



Ecological Restoration Strategies of Rock-Soluble Stone Desertification Regions under the Background of Big Data and the Internet of Things

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ABSTRACT

As the focus and difficulty of global ecological governance, rock-soluble graphite ecological issues have been plagued by the research and exploration of ecologists for many years. This article studies the current development status of rock-soluble graphite. Features and laws targeted implementing the ecological restoration strategy of rock-soluble graphite regions under the background of big data and the Internet of Things. By establishing a mathematical analysis model of the total ecological assets, the theoretical research on the restoration process and means of ecology. In the past 20 years, the southwest region's ecological improvement and governance situation has been summarized and analyzed, and the key aspects and main contents of ecological restoration are analyzed and demonstrated.

Keywords: big data; Internet of Things; rock-soluble stone desertification; ecological repair; comprehensive governance; southwestern China;

Estrategias de restauración ecológica en regiones de desertificación de rocas solubles bajo el contexto de los macrodatos y el internet de las cosas

RESUMEN

Debido al enfoque y a las dificultades que representa en la gobernanza ambiental mundial, los temas ecológicos relacionados con los grafitos solubles de roca han sido ampliamente abordados durante muchos años por los ecologistas. Este artículo estudia el actual desarrollo de los grafitos solubles de roca. Algunas normas buscan implementar estrategias de restauración ecológica de los grafitos solubles de roca bajo el contexto de los macrodatos y el internet de las cosas. Se establece un modelo de análisis matemático del total de las ventajas ecológicas, la investigación teórica del proceso de restauración y medios de la ecología. También se resume y se analizan las mejoras ecológicas y situación de gobernanza en el suroeste de China durante los últimos 20 años además de probarse y analizarse los aspectos claves y contenidos principales de la restauración ecológica.

Palabras clave: Macrodatos; internet de las cosas; desertificación de rocas solubles; reparación ecológica; gobernanza integral; suroeste de China;

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1. Introduction

As a significant ecological problem globally, the issue of desertification of rock-soluble stones has brought an essential impact on ecological deterioration around the world. In recent years, with the problem of rock-soluble graphite, more and more ecologists have been concerned. People attach more and more attention to the problem of lonely stone desertification. The domestic academic circles have also put forward much theoretical basis for the recovery of rock-soluble stone desertification ecological recovery and have made a variety of practical summaries. Regarding realizing rock-soluble stone desertification ecological recovery projects, the state government has also introduced specific policies and capital investments (Xu, 2015). By integrating the research results in related fields such as agriculture, forestry, and animal husbandry and adopting the ecological recovery strategy that meets the laws of nature development, it meets the improvement of rocky graphite in different regions. It provides some ecological recovery and constructs a green low-carbon ecological development strategy.

The current status of stone desertification problems

Status of the regional development of the desertification of rock-soluble stone

The research of rock-soluble graphite is widely concerned in the global academic community. After the statistics of the State General Administration of Geological, the area of desertification of rock-soluble stones in China has continued to expand in recent years, and the problem of desertification in the stone-soluble stone in the southwest is the most serious. In exploring domestic lava regions, geological personnel, as the most desertified areas in the southwest, are one of the leading causes of various types of natural disasters. Graphite is accompanied by problems such as climate and environment, human factors, and unscientific development. Throughout the problem of rock-soluble stone in other countries, the causes of such ecological problems are accompanied by problems such as economic development, ecological deterioration, and artificial destruction. Investigating the global graphic area, about 20.6 million square kilometers of land in the world was deserted, accounting for about 15% of the world's land area, and about 1.1 billion people lived in the rocky region. My country has 3.44 million square kilometers of land in rocky-soluble areas, accounting for about 36% of the domestic land area. These areas that are developing in stone desertification ecological issues account for approximately 1.25 million square kilometers. Facing the huge problem of ecological environment, the state and government departments should take targeted measures to implement corresponding policies to achieve effectively improved graphitization problems in the rock-soluble region (Yuan and Cai, 2018; Yuan, 2013; Yuan, 2017).

As the most widely distributed area of the rock-soluble region in southwestern China, it includes a number of provinces and regions, with an area of 1.5 million square kilometers. In this vast land area, it is very sensitive to the environment. In the process of ecological evolution, the state pays more and more attention to the problem of desertification of rocky stone. Due to the central task of economic development in recent years, local governments have ignored ecological construction problems in the process of promoting economic construction.

