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In the Context of Dual Carbon, the Application of Advanced Technology in the Digital Economy

Jianhua Chen[1,a,*]

[1]*Saint Anthony's High School, New York, 11747, United States*
a. 1540351750@qq.com
**corresponding author*

Abstract: The digital economy which counts on the application of information nets and platforms is serving as the main element for the development of modern economic system. In China, this has resulted in production competence, the construction of new occupations, and a synergistic effect in countless trades. China has been catching up speedily and getting into online retail trades by a great margin. The digital economy overall increases carbon release. The nation must engage in a strategy that can enhance the adoption and advantage of the digital economy and at the same time can also decrease the impact of technology on its environment. This paper discusses the application of advanced technology in the digital economy of China in the context of dual carbon.

Keywords: Digital economy, Carbon emissions, Environmental regulation

1. Introduction

In the past few decades, the idea of "dual carbon" has become essential to China's ambitious plans for sustainable development and technological improvement as it has quickly emerged as a worldwide powerhouse in the digital economy. The term “dual carbon" summarizes China's commitment to deal with both carbon emissions and carbon intensity. It represents a dual strategy of encouraging low-carbon technologies and sectors while also lowering carbon emissions [1]. In this context, China is aware of the critical role that advanced technology will play in determining the direction of its digital economy. It has made impressive progress in utilizing advanced technology to promote innovation and economic growth. It has also acknowledged the urgent need to address environmental issues and slow down climate change, which has led to the creation of ambitious dual carbon objectives with the end goal of being carbon neutral in the future. This research examines the dynamic interaction between China's dual carbon programs and the digital economy, focusing on how advanced technology serves as a driver for sustainable development. China's digital economy, which is defined by fast digitalization, vast data collection, and advanced technologies like artificial intelligence, 5G, and blockchain, has been a key factor in promoting economic growth and development. Its global economic dominance has greatly benefited from this digital transformation, which has redefined industries, empowered businesses, and changed consumer experiences. Environmental sustainability is one of the main uses of innovative technology in its digital economy. The government has specified specific goals for lowering carbon emissions, promoting energy efficiency, and switching to renewable energy sources [2]. For instance, automated networks optimize energy distribution, and connected devices continuously track and manage energy consumption. These technological

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advancements support China's "green development" objectives, which are crucial elements of the dual carbon strategy [3]. Furthermore, China's industrial environment has been significantly impacted by the internet economy. Manufacturing powered by Technology and advanced automation is more productive while using fewer human resources. This improves economic efficiency while also aligning with the dual carbon strategy's goal of reducing carbon intensity.

2. The Purpose and Scope of the Research Work

Digital technologies have altered domestic and global economies. These are now considered as the new production factors that have a key part in the development of society, economy, and the atmosphere [4]. Currently, digital technologies constitute 8-10% of energy intake and 2- 4% of greenhouse gas releases [5]. China is one such nation that has experienced speedy economic growth during the past 40 years. Conversely, this has also made the country the principal carbon emitter in the world. China is now confronting the challenge of economic development and environmental protection along with achieving dual carbon goals [6]. Therefore, to control carbon emissions, the government has established a succession of emission decline marks. The Chinese economy is in an important changeover retro, fronting economic troubles triggered by progression rate move, operational alteration, and the captivation of preceding spur strategies, in addition to handling climate heating because of enormous carbon release.

As the world's chief developing nation, China's economy has practised quick progress over the past few eras, with heavily contaminating businesses such as electricity and steel. The nation has largely shifted to the adoption of digital technology in every trade. However, this has also resulted in increased carbon pollution and overall Carob percentage in the environment. To take advantage of the digital economy, China is required to add the “dual carbon” objectives to enhance the overall layout of ecological conservation [7]. This will result in new technological development and widespread socioeconomic modifications. This paper will find the strategies that can decrease carbon development while improving the digital industry and overall China industry.

