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RESEARCH ARTICLE

Revitalization of Chinese's manufacturing industry under the carbon neutral goal

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Abstract

Since the beginning of the Industrial Revolution, the manufacturing industry has been crucial for economic growth. China's manufacturing activity began after China approved and opened legal reform to the rest of the world in 1978. There are usually three stages of development, including the catch-up period. At the same time, they reflect the private economic sector, manufacturing, and foreign exchange industries, and the opening up to the international markets. This advancement comes along with high energy consumption, leading to a high rate of pollution. Therefore, this study provides a detailed overview of the "Made in China 2025" pilot target and implementations of policies to achieve a carbon-neutral goal. We assessed the efficiency of implementing policies in the Chinese manufacturing sector and recommended decision-making policies to achieve the "Made in China 2025" plan and the 2030 carbon-neutral goal. The Quantitative Strategic Programming Matrix (QSPM) and SWOT analysis matrix were used to put forward some development strategies to transform and upgrade China's manufacturing industry by combining relevant strategic theories. This study is significant in terms of energy-saving and carbon emission-reducing policy implementations for the Chinese manufacturing industry. In addition, we suggested some measures to achieve a sustainable environment in line with carbon-neutral policies.

Keywords Made in China 2025 · Manufacturing industry · Carbon neutral · Environment sustainability

Introduction

China's manufacturing industry started the development process after adopting the opening-up reform law to the rest of the world in 1978; the period lasted from 1978 to the late 1980s. It was a period of Chinese renewal of the manufacturing industry. By this time, China had built a more comprehensive production system under the economic planning system of the former Soviet Union, which was primarily engaged in industrial production, leading to a shortage of materials. Over the next decade, following the adoption of Chinese reforms and opening policy, China's manufacturing industry continues to rebound. It is marked by the entry into the domestic market of power generation and gas production, as well as light production goods. TVs, washing machines, and coolers have been found in almost every home in China, and there are many other options for Chinese clothing emphasizing slow nutritional stimulation. Today, there is no doubt that state-owned enterprises (SOEs) are strong pioneers in Chinese factories. However, supply shortages have been the cornerstone of China's current consumer market.

The second period had a profound effect throughout the 1990s—an era that emerged from the private sector and the manufacturing industry from foreign investment. The Chinese economy is expected to become an economic market, benefiting from the private sector's exposure, the establishment of economic zones and particular goods, and the opening of commercial premises. Little by little, the surplus has become a vital component of the Chinese consumer market. The market economy and high sea levels have contributed to the development of the private sector

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and created good competition also various kinds of park industries are found in China.

Meanwhile, many managers and engineers working in the public sector are quitting their jobs to start their businesses; many SOEs were unable to adapt to market changes due to a weak competitive environment and have suffered market losses. The glory of the last century of public companies is gone. The great potential of the Chinese market has prompted many foreign trade companies to locate in China. Through foreign investment companies and joint ventures, advanced methods have been used for the design and production of industries and buyers imported from abroad. At the same time, with the advent of the private sector and foreign exchange, industrial production in China's coastal areas is proliferating. The gap between the interior of China and the Chinese coast started to widen in terms of production and the economy.

The third period extends from the beginning of the twenty-first century to the present day. This is where the Chinese manufacturing industry enters the international market. In 2001, China joined the WTO. Foreign currency flows into China, leading to the opening up of the Chinese market to foreign competitors (Wang et al., 2020a). Today, the majority of foreign investment is made up of thousands of foreign manufacturers, joint ventures, or companies. China-based manufacturing companies are taking full advantage of their cost-effective processing of Original Equipment Manufacturer (OEM) orders from developing countries. China is gradually becoming the basis for the growth of the international production industry. "Made in China" is beginning to grow globally as a kind of Chinese product. The importance of these manufacturing industries comes from bringing together many workers and huge investment in research and development. In addition to cost benefits, infrastructure construction and Internet development in China have contributed to the development of manufacturing facilities. The government has made a rapid contribution to the construction of infrastructure, including railways, highways, communications, and cities' expansion.

On the contrary, the use of infrastructure and its increased use have significantly surged the need of raw materials, manufactured products, and innovation. With the success of the shipbuilding, equipment, automotive, mechanical, electrical, communications, and steel industries, the entire manufacturing industry has improved. The Internet represents a critical factor in business productivity in terms of IT development. Chinese companies widely use ERP, PLM, CRM, and SCM to enable e-commerce. Over time, the Chinese manufacturing market products have completely changed from a retail to a consumer-friendly market. At the same time, the internationalization of the manufacturing market enabled China to enter the global market.

On the other hand, competition in the market is reinforced. After China's accession to the WTO, its manufacturing industry has rapidly fused into the world economy. With the increase in international trade, China is making tremendous profits. Major manufacturers like Lenovo, Haier, and Huawei continue to expand their business globally (Williamson et al., 2020). This study first introduced the 2025 strategic goals of China's manufacturing industry by identifying the key factors that can successfully enable China's manufacturing industry to achieve those goals. We gathered vital information from previous studies and focused on the Chinese manufacturing industry by providing its strength and challenges. We then developed a strategic plan to successfully upgrade China's manufacturing industry by conducting a SWOT analysis for successful decision-making to achieve China's 2030 carbon-neutral goal.

