

Exploring Effective Ways to Achieve the "Dual-Carbon" Goals

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Abstract. Climate change and green and low-carbon development have always been global, large-scale issues, cross-regional and cross-sectoral, particularly complex, involving all aspects of the economy and society, especially now that we are not only facing a climate crisis, but also superimposed on the energy crisis, food security, and all aspects of the ecological environment, the synergistic consensus among the countries of the world is even more important. How can we tackle global warming? What are the opportunities and socio-economic benefits of adopting low-carbon development? The process of achieving the low-carbon goal is the replacement of old and new industries and the rise of new industries, which will bring about a new technological revolution, and seizing the opportunity will bring considerable economic benefits. Therefore, the search for technologically advanced, effective and sustainable methods is a matter of wisdom and ability. Help "double carbon" goal, biomass energy particles can be said to be in the right place, and never missing! It realizes the mechanism of symbiotic development of industry and ecology, is an important and indispensable part of the construction of ecological civilization, and is bound to become the mainstream energy in the future. Biomass energy companies can also use advanced "Internet +" digital technology in the process, products and services, build data models and analysis, to tap the value of biomass enterprise data, bringing higher social and corporate benefits.

Keywords: Climate warming; Green and low-carbon; National synergies; Economic opportunity; Technology and innovation.

1. Introduction

Climate change and green and low-carbon development have always been issues of global concern. Excessive emissions of large quantities of greenhouse gases, especially carbon dioxide, have led to the destruction of the ozone layer, and rising temperatures have led to the capture of more heat energy by the air and the oceans, resulting in serious natural disasters that have caused great harm to humankind.

Continuous high temperatures will also lead to widespread drought in the interior, affecting food and fodder production. The scarcity of food and meat products will be a direct threat to the stability of the country. Panic and fighting over limited food resources may no longer be reserved for backward villages [1]. We are not only facing a climate crisis but also superimposed on the energy crisis, food security, ecological environment in all aspects of the problem, cross-regional, cross-field complex communication and collaboration, involving all aspects of the economy, society, etc., so the only way to solve the problem is to reach a consensus with all countries in the world, concerted efforts, minimize carbon emissions put.

In July 2021, Germany, Belgium, Luxembourg and other Western European countries experienced unprecedented heavy rainfall and massive flooding, with two days of rainfall amounting to two months of normal rainfall. A few days later, Zhengzhou City in China's Henan Province also suffered from rare and sustained heavy precipitation, resulting in severe infrastructure damage, flooding, and the deaths of hundreds of people. Although thousands of kilometers apart, the extreme rainfall and flooding in the two places were not unrelated. According to researchers at the Potsdam Institute for Climate Impact Research in Germany, surface air in Western Europe as well as much of China contains more moisture, and higher atmospheric temperatures and water-holding capacity can lead to sharp and intense precipitation when conditions for precipitation are met [2]. Not only is that, but the occurrence of forest fires also closely linked to high temperatures. Sustained high temperatures and

drought can dry out surface combustibles, making them susceptible to reaching flammability, increasing the frequency of lightning and exacerbating the occurrence of wildfires. For example, the Australian fires of 2019, known as the "black summer", the West Coast forest fires in the United States of America in the summer of 2022, and the Canadian forest fires of 2023, all of which caused significant damage and air pollution, The release of air pollutants such as PM2.5 and PM10 from the fires has developed into a "global environmental event". The Arctic environment is sensitive to global warming, and on 14 August 2020, the Greenland ice cap remained above 0°C for several hours and dropped rain, accelerating the melting of icebergs and leading to rising sea levels and freshwater scarcity. Since June this year, many parts of the northern hemisphere have been experiencing unusually hot weather, leading to an increase in sudden deaths. That these extreme weather events have all been shown to be directly linked to increased global warming. "Human activities contribute to climate change" [3]. This conclusion has been made very clear. At a global warming of 2°C, extreme heat will more frequently reach critical tolerance thresholds for agriculture and health, posing widespread and serious threats to human livelihoods and lives, as well as to ecosystems.