3. Theoretical backgrounds and research methods

The digital economy improves the performance of the manufacturing industry by altering its production approaches, redesigning personnel assembly, and refining technical revolution to ensure the green and small-carbon growth of the industrial business. The digital economy improves resource distribution efficiency, consequently subsidizing suggestively high-quality development. China has rapidly adopted the digital economy resulting in high pollution, depletion, and release. The disproportionate consumption and production goings-on have resulted in substantial CO2 and have disturbed the economic and social existence of humans [8]. The digital economy results in greater caliber growth, and in the setting of the greatest carbon dioxide releases and carbon-neutral approach, it is acute to comprehend what type of influence the digital economy will have on verve releases and how it will come into effect. In 2020, China officially projected its plan of getting the carbon climaxing in 2030 and after that achieving carbon neutrality in the next 30 years [9]. Countries particularly China can go for the "industrial pollution emission reduction effect" to upsurge energy efficiency as a result of technological development predisposition [10]. Figure 1 shows the theoretical basis of digital economy.

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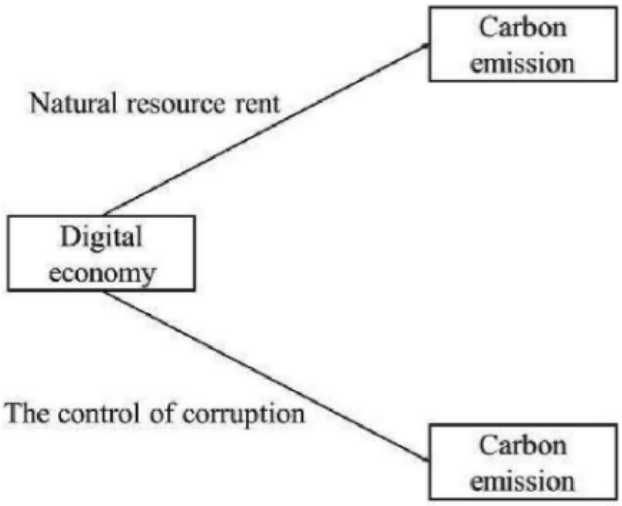

Figure 1: Theoretical basis (Author; Wang et al., 2023).

Scholars have conducted far-reaching exploration to clarify the understanding of the environmental impacts of digital economic actions. Several studies have shown the impact of carbon consequences related to the intensification of the digital economy goings-on. They are only limited to the regional production system viewpoint and consider the digital revolution as the trigger for economic boost and development [11]. However, the research is still in the early period and there are distinguished knowledge slits that need to be filled. Extensive research must be conducted to find know about the spatial spillover effect that is the consequence of the digital economy happenings.

The digital economy also possesses the capability to stand in high-quality economic growth. It can play an essential part in the ecological shield, sustainable growth and ease air pollution. The progress of the digital economy in the nearby areas can confine native ecological contamination, and the digital economy can detain ecological effluence via "the green development effect" [12].

This study relies on qualitative analysis and the focus has been on previous research. The journals have been explored for the past three years and research is mainly focusing on China. The results of different studies have been compared and the conclusion is drawn from the past research.

4. Related work in the areas of digital economy

4.1. Concepts of Digital Economy

The quick progression of information and communication technology (ICT) has shaped the digital economy. It is labelled as the segment of the economy that energies its all-inclusive basis from digital know-how and has a belicommercial approach positioned about digital goods and services. This is such an economy in which information and communication technologies (ICT) are employed that can transform customary brick-and-mortar economic doings. The digital economy has been mounting chiefly rapidly in developing countries and has dislocated human activities. Digital technologies are related to high energy intake which upsurges carbon releases if the energy spent is caused by sizzling fossil fuels. There are also studies that have confidence in that low-carbon technology novelty indicates the drop of energy concentration by refining the efficacy of energy usage and comprehending the swap association between energy and other aspects [13]. Nevertheless, the digital economy can also enhance industrial procedures and increase energy efficacy, therefore dropping carbon emissions. Scholars have conducted substantial investigations on the influence of variations in manufacturing constructions on carbon discharges. Early scholars mostly absorbed on the sharing of production factors among diverse businesses and related relations and their influence on carbon

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discharges. In contemporary years, though, the digital economy has thrived and become a new appliance of economic development, and researchers have now started to study the impact of the digital economy on carbon emissions.