China's strategic goals for 2025

After years of development, the Chinese manufacturing company needs another new way to cope with the current situation. As a result, on May 8, 2015, the State Council announced "Construction in China 2025" to transform China from the world's largest manufacturing industry. The plan, backed by Prime Minister Li Keqiang, is the first job creation in the country to boost productivity (Klomfass, 2020). The "Made in China 2025" plan presents a three-step plan to transform China into a significant manufacturing industry by 2049, on the principle of "promote innovation, quality first, green development, promote efficiency and people's hearts" with the vital principle of market governance, organizational governance, focus on the present, vision for the future, global recognition, key results, independent development, openness, and cooperation (Huimin et al., 2018). The first step is transitioning from power generation to power generation by 2025. The second step is to reach the global average generation level by 2035. The third step is to combine and list the level of power generation in Greater China production in China to be on the global list in 2049 (Zenglein & Holzmann, 2019).

Priorities to achieve those goals

Based on the strategic plan of becoming a leading manufacturing industry globally, the "Made in China 2025" plan identifies nine key priorities, which can be highlighted in Fig. 1 below.

The "Made in China 2025" plan envisions innovative products as a key means of progress. To identify smart factories, China will create specialized technology stores and digital programs as pilots in large part, as well as accelerate the use of advanced manufacturing methods and equipment. Technical knowledge between human machinery, industrial

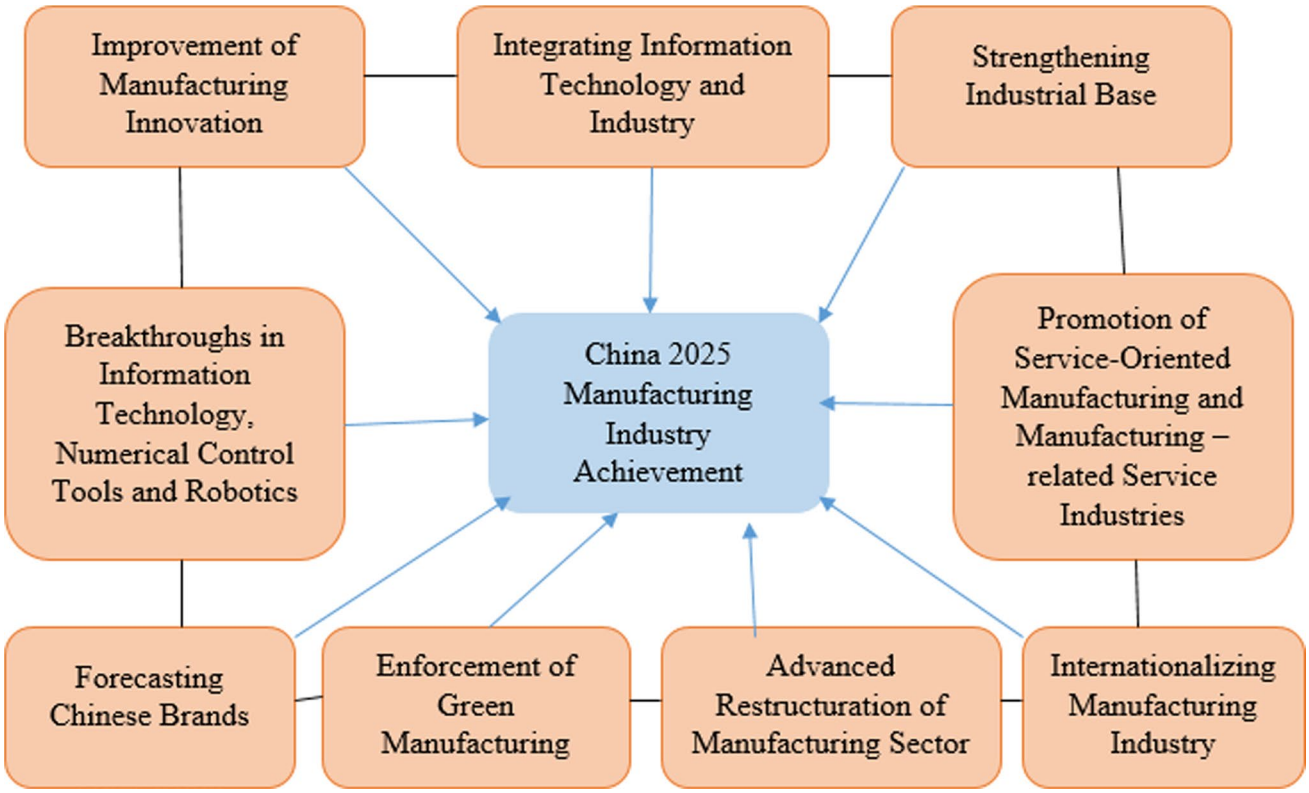

Fig. 1 Strategic plans for "Made in China 2025"

robots, intelligent logistics management, and additional manufacturing in manufacturing operations is also included. They promote productivity, digital control, real-time data quality monitoring, and flexible manufacturing operations (Müller & Voigt, 2018). In addition, efforts will be made to accelerate and implement the entire product lifecycle management system, messaging relationships, and supply chain selection, as well as strengthen the integration of key communications, including party management and regulation, development and manufacturing, financial marketing, and business and finance, and acquire managerial and administrative experience (Wang et al., 2020b).