In order to mitigate the trend of global warming, mankind has taken a variety of actions and endeavors. The Paris Agreement was put forward in 2015 by the member states under the United Nations Framework Convention on Climate Change, aiming at controlling global greenhouse gas emissions, mitigating the impacts of climate change on societies, economies and ecosystems as well and enhancing the adaptive capacity of countries to cope with climate change, through concerted efforts [4]. The Glasgow Climate Convention (hereinafter referred to as "the Convention"), which was reached in Glasgow, UK, in November 2021, determines that countries across the globe will have to work much harder by 2030 to halve their emissions in the next decade and to achieve net-zero by mid-century if they are to ensure that the goal of limiting warming to 1.5°C is not to be missed [5].

2. Achieving Dual Carbon Can Bring New Development Opportunities and Increased Social Benefits to Countries' Development

The main cause of global warming is the human use of fossil fuels such as coal, oil and natural gas for more than a century, of which coal is the most inefficient and carbon-intensive, with a quarter of global greenhouse gas emissions coming from coal-fired power generation emissions. This is followed by methane emissions, which come from oil, natural gas, waste products, and agriculture. The Convention calls on countries to halt the construction of new coal-fired power plants and phase out existing ones, to scale up clean energy sources and requires parties to "phase down coal power and end fossil fuel subsidies", which is the first time in history of the Climate Conference that fossil fuels have been negotiated into the Conference's final agreement document [5].

Thirty-four countries and five public financial institutions committed to ending direct public support for unmitigated international fossil fuel energy by 2022; more than \$20 billion in public and philanthropic funding was mobilized to support developing countries in scaling up cleaner energy sources, including by moving away from coal power, halting and reversing deforestation, reducing methane emissions and accelerating the transition to electric vehicles. To curb future climate change, countries are pushing for "net-zero" emissions. The United States and the United Kingdom have pledged to achieve net-zero emissions by 2050; China announced in 2020 that it aims to be carbon neutral by 2060; and India, the world's third-largest emitter of greenhouse gases, has declared that it will achieve net-zero emissions by 2070, covering about 80 percent of global greenhouse gas emissions.

Table 1. Carbon Neutral Timetable for Selected Countries [6]

Country/Region	Carbon Neutral Time	Forms of commitment	Country	Carbon Neutral Time	Forms of commitment
Finland	2035	Ruling Party	Germany	2050	Legislative
Austria	2040	Policy	Japan	2050	Policy
Iceland	2040	Policy Pledges	European	2050	Green Deal
Canada	2050	Policy Pledges	Denmark	2050	Policy
Korea	2050	Policy Pledges	Chile	2050	Policy
France	2050	Legislative	California	2045	Legislative
Sweden	2045	Legislative			

Table 2. Carbon emissions in selected countries [6]

No.	Country/region	2019 emissions		Global share of emissions	
		value	growth rate	2019	2010-2019
1	China	14	3.1%	26.7%	26%
2	United States	6.6	-1.7%	12.6%	13%
3	European Union (27 plus UK)	4.3	-3.1%	8.2%	9.3%
4	India	3.7	1.3%	7.1%	6.6%
5	Russia	2.5	0.8%	4.8%	4.8%
6	Japan	1.4	-1.6%	2.7%	2.8%

From the data in Table 1 and Table 2, China's total carbon emissions are about twice as much as those of the United States, three times as much as those of the European Union, and more than the total of the United States, the European Union and Japan, and the reduction in carbon emissions is much higher than that of other economies. In order to respond to global climate change, China has committed to "striving to peak carbon dioxide emissions by 2030 and endeavoring to achieve carbon neutrality by 2060" (hereinafter referred to as the "dual-carbon" goal). China will achieve carbon peaking step by step and steadily promote carbon neutrality [7].

Table 3. Dual-carbon" goal [7].

