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The Effects of Chinese Green Economy Policies on Industrial Upgrading

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Abstract: This article focuses on the path to green and low-carbon development in China under the era of carbon neutrality. Starting with exploring the significance to reach carbon neutrality, the actions taken by different countries are demonstrated and the global milestones such as The Paris Agreement are illustrated. Based on Solow-Swan Growth Model, the method of calculating environment capital as a new parameter is discussed. In this case, China plays an important role in global carbon neutrality. To develop sustainably, it is crucial to figure out how China keep its way on Green Economy. Energy Industry, Manufacturing Industry, and Financial Service Sector will be analyzed separately to find out what is best strategy for those industries to evolution under the 'Green oriented' policy and what are their responsibility respectively. We found the stronger governance, the better nature capital would be utilized. The chance and challenge are concluded in the end with the potential pathway to realize the carbon neutrality in China.

Keywords: policy analysis, economic growth, green finance, industry analysis

1. Introduction

In recent years, global warming and the extreme climate change is one of the serious disasters facing by our planet. In order to recognize these problems and get better understand to climate change, the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) jointly established the Intergovernmental Panel on Climate Change (IPCC) in 1988, an organization of scientists, to organize and report scientific research results on climate change.

In the past, when all countries are aiming for rapid economic growth, the importance of ecological balance and over-consumed the existed resources during the process of high industrialization are ignored. The idea of green economy comes from UNEP defined as "one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities". It is a new economic concept that operate around three key words 'efficiency, harmony and sustainability'. This trinity theory links economy and environment together and shows the positive attitude of mankind towards ecosystem protection by pointing out a new pathway for the future economy development. However, it has a long way from the idea to implementation.

In order to reduce the green-house gases (GHG) in the atmosphere, the idea of carbon neutrality comes up. From Tokyo Protocol to The Paris Agreement (see Fig.1), it took human beings 2 decades to build a systematic regulation towards to green economy.

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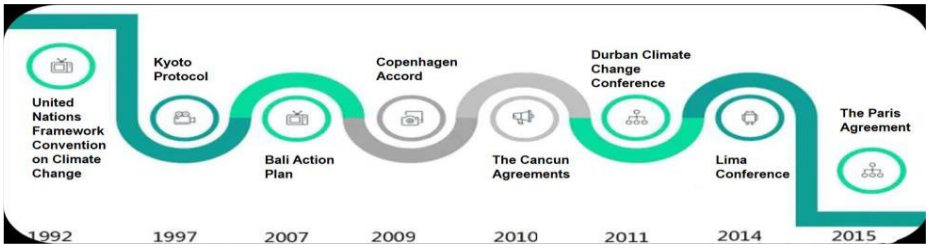

Figure 1: Time line of the important milestones in carbon neutrality [1].

1.1. Actions of Carbon Neutrality Taken in Developed Countries

UK is a country that has made significant contributions to carbon neutrality. In the early age of 1997, Future forests, a UK company, proposed carbon neutrality as a business planning concept by focusing on the path to achieve carbon neutrality from the perspective of energy technology. In 2010, the British Standards Institute (BSI) formulated and released the carbon neutralization commitment specification, which put forward the definition, certification standard and declaration method of car-bon neutralization from the product level. Meanwhile, they pointed out that carbon neutralization can be achieved by reducing and offsetting greenhouse gas emissions.

Early in 1972, the UK has achieved the local carbon peak. In 2008, the United Kingdom set the big goal of reducing emissions by 80% in 2050 in the "Climate Change Act 2008". After this goal was set, the UK's GHGs emission reduction plan has begun to take effect, with a decrease of 30% in 2018 compared with 2008. Later on, in April 2021, the United Kingdom even announced that the emissions of green-house gases could be reduced to 78% by 2035. The UK is also trying to encourage more active participation of agricultural practitioners by increasing market incentives and supporting more market investment in environmental land management.