Implementation of systems to prioritize manufacturing revolution

"Made in China 2025" is expected to meet the limited progressive goals of developing China's manufacturing industry through government guidelines, unified resources, and five key projects, including building a local manufacturing industry and producing products to strengthen the business base, green manufacturing, and innovation in advanced machinery. These efforts have helped improve the overall competitiveness of China's manufacturing industry. To achieve the aforementioned goals, "Made in China 2025" responds to a need for institutional restructuring, building a friendly environment and relevant supply market, supporting policies to strengthen the financial systems, and developing talent training at different levels, as well as further promote policies that support the development of small, medium-sized, and large enterprises, broaden the product possibilities of enterprises, and simplify organizational and operational approaches. It also stresses the need for central and local governments to understand the importance of building a manufacturing force, strengthening its organization and leadership, improving its working methods, monitoring, and planning: technical implementation, policy data, and performance assurance in various professions. In addition, local governments should promote policies to promote the development and transformation of factories according to regional characteristics.

Literature review

Kurramovich et al. (2022) regression results showed that increased investment in research and development for clean energy development only reduces carbon dioxide emissions in the long term. Similar effects on emissions control are also associated with increased electricity generation from clean energy. In addition, it is also pointed out that increased investment related to clean energy development plays a

mediating role in increasing the long-term CO_2 reduction effects of clean energy generation. In addition, economic growth is seen as a barrier to environmental quality, as it leads to increased carbon emissions in the short and long term. According to Li and Ouyang (2020), pure engineering efficiency and scale efficiency have declined due to the need to optimize industrial scale and structure. The results of their study represent an objective and comprehensive assessment of the green economic development of China's equipment industry and provide valuable information for improving the efficiency of green economic development. Primary education and urbanization favor the strengthening of the manufacturing industry. However, the growing dependence on foreign trade would not favor the revaluation of the manufacturing industry. The Chinese government should further strengthen renewable energy and make full use of the interaction mechanism of infrared relations to control foreign investment flows and force IT companies to implement it. Meanwhile, the Chinese government must also ensure balanced regional development, which would improve the manufacturing industry (Hu et al., 2019).

Changing business needs and shrinking product life cycles require new approaches and services from manufacturers. In recent years, research and technology in manufacturing enterprises have advanced rapidly. The technologies used in standard production are very old and did not show much interest in the company's position. Organizations that want to accumulate more resources to solve problems and achieve customer goals (Khan & Turowski, 2016). Ghobakhloo (2018) explained that there is no single strategy that fits all companies or industries, which means that the Industry 4.0 roadmap is unique to each company and must be designed accordingly. The strategic roadmap for the transition to Industry 4.0 presented in this study aims to help today's manufacturers understand what the implementation of Industry 4.0 requires them and the challenges they may face during the transition process. Technical innovation drives the manufacturing industry to save energy and reduce emissions. As a region accounting for more than 50% of China's economy, China's eastern region has played a leading role in the development and focused on promoting industrial improvement based on a development strategy focused on innovation. The potential solution for China's manufacturing industry transformation is to build capacity for independent innovation by investing more in research and development. Research on the sustainable development capacity of the manufacturing industry in the eastern region has provided important clues for the improvement of the manufacturing industry across China (Cheng et al., 2020b).

Improving energy-saving efficiency is one of the prerequisites for transforming and upgrading China's manufacturing industry. Jiangsu Province with the largest manufacturing economic volume and its economic situation in eastern China is comparable to Shanghai. Exploring the sustainable development potential of Jiangsu's manufacturing industry provides essential clues for improving the manufacturing industry throughout China. Strengthening its independent innovation capabilities to improve energy efficiency and its position in the global value chain is central to China's transformation into a manufacturing powerhouse (M. Cheng, 2020). Hao et al. (2022) show that the conservation of inputs reduces carbon intensity. In terms of diversity in manufacturing, the CO_2 reduction effect of incoming services is more significant in polluting sectors than in non-polluting sectors. In terms of service diversity, more emphasis should be placed on transportation and business services across all manufacturing sectors to reduce carbon emissions. In addition, the mechanism analysis shows that carbon sequestration is reduced by replacing input services with energy elements, promoting technological innovation, and optimizing the structure. Following the Paris Agreement, green innovation practices have garnered much attention worldwide. Consumers, producers, governments, and businesses are beginning to understand the seriousness of environmental risks and climate change. The manufacturing sector is one of the largest industrial waste producers and contributes to environmental pollution, which threatens environmental sustainability. Introducing green innovation practices in the manufacturing sector is crucial to ensuring environmental sustainability. However, it is crucial to identify, assess, and (partially) evaluate aspects of green innovation in terms of sustainability performance indicators in the manufacturing industry (Y. Wang & Yang, 2021).

Cheng et al., 2020a results show that manufacturing capacity utilization varies significantly across China, with technical efficiency improvements playing the leading role, albeit with significant regional differences. Regulations on environmental incentives and market incentives lead to better utilization of productive capacities. However, market-oriented environmental regulation plays the most important role. According to Wu et al. (2021), the shift of Chinese manufacturing to Thailand has been positively correlated with CO_2 emissions from trade between the two countries and has helped ease pressure from China to save energy and reduce emissions. Ministries should therefore formulate differentiated and stable national production policies, devote themselves to the development of energy-saving and technology-intensive manufacturing industries, and promote the relocation of low-tech and carbon-intensive industries under environmental pressure in China. The eco-efficiency of the manufacturing industry has been an issue in China for decades. However, less attention has been paid to the growth of input services in manufacturing and its impact on eco-efficiency. Based on the Input-Output Tables for China of the following years compiled by the OECD's published Structural Analysis Database, this study describes manufacturing

service inputs with direct and aggregate consumption coefficients and, therefore, it primarily analyzes its environmental impact, measured by the overall green productivity factor (Zhao & Chen, 2021).

