

The SWOT Analysis of Low Carbon Economy Development in Gansu Province under New Normal

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Abstract—Nowadays, almost all countries and regions, facing the challenge of global climate change, are actively developing low-carbon economy. As an important province in underdeveloped areas, Gansu has gradually developed a model based on heavy industry with most enterprises are highly carbon consumed and heavily relied on coal and other fossil fuels. Therefore, efforts to find effective ways to develop a low-carbon and recycling economy in Gansu Province should be made urgently to respond to future development challenges. Based on the review of low-carbon economy research at home and abroad, this paper analyzes the advantages, disadvantages and opportunities method and challenges of developing low-carbon economy in Gansu Province by means of SWOT analysis. The results obtained will provide relevant reference for the development of low-carbon economy in Gansu Province.

Keywords—Gansu Province; low-carbon economy; SWOT analysis

I. RESEARCH BACKGROUND

In recent years, global warming continues to intensify, the human living environment is deteriorating, and various types of extreme climate events have threatened the sustainable development of humankind. According to the UN Climate Change Committee, the global surface temperature has increased by 0.74 degrees Celsius in the past 100 years. Therefore, it is imperative to jointly control global carbon dioxide emissions. The formal formulation of a low-carbon economy appeared in a white paper entitled "Our Future Energy—Creating a Low-Carbon Economy" published by British Prime Minister Tony Blair on February 24, 2003, pointing out that by adjusting the energy structure, improving energy efficiency, reducing natural resource consumption and the environment Pollution, promoting the development of a low-carbon economy [1]. The Copenhagen Accord of 2009 put forward corresponding policy requirements for the reduction of carbon dioxide emissions in both developed and developing countries. Economists from all over the world have conducted in-depth studies of climate change issues from the perspective of economics and called for countries to take the path of low-carbon economy development. In this context, the concepts of low-carbon, new energy, and environmental protection have penetrated through all stages of economic development and have attracted the attention of governments and academia in various countries. In the process of low-carbon economy development, the analysis of low-carbon economy development has become an important issue. In order to

achieve green development, the practice of the "beautiful China" goal, we should focus on how to objectively and comprehensively analyze low-carbon development status and development potential of a certain region and how to reduce energy consumption, decrease environmental pollution.

In the 40 years of reform and development, China's economy has achieved remarkable achievements and it has become the world's second largest economy. However, coupled with high-speed economic growth and high prosperity, it is energy shortages and environmental pollution that prevent the economic development. Although China's economic development has entered new normal, economic growth has slowed down significantly. This is not only a sign that China's economic development has entered a new phase, but also a result of China's abandonment of backward development methods and focusing on low-carbon development[2]. As an important province in underdeveloped areas, Gansu Province has gradually developed a development model based on heavy industry through 40 years of rapid development during China's reform and opening up. Most enterprises belong to high-carbon companies and have strong dependence on coal and other fossil fuels. Therefore, Gansu Province needs to vigorously develop a low-carbon economy through scientific and technological progress and promote industrial optimization and upgrading, promote international cooperation, develop CDM projects, introduce low-carbon technologies from developed countries, and promote sustainable development of the regional economy.

II. RESEARCH STATUS OF LOW-CARBON ECONOMY AT HOME AND ABROAD

Foreign research on low-carbon economy mainly focuses on the relationship between carbon emissions and economic growth, carbon emissions and per capita income. Grossman (1991) proposed the "Environment Kuznets Curve", which states that both environmental quality and economic growth show an inverted "U"-shaped curve over time. In the early stages of economic development, per capita income increased while environmental pollution increased, reaching after the critical point, as the per capita income increases, the environmental pollution decreases. K. Liaskas (2000) divided the carbon emission factors into four factors: output level, fuel composition, energy intensity, and structural change. K. Liaskas pointed out that the EU can reduce carbon emissions while maintaining the economic growth rate. Franz Alt (2001) advocates solar energy policy and believes that governments of all countries should pay attention to the transformation of urban

development, especially the transformation of the transportation industry and at the same time, the transition will increase employment. Grubb (2004) believes that in the early period of industrialization, per capita income increased and carbon emissions increased, but after this stage, per capita carbon dioxide will tend to be saturated. Ankarhem (2005) visited Sweden and found that the emission of CO₂, SO₂, and VOC showed an environmental Kuznets curve [3]. Richards (2007) studied and analyzed the factors affecting carbon emissions and pointed out that population, per capita income, and economic structure were the main influencing factors. Thomas L. Friedman (2008) proposed that the Green Revolution will create business opportunities and pointed out policy proposals such as institutional innovation, technological change, and public awareness raising. Zhou (2010) used the Malmquist index method to calculate the emission reduction performance and dynamic factors of the top 18 carbon-emitting countries in the world. Jar (2012) uses the FAHP to determine the index weights and introduces the TOPSIS method to the low-carbon economy evaluation, taking into account the issues of fuzziness and nonlinearity [4].

