

# Beautiful China Initiative: Human-nature harmony theory, evaluation index system and application

FANG Chuanglin<sup>1,2</sup>, WANG Zhenbo<sup>1,2</sup>, LIU Haimeng<sup>1,2</sup>

1. Institute of Geographic Sciences and Natural Resources Research, CAS, Beijing 100101, China;

2. University of Chinese Academy of Sciences, Beijing 100049, China

**Abstract:** The Beautiful China Initiative (BCI) is a plan for the sustainable development of the Chinese nation as well as for China to fulfill the United Nations' 2030 Agenda for Sustainable Development. The Chinese government's "five-in-one" approach provides strategic arrangements for developing the BCI, and President Xi Jinping proposed a timetable and "road map" for the BCI at the National Conference on Ecological and Environmental Protection. Nevertheless, the theoretical basis, evaluation index system, evaluation criteria and effectiveness of the BCI are currently unclear. This paper begins by exploring the basic content of the BCI from narrow and broad perspectives. It regards the theory of human-nature harmonious coexistence and the five-in-one beauty theory as the core theoretical bases of the BCI and constructs a five-element BCI evaluation index system (ecological environment, green development, social harmony, system perfection and cultural heritage) and utilizes the assessment method of the United Nations' Human Development Index to assess scientifically the effectiveness of the BCI in 341 prefecture-level cities. The results show the average BCI index (the Chinese Academy of Sciences Beauty Index) score to be 0.28, which is quite low, while the average scores for the individual element indexes of the ecological environment index, green development index, social harmony index, system perfection index and cultural heritage index are 0.6, 0.22, 0.29, 0.22 and 0.07, respectively. All of these are relatively low values, with relatively large discrepancies in regional development, indicating that progress in the BCI is generally slow and unbalanced. To realize the BCI's timetable and roadmap to a high quality and high standard, it is suggested that a common system for evaluating the progress of the BCI is developed and promulgated so that dynamic monitoring and phased evaluations can take place; BCI technical assessment standards are compiled and published; BCI comprehensive zoning is undertaken; pilot projects adapted to local conditions are launched in BCI sample areas; and BCI results are incorporated into performance indicators at all levels of government.

**Keywords:** Beautiful China Initiative; theoretical basis; theory of human-nature harmonious coexistence; evaluation index system; Chinese Academy of Sciences Beauty Index; evaluation plan

---

**Received:** 2020-01-09 **Accepted:** 2020-02-18

**Foundation:** Major Program of the National Natural Science Foundation of China, No.41590840, No.41590842; The Strategic Priority Research Program of Chinese Academy of Sciences; Pan-Third Pole Environment Study for a Green Silk Road (Pan-TPE), No.XDA20040400

**Author:** Fang Chuanglin (1966–), PhD and Professor, specialized in urban geography, urban agglomeration development and urbanization resource and environmental effects. E-mail: [fangcl@igsnr.ac.cn](mailto:fangcl@igsnr.ac.cn)

## 1 Introduction

The Beautiful China Initiative (BCI) is a major strategic idea and task proposed at the 18th National Congress of the Communist Party of China (CPC). The *Decision on Major Issues Concerning Comprehensively Deepening Reforms* adopted at the Third Plenary Session of the 18th Central Committee of the CPC went further by proposing the development of an eco-conscious civilization focused around the building of a “Beautiful China,” thereby promoting a new pattern of modernization characterized by harmonious development between humans and nature. Building a Beautiful China is not only a new path for realizing China’s Two Centenary Goals, but also an inevitable requirement for stabilizing its status as a great power and realizing the Chinese Dream of the great rejuvenation of the Chinese nation. It holds great significance, involves arduous tasks and is time-critical.

In May 2018, President Xi clarified the timetable and roadmap for the BCI at the National Conference on Ecological and Environmental Protection, promising to “ensure that, by 2035, there will be a fundamental improvement in the quality of the environment so the goal of building a Beautiful China will be basically attained.” He went on to say, “By the middle of this century, material, political, cultural, social and ecological progress will have been made; a green development mode and way of life will have fully taken shape; harmony will exist between humans and nature; the State’s governance system and governance capacity of the ecological environment will be comprehensively modernized; and the Beautiful China Initiative will be completed” (XNA, 2018).

The BCI is about fundamentally transforming China’s mode of economic development, but also about building a modern socialist civilization with Chinese characteristics and perfecting the theoretical system of socialism with Chinese characteristics. The fundamental transformation of China’s economic development model from “extensive and inefficient” to “intensive and green” has occurred in stages, from the material, cultural and ethical progress proposed during the initial implementation of the policy of reform and opening up, to the Party’s “three-in-one” development strategy for economic, political and cultural progress proposed by the Fourth Plenary Session of the 13th Central Committee of the CPC, to the “four-in-one” development strategy for economic, political, cultural and social progress proposed by the 16th National Congress of the CPC, and finally to the Beautiful China “five-in-one” development strategy for economic, political, cultural, social and ecological progress basically formulated by the 18th National Congress of the CPC, which stated, “We must give high priority to making ecological progress and incorporate it into all aspects and the whole process of advancing economic, political, cultural and social progress, work hard to build a beautiful country and achieve lasting and sustainable development of the Chinese nation.” The report of the Party’s 19th National Congress pointed out that, “Speeding up reform of the system for developing an ecological civilization and building a Beautiful China,” would push the BCI to an accelerated implementation stage. In the new era, the BCI is one of President Xi Jinping’s six core objectives for realizing socialist modernization by 2035 as well as a core goal for implementing the United Nations’ 2030 Agenda for Sustainable Development. It is a fundamental goal of ecological progress in the new era, and its comprehensive, regional and systematic characteristics make it a major initiative for raising understanding of the human-nature relationship in China to a new level and new stage of

development.