4.2. The development of digital economy in China

In China's digital economy, where advanced technology and the dual carbon strategy come into contact, a complicated relationship between economic growth, environmental sustainability, and technical innovation is highlighted in the discussion. Dual carbon is not only an international goal, but also a goal of China's national plan. High-end sci-tech think organizations should offer Chinese knowledge and power by upholding the values of justice, shared but distinct duties, and individual capacities. To break down technical, trade, and financial obstacles, strengthen international green economy/trade, and technical/financial cooperation, and develop an international law system to address climate change as quickly as possible, comprehensive research should be performed. First of all, China's explosive economic expansion in the digital sector has been supported by technological advances. Artificial intelligence, big data analytics, and 5G infrastructure are just a few of the digital technologies that have proliferated recently and opened up new opportunities for economic growth. This digital transformation has not only improved China's position in the world economy but has also led to a significant increase in job prospects, proving that technology can support economic growth. China has also taken significant measures to solve the environmental issues brought on by its quick industrialization. Figure 2 shows that the dual carbon strategy is an all-encompassing strategy with the goal of lowering carbon emissions as well as carbon intensity. By enabling energy-efficient manufacturing processes, maximizing resource usage, and easing the switch to renewable energy sources, advanced technology plays a crucial role in attaining these goals. These environmentally friendly changes require the use of technologies like smart networks. Citywide data of China was explored from 2011 to 2018 that showed a non-linear association between the digital economy and carbon releases.

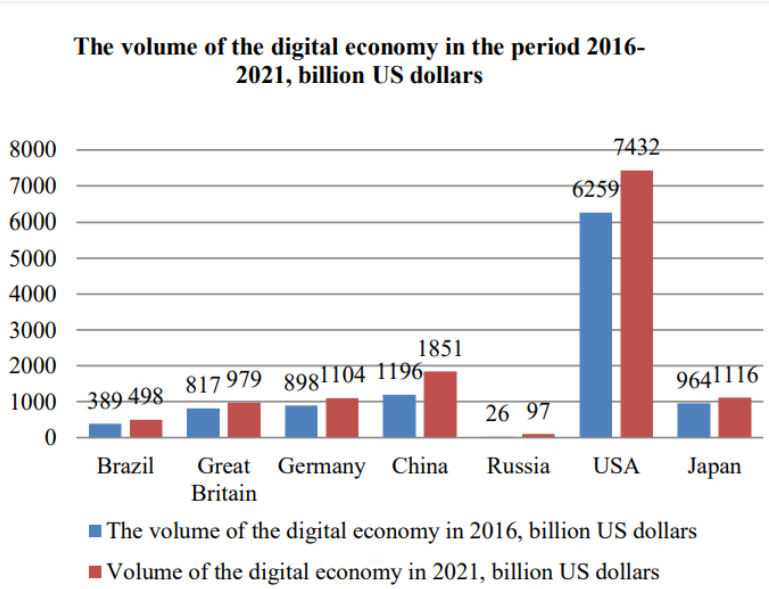

Figure 2: Digital economy from 2016-2021 [Author; Wang et al., 2023].

4.3. Current position of carbon emissions in China

China has made unbelievable developments in cultivating digital availability for inclusion, even in the most sidelined parts. It has made the digital economy a precarious share of its national growth

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plan. China has become the world's principal home marketplace that has brought a hearty revolution and reckless commercialization of B2C and C2C facilities. However, digital transformation is measured as a dual sword which not only improves energy consumption but also leads to green innovation for climate action. The reliance on the digital economy has resulted in increased pollution and carbon footprint [13]. The global warming has damaged the environment greatly. Along with this, the energy consumption structure also has an enhancing effect on local carbon emanations. Therefore, the quick economic growth in the previous years, China's carbon emissions are presently having the highest values in the globe. From 1980 to 1996, China's entire carbon emissions increased rapidly. Then the country saw a relatively stable period from 1996 to 2000, and in the next five years, the values again increased.