As the world's largest economy, the United States has accumulated a large amount of carbon emissions, its cumulative carbon emissions (from 1900 to 2019) ranked first in the world, so the United States has to take this responsibility to deal with climate change. For the United States, there are differences in the governing concepts of the two parties, which lead to different attitudes of the carbon reduction policy at various stages. Since the beginning of the Biden administration, the United States has shown a more positive attitude towards carbon reduction policies. In the USA, Biden has restored the positive attitude of the Obama administration and put forward the "3550" goal, that is, to achieve carbon free power generation through renewable energy by 2035 and carbon neutral by 2050 [2]. Although there is still a gap between the commitment and implementation, the good news is that countries have reached consensus on carbon control and global warming.

1.2. Pathway to Carbon Neutrality in China

Since 2013, China's carbon emissions have keep ranked first in the world. Especially after 2019, China's carbon emissions accounted for 26% of the global emissions, this is already twice of USA's share of world. For this reason, China has a great responsibility and must act to achieve carbon neutrality [3] [4].

The green economy system will open up a new economic path. By 2019, the import rate of oil and natural gas in China's energy consumption has already increased to 50%. If energy transformation can be achieved on the road of green economy, China's consumption of fossil fuels is expected to reduce by 80% by 2050. Chinese president Xi Jinping announced that China's new target of "aim to reach carbon emissions peak before 2030 and achieve carbon neutrality before 2060" at the general debate of the 75th session of the United Nations General Assembly. The target is that by 2030, the proportion of non-fossil energy consumption will reach about 25%. However, if China

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wants to achieve carbon neutrality, a huge shock will be on the current domestic industrial pattern. Thus, it is very important to analysis the way to transformation in each industry.

2. Literature Review

2.1. Policy Driven from 'Brown Economy' to 'Green Economy'

Transition from a brown economy to a green economy makes current stage of the economy of China. As the percentage of energy used per day on private vehicles takes large amount, China is encouraging a new energy power industry such as electricity supply for vehicles, especially on public transportation. Furthermore, the Chinese government publishes environmental taxes related to sustainability economics. The carbon trade plays a good role in developing a green economy as well, which sets up the goal of restricting the number of carbon emissions in financial solution. Also, follow-up policies are coming up equipping further development of the former future green economy, which means the effect of the goal is about to be cashed. The government would encourage the public interests in transferring to an environmental friendly economic structure from both supply and demand side. The market should act as an 'assistant' to the government by involve all business participants. Moreover, the individuals are the role that can make efforts to make changes as nature depends on human actions.

Humans value the environment because all living matters rely on nature. If natural capital is degraded or under produced, the productivity of human society will be inefficient. Therefore, saving the natural resources that are in danger and producing more wealth are crucial to improving human livelihood and social equity. The tightness between humans and nature can effectively create a healthy society.

2.2. Natural Assets Monetization

Wei-bin Zhang stated that the neoclassical growth theory is basically concerned with capital and wealth accumulation in perfectly competitive market [5].

$$Y = A*F(K, L) \quad (1)$$

K-Capital; L-Labor; A-Level of Technology

The Neoclassical Growth model outlines three fundamental factors of a growing economy - labor, capital and technology. The theory over the model implies that if the same technology is available to all countries, every country will converge to a growth rate that differs from any other country, which may only be by the difference in their population growth rates. In green economy, the natural resources could be seen as a capital resource in that model.

Nature is the origin of a green economy. Humans' resources from nature include minerals, energy, land, soil, metal, other biological resources and aquatic resources. Those are used to produce final goods and then services.

Edward B Barbier stated that the natural environment is now commonly viewed as a form of capital asset, or natural capital. Ecosystems that provide important goods and services to the economy are included in. Managing natural capital has consequences for sustainable development [6].

Resources can be categorized into different roles. The land is linked to agriculture and forestry; water is used for fishing; underground resources like oil and gas are applied in mining and quarrying and the manufacturing in plastic and rubber; and animals and plants are the food resource. All of those in nature can be used for production or research and development in any industry. Commodification makes the original natural capital quality and value higher and higher.