The strategic ideas behind the BCI have emerged over the past six or so years, and the central government has fruitfully explored a development model and development path to achieve a Beautiful China in response to the “five-in-one” strategy. Domestic scholars have also conducted exploratory research on the BCI from different angles. This research mainly consists of qualitative analyses and summaries, and the research content concerns the theoretical connotations of the BCI (Li, 2013; Wan, 2013; Wan *et al.*, 2013), significance of action (Li, 2013), the BCI and control of territorial space (Huang, 2018), the BCI and development of the tourism industry (Zhang and Li, 2013; Zhang and Chen, 2016), the BCI and rural revitalization (Yu, 2018), the BCI and academic discipline development (Xiong, 2015; Wang, 2016) and the BCI and urban planning (Yang, 2015; Lu, 2016). There are also a small number of studies that discuss an index system for evaluating the BCI. These include the Beautiful China Evaluation Research Group of Sichuan University, Xie Binggeng and others who constructed evaluation index systems to assess the BCI at the provincial level in the five areas of ecology, economy, society, politics and culture (Xie *et al.*, 2015; Xiang *et al.*, 2015); Hu Zongyi and others who constructed an evaluation index system to assess BCI effectiveness in Hunan Province in terms of the six areas of a beautiful economy, beautiful society, beautiful environment, beautiful culture, beautiful institutions and beautiful education (Hu *et al.*, 2014); and Deng Wei, Huang Lei, Wang Xiaoguang and others who developed a Beautiful China indicator system and a “Beautiful Countryside” indicator system from the perspective of ecological progress (Wang, 2013; Huang *et al.*, 2014; Deng *et al.*, 2018). These studies serve as an important reference for the BCI. In reality, however, it is unclear how each locality should build a Beautiful China, to what extent it should build a Beautiful China, and how to evaluate the effectiveness of building a Beautiful China. There is an urgent need to summarize the theoretical connotations of the BCI and establish an evaluation system with scientific authority, formulate operational technical assessment standards and quickly implement progress assessments for the BCI, so as to discover pertinent issues, summarize useful experiences and promote the steady knowledge-based construction of the BCI.

## 2 Theoretical basis of the Beautiful China Initiative

### 2.1 Basic content: Broad and narrow senses

The BCI is a phased strategic plan to implement China’s long-term goals of building an ecological civilization, promoting national sustainable development and enhancing its capacity for and the quality of sustainable development. It is also a core goal for China to achieve high-quality development. It includes two aspects: a broad sense (the “big BCI”) and a narrow sense (the “small BCI”).

In the broad sense, the Beautiful China Initiative refers to the implementation of the “five-in-one” strategy of national economic, political, cultural, social and ecological progress implemented in China’s territorial space based on its different major functions, within a specified period and in accordance with the principles of national sustainable socioeconomic development, of sustainable use of natural resources and of ecological and environmental protection, so as to achieve beautiful scenery, great wealth, harmony between hu-

mans and nature, the preservation of cultural heritage and political stability. This has become a core objective for achieving China's basic modernization by 2035 and a necessity to achieve China's Two Centenary Goals and to move closer to the great rejuvenation of the Chinese nation. Having immaculate mountains and rivers with grinding poverty is not the vision of a Beautiful China, nor is great material prosperity with environmental poverty. Only by achieving harmonious ecological, economic, social, political and cultural development can the goal of a Beautiful China be truly realized.

In the narrow sense, Beautiful China refers to the implementation of national economic, social and ecological progress implemented in China's territorial space based on its different major functions, within a specified period and in accordance with the principles of national sustainable socioeconomic development, of sustainable use of natural resources and of ecological and environmental protection, so as to achieve the goals of sustainable development, including effective protection of the ecological environment, sustainable use of natural resources, green socioeconomic development and harmonious coexistence between humans and nature, and to create a new pattern of sustainable development consisting of clean skies and green fields, beautiful scenery, great prosperity and harmonious coexistence between humans and nature. It involves creating more material and cultural wealth to satisfy people's desire for a better life as well as producing higher-quality ecological products to satisfy people's yearning for a beautiful ecological environment.

To achieve urban-rural integrated development, the BCI must include two types of completely different entities: beautiful cities and beautiful villages. It is, therefore, necessary to formulate different evaluation index systems and technical standards for cities and villages, so as to evaluate separately the development progress and beauty of urban and rural areas.

## 2.2 Theoretical basis: Harmonious coexistence between humans and nature

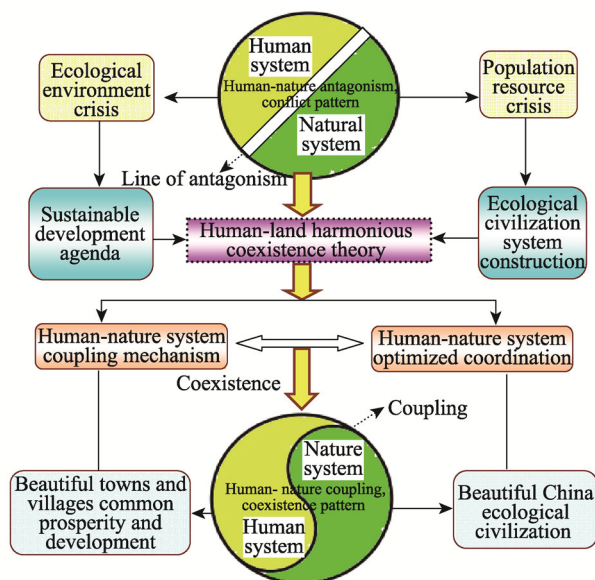
Human society has experienced three major development stages: agricultural civilization, industrial civilization and commercial civilization. It is now entering the fourth stage: ecological civilization. The essence of ecological civilization is not only that humans are required to obtain their living materials through production activities, but they must also ensure that their production behavior in the course of obtaining living materials does not threaten the sustainable survival of human beings by destroying the natural ecological environment. This requires maximum coordination of the relationship between humans and nature.