Rock-soluble stone deadized ecological resources

The problem of desertification of rocky stone brings new problems to ecological resources. In the economic value estimation of natural ecological resources, a clear calculation model of ecological resource asset loss is established based on quantitative calculations based on ecological resources within a certain area. Through the research and analysis of this model, we can further effectively build an ecological resource repair mechanism. On the basis of the above research and analysis of ecological resources, we have built a model for the loss of ecological assets as:

$$V_{MK} = \sum_{k=1}^p M_K \bullet W_K \quad (1)$$

In building an ecological asset loss model, we expressed the social value of ecological resources as V . K represents the influencing factors of ecological resources. M_K represents the changes in the total ecological assets under the influence of the K -class factors. W_K represents the influencing factors of Class K for currency conversion of ecological economic value (Department of Chinese Academy of Sciences, 2018).

In the model component of the impact of rock-soluble graphite on ecological destruction, we mainly analyze the severity of the degradation of rock-soluble stone desertification ecological degradation and build an analysis model of ecological asset loss based on different ecological environments and regional characteristics. By selecting and analyzing the important factors affecting ecological degradation, quantifying the problem of the evolution of rock-soluble stone in the entire ecosystem space. In the process of building an ecological asset quantitative analysis model, the factors of the total ecological assets of the ecological environment evolution of the ecological environment are based on the two aspects of the degradation and environmental improvement of rock-soluble graphitization and environmental improvement:

$$V_{MK} = V_1 + V_2 \quad (2)$$

Ecological assets in rock-soluble areas can be analyzed according to the amount of graphitization increase in the rock-soluble area and the improvement of the amount of desertification in the rock-soluble stone. In terms of V_1 , the increase in ecological assets of lava graphite.

$$V_1 = \sum_{i=1}^n \sum_{j=1}^m V_{ci} \times S_{ij} \quad (3)$$

In the mathematical model component of the evolution of lava deserted ecological assets, we use the degree of lava glowing in the graphitization ecological service function and the degree of lava graphite in the unit area. The influencing factors of the ecosystem are analyzed as a constant quantity.

Regarding the improvement of graphitization in the rock-soluble area, we use V_2 to indicate that during the evolution of the total ecological assets of the entire rock-soluble area, the continuous improvement and optimization of the stone desertification problem by taking certain ecological restoration methods and measures are used to build the following, and the construction is as follows. Mathematical evaluation model.

$$V_2 = \sum_{i=1}^n \sum_{j=1}^m R_{ij} \times V_{ci} \times S_{ij} \quad (4)$$

In V_2 , through the analysis of the ecological restoration and related factors of the desertification and related factors of the rock-soluble stone, based on the desertification measures and related policies in different regions, through the degree of capital investment, manpower input and ecological restoration of government departments as an important reference indicator, to build a V_2 analysis of the entire mathematical evaluation model (Cao et al., 2014; Li, 2006).

The ecological evolution brought by the desertification of rock-soluble stone

Characteristics of rock-soluble stone desertification

The problem of desertification of rock-soluble stone is an important ecological influencing factor in the rock-soluble area. Through research on the problem of rocky graphite in different regions of China, it is found that due to uneven distribution in the rock-soluble area, the severity of graphitization problems is different. With the rock-soluble landform covered in different regions, it is found that the structure of hydrogeological sealing in the rock-soluble area is special, and it has become an important factor affecting the problem of graphitization. Moreover, the growth of vegetation in rock-soluble areas is affected by various natural environments, resulting in the evolution of

stone desertification problems in the rock-soluble area, and it is more obvious due to regional impact (Zhu et al., 2014).

Looking at the distribution of global rock-soluble areas, the distribution of the backbone regions north is the most widely distributed. My country is in the southwestern region of the northward backbone. In improving and treating rock-soluble graphite problems, corresponding measures have also been taken (Wan et al., 2014). In the global distribution of the rocky region, there are about 22 million square kilometers according to statistics, accounting for 15% of the global land area. About 25% of people around the world live in rock-soluble areas and drink rocky water in rock-soluble areas, which has a certain impact on the health of these people. The problem of rock-soluble graphite mainly occurs near tropical subtropical and near the North Tropic of water quality. As is shown in Figure 1.

