Analysis of Resource and Environment Patterns along the Belt and Road

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Abstract. The "Belt and Road" is an international cooperation strategy proposed in 2013, which spans the continents of Asia, Europe and Africa, involving more than 140 countries and covering various infrastructure projects, trade networks and economic cooperation. Countries along the "Belt and Road" form a complex, diverse and interrelated community of destiny due to differences in national systems, resource endowments, development levels, complementarity with China's economic structure and the strength of international cooperation relations. Therefore, in the process of deepening the high-quality development of the "Belt and Road", scientific analysis of the resource and environmental patterns along the route is essential to accurately grasp the direction of international cooperation and efficiently carry out international cooperation. Therefore, based on the public data provided by the World Bank, FAO, UNESCO and other international institutions, this paper analyzed the resource and environment pattern along the "Belt and Road" and finds that the east and west ends of the route are the fast-growing East Asian economic sphere and the developed European economic sphere respectively, while the middle is the resource-rich, relatively fragile, sensitive and fragmented continental hinterland, with rich agricultural resources and products, tourism resources, multiple cultures and religions, and great potential for economic development and cultural exchange and cooperation. Our results will provide a scientific reference for promoting the high-quality development of the "Belt and Road" together.

Keywords: Belt and Road, Resources and Environment, International Cooperation

1   Introduction

The "Belt and Road", which includes the "Silk Road Economic Belt" and the "21st Century Maritime Silk Road", is an international cooperation development strategy proposed in 2013 [1, 2]. It aims to strengthen connectivity and cooperation between Asia, Europe and Africa. The "Belt and Road" spans the continents of Asia, Europe and Africa, involving more than 140 countries and covering various infrastructure projects,

trade networks and economic cooperation [3, 4]. It has now received increasing attention from governments, scholars and enterprises around the world [5, 6].

Countries along the "Belt and Road" form a complex, diverse and interrelated community of destiny due to differences in national systems, resource endowments, development levels, complementarity with China's economic structure and the strength of international cooperation relations [7, 8]. Therefore, in the process of deepening the high-quality development of the "Belt and Road", scientific analysis of the resource and environmental patterns along the route is essential to accurately grasp the direction of international cooperation and efficiently carry out international cooperation.

Therefore, based on the public data provided by the World Bank, FAO, UNESCO and other international institutions, this paper scientifically analyzed the current resource and environment pattern along the Belt and Road in terms of economic development level, agricultural resources, tourism resources and ethnic culture. This study aims to analyze the differences and summarize the overall characteristics of resources and environment among countries along the "Belt and Road". On this basis, the results will provide scientific reference for deepening cooperation between China and countries along the Belt and Road in economic and trade, agricultural resources development, tourism resources development and cultural exchanges, and to continue to promote the high-quality development of the "Belt and Road" together.

2   Study Area

The "Belt and Road" economic zone includes 65 countries in Asia, Europe and Africa, and 29 other countries in the radiation areas. The core countries have a total area of 55.39 million km^2, accounting for 41.3% of the world's total area, a total population of 4.669 billion, accounting for 66.9% of the world's total population, and a GDP of 27.4 trillion USD, accounting for 38.2% of the world's GDP. If we add the countries within the radiation areas, the total area accounts for 53.6% of the world, the population accounts for 77.5% of the world, and the share of GDP reaches 65.0% in the world (Table 1).

Table 1. Belt and Road" economic belt main indicators.

	Country (or region) (pcs)		Land area (million km2)		Population (billion people)	
	Total volume	Share in the world (%)	Total volume	Share in the world (%)	Total volume	Share in the world (%)
core countries	65	28.3	5539	41.3	46.69	66.9
Radiation Countries	29	12.6	1653	12.3	7.07	10.6

3   Materials and Methods

Social statistics spatialization method
Social statistics are statistical data collected by administrative divisions, which reflect the average or aggregate level of social and economic characteristics within the administrative division. Combined with Goodchild and Lam's view [9, 10] social statistics can be divided into two types, namely, sum variable (extensive variable) type statistics and mean variable (intensive variable) type statistics.