Based on the above, capital investment and innovation factors seem to significantly impact CO_2 emissions, amid concerns about the impact of CO_2 emissions on production being insufficient. Therefore, much empirical research is needed. Compared to the existing literature, this research's main contributions and innovations are mainly reflected in the following aspects. First, updated data up to 2021 was used in this article, which is longer than the previous search period, with more detailed information on the historical trend of the development of CO_2 emissions in the Chinese manufacturing industry. Secondly, the research in line with China's carbon-neutral 2030 goal assesses the Chinese manufacturing industry under China's Made in 2025 plan to efficiently recommend policies to achieve the 2030 goal as China represents the major country emitter of CO_2. We also investigated the evolution of CO_2 emissions from the manufacturing industry in the different phases of the planned economy. Based on traditional factors (emission factors, energy structure, energy intensity, economic structure, and activities), this study integrates capital investments and contributions to innovation by promoting factors such as R&D efficiency, R&D intensity, and investment intensity. The SWOT analysis widens and provides an efficient assessment of the Chinese manufacturing industry to identify its weaknesses and promote the adoption of policies that align with the investments in innovation related to CO_2 emissions, which is useful and provides a policy benchmark for reducing emissions at source.

Overview of China's manufacturing industry

Over the past decade, China has established a stable domestic market with many divisions and a strong independence system. With the rapid development of the Chinese economy, the "Made in China" is actively working in the global market and proving its interests (Soomro et al., 2020). China, the world's largest exporter, accounted for 18% of its exports to the USA last year. Today, $34 billion worth of goods is estimated at 25% of Chinese prices, prompting some companies to expand manufacturing outside of China. China certainly has more factories and manufacturers selling more manufactured goods than any other country in the world. China is also the world leader in many types of products. Especially if one wants to make a unique product, he can save a lot of time and money by working with a manufacturer who specifically shares his product. Made in China 2025 will accelerate existing efforts by sharing other resources and developing more strategic initiatives to coordinate government, private companies, and universities. The plan includes public relations guidelines and other special measures cited by some researchers as designed to protect China from allegations of violating its obligations to the World Trade Organization (WTO) and the USA to avoid from retaliation. These guidelines include setting clear goals, setting common goals, and coordinating specifics beyond problems. Chinese leaders are calling on public and private companies to include their results and priorities in the plan. By providing direct support, the government will increase direct support to Chinese manufacturers through government funding, aid loans, tax breaks, and other forms of support up to 2025. The amount is not clear, but some external sources put the total in the hundreds of billions of dollars.

From an economic perspective, critics point out that China is attracting global markets by prioritizing political views over economic stimulus. Markets harm their subscriptions and lead to the proliferation and abandonment of cheap products in global markets that many countries still believe in — relative to the sun. In March 2018, a Trump administration study (released under Section 301 of the Commerce Act of 1974) found China's actions to be "unreasonable and discriminatory," he said, hurting American manufacturers, while companies based in the USA, Europe, and elsewhere complained about the inconsistency of forcing China to invest abroad. Investment and other regulations severely limit the sales and operations of foreign companies in China. In 2017, the Pentagon warned that China's efforts to become a high-tech leader were in the country's best interest. The Chinese government does not directly fund US companies involved in image production, 3D printing, real estate, and self-driving vehicles as a threat, as these studies show they are "exposing" the boundaries between the public and the people. In April 2018, US intelligence officials called the hiring of Chinese scientists, the theft of US assets, and corruption by US companies an "unprecedented threat" to China. Its goal is to regulate all supply chains, as cobalt powers most electronics, meaning all industries are under the control of geopolitical power. The June 2018 White House report warns that Chinese economic activity threatens "not just the U.S. economy, but the entire global innovation system."

Benefits of the manufacturing industry

China is the world's largest manufacturer of products and recently gained a reputation as a "global manufacturer" after joining the World Trade Organization (WTO) in 2001. Motivated by cheap labor, China's commitment to an open economy and access to low-wage markets, all due to WTO membership, foreign companies, and investors, have established businesses in China, the most populous country in the new millennium. With the help of public investment, China

is now at the forefront of steel, auto parts, pharmaceuticals, electronics, and robotics.