The main features of the restoration of ecosystems

The formation of graphitization problems in domestic rock-soluble areas has distinctive characteristics, and measures should be taken for targeted during the implementation of the repair process. First, the carbonate rock in the rock-soluble area is exposed. The terrain in the rock-soluble area is straight and steep, and the stone desertification problem in the rock-soluble area has brought an important impact on the global environmental ecological environment. The second is affected by the monsoon climate. Under the influence of marine monsoon climate, the carbonate structure of the entire rock-soluble area is continuously eroded and deposited, resulting in the evolution of graphitization issues more and more serious (Zhang et al., 2019). Third, the geological movement of carbonate rocks continues to rise, resulting in the thinner surface layer of the ground soil, which makes the rock dissolved on the surface. With the erosion of the weather climate, the rock-soluble stone deserted. Fourth, due to the long-term glacier erosion process, the surface has formed a relatively fragile ecological environment in the rock-soluble region. In addition, the deterioration of human activities and ecological environment, resulting in the weaker and weaker ability to resist external erosion. Fifth, with the gradual increase of population density and the continuous expansion of human activity areas, the rock-soluble region is affected by all aspects of human production and

life, so that the entire ecological environment of the rock-soluble area has not been well repaired (Guang et al., 2011).

The main measures for restoration of ecosystems

Aiming at the main characteristics of the above rock-soluble graphite, graphite ecological restoration measures are targeted. The chemical erosion that the carbonate soil quality in the rock-soluble area is during the process of desertification should improve the soil quality. Auxiliary carbonate rocks can better resist the impact of the monsoon climate during the weathering process, so that the entire soil can make the entire soil. The carbonate content of the layer meets the standard. In response to the characteristics of the soil structure in the southwestern rock-soluble areas, we must conduct targeted research. For the surface rock dissolved and naked caused by the rising of the crustal movement, we must carry out geological research and exploration according to the problem of thinning the soil layer (Cao and Li, 2014; Cao and Yuan, 2015; Li, 2020).

According to the structure of the soil layer of the southwestern rock-soluble area released by the State Administration of Geology, we can find that among the soil quality of carbonate rocks, The diameter of soil ash is less than 0.05 mm, reaching 95.2%, less than 0.001 mm reached 51.9%, soil gray grains less than 0.0005 mm accounted for 38.09%, soil ash particles were less than 0.0001 mm accounted for 29.19%, and 29.19%. The study of this type of lime soil's clay composition can better assist the soil repair and ecological environment improvement in the rock-soluble areas (Wang et al., 1999). We must carry out the improvement and repair of lime soil, and to assist the stone desertified ecological problems in the rock-soluble area. As is shown in Figure 2.

In response to the characteristics of the monsoon climate in the dilute area of the southwest, we must take water resources to protect the characteristics of rainfall concentration and the decline in groundwater levels. For seasons that are prone to rainstorms, we must increase monitoring of seasonal climate, take measures in advance to protect the soil layer of the surface, prevent the surface of the surface of the rock-soluble area due to soil loss, and exacerbate the problem of rock-soluble graphite. As is shown in Table 1.