The sum-variable statistics are a type of statistical indicator that reflect the aggregate level of social and economic attributes of an administrative unit, such as gross domestic product, gross industrial output, total land area, total population, etc., while the mean-variable statistics are a type of statistical indicators that reflect the average level of social and economic attributes of an administrative unit, such as population density, per capita food production. Both types of data can be spatialized using modeling methods such as interpolation of area weights of administrative districts or kilometer grid cells.

Kernel Density Estimation model

$$f(x) = \frac{1}{nh} \sum_{i=1}^{n} k \left[\frac{d(x - x_i)}{h} \right] \tag{1}$$

Where $f(x)$ is the estimated kernel density value, n is the sample size, h is the bandwidth, $k(x)$ is the kernel function, x is the estimated point, x_i is the observation point, and $d(x - x_i)$ is the distance from the estimated point x to the observation point x_i. In this paper, we use the kernel density estimation tool in the Spatial Analyst toolbox of ArcGIS software to implement kernel density analysis. The kernel function used in the software is Quartic [11] (41), the 4th kernel function used to calculate the point density as described in the work of Silverman [12], p(76, equation 4.5).

Data sources
The data used in this study are all publicly available statistics from international organizations and institutions. The data on per capita income, GDP per capita, GDP growth rate, and merchandise import and export are from the World Bank Open Data, the data on agricultural value added, arable land per capita, and food production per unit area are from the FAO Statistical Database (FAOSTAT), and the data on natural and cultural tourism sites are from the UNESCO World Heritage List (2021). Data on natural and cultural tourism sites are from UNESCO, World Heritage List, 2021, and data on ethnic religions are from World Religion Database. Public data were obtained from these sources (Table 2) and then processed for analysis.

Table2. list of data with citations.

Number	Data Base	Citations
1	World Bank Open Data	https://data.worldbank.org.cn/
2	FAOSTAT	http://faostat3.fao.org/home/index.html

| 3 | UNESCO, World Heritage List | https://whc.unesco.org/en/list/ |
| 4 | World Religion Database | https://www.worldreligiondatabase.org/ |

4   Result

Large differences in the level of economic development along the "Belt and Road", East and West three gradient pattern is obvious

The "Belt and Road" economic belt connects the rapidly developing Asia-Pacific economic circle in the east, the more developed European economic circle in the west, and the Central Asia and South Asia regions in the middle form an economic depression belt, with significant differences between the East and West regions (see Fig. 1).

The eastern plate China, Russia, India and other emerging economies, with larger countries, entered the mid-industrialization, relying on institutional reform and expanded openness, and sustained high growth. The central plate shows two types of development, one is resource-based high-income countries, such as the Middle East oil-exporting countries, the other resource-based less developed countries, such as resource-based countries in Central Asia, are at a lower stage of industrialization, the country relies on resource trade, and is in the underdevelopment stage, with slow economic growth. Developed countries, such as the EU in the western sector, have entered the post-industrial stage, showing a technology-driven economic growth model, with a large economic volume, and relatively slow economic growth due to the international financial crisis.
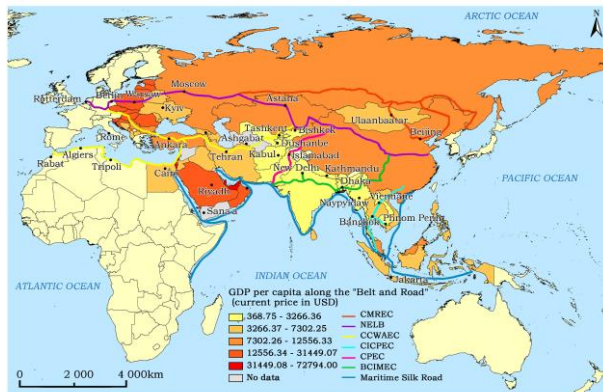

Fig. 1. GDP per capita distribution of countries along the "Belt and Road".