The territorial system of the human-nature relationship is an enormous open system of interactions between land-based human activities and the geographical environment (Wu, 1998). People have always dominated this complex system, and efforts to manage conflicts between humans and nature are an ancient and eternal theme of geographical research (Mao, 1995). Thinking on this topic has always centered around the harmonious coexistence of humans and nature, developing from the ancient belief in the "oneness of man and nature," to the modern concept of coordinating the relationship between man and nature, on to the modern theory of "sustainable development," and latterly to the theory of "ecological civilization." Four decades ago, Chinese Academician Wu Chuanjun proposed in an academic report titled *Dilixue de zuotian, jintian he mingtian* (*Geography's Yesterday, Today and Tomorrow*) delivered at the Fourth National Congress of the Chinese Geographical Society that

the human-nature relationship sits at the core of geographical research, and coordinating the relationship is its central goal (Wu, 1991; Lu *et al.*, 1998). Human understanding of the human-nature relationship has also evolved from the nature worship of primitive religions, to the theory of manifest destiny, the theory of the oneness of humans and nature, environmental determinism in geography, the theory of environmental probabilism, the theory of the victory of humans over nature, and the theory of harmony between humans and nature. From Marx's thinking on "appropriate adjustments," to Engels' view of humans and nature as a "harmonious whole," the evolution to today's ideas of sustainable development and ecological civilization has seen an increase in human understanding of the human-nature relationship. Historical lessons from China and abroad remind us that human beings must not regard nature as a slave, nor be a slave to nature. What is needed between humans and nature is harmony. They must exist in harmony and thrive through coordination. The BCI is an attempt to seek the best means for humans to live in harmonious coexistence with nature (Wu *et al.*, 2002).

The basis for the harmonious coexistence of humans and nature is that the human-nature relationship is an objective original relationship and a symbiotic and reciprocal relationship that has existed since the beginning of humankind, and when humans develop and utilize natural resources and their environment, they need to remain in balance and symbiosis with the natural environment. This specifically involves three types of harmonious symbiotic relationships. The first is the relationship between nature and nature, which emphasizes the need for human beings to maintain ecological balance and coordination between natural environments when utilizing nature; they cannot sacrifice the ecological environment of one region to optimize the ecological environment of another region. The second harmonious symbiotic relationship is that between nature and human beings, which emphasizes the need for human beings not to exceed the carrying capacity and threshold of the natural world in the process of developing and utilizing nature, so as to maintain harmonious coexistence between the natural environment and human beings. The third harmonious symbiotic relationship is between humans and other humans, which emphasizes the need for harmony, compromise and coordination between people in the course of developing and utilizing natural resources and the environment, and not to regard the natural world simply as a means for humans to derive benefits (Fang, 2004). These three harmonious relationships are the relationships that need to be coordinated in order to realize the "five-in-one" development strategy for economic, political, cultural, social and ecological progress outlined in the BCI, making them the core theoretical basis of the BCI.

Harmonious coexistence between humans and nature is the human-nature relationship for the new era, and it is the main objective of the BCI. Putting people first is the starting point for optimizing the coordination of the human-nature system and for constructing a Beautiful China; development of human awareness is the focus in optimizing and regulating the human-nature system and the BCI; and harmonious coexistence is the goal of the optimal regulation of the human-nature system, as well as the target point for coordinating the BCI (Fang, 2003). Changing from a pattern of conflict between humans and nature to a coupled coexistence pattern of humans and nature is a dynamic mechanism for simulating "optimum distance" and optimizing and regulating the human-nature relationship in the course of the



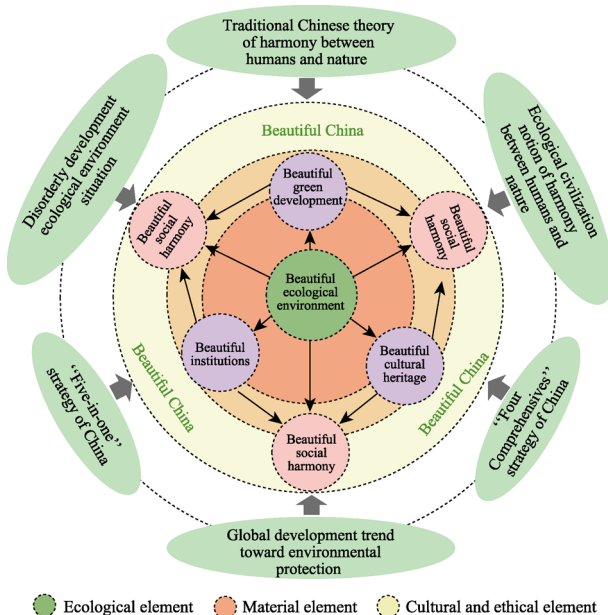
**Figure 1** The schematic diagram of the man-earth harmony theory of BCI

BCI. It is also the objective being sought in the struggle to achieve human-nature optimum distance in the BCI (Figure 1). As the British scholars R. J. Benett and R. J. Chorley wrote in their co-authored work titled *Environmental Systems: Philosophy, Analysis and Control*, coordination and coexistence are two major relationships in the human-nature system. Coordination involves the short-term human control of small-scale energy and material flows, as humans cannot adjust large-scale energy and material flows. It is only by coordinating humans and nature that peaceful coexistence is possible (Li, 1996; Liu *et al.*, 2020). The ecological civilization concept of harmonious coexistence

between humans and nature is the basis of the Beautiful China Initiative.

