Since 2000, the relative poverty counties of the eliminating type are mainly distributed in eastern coastal areas and areas of low mountains and hills, such as Liaoning, eastern Inner Mongolia, Anhui, eastern Hubei, and southern Guangxi. Some counties and districts in central and west China which are adjacent to Chengdu, Chongqing, Bohai Rim, Pearl River Delta, and Yangtze River Delta successfully reduced the spatial distribution scope of RPAs, with the aid of the leading effect of urban agglomerations and the development of resource-intensive industries such as characteristic tourism, industrial and mining product development, and characteristic agricultural production. ④ There are 5.08% of the relative poverty counties belonging to the recurrence type and uniformly distribute in 14 contiguous areas, which are located in the transition zone of the first and second steps. The type indicates the fluctuation from poverty-eliminating to poverty-returning and the protracted nature of anti-poverty.

Table 2 Population of four major RPAs in China from 2000 to 2018 and proportions of their proportion in the total relative poverty population

Area	2000		2010		2018	
	Population (×10 ⁴)	Proportion (%)	Population (×10 ⁴)	Proportion (%)	Population (×10 ⁴)	Proportion (%)
Northeast	1 837.97	7.11	651.26	2.77	775.04	4.15
East	790.57	3.06	1 639.96	6.98	1 392.30	7.45
Central	6 556.23	25.37	8 048.15	34.26	5 861.67	31.35
West	16 658.54	64.46	13 153.25	55.99	10 665.13	57.05
Total	25 843.31	100.00	23 492.61	100.00	18 694.14	100.00

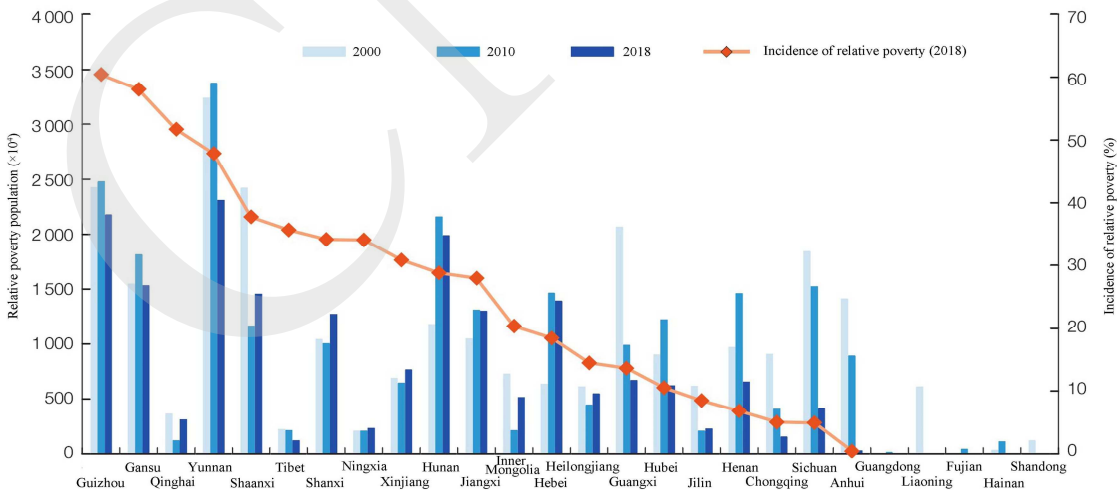


Figure 4 Changes of relative poverty population in China's provinces from 2000 to 2018

During the research period, there were no relative poverty counties in Beijing, Jiangsu, Shanghai, Tianjin, and Zhejiang, and thus they were not presented in this figure. The data shown in the figure exclude Hong Kong, Macao, and Taiwan.

② Relative poverty counties in 2000, 2010, and 2018 are divided into four categories: stable, newly included, recurring, and eliminated: stable: the relative poverty counties present in all three phases; newly included: those not included as relative poverty counties in 2000 but included in 2010 and 2018; recurring: those included as relative poverty counties in 2000 and 2018 despite their exit in 2010; eliminated: counties getting rid of relative poverty in 2018.