At present, domestic scholars mainly focus their research on the development model, influencing factors, and policy recommendations of low-carbon economy. Fu Yun (2000) started from the necessity of low-carbon economy development in China and studied the direction, methods, and methods for the development of a low-carbon economy. Zhuang Guiyang (2002) used the SWOT analysis to analyze the continuous power of China's low-carbon economic development. In recent years, domestic scholars have conducted a study on the comprehensive evaluation of regional low-carbon economic development. This type of research examines the integrated status of low-carbon development in a region from the energy-environment-economy system (3E). Andong (2006) applied the two-stage LMDI factor decomposition method to comprehensively analyze China's carbon emission data. Under the influence of the two factors of output scale and energy efficiency, China's economic growth is divided into four phases. Feng Bimei (2011) established a low-carbon state analysis subsystem, namely the three subsystems of natural ecology, industrial ecology, and humanistic ecology, and established the Hubei Province low-carbon economic index system. Tang Xiaofei (2011) proposed a provincial low-carbon economic indicator system in his paper and identified the primary indicators as economic, energy, carbon emissions, carbon absorption, and low-carbon industries. Liu Yulin (2012) has constructed a low-carbon economy index system from the five levels of economic development, social progress, environmental protection, scientific and technological innovation, and energy conservation and emission reduction. Han Xueying (2012) used cluster analysis for the first time to classify regions where carbon emissions are similar, and introduced a TOPSIS method to comprehensively evaluate each region.

III. THE SWOT ANALYSIS OF DEVELOPING LOW CARBON ECONOMY IN GANSU PROVINCE

A. Strengths

Located in the upper reaches of the Yellow River, Gansu is located in the geographical center of China. It borders on Shanxi Province in the east, neighboring Ningxia in the east, Sichuan in the south, Qinghai and Xinjiang in the west, Inner Mongolia in the north, and bordering on the Mongolian People's Republic with a total area of 454,000 square kilometers. Gansu is a vast country with abundant land resources. From the Eastern Yunnan Plateau to the Hexi Corridor, from the Mount Beishan to the mountains in southern Anhui, there are mountains, hills, plateaus, plains, deserts, Gobi, forests, grasslands, oasis, marshes, glaciers and so on. Gansu has abundant water resources, and water resources are mainly distributed in the three basins of the Yellow River, the Yangtze River and the inland rivers. The annual total runoff of rivers in the province is 60.3 billion cubic meters, and 78 of them have more than 100 million rivers. There are 29 hydropower stations in the province, including Liujiaxia, Yanguoxia, Bapanxia hydropower stations and Bikou River hydropower stations in the upper reaches of the Yellow River. The total installed capacity is 212.5 kilowatts. The total installed capacity in the province has exceeded 3 million kilowatts, and the annual power generation is 23.565 billion yuan. Since rich in wind power and electric energy, the application of new energy can reduce the use of energy. Gansu is also one of the major provinces of China's mineral resources. It is particularly rich in non-ferrous metals and precious metals. Up to now, the province has discovered 145 kinds of useful minerals, among which 11 kinds of nickel, cobalt, platinum group, selenium, cast-type clay, and surface-snake-snake-mosquito have the largest reserves in the country and are an important energy region in China.

B. Weakness

Gansu is rich in energy resources, industrial industries are mostly resource-intensive, and industrial energy is dominated by coal. As a result, environmental pollution and carbon emissions have increased, forming an extensive industrial model. In addition, the government tends to make economic development more effective and does not attach importance to resource efficiency and environmental quality. As a result, enterprises have gained a superior position in market competition with higher resources and energy inputs. Gansu Province has historically been an economically backward province with insufficient technological innovation and investment. Gansu has formed an extensive development model with high energy consumption, industrial pollution, and low economic efficiency. The proportion of medium- and heavy-duty industries in the secondary industry is too high in Gansu Province. The development of resource-based industries is ahead of schedule, and the development of light industries is lagging behind, which leads to the structural contradictions in Gansu's economic development. This unreasonable secondary industry structure has restricted the development of low-carbon industries in Gansu Province. In addition, Gansu has a backward technology level, lacks innovative capacity, and

lacks of low-carbon technology innovators. It is difficult to break through the bottleneck of low-carbon technology development and restricts the transition from a “high-carbon economy” to a “low-carbon economy” in Gansu Province.

C. Opportunity

Although China’s overall economic development has slowed down, China’s economic development potential is still great. The strong domestic market demand, unfinished industrialization and urbanization, and the Go Global Strategy relying on the One Belt and One Road all determine that China’s low-carbon development is in a period of major strategic opportunities. The One Belt and One Road Strategy proposed by General Secretary Xi will build the longest-spanning economic corridor with the most potential for development. This will bring about better opportunities for Chinese enterprises to go abroad and use overseas resources and markets. The Belt and Road Strategy has entered the implementation phase, and green environmental protection is one of the important contents of the One Belt and One Road Strategy of going global. In this context, Gansu needs to innovate strategic policies and continuously promote ecological development. At the same time, we should advocate the construction of ecological civilization, build new development mechanisms, develop low-carbon economy, realize low-carbon economy, and reduce environmental pollution. With regard to the use of resources, Gansu must change its economic structure in order to accelerate economic development. This also provides a certain basis for the development of the new era.