### 2.3 Theoretical framework: The five-in-one strategy

Based on the broad sense of the BCI and the five-in-one strategy, the basic theoretical framework of the BCI is to create a beautiful ecological environment, beautiful green development, beautiful social harmony, beautiful cultural heritage, and beautiful institutions (Figure 2). Nevertheless, faced with new patterns and new requirements of modern construction in human-nature harmony in different regions, and with comprehensive consideration given to current divisions in physical geography zoning, human geography zoning, major function zoning and new-urbanization zoning (Fang *et al.*, 2017), it is necessary to formulate a Beautiful China comprehensive zoning strategy to facilitate and integrate regional development, to create an assessment program that combines the BCI processes of China's different regions, to select an applicable assessment method, to construct me-



**Figure 2** Five-dimensional integration theory framework of BCI

thodically a framework for assessing the BCI, to identify the key regions for the BCI, to discover key issues, and to construct a roadmap that summarizes the modes, patterns, methods, and stages for constructing a Beautiful China in key areas according to local conditions.

### 3 Evaluation index system for the Beautiful China Initiative

#### 3.1 Index system and data sources

Based on the basic context and theoretical framework of the BCI, and with reference to the national *Ecological Civilization Construction Assessment Target System* and *Green Development Indicator System*, we developed a BCI evaluation index system with five objectives (beautiful ecological environment, green development, social harmony, institutions, and cultural heritage) and 31 specific indicators (Figure 3). The positive and negative signs in the inner rings of Figure 3 represent direction, and the outer values represent the weight of the indicators. The data used in this paper are all from 2016. In terms of constructing the index system, data on national ecological function zones is based on world natural heritage sites, national-level scenic spots, and national nature reserves. The proportion of ecological land area refers to the proportion of areas of forest, grassland and water in urban areas, with data coming from the Data Center for Resources and Environmental Sciences of the Chinese Academy of Sciences. Average annual concentrations of PM<sub>2.5</sub> were calculated according to measurements from State-controlled stations (Liu *et al.*, 2017). Frequency of corruption, frequency of vicious incidents and frequency of disasters were all calculated for the period 2011–2016 using the Baidu Index big data platform. The quality of local government information disclosure was determined using the *People’s Daily* research database. Government credit status was based on the Urban Business Environment Survey Database of the National Development and Reform Commission of the People’s Republic of China. Data on global and Chinese intangible cultural heritage is from China’s intangible cultural heritage protection network. Data on other indicators is from the *China Urban Statistical Yearbook 2017*, provincial statistical yearbooks from 2017 and statistical reports on economic and social development of cities from 2016.

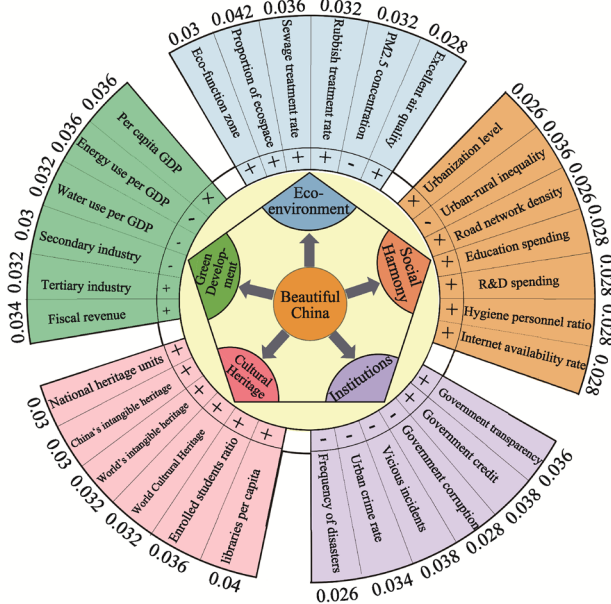


Figure 3 Evaluation index system diagram for BCI

#### 3.2 Evaluation method

The BCI evaluation method borrows heavily from the method of the United Nations’ Human

Development Index (HDI).<sup>\*</sup> The overall beauty index consists of the five elements of ecological environment, green development, social harmony, institutions and cultural heritage, to reflect the BCI levels of different areas. Each indicator was calculated according to the upper and lower thresholds of each evaluation indicator, and then the sum of the indicators was used to measure the BCI level of cities, provinces (municipalities) and the whole country (Wang *et al.*, 2011; Fang and Yu, 2017).

We first determined the upper and lower thresholds of the indicators to evaluate BCI levels and performed dimensionless normalization of the indicators. The value of evaluation indicator  $i$  is given as  $X_i$ , the weight coefficient as  $W_i$ , the lower threshold and the upper threshold as  $X_{\min}^i$  and  $X_{\max}^i$ ;  $i$  is the third-order indicator ordinal, and  $j$  is the second-order indicator ordinal. The equations for normalization result  $Z_i$  are shown in equations (1) and (2) below, and the values of each evaluation indicator after normalization are in the interval [0, 100].