2020.9.22	2021.7	2022.10	2023.03	Before 2030	Before 2060
Commitment of President Xi Jinping at the 75th General Debate of the United Nations General Assembly	National Carbon Market go live	Twentieth report	National People's Congress and Chinese People's Political Consultative Congress	Achieving carbon peaks Achieving carbon neutrality	Achieving carbon peaks Achieving carbon neutrality

As shown in Table 3, since General Secretary Xi Jinping's commitment to a dual-carbon goal at the 75th General Debate of the United Nations General Assembly on 22 September 2020, he has made more than 60 speeches on dual-carbon at domestic and international conferences, which is a major decision and need in the context of China's national policy to achieve a "dual-carbon" goal.

2.1. Achieving the "Dual-Carbon" Goal Is Also a Necessity in the Light of the Energy Problems Faced by China.

China's fossil energy is heavily dependent on imports, the dependence on oil imports is as high as 73%, natural gas imports nearly 50%, and coal imports more than 300 million tonnes, the proportion

of imports is too large, seriously affecting the country's energy security, and there will also be a stranglehold triggered by the political and economic problems.

China's total energy demand is 30% of the world's, requiring 5.3 billion tonnes of standard coal per year.

China's energy structure is irrational, with coal accounting for 60 percent of the total, and the mining and use of coal is the largest in the world, about half of the world's total, so it is also the country that emits the most carbon dioxide, accounting for 30 percent of the world's total emissions.

There is also a year-on-year increase in the amount of agricultural and forestry waste on which we depend for our survival. If the biomass produced is not utilized, the methane produced by decay and fermentation has a greenhouse effect that is more than 20 times that of carbon dioxide. It can also cause forest fires, resulting in environmental pollution, casualties and property damage. In September 2021, Nature published an article that dead wood releases 40 billion tonnes of carbon dioxide annually, equivalent to 1.15 times the amount of fossil energy [8]. The environmental problems caused by forest fires resulting from the irrational use of biomass also exist in China.

In view of the above, it has become inevitable to seek a path for China to implement the "dual-carbon" goal.

2.2. The pathway to global carbon neutrality

2.2.1. Existing technologies and issues

Absorption: Carbon dioxide absorption can be achieved through extensive afforestation, but overgrown trees and fermentation of humus to form a humus layer produce flammable and explosive methane, which is prone to cause forest fires.

Carbon reduction: energy transition. By moving from high-emission traditional energy sources to low-emission, zero-emission, and negative-emission. The transition to new energy sources requires policy, financial and technological support.

Carbon sequestration: Internationally, CCS or CCUS is currently adopted in Western countries led by the United States, which is costly, captures carbon dioxide out of sight and out of mind, and eventually stores it under the ground, where it can be easily released.

2.2.2. Solutions and Future Prospects

Scientists have been searching for a proven scientific method of carbon sequestration, a carbon sequestration technology that can "carbon lock" the earth - biomass charcoal. That is, turning biomass into carbon and "locking" in carbon dioxide is a proven method. This kind of carbon is very stable and friendly to the environment, and one tonne of biomass carbon can fix about three tonnes of carbon dioxide [9].

Agroforestry biomass refers to straw, rice husk, agricultural and forestry processing scraps and forestry residues in the production process of agriculture and forestry, and agroforestry material resources are renewable resources. Life on earth is based on carbon, life comes from carbon, carbon-based returns to the field, nutritious life, and life ends in carbon and begins in carbon, which is the cycle of life and endless life.

Advantages of biomass: the chemical composition of biomass mainly consists of cellulose, hemicellulose, lignin and other ash substances, not the so-called "volatile matter" in the energy sector is the main component of Table 4 [10].

Table 4. Ingredient [10]

	C	H	O	S	N	kcal/kg
biomass	48.5	7.8	43.0	0.04	0.07	4000
coal	60.0-98.0	3.5	8.0	5.14	1.5	5500

Coal has 128 times the sulphur content and 21 times the nitrogen content of biomass. When combustion releases the same amount of heat, no emission of sulphur dioxide is 181 times that of biomass, and nitrogen dioxide is 40 times that of biomass [10].