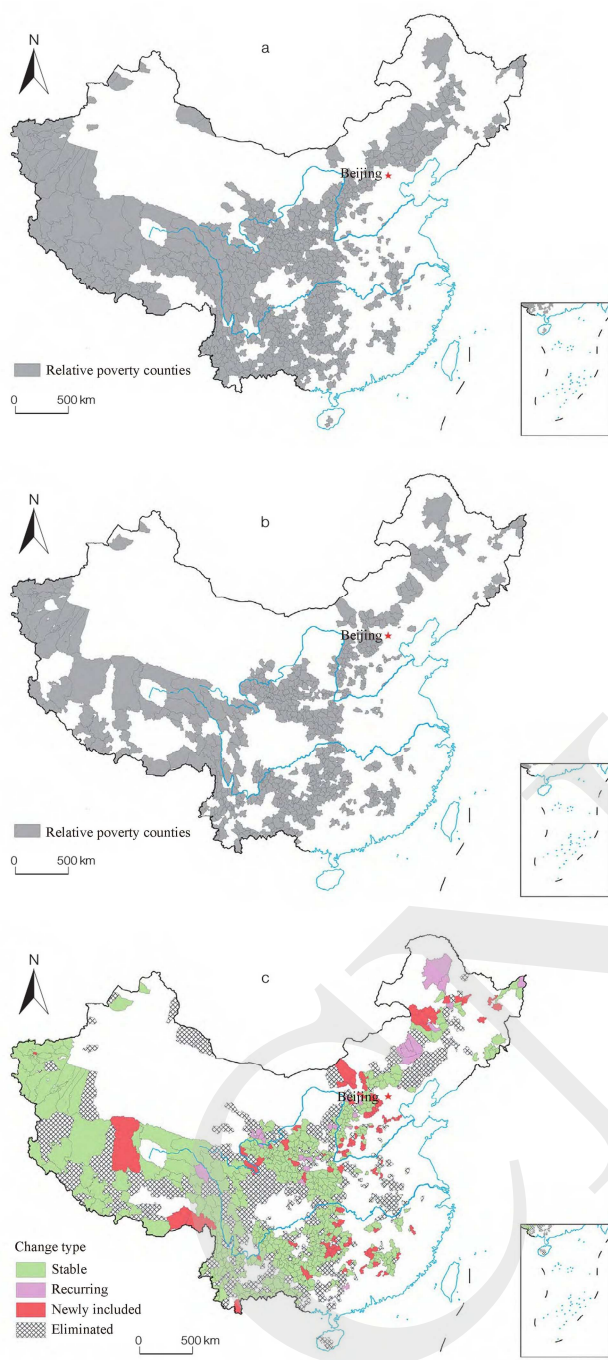


Figure 5 Distribution of RPAs in China from 2000 to 2018
(a) 2000; (b) 2018; (c) change type.

3 Basis of regional types for sustainable development in RPAs

3.1 Regional functions: ecological service function as the orientation

RPAs in China are dominated by mountain and hilly

landforms, which are highly and spatially overlapped with the Qinghai-Tibet Plateau ecological barrier, the northern sand prevention belt, the Loess Plateau-Sichuan-Yunnan ecological barrier, and the southern hilly and mountainous areas. They are the main spatial carriers of the national “two barriers and three belts” ecological security strategy [9]. Among the various main function zones, key ecological function zones have the largest number of counties and the widest distribution (Table 3 and Figure 6). The total area of 354 key ecological function zones is $2.2021 \times 10^6 \text{ km}^2$, accounting for 77.06% of the total area of RPAs. These key ecological function zones include the Greater Khingan Range, Lesser Khingan Range, Three-River-Source region, Gannan region, Qilian Mountains, Nanling Mountains, Loess Plateau, Dabie Mountains, karst rocky desertification areas in Guangxi, Guizhou, and Yunnan, Hunshandake Desert, forests and biodiverse areas in Sichuan and Yunnan, biodiverse areas in Qinling-Daba Mountains region, Wuling Mountain, the plateau edge in the southeastern Tibet, and Qiangtang Plateau in northwestern Tibet, covering four types of water conservation, soil and water conservation, wind prevention and sand fixation, and biodiversity maintenance [10,11]. The geographical function attribute with ecological service function as the orientation determines that RPAs do not have the conditions for large-scale population agglomeration and high-intensity industrial development. In 2018, the population size was still as high as 91.8295 million in the key ecological function zones of RPAs, accounting for 49.76% of the total permanent population in RPAs. The large population base leads to the continuous disturbance of various production and living activities to the natural environment, and the development of high-intensity non-main functions will inevitably affect the main functions of ecological protection while aggravating the overload of natural carrying capacity.