For positive indicators, the normalization equation is as follows:

$$Z_i = \frac{X_i - X_{\min}^i}{X_{\max}^i - X_{\min}^i} \times 100 \quad (1)$$

For negative indicators, the normalization equation is as follows:

$$Z_i = \frac{X_{\max}^i - X_i}{X_{\max}^i - X_{\min}^i} \times 100 \quad (2)$$

Second, the weight of each evaluation indicator was calculated. To reflect the balanced development pattern of the “five-in-one” strategy, this paper used the equal weight method to determine that the weights of the five first-order indicators (ecological environment, green development, social harmony, institutions and cultural heritage) are 20%. Using an analytical model supported by an entropy technique, the weight coefficients of first-order indicators were broken down to second-order indicators to obtain the 31 second-order indicator weights (Figure 3).

Finally, we calculated the beauty index score for each element and the overall beauty index score. The specific indicators of each element were normalized, and the resulting values and weights were calculated according to the following formula, giving the dedicated beauty index value  $I_k$  for each element, wherein  $k$  is the first-order indicator ordinal (Fang and Li, 2017).

$$I_k = \frac{\sum Z_i w_i}{\sum w_i} \quad (3)$$

The results of the normalization of 31 indicators from the BCI evaluation index and their weights were calculated according to the following formula, giving an overall beauty index score for determining BCI levels. We have called this index the Chinese Academy of Sciences Beauty Index.

$$I = \sum_{i=1}^{31} Z_i w_i \quad (4)$$

<sup>\*</sup> Cai Shangwei, Cheng Li, *et al.*, *Study Report on ‘Beautiful China’ Development Levels in Provinces* (2016), Sichuan University, 2017.



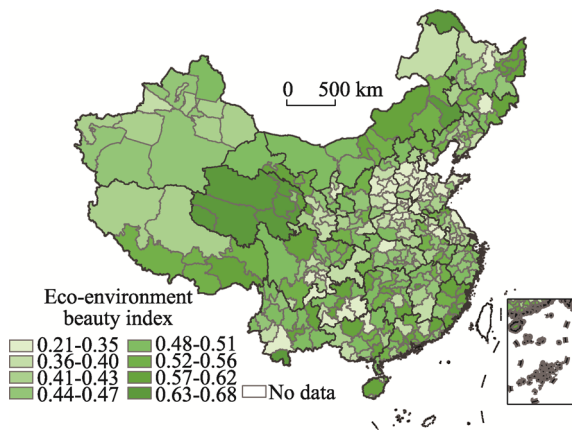
## 4 Analysis and discussion of the Beautiful China Initiative evaluation results

Using nationwide prefecture-level administrative units as our unit of research, we built a comprehensive database made up of China's basic geographic data as well as data on its ecological environment, economy, society, policy system, and cultural heritage. Based on the index system for evaluating progress of the BCI, single indicator indexes were calculated according to the upper and lower thresholds of each evaluation indicator, and the five elements of the dedicated beauty index (ecological environment, green development, social harmony, institutions, and cultural heritage) were obtained according to the weights of the indicators. Based on this, the HDI method was used to obtain the overall index scores of progress in the BCI (the Chinese Academy of Sciences Beauty Index).

### 4.1 Analysis results of the Beautiful China Initiative evaluation

#### 4.1.1 Ecological environment

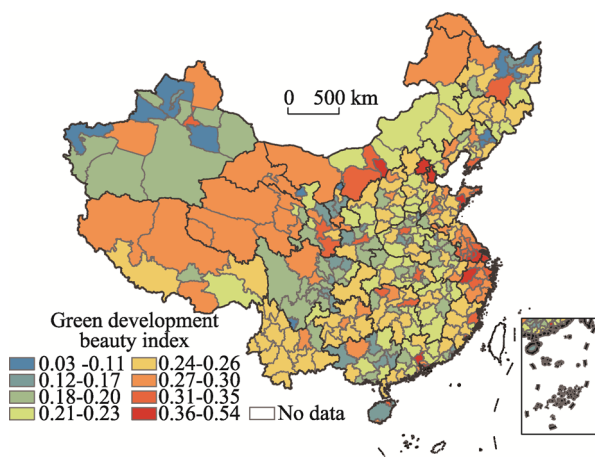
The ecological environment in China scores highly on the beauty index, with significant spatial differentiation. The ecological environment beauty index was used to evaluate the beauty of the ecological environment under the BCI. The results show the quality of the ecological environment in different regions, which is mainly reflected by the number of ecological function zones, the proportion of ecological land area, sewage treatment rate, harmless treatment rate of domestic waste, annual mean PM<sub>2.5</sub> concentration and rate of excellent air quality. The results show that the national average score for the ecological environment beauty index is 0.6, which is generally good. The Inner Mongolia Plateau, Qinghai-Tibet Plateau, and south China region are areas with high beauty scores; whereas, the North China Plain scores badly in the ecological environment beauty index. A comparison of each province shows that Qinghai and Fujian have relatively good ecological environments, but Hebei and Shanxi have relatively poor ecological environments (Figure 4). A comparison of administrative units at the prefecture level shows that the cities of Danzhou, Xinyu, Tongliao, Xiamen, and Quanzhou as well as the prefecture of Haibei have relatively high ecological environment beauty index scores, while the cities of Hengshui, Dezhou, Puyang, Shijiazhuang, and Leshan have relatively low scores.