(1) China has a large production capacity which includes 39 large enterprises, 191 medium enterprises, and 5252 small enterprises. Let us say China is the country with the best ranking class globally. The unique trading system involving almost all segments has enabled China to compete in almost all industrial production lines, from systems and footwear to aircraft, natural products, and minerals. In machine guns, it was a massive competition for China and paved the way for the best service from China.
(2) China is the world's largest market. This will ensure the transformation and modernization of the Chinese manufacturing industry. Since November 2020, Chinese sales have increased by 5% and represent nearly 25% of the world population, a direct share of 38% worldwide (Kuzemko et al., 2020). In comparison, Europe and North America contributed less than 5%. The split showed vigorous activity and growth in the Chinese equity market. During the years of rapid growth, the Chinese market reached 3.8 billion RMB, registering an increase of 36.2%. Its global market share is 35% and 46%, respectively. This vital decision placed China at the top of the world trade market. Expanding consumer markets often reflect growth in demand, and increasing demand can create an enabling environment for transformation and upgrading manufacturing facilities.
(3) China has the most significant number of workers in the world. The Chinese government has many people with many tools. Since the advent of the 9-year compulsory education system in 2000, China's educational standards have improved dramatically (Wübbeke et al., 2016). Higher education and the strengthening of various vocational training have embraced higher education. Since 2011, governments at all levels have achieved the "National Medium and Long Term Program for Educational Development and Reform from 2011 to 2020" with significant achievements, especially in priority areas for educational development constituting a potential for strengthening and reforming educational institutions (Feng et al., 2020). The resource management industry highly values the balance between supply and demand for education.
(4) China has added research and development infrastructure to encourage the creation of new industries. Competition from industrial production was the first thing observed in the new sector. China has become a destination country for innovations. In 2015, the country's contribution to R&D was 1.4 trillion yuan, an increase of 38.1% over 2012. From 2012 to 2015, China's contribution to R&D continued to grow, but it is more significant than 11.4% each year. In terms of foreign exchange, R&D spending in China was higher than in Germany and Japan on R&D investments just after the collapse of the USA. In the future, China's growing supply will continue research and development with the introduction of new technologies and the development of manufacturing facilities.
(5) China's regional development policy guarantees the sector's integrity despite changes in industrial production. There are various policymaking industries in China's regions. This lays the foundation for developing national business plans in China. Conversely, the development of the Chinese manufacturing industry is accelerating on the southeastern coast of China, followed by the development of central China, while western China is still lagging (Butollo & Lüthje, 2017). The different distribution of industries and different stages of development allows companies to move between different sectors. In this way, an honest business can also survive by upgrading and renovating Chinese industrial facilities.
(6) The growth and quality of scale efficiency are good. The top 500 Chinese enterprises made a profit of 86.02 billion yuan, an increase of 6.92 trillion yuan over last year, an increase of 8.75%; the net profit was 3,892,414 million yuan, an increase of 360,319 million yuan from the previous year, with a growth rate of 10.20%. R&D increases from 500 Chinese companies by 2020, and R&D will remain at 1.61%, reaching a record level; innovation was available for 39.08% of all patents, an increase of 2.47 percentage points from the top 500 last year.
(7) China is expected to be the world's largest nuclear power producer by 2030, with backup power plant installation expected to increase from 34 GW in 2016 to 111 GW in 2030 and 145 GW in 2040.

China's two purchasing managers' indices (PMIs) are indicators of the economic health of the economy, gauging business sentiment in the sector. It measures the sentiment among larger firms, many of which are state-owned (Fig. 2).

Challenges

Chinese manufacturing companies appear to be enjoying a good recovery. Some say the instability of the world

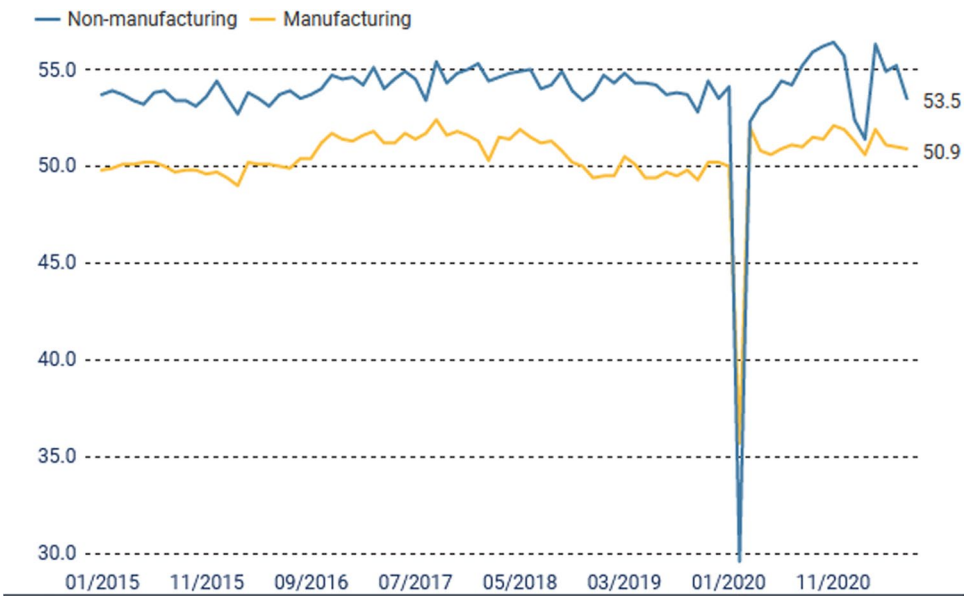

Fig. 2 China's official Purchasing Manager's Indices (source: National Bureau of Statistics)