Table 3 Main function types of RPAs in China in 2018

Main function type	Number of counties	Land area (10^4 km^2)	Economic aggregate (10^8 CNY)	Total population ($\times 10^4$)
Urbanization area	67	20.14	7 683.66	2 451.86
Main producing area of agricultural products	173	89.19	16 234.80	6 821.03
Key ecological function zone	370	166.31	22 844.51	9 182.95

In addition, there are scattered counties in RPAs with urbanization areas and main producing areas of agricultural products as main functional orientations, which account for 7.31% and 32.36% of the total land area of RPAs, and 13.29% and 36.96% of the total permanent population, respectively. This reflects that because RPAs are far away from the mainstream, trunk stream, and low land in the lower reaches of rivers, and away from regional central cities with more advanced social economy. Such marginality and closure hinder the input of material and energy outside the areas, and the carrying potential of resources and environment within

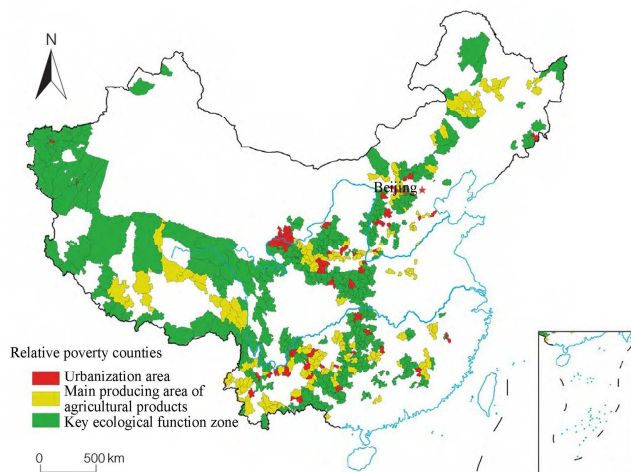


Figure 6 Distribution of main function types of RPAs in China in 2018

the areas is limited. It is worth noting that in 2018, the per capita GDP of urbanization areas in RPAs was 31,338 CNY, which was 1.32 times that of the main producing areas of agricultural products and 1.26 times that of the key ecological function zones, far lower than the multiple (2–5 times) of the national urbanization areas compared with the main producing areas of agricultural products and key ecological function zones at the national scale. This shows that RPAs have weak economic growth and leading effect, and it is unrealistic to cultivate and form economic and social pull in internal areas for the overloaded population in key ecological function zones. Therefore, relying on the development of urban agglomerations, metropolitan areas, and neighboring central cities, a new pattern of “the rich first driving those being rich later” should be implemented across regions to guide the rational flow of population and development factors in RPAs.

3.2 Natural carrying capacity constraints: coexistence of areas with development conditions and those lacking development conditions

3.2.1 Single-element evaluation

The elements and comprehensive constraints of the water and soil resources, ecological importance, and ecosystem vulnerability of relative poverty counties in 2018 are identified. As shown by the evaluation results of the elements (Figure 7), ① the constrained areas of land resource elements (i.e., areas with a general or low level of available land resource potential) are mainly distributed in the Qinghai-Tibet Plateau, Henan, Hubei, Hunan, Jiangxi, Yunnan, Guizhou, and Guangxi; ② the constrained areas of water resource elements (i.e., areas with a general and low level of available water resource potential) are contiguously distributed in areas

such as the Loess Plateau, the Northeast Plain, and the Hexi Corridor; ③ the constrained areas of ecological elements (i.e., areas with a moderate or above level of ecological importance and ecosystem vulnerability) are mainly concentrated in southern Xinjiang, the Qinghai-Tibet Plateau, the Loess Plateau, and the Yunnan-Guizhou Plateau.