**Figure 4** Ecological environment beauty index

#### 4.1.2 Green development

China does not score well for green development using the beauty index, and scores gradually decrease from the southeast to the northwest. The green development beauty index was used to evaluate the degree of green development under the BCI. Beautiful green development reflects the degree of economic green development of a region, which is based on in-



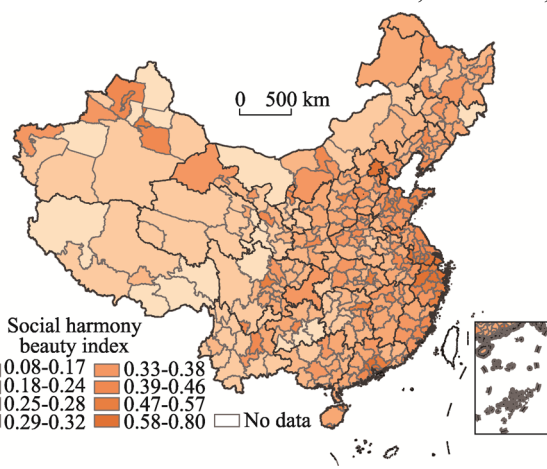
**Figure 5** Green development beauty index

good green development, but Xinjiang, Sichuan and Guangxi have relatively poor green development (Figure 5). Prefecture-level analysis shows that 51% of prefecture-level cities have scores above the national average. Changdu, Sansha, Shannan, Nyingchi and Danzhou have the highest green development index scores, but former revolutionary base areas, areas inhabited by minority nationalities, remote and border areas and poverty-stricken areas, such as the Qianxinan Buyei and Miao Autonomous Prefecture, Yanbian Korean Autonomous Prefecture, Qiannan Buyei and Miao Autonomous Prefecture, city of Heihe, and Changji Hui Autonomous Prefecture, have low green development beauty index scores.

#### 4.1.3 Social harmony

The degree of social harmony in China is generally quite low according to the beauty index, but the degree of beautiful social harmony in economically developed areas is relatively high. The social harmony beauty index was used to evaluate social harmony under the BCI. Beautiful social harmony is reflected by such indicators as level of urbanization, education, health, science and technology, transportation, informationization and urban and rural incomes. The results show that the national average social harmony beauty index score is 0.29, which is a low overall level. The Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta urban agglomerations have high beautiful green development scores; whereas, the southwestern region has a low social harmony beauty index score. A comparison of provinces shows that economically developed coastal provinces, such as Guangdong,

dicators including economic development level, industry ratios, public finance capacity and economic benefits of resource utilization. The results show that the national average green development beauty index score is 0.22, which is low. The Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta urban agglomerations have high beautiful green development scores; whereas, the northwest border area scores badly in the green development beauty index. Provincial analysis shows that Guangdong, Zhejiang and Jiangsu have relatively



**Figure 6** Social harmony beauty index

Guangdong, Zhejiang and Jiangsu, have higher levels of social harmony, while Xinjiang, Tibet and Qinghai have lower levels (Figure 6). Looking at prefecture-level cities, about 42% have social harmony beauty index scores above the national average. Shenzhen, Dongguan, Zhoushan, Hangzhou and Guangzhou are the top five cities in terms of social harmony beauty index scores, of which, Shenzhen has the highest score (0.8). The cities of Aksu, Nyingchi, Shannan and Changdu have relatively low scores.

#### 4.1.4 Institutions

The degree of beautiful institutions in China is low, with insignificant spatial differentiation. The results of the institution beauty index reflect the quality of regional institutions using the main indicators of the credit system and infrastructure, number of major environmental incidents in the past five years, the frequency of major corruption cases in the past five years, the number of vicious incidents in the past five years, and the number of major natural disasters in the past five years. The evaluation results show that the national average institution beauty index score is 0.22, which is low. Northeast China, southern Tibet, the Yangtze River Delta, and central China are areas with high scores. Provincial analysis shows that Heilongjiang, Zhejiang, Jilin and Jiangsu have relatively high beautiful institution scores; whereas Guizhou and Hebei have relatively low scores (Figure 7). According to analysis of prefecture-level administrative units, Beijing, Handan, Hangzhou, Zaozhuang and Quzhou are the top five cities in terms of institution beauty index scores, and western China and border areas have the lowest scores.

#### 4.1.5 Cultural heritage

Cultural heritage had the lowest beauty index scores, making it the weakest link in the BCI.

The results of the evaluation of beautiful cultural heritage represent the degree of transmission of traditional culture of regions, which is based on the main indicators of regional education development as well as cultural and intangible cultural heritage protection. The national average cultural heritage beauty index score was only 0.07, which is the lowest score. North, east, northwest and southwest China have higher cultural heritage beauty index scores. According to provincial analysis, Xinjiang and Shanxi had higher scores, while Guiz-