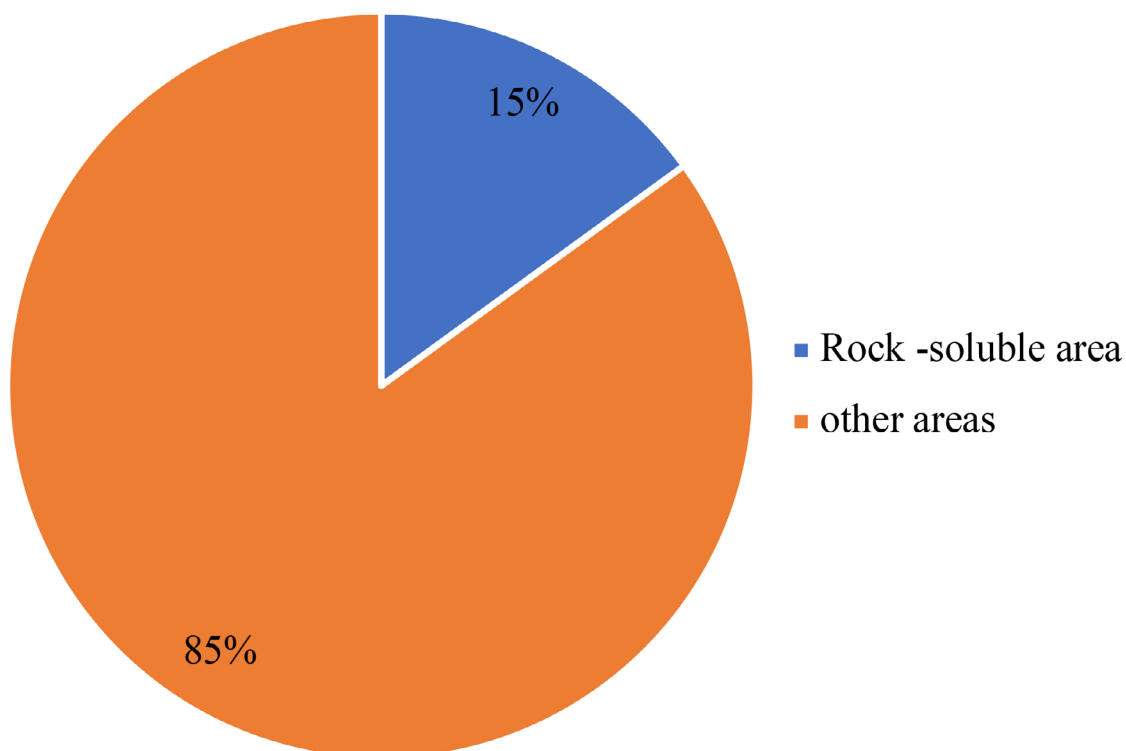


Figure 1. The proportion of rock-soluble areas in the world

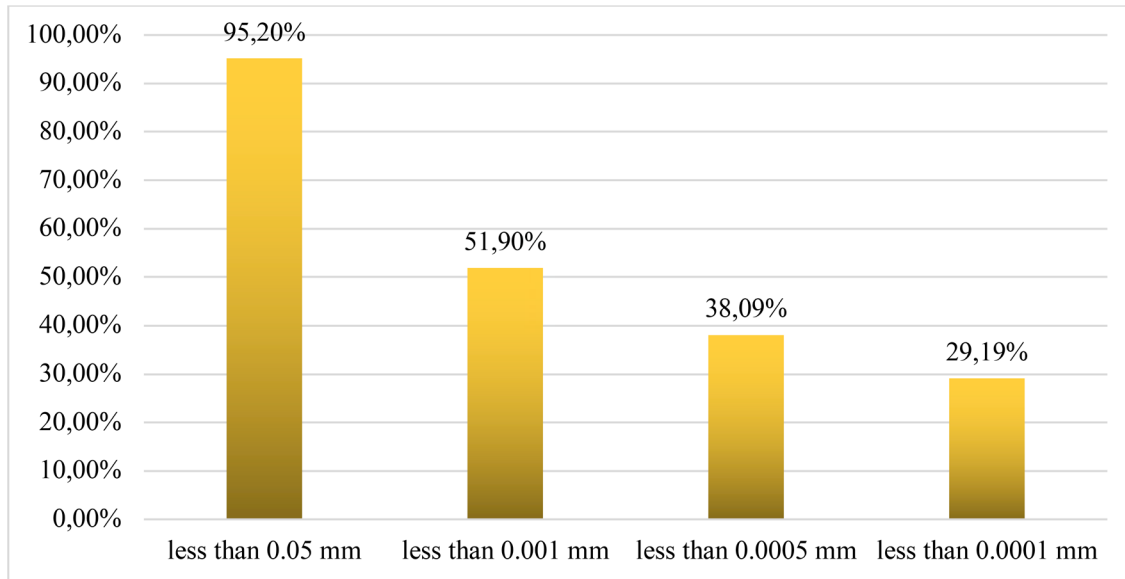


Figure 2. The diameter distribution of carbonate rocks and corrosion of different soil grains

Rock-soluble stone desertification ecological restoration strategy

Implementation of regional characteristics governance strategies

The ecological restoration of rock-soluble graphite should be effectively governed by characteristics. For regions with frequent human activities, human activities and production and operation must be further standardized. According to statistics, the area of the southwest rock-soluble area has reached 513,600 square kilometers. On this vast land, 30% of the land is distributed with human activities (Li, 2020; Zhou and Lv, 2003). There are 299 Iwari County, of which 185 are more serious. It accounted for 62.20%. As is shown in Table 2.