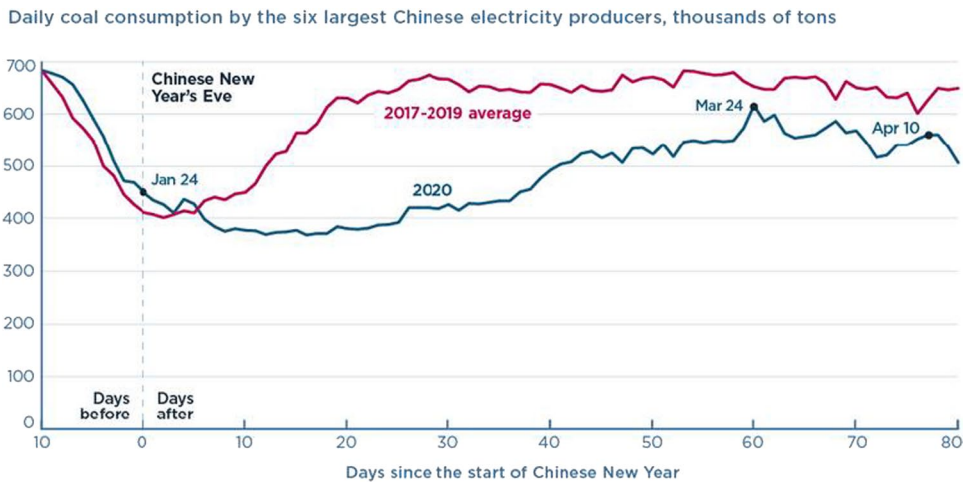

Fig. 3 Resumption of electricity production by the Chinese manufacturing industry after the Chinese New Year (source: cqcoal.com via Wind Financial Information)

economy caused by the COVID-19 outbreak is undermining China's results, indicating that this recovery is unlikely to last. Nevertheless, these researchers appreciate the importance of exports in China's growth. Figure 3 shows the resumption of energy production with the resumption of factories in China after the lockdown.

At the same time, China achieved the core business 4.0 by establishing a standard set of databases, which will allow communication and data integration between different companies. China is at the forefront of defense, long-term transformation and acquisition of the manufacturing industry, intellectual property protection, well-trained workers, managerial leadership, and well-managed administration governance and control.

The conflict between China and USA has had devastating effects on their economies. In USA, this has resulted in high consumer prices and financial hardship for farmers. In China, the trade war helped slow economic growth and the already collapsed manufacturing industry. Many American companies have diverted their supplies to other Asian destinations for fear that war and trade will be a "split" of the American and Chinese economies.

China's 5G network team entered the global market in a major war trade with USA, preventing Huawei from providing communications; USA is concerned about the problem of online security. The importance of online communication is paramount in the 4.0 application. Huawei of China is currently being viewed as a trailer for

Sweden's Ericsson, and Samsung of South Korea is a market leader in developing 5G infrastructure.

Strategic development to achieve a successful upgrade of the manufacturing industry

China's manufacturing industry external factor evaluation matrix

The Quantitative Strategic Programming Matrix (QSPM) is designed to analyze important factors such as socio-economic, cultural, environmental, cultural, legal technological, and industrial conditions that influence the interpretation of systems by strategic planners. This matrix is useful for governmental and non-governmental organizations to develop a particular component over time. However, research will be needed to determine if the results have improved the system. The quantitative Strategic Programming Matrix technique is an efficient device for the strategy defining stage. This tool helps us select the best method and provides a simple basis for prioritizing available space.

Each group is assigned a score between 1 and 5. In the next step, the weight score is calculated (all important points are shown on a large scale) and the total score is calculated. Furthermore, the environmental evaluation matrix is calculated from this total score. The internal factor matrix is measured in the same way. Also, by defining a set of external and internal factors, which are the reasons for defining the methods, the SWOT matrix is derived and appropriate initial methods based on a superior result. In addition, different programs are used to analyze the results of the matrix. We adopted the evaluation matrix of Emami et al. (2012) for our analysis. We used the Quantitative Strategic Planning Matrix (QSPM) to identify the manufacturing industry's external factors. When creating a QSPM, the first step is to include basic industry information and basic business characteristics of the organization. We obtained this information from published articles and research targeting the Chinese manufacturing industry. The beauty score was defined by the importance of each category in defining each direction and is between 1 and 5 where 1 = unattractive, 2 = relatively attractive, 3 = acceptably attractive, 4 = attractive, 5 = very attractive. We then used the SWOT analysis model to tackle the observed weaknesses and then provided recommendations to improve China's manufacturing industry (Tables 1 and 2).

SWOT analysis

The key priorities of SWOT organizational analysis are the improvement of strength, resilience, access to space, and threat notification and removal (Garner, 2005). SWOT

Table 1 External factors influencing China's manufacturing industry

External strategic factors: opportunity	Code	Weight	Score	Weighted score	Explanation
Opening up to the rest of the world	O1	0.09	4	0.36	1948 reform by the government
Exploiting geographical condition of neighboring countries	O2	0.09	4	0.36	Expansion of market
Silk and Belt Road Initiative	O3	0.09	4	0.36	A win-win situation for all countries associated
Governmental facilities	O4	0.09	4	0.36	Adequate infrastructure
Scientific research development and promotion	O5	0.06	4	0.24	Development of new technologies
Establishment of online service platform	O6	0.09	4	0.36	E-commerce empowerment
5G technology to boost the e-commerce environment	O7	0.08	3	0.24	Increase speed of telecommunication
Supporting establishment of export institutes	O8	0.09	3	0.27	Partnership with other companies
Cheap labor force	O9	0.09	4	0.36	Availability of huge human force
Threats					
Competition from other countries such as USA and Germany	T1	0.09	2	0.18	Huge concurrence from other countries
Lack of management and technical knowledge of some managers	T2	0.02	2	0.04	Lack of training to meet the rest of the world's standards
Lack of R&D innovation	T3	0.06	3	0.18	Lack of patent ownership
Political prohibitions	T4	0.03	2	0.06	Restriction by governmental laws
Language barrier	T5	0.01	2	0.02	Barrier in terms of communication
Bad perception about manufacturing products	T6	0.02	1	0.02	False perception about Chinese product
Total		1		2.81	