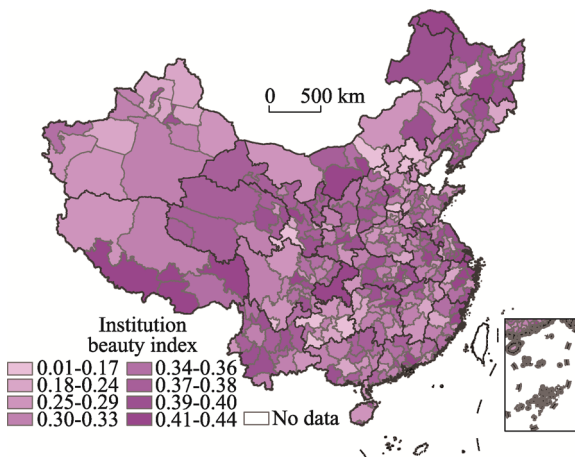


Figure 7 Institution beauty index

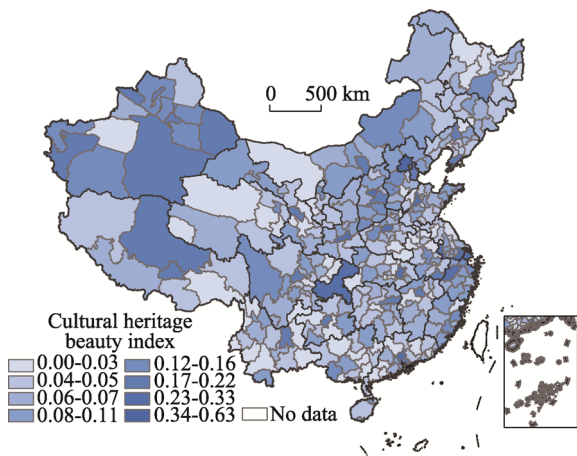


Figure 8 Cultural heritage beauty index

Guizhou and Guangxi had lower scores (Figure 8). According to prefecture-level analysis, Beijing, Xi'an, Nanjing, Urumqi and Suzhou are the top five cities in terms of cultural heritage beauty index scores, with the highest being Beijing (0.63). The cities of Sansha, Guigang, Zhaotong and Suihua and the Huangnan Tibetan Autonomous Prefecture have the lowest scores.

## 4.2 Results and analysis of the overall evaluation of the BCI

The evaluation results of the overall index of BCI progress (the Chinese Academy of Sciences Beauty Index) reflect the regional development levels of areas in terms of their ecological environment, green development, social harmony, institutions and cultural heritage, and they represent the degree of accomplishment of the BCI. The calculation results show that the national average overall index score is 0.28. The results of the evaluation of different elements of the BCI have been visualized using a radar chart in Figure 9. It can be seen that of the five elements, ecological environment beauty index scores are the highest, while the beauty index scores of the other four elements are lower. Green development and social harmony index scores are more scattered, indicating that the degree of development in these

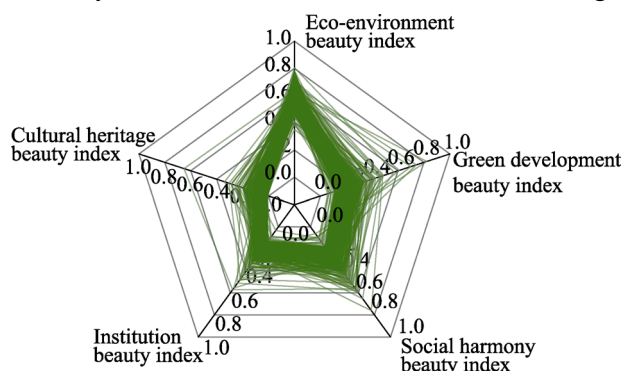


Figure 9 Radar map of Beautiful China indexes

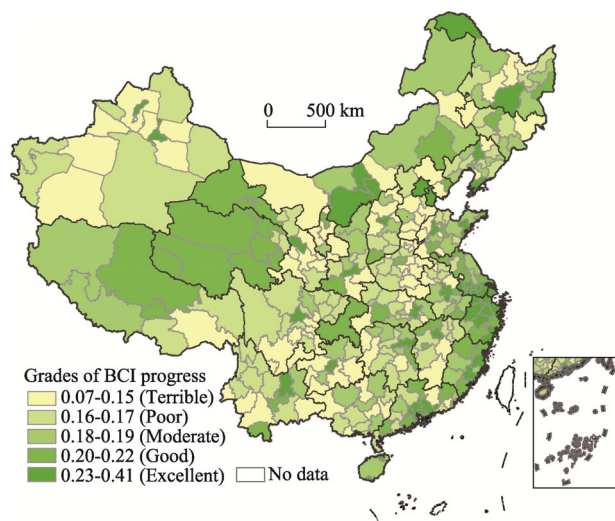


Figure 10 Chinese Academy of Sciences Beauty Index

areas is quite different between cities. Cultural heritage has the lowest beauty index scores and is the weakest link that needs improvement.

In accordance with the median-cut method, and based on the scores of the Chinese Academy of Sciences Beauty Index, BCI progress was divided into five grades: terrible, poor, moderate, good and excellent. The results are shown in Figure 10. On the whole, BCI progress in eastern coastal areas is relatively fast; whereas, BCI progress in central and southwestern China as well as Xinjiang is slow and its level is low. According to analysis at the provincial level, the Chinese Academy of Sciences Beauty Index scores of Zhejiang, Fujian and Qinghai are relatively high, while scores of Guizhou, Guangxi and Hebei are lower. According to analysis at the prefecture level, Beijing, Shenzhen, Nanjing, Hangzhou and Xiamen have the top five Chinese Academy of Sciences Beauty

Index scores, and Qiannan, Qianxi, Dingxi, Linxia and Changji are among the lowest.

The BCI is a long-term, complex and systematic social project involving multi-disciplinary and multi-sectoral efforts. To implement the timetable and road map for the BCI to a high quality and high standard, it is necessary to use dynamic evaluation results of the BCI's progress to compile and publish technical evaluation standards and carry out comprehensive BCI zoning. This will allow zones to launch pilot projects adapted to local conditions in BCI sample areas, to incorporate BCI achievements into assessment indicators at all levels of government, and to truly make the BCI an important measure for developing an ecological civilization.