The "Belt and Road" initiative has provided development opportunities for countries along the route and narrowed the economic development gap, but some countries in Central and South Asia still have GDP growth rates of less than 1%, and even negative growth in individual countries, which is not conducive to high-quality and sustainable economic exchanges among countries along the route (see Fig. 2).
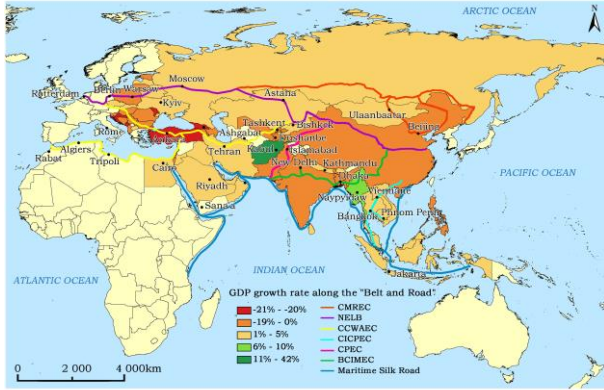
Fig. 2. GDP growth rate distribution of countries along the "Belt and Road".

In many big agricultural countries along the Belt and Road, arable land per capita is among the highest in the world, with abundant agricultural resources and products

The countries along the Belt and Road are mostly agricultural countries, among which China, India and Indonesia are among the top 10 countries in the world in terms of agriculture value added. In 2021, agriculture value added of China reached 1,288.347 billion U.S. dollars, ranking first in the world, India reached 534.209 billion U.S. dollars, ranking second in the world, and Indonesia reached 145.893 billion U.S. dollars, ranking fourth in the world. In addition, Vietnam and other Southeast Asian countries also have an agricultural value added of more than 40 billion U.S. dollars, also among the world's top (see Fig. 3).
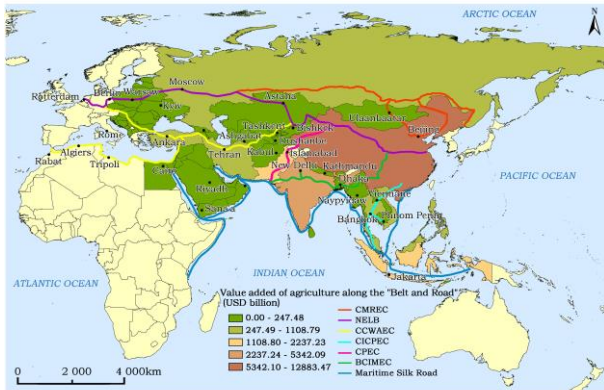

Fig. 3. Agricultural value added distribution of countries along the "Belt and Road".

From the point of view of per capita arable land area, there are a large number of countries along the Belt and Road with a large number of sparsely populated areas, from an overall perspective almost all countries along the Belt and Road are higher than China's per capita arable land area level. In particular, Russia, Central and Eastern European countries, five Central Asian countries, Laos, Thailand, Cambodia and other

countries have a higher per capita arable land area more extensive, with huge potential for agricultural development (see Fig. 4).
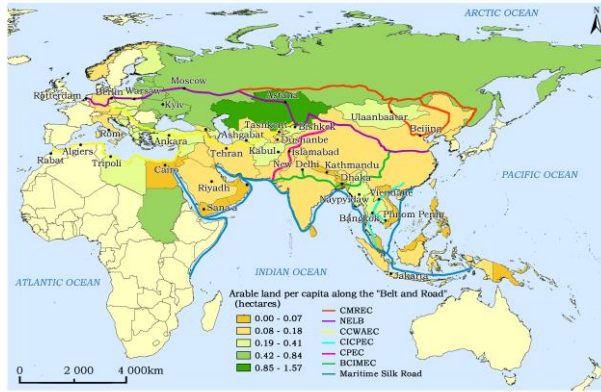

Fig. 4. Arable land per capita distribution of countries along the "Belt and Road".