According to statistics from the Ministry of Land and Resources and the State Forestry Administration, it was found that the desertification of rocky stone in 8 provinces. In 2000, 113,400 square kilometers, 120,700 square kilometers in 2005, 130,100 square kilometers in 2010, 144,500 square kilometers in 2015, and 159,100 square kilometers by 2020. With a large amount of measures for regional characteristics, a large number of manpower and material resources have been invested, and the restoration of rocky graphite ecological problems has been performed to alleviate the rate of desertification evolution. It is said that it is necessary to take targeted measures and means in combination with regional characteristics. As is shown in Figure 3.

Fixed analysis of the evolution of stone desertification

Constructing an ecological repair system

In the rock-soluble areas, the entire rock-soluble area ecosystem should be effectively repaired by building a system of human activity ecological recovery and natural environment improvement systems. Further regulate the scope of human production and life activities, and reduce the degree of impact on the environment. By adopting the means of natural disaster prediction and human intervention, the occurrence of natural disasters such as heavy rains in rock-soluble areas. Effectively reduce the severity of soil and soil loss in rock-soluble areas, and effectively relieve and restore the graphization ecosystem of the entire rock-soluble area. Through the construction of systems in recent years, 67 counties and cities in the southwest of the country have been improved well, and the area of cultivated land accounts for about 29% of the total arable land area in the region. The arable land has also been well protected (Pei and Li, 2001).

Repair the effective operation mechanism of the ecosystem

For the construction and improvement of the ecosystem of the rock-soluble region, it is necessary to improve the characteristics of the regional environment in the process of the ecological environment. Due to the characteristics of strata and terrain, in the process of restoration of the ecological environment, we must

Table 1. Climate characteristics in the dilute area of Southwest China

Area	Altitude/m	Annual Average Temperature	Average Annual Rainfall/mm
Lhasa	3569	7.9	458.9
Aba	3909	3.9	753.9
Chengdu	515	16.9	976.9
Chongqing	210	18.0	1098.3
Kunming	1890	15.9	997.2
Yichang	138	17.1	1187.9
Guiyang	1079	16.8	1165.9
Guilin	148	19.1	1890.9
Nanning	78	22.0	1254.9
Wuhan	29	17.6	1268.9
Changsha	45	18.1	1435.6
Guangzhou	6	22.9	1689.3

Table 2. The actual situation

Project	Statistical Data	Proportion
The rock-soluble area in the southwest	513,600 square kilometers	5.35%
Iwari Prefecture	299	22.91%
Rock-soluble stone desertification serious district and county	185	62.20%
National Key Reserve County	151	50.5%

pay attention to the diversity of regional plants, so that green vegetation the coverage rate has risen year by year. Through investigations in 14 districts and counties in the Southwest, in the 20 years from 2000 to 2020, the green coverage rate of the 14 districts and counties climbed from 29% to 49% year by year, reflecting that the state is restoring the ecological environment of the Southwest region in the Southwest region. The huge measures and achievements in the system. As is shown in Table 3.

Focus on implementing policy capital support for poor areas

In recent years, the state has adopted corresponding methods and policies to help the governance of the problem of desertation of rock-soluble stone in poor areas. In terms of promoting the galginization of rock-soluble graphite in the southwest, we need to invest in human and funds in the ecological improvement of poor areas. According to statistics in 2020, the economic conditions of 131 districts and counties in the Southwest region are relatively backward. The funds and manpower invested in the improvement of these areas in the process of improving these areas are not enough.

Pay attention to the construction and improvement of the ecological governance mechanism

State government departments must work together

The state and government departments should strengthen the restoration measures of standardized and standardized rock-soluble stone desertified

ecosystems, and further strengthen the ecological restoration and governance of the rock-soluble region through comprehensive governance methods, and pay attention to the coordinated development of ecological and economic benefits. In the process of ecological governance, while ensuring the local economic development and construction on the road of healthy, harmonious, green, and low-carbon economic development, it is necessary to adapt to local conditions in combination with the characteristics of different regions. Excellent methods and measures in other areas have achieved effective improvement of graphite problems in the rock-soluble area.