3.2.2 Spatial matching of elements

From the perspective of spatial matching of elements, the Taihang Mountains, Qinling Mountains, and other regions are constrained by land–water resources; the Qinghai-Tibet Plateau, Yunnan-Guizhou Plateau, and southern hilly areas are constrained by land–ecological elements; the Loess Plateau is constrained by ecological elements–water resources. RPAs are dominated by mountainous and hilly landforms, where the types of constraining elements of natural carrying capacity are diverse and conjugate, and the degree of spatial matching of supporting elements is low, which leads to the areas without development conditions (Figure 8).

(1) Areas lacking development conditions are strongly constrained by the natural carrying capacity. Due to the extremely harsh natural geographical environment or the quite important ecological function, the natural carrying capacity is difficult to improve. After the problems of food and clothing are solved, the areas of this type no longer have the basic conditions and motive force for development^[12]. There are 250 counties of this type, which cover a land area of $1.372,1 \times 10^6$ km² and have a total permanent population of 78.831,2 million, accounting for 42.17% of the total population in RPAs. They are concentrated in the Qinghai-Tibet Plateau, Liupan Mountains region, Hengduan Mountains region, Wumeng Mountains region, Luoxiao Mountains region, etc.

(2) RPAs also include areas with moderate or weak natural carrying capacity constraints and certain development conditions. These areas are often less constrained by ecological conditions, have a certain potential for water and soil development, and are also rich in mineral and biological resources. There are 360 counties of this type with a land area of $1.583,2 \times 10^6$ km², and a permanent population of 108 million, accounting for 57.83% of the total population in RPAs. They are mainly distributed in the northeast of the Greater Khingan Range, northeast of the Lesser Khingan Range, Qinling-Daba Mountains region, Yanshan-Taihang Mountains region, and karst regions in Guangxi, Guizhou, and Yunnan. Under the premise of maintaining the stability of the natural carrying capacity, the mechanism of poverty alleviation can be innovated in this type of areas, so as to reflect the value of regional resource advantages in policy formulation, realize the transformation of resource advantages to economic advantages, and promote the effective improvement of the local economy and people's livelihood.