High-quality natural and humanistic tourism resources along the "Belt and Road" are concentrated, with great prospects for cooperation in tourism resources
The Belt and Road region contains over 70% of the world's folklore and 68% of the world's natural heritage, accounting for 70% of the world's international tourism. Natural tourism resources are mainly concentrated in the Asia Pacific region at the eastern end of the Belt and Road and in the European region at the western end. Among them, the "rich areas" with a high density of distribution include East Asia - South Asia natural tourism area, Central Europe - Mediterranean natural tourism area (see Fig. 5). The good ecological environment and rich natural resources have made these regions the top destinations for eco-recreation tourism, coastal vacation tourism, alpine ski tourism, nature tourism and outdoor sports tourism in the international tourism market.
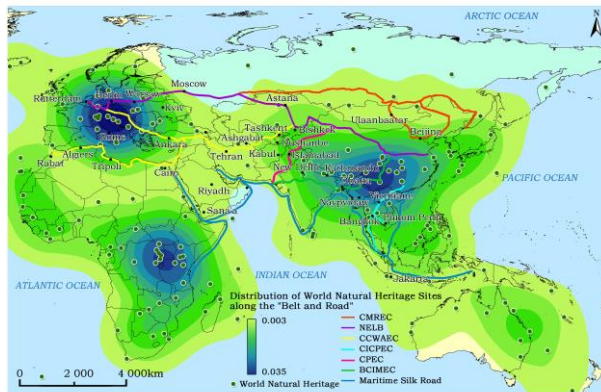

Fig. 5. World natural heritage sites distribution of countries along the "Belt and Road".

Cultural tourism resources distribution density of the "rich areas" include the Rhine, Danube and Volga River basin in Central and Eastern Europe Germanic Slavic cultural tourism area, Mediterranean Sea, the Aegean Sea coast of Southern Europe, ancient

Greece and Rome cultural tourism area, the Nile River basin in the Middle East, ancient Egypt cultural tourism area, the Yellow River, the Yangtze River basin in East Asia, ancient China Cultural tourism area in the Yellow River and Yangtze River basin, ancient Babylonian cultural tourism area in West Asia in the Euphrates and Tigris River basins, ancient Indian cultural tourism area in South Asia in the Ganges River basin, etc. (see Fig. 6). The cultural tourism belt of the Maritime Belt and Road, the cultural tourism belt of the Second Eurasian Continental Bridge and the cultural tourism belt of the Third Eurasian Continental Bridge, etc., which carry out these ancient civilizations' historical and cultural relics, are organically linked together.
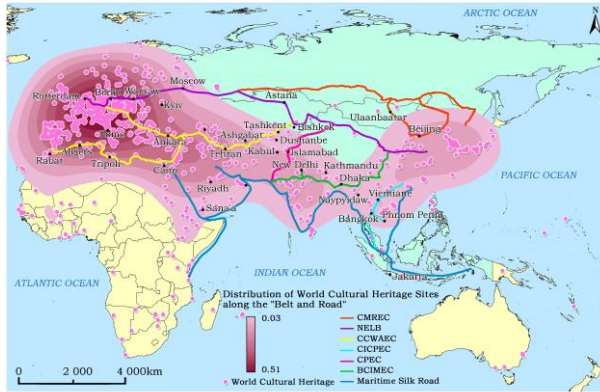

Fig. 6. World cultural heritage sites distribution of countries along the "Belt and Road".