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With the continuous expansion of human activities, negative nature influence has shown gradually. Pollution and waste damage the environment. Although the output is profitable for both households and public sectors due to exports/imports and demotic consumptions, overload use of resources makes a loss from nature in long term. The key is to match up the amount of inputs with the output, including labor and natural resources investment. Natural resources include biotic resources, abiotic resources, and energy flows like solar and wind energy. The investment could secure the nature capital and add value to ecosystem. The ecosystem offers provisioning and regulating services to the natural capital, and transfers them to society capital.

In 1973, economist E.F. Schumacher pioneered the term "natural capital" in Small is Beautiful, arguing that natural resources should be managed as assets rather than as a disposable income, and he called on governments to focus on sustainable development in their own countries rather than on the transfer of unsustainable technologies to third world countries. This idea was supported by ecological economists such as Herman Daly whose research focus on how conventional economics and a growth-oriented industrial economy have led us to the brink of environmental disaster [7]. Moreover, Robert Costanza evaluated the worldwide natural capital at US$16-54 trillion per year [8].

3. Discussion

3.1. Energy Industry

From IEA reports, China’s annual carbon emissions are about 10 billion tons previously, nearly 90% of greenhouse gas emissions come from the energy system. The transformation of energy structure will be a significant step for China to achieve carbon neutrality. However, the current economic stage of China would experience more difficulties than developed countries to reduce the emission [9].

According to the data in the "National Economic and Social Development Statistics Bulletin", the coal-fired power accounted for about 60% of China's total power generation, and China is continuing to build new coal-fired power plants currently. To keep the balance between growth and emission reduction, the policy would concentrate on funding support in research and development of green technology. The key to industrial transformation in energy industry would be the promotion of coal consumption substitution, transition, and upgrading.

In addition to establish the strict regulation on use of fossil energy, China will apply the clean utilization of coal in the key industries and delineate of the “no coal combustion area” [10].

China, as a vast territory country with abundant resources, could take advantages of the development of new energy. For the wind power, China accelerates in its construction, especially for the offshore wind power, China will improve its industry chain and do further encouragement in the construction and development of the offshore wind power bases. According to the geo-graphical characteristics, China actively promote the construction of hydro power bases, balance the hydro power development and ecological protection, and explore the establishment of compensation mechanism for hydro power resource development and ecological protection in the Southwest of China. It is expected that the installed capacity of hydro power will be increased by about 40 million kilowatts during the "14th Five Year Plan" and the "15th Five Year Plan" respectively. China’s first step is to determine the layout and the development schedule of nuclear power plants, and then develop nuclear power under the premise of ensuring safety, and maintain a steady pace of construction. China also stepped up nuclear power standardization and autonomy. Key technology and equipment research will be speed up in future years. China promised to improve our nuclear safety supervision capabilities and ensure that there are no accidents such as nuclear leakage in this process.

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The other task is to update the power systems. The new power system built by China will gradually increase the proportion of new electric energy and promote the optimal allocation of clean power resources in a large scale. It is expected that by 2025, the in-stalled capacity of new energy storage will reach more than 30 million kilowatts; by 2030, the in-stalled capacity of pumped storage power plants will reach about 120 million kilowatts, and the provincial power grid will basically have a peak load response capacity of more than 5%.

3.2. Manufacturing Industry

According to the 2020 data in the "China Climate Path Report", the greenhouse gas emissions from industrial production reached 3.8 billion tons per year, accounting for 33% of China's total greenhouse gas emissions. At present, the industrial sector accounts for 48% of the energy consumption in China, reaching 2 billion tons. Carbon reduction in the industrial industry become a major goal of China's energy conservation and emission reduction [11].

Same as the energy industry, the policy support on manufacturing industry is also important for its reform. Steel industry is not only a representative of energy intensive industry, but also a pillar industry in the industrial system. It has three main types of emissions: the first type is the formation of a large amount of carbon dioxide in the process of iron making, steel making, rolling and post-treatment of steel production; The second is that all kinds of equipment used by the steel industry are heavy users of electricity, and this part of the electricity caused by the indirect carbon emissions; The third is the mining enterprises on the supply side and the processing and production of various iron and steel products on the demand side. Thus, steel could be an appropriate example to carbon neutrality.