Table 2 Internal Factors influencing China's manufacturing Industry

Internal strategic factors: strength	Code	Weight	Score	Weighted score	Explanation
Availability of resources	S1	0.09	4	0.36	Abundance of raw materials for production
Low production prices	S2	0.09	4	0.36	Cheap manufacturing cost
Diversification of production	S3	0.09	4	0.36	Existence of diverse technology
Ability of production in large scale	S4	0.09	4	0.36	Large-scale enterprises
Training of personnel	S5	0.09	4	0.36	Routine training of personnel
Easy access to equipment	S6	0.09	4	0.36	Reachability of resources
Adoption of new technologies	S7	0.09	3	0.27	Innovation
Weakness					
High rate of pollution	W1	0.09	2	0.18	Heavy production of CO_2
Overcrowding work environment	W2	0.04	2	0.08	Due to high labor force
Low wages compares to working time	W3	0.06	3	0.18	Cheap working force wages
Mechanization leading to loss of jobs	W4	0.09	2	0.18	Adoption of computerized system
Weak marketing and propaganda	W5	0.09	2	0.18	Language barrier and connection with other countries
Total		1		2.51	

analysis (or SWOT matrix) is a high-level standard used at the beginning of an organization's design process. It stands for "strengths, weaknesses, opportunities and threats." Strengths and weaknesses considering internal values and opportunities and external threats. SWOT analysis helps an organization identify where they are doing well and where they can improve. SWOT analysis allows researchers to point out factors affecting a business by allowing to collect and compare data of many different types and purposes. Therefore, these SWOT analysis matrices provide valuable information for a more complete and in-depth analysis of various risk factors. A SWOT analysis helps develop an understanding of the situation. This method balances internal strengths and weaknesses with positive and threatening opportunities in the organization. It not only determines the options but also all the advantages available over competitors. According to GURL (2017), SWOT analysis is used as an effective situation analysis technique that plays an important role in marketing, public relations, advertising, and any area that requires strategic planning. SWOT analysis is a method of analysis used to assess the "strengths," "weaknesses," "opportunities," and "threats" of an organization, plan, project, person, or company. Irfan et al. (2020) developed a value chain model for the wind power industry in South Asia by assessing the internal and external factors. They analyzed the feasibility of the current state and the future roadmap to promote wind turbines in the energy sector with modalities of the SWOT analysis by focusing on the Strengths, Weaknesses, Opportunities, and Threats of the wind power industry. Bakhtari et al. (2020) assessed certain characteristics of Industry 4.0 using a SWOT analysis that affects the adoption and implementation of Industry 4.0. They identified the strengths, weaknesses, opportunities, and threats related to Industry 4.0; by considering these four sets of factors, industry experts can understand how Industry 4.0 can be implemented. They recommended that industry professionals must use Industry 4.0 strengths/opportunities to make strategic decisions to mitigate the impact of Industry 4.0 threats and weaknesses. Based on previous studies that highlighted the importance of SWOT analysis in the manufacturing industry, we adopted the SWOT analysis to analyze the internal and external factors affecting China's manufacturing industry by focusing on its strengths, opportunities, weaknesses, and threats (Table 3).

Decision-making stage

According to Frost (2020), "Two roads diverged in a wood, and I took the one less traveled by, and that has made all the difference." Nevertheless, unfortunately, not every decision is as simple as "Let us just take this path and see where it goes," especially when you are making a decision related to a business. People are increasingly faced with career changes in the twenty-first century. Each of these transitions involves a decision-making process, usually identifying promising alternatives, gathering information about them, comparing alternatives, and selecting one. It is important to identify areas where people struggle in this process to help them and facilitate career choices (Kulcsár et al., 2020). Peters et al. (2020) analyzed and estimated the relationship between product intelligence information systems, real-time big data analytics, and deep learning–based intelligent process planning using the decision-making process for the sustainable 4.0 industry. Based on previous studies, we implemented the decision making process to investigate the Chinese manufacturing industry efficiency to transition from CO_2 emission to carbon-neutral goal by 2030. Considering the internal and external factor matrix,

Table 3 SWOT matrix

External factors	Opportunities	Threats
Internal factors	-Opening up to the rest of the world -exploiting geographical conditions of other countries. -Silk and Belt road initiative with other countries. -Infrastructure facilities -Government facilities -R&D innovation and promotion	-Competition from other countries such as US, Germany etc. -Lack of management and technical knowledge of some companies -Political effect -Language barrier -Low quality of Manufacturing products
Strengths	Aggressive Strategies (SO)	Conservative strategies (WO)
-Availability of resources - Availability of labor force - Easy access to equipment -Diversification of production -Ability of production in large scale - Low production costs -E-commerce technology platform	-Identification of potential target markets -Export development and insertion into global markets -Production of high quality equipment -Achieving government satisfaction by meeting the set goals.	-Focus on products and insertion into the global markets -Control increase on distribution system -Control increase on product quality and customers' satisfaction -Sales increment through research and marketing activities -Adoption of advanced technologies
Weaknesses	Competitive Strategies (ST)	Defense Strategies (WT)
-Lack of a comprehensive strategy for having better performance local and foreign markets. -Weak marketing and propaganda -Lack of comprehensive distribution network -High mechanization leads to loss of jobs. -High rate of pollution	-Financial and performance risk management -Propaganda increased for introducing China's manufacturing industry to the rest of the world and attracting customers -Promotion of exports	-Constant product quality improvement -Long term planning based on export policies -Adoption of green energy -Mechanization of the whole sector