The intersection of multiple religions and cultures along the "Belt and Road" is an important channel for exchanging and integrating Eastern and Western ethnic and religious cultures

At present, there are as many as 1,000 ethnic groups in the countries along the Belt and Road, accounting for 50% of the total number of ethnic groups in the world, among them, there are more than 200 ethnic groups in India, accounting for 1/10 of the total number of ethnic groups in the world, Countries with more than 100 ethnic groups are concentrated in Russia in North Asia, Kazakhstan and Kyrgyzstan in Central Asia, India in South Asia, Myanmar in Southeast Asia, and Ukraine in Eastern Europe, countries with less than 20 ethnic groups are concentrated in North Africa, Europe, and Afghanistan and Pakistan in South Asia.

The religious cultures of the countries along the Belt and Road are colorful, including not only the world's three major religions: Buddhism, Christianity and Islam, but also other religions with wide influence, such as Judaism and Hinduism (see Fig. 7). Christianity is dominant in Europe and America, Islam is dominant in West Asia, Central Asia and North Africa, Buddhism is popular in East Asia, and Hinduism is flourishing in South Asia.
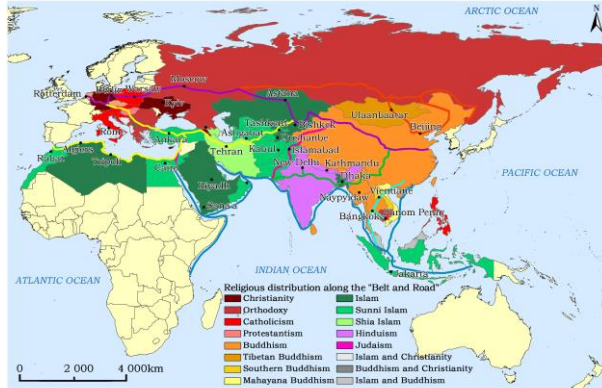
Fig. 7. Religious distribution of countries along the "Belt and Road".

5   Discussion

This paper scientifically analyzed the current resource and environment pattern, differences and characteristics along the "Belt and Road" in terms of economic development level, agricultural resources, tourism resources and ethnic culture. Compared with other studies on this theme, this paper carried out a comprehensive assessment of resources and environment in the "pan-Belt and Road" region, covering 65 countries in Asia, Europe and Africa and 29 other countries, so as to comprehensively analyze the current situation of resources and environment along the "Belt and Road". Current studies pay more attention to local regions and countries such as ASEAN and Central Asia [13-16] while the overall research on resource and environment conditions along the "Belt and Road" needs to be strengthened.

In addition, the statistical data used in this study are the latest data provided by international organizations and research institutions, which can represent the latest development of the region. The statistic data used by current research on this region are not updated in a timely manner. Most of the existing research is supported by statistical data before 2020 [17-19] and some of the latest research focuses on agriculture [20], urbanization level [21], transport channel construction [22] and other single aspects. It is difficult to support the deepening cooperation of countries along the "Belt and Road" in economy and trade, agricultural resources development, tourism resources development and cultural exchanges under the new pattern and new situation. Therefore, it is of great practical significance to carry out this research.

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6   Conclusions

This paper described the current pattern of resources and environment along the "Belt and Road", analyzed the differences, and summarized the overall characteristic. The results shows that the east and west ends of the route are the fast-growing East Asian economic sphere and the developed European economic sphere respectively, while the middle is the resource-rich, relatively fragile, sensitive and fragmented continental hinterland. Countries along the "Belt and Road" are rich in the agricultural resources and products, tourism resources, multiple cultures and religions, and great potential for economic development and cultural exchange and cooperation.

In the future, in the context of the continuous deepening of the Belt and Road Initiative, we will continue to adhere to the values of mutual respect, equal consultation, openness, inclusiveness, mutual benefit and win-win and the concept of global governance of "extensive consultation, joint contribution and shared benefits", fully consider the different resource and environmental advantages of countries along the Belt and Road, carry out international cooperation projects that integrate resources and complement each other's advantages, and comprehensively promote resource development cooperation among countries along the Belt and Road. Build an upgraded version of win-win cooperation and open up a new vision of mutual benefit.

7   Acknowledgments

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