The green development of customary manufacturing business is the regeneration and the founding of environmentally friendly processes. Here workers take advantage of digital technology and increase production efficacy while decreasing pollution and waste. The country can use green production methods and enhance the energy revolution. In this way, it can hunt synergy in the decrease of pollution and carbon discharges.

5. Results and research significance

Researchers have mostly explored the effects of industrial structures and the digital economy on carbon releases. The digital economy does not straight result in increased carbon emissions, rather it indirectly increases carbon emissions through midway variables such as manufacturing construction and technological advancement. With the unceasing and profound use of digital technologies such as the use of Internet and big data, tied with the imperative demand for the Internet and digitalization in every industry, digital evolution has been impacting numerous nations and industry segments. China’s development is influenced by political control and economic regionalization. The effects can also be seen in both local digital economy actions and ecological controlling approaches. The Chinese government recommends shaping Digital China, counting the edifice of digital economy and culture aiming to bring significant alterations in the mode of production. The negative effects of the profound incorporation of the digital economy can be mitigated with green development and carbon neutrality that can in turn endorse high-quality economic expansion [11]. Simultaneously, the industrialized business is the chief subdivision of energy intake and carbon releases in China and the main strength for attaining the carbon climaxing and carbon neutrality objectives. The positive interface and deep incorporation of the digital economy and the "dual carbon" aims are helpful in enlightening new drivers of growth, cultivating the excellence of progress, and promoting the construction of a new arrangement of high-quality expansion. Future research must explore different methods to effectively synchronize with the "dual carbon" objectives of China and validate the corresponding growth of industrial digitalization and green progress.

6. Conclusion

Depending on the comparative advantage of production features, China has made substantial attainments in stimulating industrial construction alteration, excavating international collaboration, growing trade gauge, and improving the global attractiveness of China’s industrial business. The idea of “dual carbon” has come to represent China’s comprehensive strategy for technological innovation and sustainable development, especially in light of its developing digital economy. This study has shed light on the mutually beneficial relationship between China’s dual carbon goals and the essential role that modern technology plays in directing the course of its digital transformation. China’s path to becoming a leader in environmental sustainability and a worldwide digital economic powerhouse is characterized by both great accomplishments and overwhelming challenges.

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China's commitment to greener development within its digital economy serves as the best example of ambitious programs like automated energy networks, which improve energy distribution, and connected gadgets, which constantly monitor and regulate energy consumption. These developments perfectly complement efforts to reduce carbon emissions, highlighting the power of technology to promote sustainability. Most importantly, it is significant that China has used modern technology as a powerful tool to achieve its environmental goals. The combination of energy-efficient infrastructure, data-driven solutions, and smart manufacturing is an example of how technology may enable accurate and successful emissions reductions, resource optimization, and environmental preservation. Moreover, China's dedication to advancing green growth through innovative technology has taken many forms, from automated energy networks that optimize distribution to connected devices that constantly monitor and manage energy consumption. These developments perfectly complement the dual carbon strategy's objectives and demonstrate the power of technology to reduce negative environmental effects.

China must continue to be flexible in embracing new technology, encouraging moral and sustainable behaviour, and participating in international collaborations as it continues this path. By doing this, China can not only strengthen its position as a leader in the digital economy on an international level but also serve as an inspiration to other countries by showing how economic growth and environmental responsibility may interact peacefully in the quest for a sustainable future. In the end, China's digital journey and its matching obligation to reducing carbon emissions have the potential to change how the world views how advanced technology could open the way for a greener and more prosperous future.

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