## References

- Deng W, Song X X, 2018. Reflections on the construction of the system of the Beautiful China. *Chinese Journal of Nature*, 40(6): 445–450. (in Chinese)
- Fang C L, 2003. The optimal control of regional human-earth system and its sustainable development. *Earth Science Frontiers*, 10(4): 256–259. (in Chinese)
- Fang C L, 2004. Recent progress of studies on man–land relationship in China and its prospects. *Acta Geographica Sinica*, 59(Suppl.): 21–31. (in Chinese)
- Fang C L, Liu H M, Luo K *et al.*, 2017. Comprehensive regionalization of human geography in China. *Acta Geographica Sinica*, 72(2): 179–196. (in Chinese)
- Fang C L, Ren Y F, 2017. Analysis of emergy-based metabolic efficiency and environmental pressure on the local coupling and telecoupling between urbanization and the eco-environment in the Beijing-Tianjin-Hebei urban agglomeration. *Science China Earth Sciences*, 60(6): 1083–1097. (in Chinese)
- Fang C L, Yu D L, 2017. Urban agglomeration: An evolving concept of an emerging phenomenon. *Landscape and Urban Planning*, 162: 126–136.
- Hu Z Y, Zhao L K, Liu Y W, 2014. The construction and evidence of the evaluation index system of “Beautiful China”. *Statistics & Decision*, (9): 4–7. (in Chinese)
- Huang L, Shao C F, Sun Z S *et al.*, 2014. Research on the evaluation index system of “Beautiful Village”. *Ecological Economy*, 30(1): 392–394. (in Chinese)
- Huang X J, 2018. Beautiful China and the land space use control. *Journal of China University of Geosciences (Social Sciences Edition)*, 18(6): 1–7. (in Chinese)
- Li H Q, 1996. Nonlinear system, human-earth synergetics and system dialectics. *World Science & Technology Research and Development*, 18(5): 36–40. (in Chinese)
- Li J H, Cai S W, 2013. The scientific connotation and strategic significance of “Beautiful China” concept. *Journal of Sichuan University (Philosophy and Social Science Edition)*, (5): 135–140. (in Chinese)
- Li Z, 2013. Building a Beautiful China to achieve sustainable development. *Economic Research Journal*, 48(2): 17–19. (in Chinese)
- Liu H M, Fang C L, Fang K, 2020. Coupled Human and Natural Cube: A novel framework for analyzing the multiple interactions between humans and nature. *Journal of Geographical Sciences*, 30(3): 355–377.
- Liu H M, Fang C L, Zhang X L *et al.*, 2017. The effect of natural and anthropogenic factors on haze pollution in Chinese cities: A spatial econometrics approach. *Journal of Cleaner Production*, 165: 323–333.
- Lu B, 2016. The construction of Beautiful China calls for landscape management legislation. *City Planning Review*, 40(1): 70–71. (in Chinese)
- Lu D D, Guo L X, 1998. Man-earth areal system—the core of geographical study: On the geographical thoughts and academic contributions of Academician Wu Chuanjun. *Acta Geographica Sinica*, 53(2): 97–105. (in Chinese)
- Mao H Y, 1995. Man-Earth System and Regional Sustainable Development. Beijing: China Science & Technology Press, 48–60. (in Chinese)

- Wan J R, 2013. The philosophical wisdom and action significance of Beautiful China. *Social Sciences in China*, (5): 5–11. (in Chinese)
- Wan J R, Pan J H, Lu Z M *et al.*, 2013. Commentaries: Ecological civilization and “Beautiful China”. *Social Sciences in China*, (5): 204–205. (in Chinese)
- Wang J, Wang J Y, Tian Tao *et al.*, 2016. Building a Beautiful China: A summary of the 15th China Ecology Conference in 2016. *Acta Ecologica Sinica*, 36(22): 7492–7500. (in Chinese)
- Wang X G, 2013. Constructing a Beautiful China under the idea of ecological civilization. *Journal of Beijing Normal University (Social Sciences)*, (2): 19–25. (in Chinese)
- Wang Z B, Fang C L, Wang J, 2011. Evaluation on the coordination of ecological and economic systems and associated spatial evolution patterns in the rapid urbanized Yangtze Delta Region since 1991. *Acta Geographica Sinica*, 66(12): 1657–1668. (in Chinese)
- Wu C J, 1991. Man-earth areal system: The core of geographical study. *Economic Geography*, 11(3): 1–4. (in Chinese)
- Wu C J, 1998. Man-earth Relationship and Economic Allocation. Beijing: Academy Press, 28–33. (in Chinese)
- Wu P S, Jia W Y, 2002. Man-land coupling theory: A new theory of man-land relationship. *Journal of Hainan Normal University (Natural Science)*, 15(4): 51–53. (in Chinese)
- Xiang Y B, Xie B G, 2015. Design of evaluation index system for regional construction of “Beautiful China”. *Statistics & Decision*, (5): 51–55. (in Chinese)
- Xie B G, Chen Y L, Li X Q, 2015. The “Beautiful China” evaluation system based on niche theory. *Economic Geography*, 35(12): 36–42. (in Chinese)
- Xinhua News Agency (XNA), 2018. Xi Jinping attended the National Ecological Environmental Protection Conference and delivered an important speech. Website of the Central People’s Government of the People’s Republic of China, 05-19. (in Chinese)
- Xiong Y B, Huang Y W, 2015. Research on intellectual property protection of tourism industry from the perspective of Beautiful China Construction. *Hubei Social Sciences*, (2): 133–138. (in Chinese)
- Yang Y D, Gao Q, Pan R *et al.*, 2015. Create a “sample of Beautiful China’s construction – Beautiful Hangzhou” action planning system. *City Planning Review*, 39(Suppl.1): 12–18. (in Chinese)
- Yu T Y, 2018. New era Beautiful China construction under the perspective of productivity “actuation effect”. *Guizhou Social Sciences*, (3): 17–21. (in Chinese)
- Zhang J S, Chen L P, 2016. Industrial heritage tourism and Beautiful China construction. *Tourism Tribune*, 31(10): 7–9. (in Chinese)
- Zhang W, Li C H, 2013. Environmental challenges and green technology innovation strategy for building “Beautiful China”. *Theory Journal*, (1): 64–68. (in Chinese)