D. Threats

Gansu is a province with a relatively backward economy in western China. In the Gansu national economic system, the industrial sector dominates. According to Chenari’s classification of regional economic development, economic development is divided into three stages: agricultural economy, industrialization, and advanced economy and among them, industrialization is divided into three phases: initial, middle, and later. Gansu Province is roughly in the midst of industrialization. The majority of companies are high-carbon companies, and their carbon emission pressure is relatively high. In recent years, the energy consumption in Gansu Province has been rising year by year. Since 2017, Gansu Province has begun to control energy consumption on a monthly basis. Some enterprises that consume large amounts of energy and have high power consumption have timely formulated production and production restrictions. Due to the existence of extensive industrial development methods, irrational consumption structure, backward technology, and lack of innovation ability in Gansu, Gansu has been constrained by the development of low-carbon economy. In addition, Gansu Province is located in the mid-latitude area and has complex terrain. The landforms include hills, mountains,

deserts, Gobi and oasis. The climate is temperate continental seasonal climate with large temperature differences and uneven annual rainfall distribution. As far as this province is concerned, the main problems in its ecological environment are: land desertification, frequent occurrence of dust storms, shortage of water resources, low vegetation coverage, and soil erosion. Overall, the destruction of the ecological environment is closely related to the unreasonable human economic activities and population density, which destroys the ecological balance and makes the environment worse. The lack of water resources directly affects the agricultural environment, constrains agricultural development, affects people’s daily production. Mining of mineral resources results in rapid resource consumption, pollution of the urban environment and produces a large number of pollution emissions.

IV. GANSU PROVINCE'S PROPOSAL TO DEVELOP LOW-CARBON ECONOMY

A. Developing low-carbon industries and improving energy efficiency

The key to low-carbon economic development is to vigorously develop low-carbon technologies. The development of low-carbon technologies requires the development and application of new energy, renewable energy, clean energy, and carbon-free energy technologies. We should vigorously develop ecological industry while ensuring low carbon in agriculture and applying new clean and safe energy in energy management and consumption, thereby reducing toxic gas emissions, improving environmental quality, and building a cost-effective and efficient economic model, focusing on low-carbon life and resource conservation. The idea is to fundamentally solve the phenomenon of water shortage in Gansu.

B. Applying Renewable Energy and Expanding Vegetation Coverage

To change the habit of traditionally applying coal energy, we must use a large amount of new energy-saving resources and vigorously develop solar energy and bio-energy. In order to realize a low-carbon economy, the application of low-carbon energy is a necessary measure, and implementing a low-carbon economy can not only reduce energy consumption, but also the application of new energy sources to reduce environmental pollution [5]. At the same time, to develop a low-carbon economy, we must also increase the coverage of vegetation, reduce carbon dioxide emissions and other toxic gas pollution as much as possible, and make full use of the functions of forest carbon sinks to beautify the environment and optimize air quality.

C. *Adjusting Industrial Structure and Increasing Technical Investment*

In the industrial system of Gansu, the industries that consume large amounts of energy per unit of GDP and have high carbon emissions should limit their development. At the same time, we should encourage the development of industries with low emissions and vigorously develop low-carbon model enterprises and focus on fostering strategic industries in Gansu Province. We should establish energy-saving and environmental protection industries based on the advantages of wind energy resources in Gansu Province and increase the development of new energy materials, encourage the development of electronic information industry, promote the integration of industries, universities and research institutions and realize the transformation from technology-intensive industries to new energy sources [6]. Industries and new technology-intensive industries have become the driving force for the economic development of Gansu Province, so as to reduce the proportion of high-energy-consuming industries and high-pollution industries in the Gansu economy, and promote the development of low-carbon industries. At the same time, Gansu should also actively establish a demonstration park for low-carbon industrial development, promote the application of low-carbon technologies, increase the innovation capability of low-carbon technologies, and drive the development of low-carbon industries.

D. *Improving Policy System and Improving Laws and Regulations*

The development of a low-carbon economy requires the strong support of governments at all levels. The government should change its ideology of emphasizing the economy and ignoring the environment. In light of economic incentives and environmental incentives, we should guide enterprises to take a new road to industrialization, and guide the public to attach importance to environmental protection, so that we can reduce carbon emission. At the same time, laws and regulations on low-carbon economic development should be improved. Since the development of low-carbon economy in Gansu starts relatively late, existing laws and regulations can hardly guarantee the smooth operation of low-carbon economy. Therefore, Gansu should learn from the mature laws and regulations of low-carbon economy at home and abroad, combine with its own situation, coordinate the formulation of relevant laws and regulations, make reward and punishment policies in the areas of carbon emissions, health, and environmental protection, and give play to the role of incentive and restraint mechanisms to promote the rapid development of low-carbon economy in Gansu Province.

V. CONCLUSION

Overall, the development of a low-carbon economy is imperative. Although Gansu's development of a low-carbon economy is constrained by many factors, it also has its own advantages. To ensure rapid economic development and to maintain the ecological environment, it is necessary to formulate a reasonable low carbon economy means to realize the development of circular economy and low-carbon economy, reduce consumption, reduce pollution, and promote sustainable economic development in Gansu Province.

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