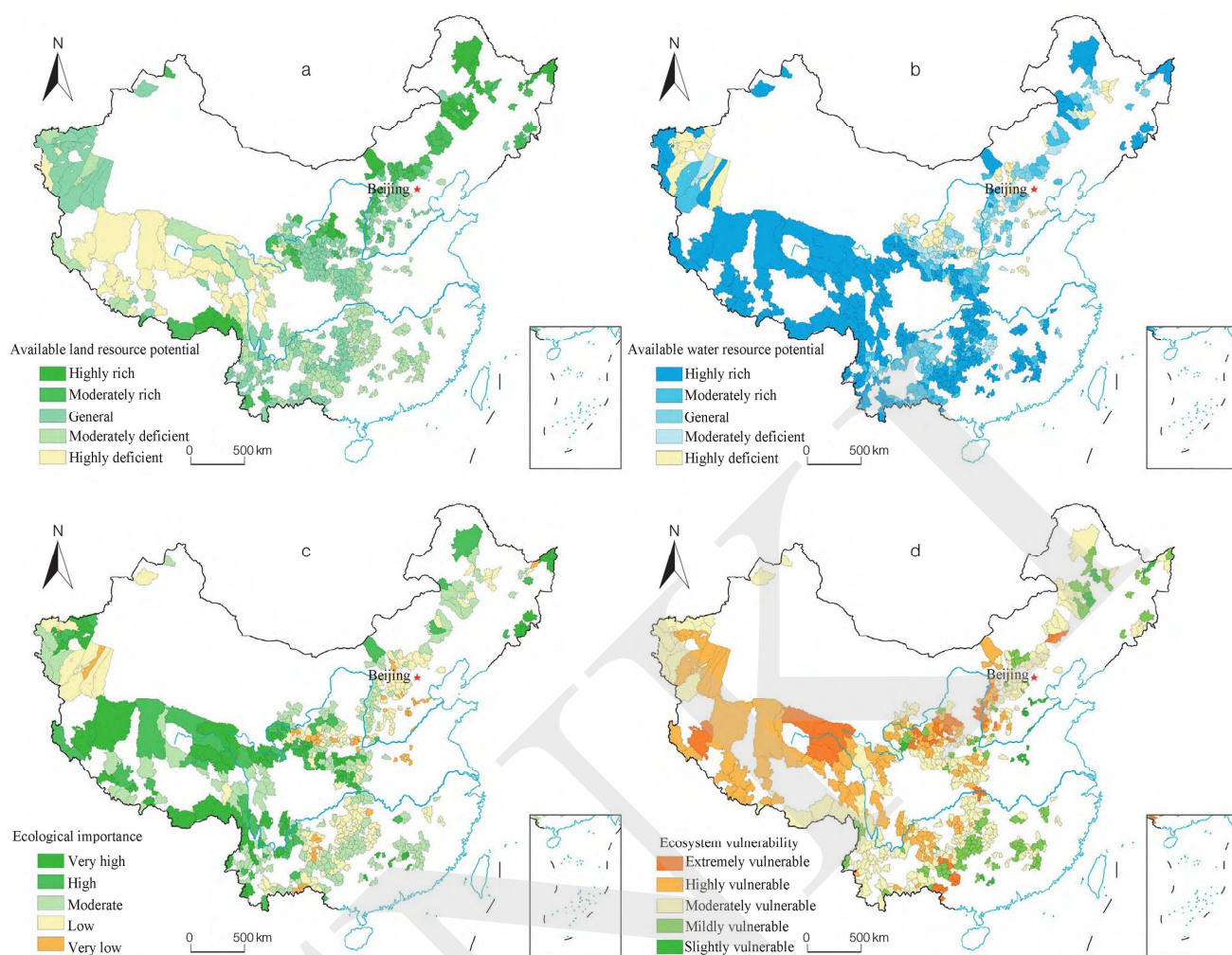


Figure 7 Single-element evaluation map of natural carrying capacity of RPAs in China in 2018

(a) Available land resource potential; (b) available water resource potential; (c) ecological importance; (d) ecosystem vulnerability.

4 Historical background of promoting the synchronized modernization of RPAs from a higher starting point

After 2020, major changes in the historical background of RPAs have taken place as compared with that during the development of the western region and the promotion of poverty alleviation. The development conditions and opportunities present the following new situations.

(1) The strategic position and location conditions have undergone fundamental changes. From the perspective of the global strategic pattern, especially from the effect of the “Belt and Road Initiative” (namely, the Silk Road Economic Belt and the 21st Century Maritime Silk Road) on the change of the global pattern, and from the perspective of national security, the strategic status and location of RPAs have changed significantly. They have become the frontier zone and key area for China to promote national security and reconstruct

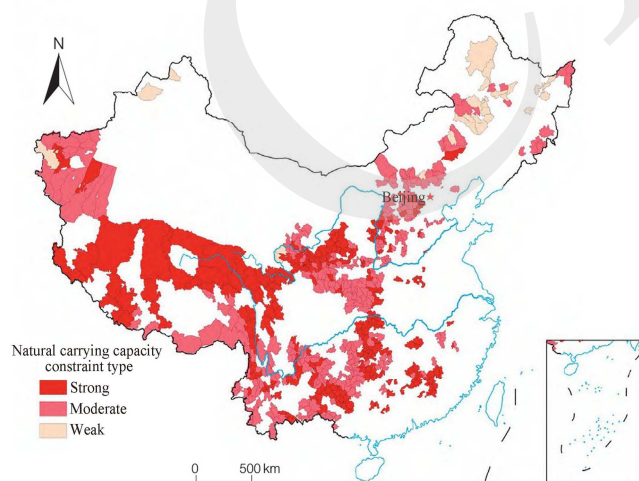


Figure 8 Distribution of natural carrying capacity constraint types in RPAs in China in 2018

the global strategic pattern, and especially for the key role of the “Belt and Road Initiative” played in restructuring the global strategic pattern. In the past, due to their inland location, RPAs were marginalized and were at the end of China’s strategic layout of opening up to the outside world. However, their strategic position has been significantly improved currently, which has become an important prerequisite for promoting the synchronized modernization of RPAs from a higher starting point.