Table 5. Comparisons [10]

Item	Carbon content
Coal	50-98%
Petroleum	83-87%
Natural Gas	75%
Biomass: as the youngest coal biomass solid, liquid and gas fuel	35-50%
Solar energy	0
Wind energy	0
Ocean energy	0

Through the analysis of Table 5 can be seen: that agricultural and forestry biomass is the only renewable clean energy in the chemical state, the only can be used as a fuel state energy, but also the only alternative to fossil energy is renewable carbon-containing stable energy source, is the most industrialized prospect of clean energy. Biomass has a wide range of sources and large reserves, which are inexhaustible and can be converted into solids, liquids and gases. The amount of agricultural and forestry biomass is huge.

2.3. International and Chinese development of biomass energy:

The world's developed countries are paying attention to the development of biomass energy, especially in Finland, Sweden, the UK's largest coal-fired power plant Drax power plant 6 * 660MW converted to biofuels, and successful operation [11]. While China is less than 2%, which is formed by a lot of stereotypes of cognitive limitations, is not fundamentally aware of the stability of biomass energy both three agricultural, environmental protection, biomass charcoal for human beings and the environment all the benefits and no harm [12-14]. The development and use of biomass energy to reduce the proportion of fossil energy and promote energy transition is an important irreplaceable guarantee, biomass energy is far from the use of the effect that should be achieved, so there is a huge business opportunity here. If we pay as much attention to forestry as agriculture, we can: effectively play a role in forest fire prevention, a large reduction in methane and carbon dioxide emissions; use biomass energy technology to solve forest pests and diseases; increase employment and income; improve the urban, rural and road environment, and help the construction of the country.

Apply digital technology to the processes, products, services, etc. of biomass enterprises, and use new technologies to utilize the data value of biomass enterprises. Use big data technologies in biomass production and manufacturing, warehousing and distribution to realize the scene of mutual information transfer, and improve distribution speed and logistics efficiency. Utilise intelligent logistics to connect the whole supply chain, obtain all information and reduce costs. It can also be extended to suppliers and markets through the quality cloud, making the supply chain process and product quality control more standardized and transparent, developing Internet+ logistics, achieving innovation and upgrading, enhancing the digital capabilities of products and improving the service quality of enterprises.

3. Conclusion

From extracting energy to planting energy, from non-renewable energy to renewable energy, the emergence of biomass energy is a major technological revolution in the field of human energy, which organically combines the agriculture and forestry industry, manufacturing industry and distribution industry into an interdependent whole, and through the linkage of the three industries, systematic circulation and synergistic development, it promotes the birth and development of many new industries. Energy is the lifeblood of the national economy and an important strategic resource for the country, and biomass energy has never been lacking in the energy sector.

The development of biomass energy can not only replace traditional fossil energy to become the future of clean, sustainable green energy mainstream but also to establish the national energy security independent guarantee system, which has become the current global attention of the hot spot. The

development of the biomass energy industry is a great cause in the current generation, but the road ahead is also destined to the pros and cons. For example, developing biomass requires a correct understanding of biomass, as many experts misunderstand biomass, believing that the amount of agricultural and forestry biomass is insufficient to take on the heavy responsibility of energy; The State has invested a certain amount of money in the field of biomass, but the existing utilization technologies are single and economically inefficient; Wind, light and power enterprises are developing rapidly, and most of them are invested by enterprises and listed companies, while the biomass energy industry is dominated by individual enterprises and so on. However, the natural and harmonious development of industrial systems and ecosystems to achieve a mutually beneficial symbiosis model is the ecological civilization.

Biomass energy realizes the mechanism of symbiotic development of industry and ecology and is the best practitioner to realize green and low-carbon transformation, which creates an opportunity to realize common wealth. Biomass energy is also an important and indispensable part of the construction of ecological civilization and is bound to become the mainstream energy in the future. In the new round of technological revolution, the industrial transformation continues to deepen today, information technology and Internet technology, synergistic innovation and application, science and technology and industrial integration and interaction are more obvious, combined with the digital platform can vigorously develop the biomass energy industry, in order to accelerate the carbon peaking and carbon neutrality goals to achieve, create a green ecological civilization, and protect the Earth's homeland.

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