Establish sustainable development repair plan

Ecological restoration methods must have long-term and sustainability. We must establish long-term graphic ecological restoration plans in the rock-soluble region, combine the overall plan of ecological restoration in the country and region, to achieve the process of regional economic development and the improvement of human living standards, pay more attention to the right paid. The emphasis on graphitization issues take ecological issues as an important construction project to achieve long-term sustainable development in the process of economic development and social progress. After investigation, from 2010 to 2020, the area of stone desertification was 30,000 square kilometers in individual districts and counties, accounting for 23% of the total area of stone desertification in the area; by 2021, the area of stone desertification was 70,000 square kilometers, accounting for the stone desert 54% of the total area.

Conclusions

The comprehensive governance of ecological graphitization problems in the rock-soluble area is affected by human life production activities, natural ecological environment, and regional characteristics. The severity of the stone desertification problems in different regions is different. For detailed introduction, focus on analyzing the problem of desertification of rocky stone in the southwestern region. By establishing a model evaluation model of ecological assets, a new research perspective is proposed to the repair of graphitization issues. For rocky graphitization in different areas, we must protect them targeted, take targeted measures, and gradually carry out environmental governance and ecological repair for seasonal climate, natural disasters and soil loss problems.

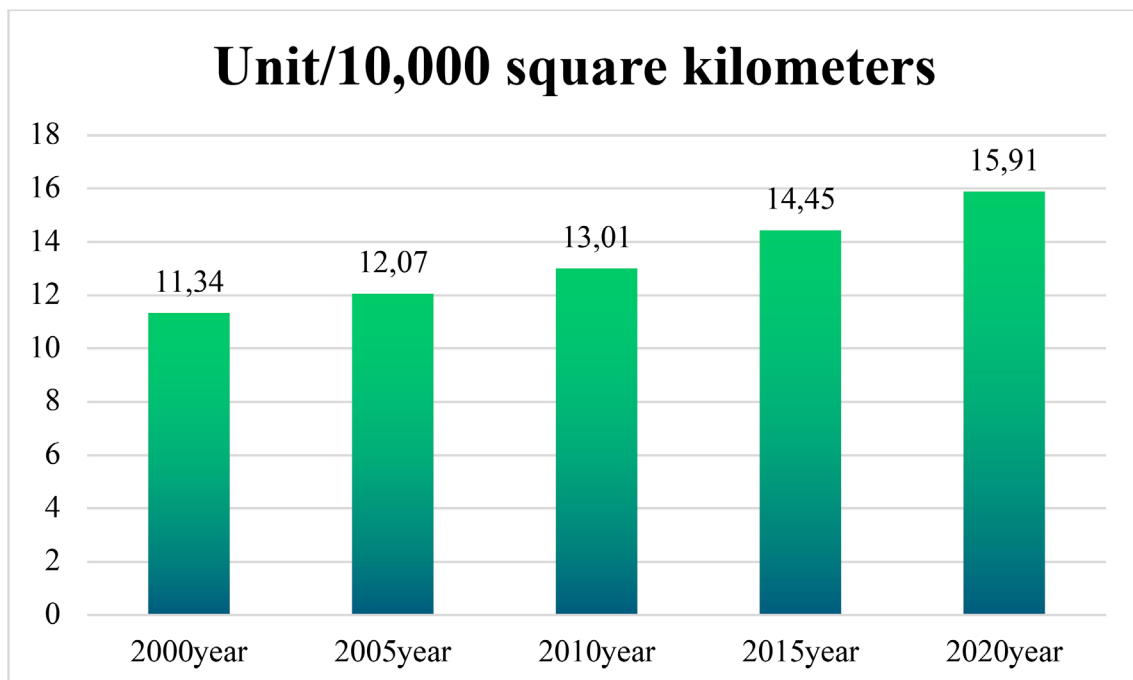


Figure 3. The evolution of stone desertification of 8 provinces and regions in Southwest China

Table 3. 2000-2020 Green vegetable coverage rate in Southwest China

Time	Green Vegetation Area	Green Vegetation Coverage Rate	Growth Rate
2000year	107 million square kilometers	29%	
2005year	115 million square kilometers	31%	6.9%
2010year	1.29 million square kilometers	35%	12.9%
2015year	153 million square kilometers	42%	20%
2020year	1.8 million square kilometers	49%	16.7%

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