(2) Ecological construction has improved the foundation of the ecological environment in RPAs. Since 2000, the implementation of major ecological protection projects such as prevention and control of desertification, natural forest protection, and returning farmland to forests and grasslands, as well as the ecological resettlement, and supporting fund compensation of relocation for ecological protection have significantly improved the ecological environment in RPAs. From 2004 to 2018, the total afforestation area in the western region where RPAs are located was 46.64 million hectares, accounting for 54.4% of the total in China. The forest area increased from 98.64 million hectares to 132.92 million hectares, and the forest coverage rate has increased from 14.5% to 19.4% accordingly. More importantly, China has made significant progress in the ecological environment protection system as well as green production technologies and processes including the green development of minerals, which provides a natural foundation and an important guarantee for management systems and production technologies for RPAs to explore green development paths based on ecological protection.

(3) Infrastructure construction has changed the investment and business environment in RPAs. In addition to general infrastructure construction such as transportation, water conservancy, and energy, China has now completed the Qinghai-Tibet Railway, the West-East Natural Gas Transmission, the West-East Electricity Transmission, and the construction of multiple high-speed railways. Complete highway and railway networks have gradually formed around the RPAs. From 2000 to 2018, the operating mileage of railways in the western region increased from 22,000 kilometers to 52,900 kilometers, and its proportion in the national level increased from 37.5% to 40.1%; the highway mileage increased from 553,900 kilometers to 1,991,500 kilometers. The most significant is the development of expressways, which increased from 3,600 kilometers to 53,600 kilometers, and the proportion in the national level increased from 22.0% to 37.6%.

5 Strategic choice and policy prospects of sustainable development in RPAs

In accordance with the national strategic plan for achieving the second centenary goal and fully building a modern socialist China, RPAs also need to be consistent with the whole country to achieve modernization goals at the same time. With the consideration of such characteristics of

relative poverty as protracted nature, arduousness, and complexity, and the systematic implementation of a differentiated anti-poverty strategy based on natural carrying capacity and main function positioning, the relative poverty population and the RPAs will be reduced to less than 50% of the levels in 2020 when the country basically realizes socialist modernization by 2035, on the basis of completely eliminating the risk of the absolute poverty population returning to poverty. When a great modern socialist country that is prosperous, strong, democratic, culturally advanced, harmonious, and beautiful is built by 2050, the relative poverty population will be reduced by over 50% compared with that of 2035, and the RPAs on the regional scale will be completely eliminated.

5.1 Optimization regulation and spatial governance of the Man–Land system should be carried out to stabilize the national defense, ecological, food, energy, and social security from a global perspective

On the basis of the overall vulnerable natural carrying capacity in RPAs, the continuously increased population, the weak industrial foundation, the insufficient facility support, the lagging construction of the market system, the low self-development ability, and the economic and social factors related to old revolutionary base areas, areas inhabited by minority nationalities, remote and border areas and poverty-stricken areas have made RPAs become a critical region with a combination of multiple regional attributes and typical characteristics of the Man–Land relationship. It is also a weak region and problem region where various regional development problems are superimposed and the Man–Land relationship is generally in a state of tension. RPAs include mountain areas, ecologically important areas, and vulnerable ecology areas in terms of natural attributes; in terms of economic attributes, RPAs include agriculture areas, livestock areas, and resource areas; in terms of social and geographic attributes, RPAs include ethnic areas, old revolutionary base areas, and border areas (Figure 9).