As mentioned in Chinese government report, it can be concluded into three main directions. Firstly, China will deepen the supply side structural reform of the steel industry by strictly implement capacity replacement, prohibit new capacity, promote stock optimization, and eliminate outdated capacity. Meanwhile, China will optimize the distribution of productive forces, continue to reduce steel production capacity. The government will also promote cross regional or cross ownership merger and gradually increase industry concentration. Then China will promote the structural optimization of the steel industry and the replacement of clean energy. China is currently improving the recycling level of scrap resources and promoting the full scrap electric furnace process. Under those regulation, the crude steel capacity utilization rate increased more than 30% from 2018 to 2015. Regional capacity replacement policies will be introduced to guide industry concentration and encourage steel industry bases for emerging technologies.

3.3. Financial Service Industry in Green Economy

Compared with other industries, the financial industry is not a particular source of carbon emissions. However, no matter the transformation of the energy structure, the change and upgrading of the operation mode or the capture and storage of carbon, there is a huge demand for investment and funding on the way to carbon neutrality. Therefore, green finance system is the key pillar to achieve carbon neutrality strategy.

At present, China's green finance development includes green credit, green bonds, green stocks, green funds and green insurance. The green bonds play the most important role. From the data of the "2019 Research Report on the Middle Ancient Green Bond Market", China issued 386.2 billion yuan of green bonds, accounting for nearly 20% of the total global bond issuance, also ranking first in the world. Roughly 28% and 33% of China's green bond proceeds went to solar, wind and other clean energy project and low-carbon transport, including urban mass transit respectively [11]. Among them, Commercial banks issued roughly 60% of Chinese green bonds. Nonfinancial corpo-

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rations took 18% while Government policy banks was accounted for only 3%. Up to 2020, China's green loan balance has exceeded 110000 yuan, ranking first in the world.

Although the great achievements has been made, there are still a demand gap in green finance. China's financial infrastructure is not as mature as developed countries. The financial system is still dominated by 'Big 4' banks, with banking assets accounting for more than 90% of all financial assets. Financing risks in society are still highly concentrated in the banking system due to the inactive private capital market.

From the perspective of the organizational system, the development of small and medium-sized financial institutions is insufficient, and there is still room for the banking industry to open up the market to private capital. From the perspective of the service field, rural financial services need to be strengthened, and as of the end of 2019, there were 2792 blank townships and towns in the country's financial institutions. Rural financial products are single, and services are not in place. Private enterprises and small and medium-sized enterprises are often struggled with financing difficulties.

In order to improve the environment of green finance, the Chinese government should continuously improve the financing environment for green industries and green projects. In addition, deepen international cooperation in green finance will be alternative to upgrade financial system in short period. As an environmental friendly has become an international concern, cooperation and trade between countries would accelerate the low-carbon transformation and structure the global carbon pricing mechanism.

4. Conclusion

Climate change has been increasingly aware by human beings. For the global temperature control target of 1.5 degree Celsius on The Paris Agreement, effort on carbon neutrality is necessary for China or in other countries. With the theory of natural assets monetization, Chinese government has made great progress on carbon reduction in recent 5 years. Transformation in energy and manufacturing industry continues to accelerate. A group of regulations will be issued to secure the industrial upgrade in heavy industry. Although the financial credit system has not been mature in China, Chinese government keep making efforts on green funds such as the bonds, debts, and credits. Those implementation makes traditional enterprises easier to get capital support when they face the difficulties in transformation.

This article takes China as an example, analyzing the green economics pathway in developing country. It can be a reference for many of developing countries to balance between the economic sustainable growth and environmental protection. Furthermore, the process of natural resources monetization has been evaluated. The strong governance would be a significant positive factor in the effects of green economy policies.

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