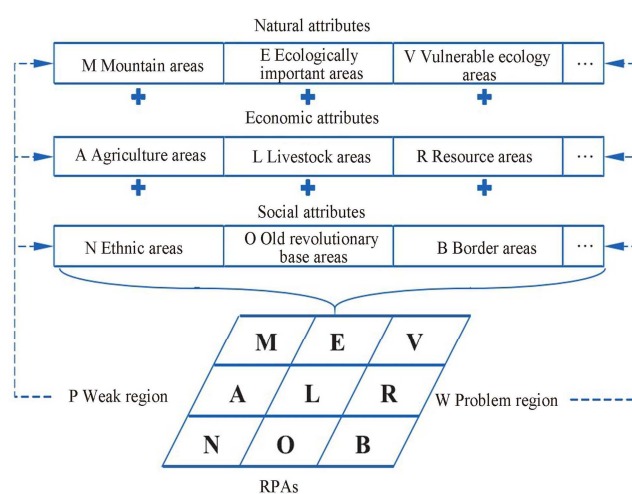


Figure 9 Schematic diagram of multi-dimensional attributes of RPAs

From the three aspects of multi-dimensional attributes, regional functions, and development reality, it is found that the overall sustainability of the Man-Land system in RPAs is weak, which is mainly manifested in excessive population pressure, intensified local ecological vulnerability, degraded ecological service functions and quality, and seriously insufficient self-development ability. External support and increased investment are needed, and the optimization regulation and spatial governance of the Man-Land system from a global perspective are required to finally achieve the spatial equilibrium between the population and the economy in RPAs, between the population economy and regional function suitability, and between quantity growth of regional development and its quality growth. To this end, global optimization and regulation should be implemented in the following three aspects: ① guiding the diversification (in terms of urban-rural development and industry-agriculture development, etc.), multi-dimensional population employment, and element convection to maintain the balance among overall benefits of ecology-society-economy; ② strengthening the optimization and upgrade of the multi-scale development and protection pattern in multiple directions (e.g., east-west, internal-external) to form and improve the basic space development framework of national land which features trans-regional interaction in the new era; ③ on the basis of the objective conditions of comprehensive regional carrying capacity, reshaping the new look of urban-rural interaction and equivalent development.

5.2 For RPAs with development conditions, the comparative advantages of the resources and ecology should be transformed into economic advantages through mechanism innovation, thereby solving the intergenerational transfer under “path dependence” and the interregional exfoliation under the “Matthew effect”

RPAs with development conditions are often superior in natural environment and geographical conditions and abundant in energy and mineral resources, agriculture, livestock, and living resources, and natural and cultural tourism resources. The relative poverty in such areas is institutional and phased in a sense. With progress in science and technology and domestic consumption converting to a high level, the material foundation and resource endowments to develop sunrise industries and green industries will be brought into play. Through the innovation of poverty alleviation mechanisms, comparative advantages could be converted into advantages that drive local economic development.

The future policy orientation of this type of areas is as follows: ① on the basis of the right confirmation of natural assets, creating a resource conversion mechanism with stable income and long-term driving force; ② taking the value of ecological products as the main focus to make the protection

of ecological background a pillar industry for RPAs and the main channel to increase the income of relative poverty population; ③ using scientific and technological innovation and modern management as levers to push forward the green economic system led by the biopharmaceutical industry chain.

5.3 For RPAs lacking development conditions, the equalization of basic public services should be improved comprehensively while steadily unloading natural carrying capacity and systematically conserving mountains, rivers, forests, farmlands, lakes, and grasslands

RPAs lacking development conditions are usually weak regions with poor natural conditions, deficient resources, and tense Man-Land relationships, which are difficult to get rid of poverty locally. Therefore, on the one hand, the burden of local natural carrying capacity should be unloaded by addressing the problem of population overload; the migration of the population should be orderly guided to achieve relocation development; a systematic approach to conserving mountains, rivers, forests, farmlands, lakes, and grasslands should be implemented to reduce ecological pressure, and the stability and benign evolution of the ecosystem should be promoted. On the other hand, with the support of a series of special policies such as ecological compensation, equalization of public services, and social security, the quality of the livelihood of local residents should be improved while building a beautiful and harmonious country.

The future policy orientation of this type of areas is as follows: ① oriented by improving the migration ability and employability, a more equitable basic education and professional skills training system with higher quality for relatively poor people should be formed; ② resources from all aspects should be integrated to form an inclusive and convenient infrastructure and public service guarantee system featuring the integration of centralized, distributed, and flow types; ③ the new mechanism that applies ecological compensation to individuals should be explored and implemented, as well as new ways to develop and utilize resources with low disturbance within natural carrying capacity.

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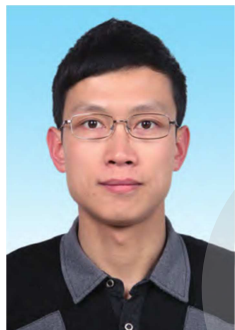
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