we identified the following points to maintain a sustainable Chinese manufacturing industry: (1) Focus on products and insertion into the global markets will enable China to maintain its goal of being the global leader of the manufacturing industry. (2) Control increase on distribution system: This will enable China to have diversified manufacturing production to meet global needs. (3) Control increase on product quality and customers' satisfaction: This will enable China to meet global customers' satisfaction. (4) Sales increment through research and marketing activities: This process will enable China to attract more talents in its manufacturing industry. (5). Adoption of advanced technologies: The advancement of China's R&D will significantly have a positive impact on its fast-growing manufacturing industry.

Table 4 China's manufacturing internal and external matrix

"Aggressive" strategy Strength	Opportunity "Conservative strategy" IF = 2.51 Weakness EF = 2.81
"Competitive strategy"	"Defense strategy" Threat

We then summarized the result in Table 4.

Regarding the results derived from Table 4, we have inserted defined strategies for SO into the quality strategy matrix to select the best strategy for the organization.

We can summarize Tables 5 and 6 in Table 7.

Table 5 Quality strategic programming matrix for China's manufacturing external factors

External factors strategy	Factor importance (weight)	1. Focus on products and insertion into the global market		2. Control increase on production system		3. Control increase on product quality		4. Research and marketing development		5. Adoption of advanced technologies	
		Attractiveness factor	Score	Attractiveness factor	Score	Attractiveness factor	Score	Attractiveness factor	Score	Attractiveness factor	Score
Strength(s)											
S1	0.09	4	0.36	3	0.27	2	0.18	2	0.18	1	0.09
S2	0.09	4	0.36	3	0.27	2	0.18	2	0.18	1	0.09
S3	0.09	4	0.36	3	0.27	1	0.09	1	0.09	1	0.09
S4	0.09	4	0.36	3	0.27	1	0.09	2	0.18	2	0.18
S5	0.09	4	0.36	3	0.27	2	0.18	1	0.09	2	0.18
S6	0.09	4	0.36	2	0.18	2	0.18	2	0.18	4	0.36
S7	0.09	3	0.27	1	0.27	2	0.18	1	0.09	1	0.09
Weakness(W)											
W1	0.09	2	0.18	1	0.09	3	0.27	2	0.18	2	0.18
W2	0.04	2	0.08	1	0.04	2	0.08	2	0.08	3	0.27
W3	0.06	3	0.18	1	0.06	3	0.18	1	0.06	4	0.24
W4	0.09	2	0.18	1	0.09	2	0.18	1	0.09	4	0.36
W5	0.09	2	0.18	1	0.09	1	0.09	2	0.18	3	0.27
	1		3.23		2.17		1.88		1.58		2.4

Table 6 Quality strategic programming matrix for China's manufacturing internal factors

Internal factors strategy	Factor importance (weight)	1. Focus on products and insertion into global market		2. Control increase on production system		3. Control increase on product quality		4. Research and marketing development		5. Adoption of advanced technologies	
		Attractiveness factor	Score	Attractiveness factor	Score	Attractiveness factor	Score	Attractiveness factor	Score	Attractiveness factor	Score
Strength(s)											
O1	0.09	4	0.36	2	0.36	3	0.27	2	0.18	3	0.27
O2	0.09	4	0.36	3	0.27	2	0.18	2	0.18	4	0.36
O3	0.09	4	0.36	4	0.36	2	0.18	1	0.09	3	0.27
O4	0.09	4	0.36	3	0.27	3	0.27	2	0.18	3	0.27
O5	0.06	4	0.24	3	0.18	2	0.12	1	0.06	3	0.18
O6	0.09	4	0.36	4	0.36	2	0.18	2	0.18	4	0.36
O7	0.08	3	0.24	3	0.24	4	0.32	2	0.16	3	0.24
O8	0.09	3	0.27	3	0.27	4	0.27	2	0.18	4	0.36
O9	0.09	4	0.27	4	0.36	4	0.36	1	0.09	3	0.27
Weakness(W)											
T1	0.09	3	0.27	2	0.18	3	0.27	2	0.18	2	0.18
T2	0.02	2	0.04	1	0.02	2	0.04	2	0.04	3	0.06
T3	0.06	3	0.18	2	0.12	3	0.18	1	0.06	4	0.24
T4	0.03	2	0.06	2	0.12	2	0.06	1	0.03	4	0.12
T5	0.01	2	0.02	1	0.02	1	0.02	2	0.02	3	0.03
T6	0.02	3	0.06	3	0.18	3	0.06	2	0.04	2	0.04
	1		3.45		3.31		2.78		1.67		3.25

Table 7 Strategies attractiveness in regard to China's manufacturing industry based on internal and external factors

Strategy	1. Focus on products and insertion into the global market	2. Control increase on production system	3. Control increase on product quality	4. Research and marketing development	5. Adoption of advanced technologies
Internal factors attractiveness score	3.45	3.31	2.78	1.67	3.25
External factors attractiveness score	3.23	2.17	1.88	1.58	2.4
Average scores	3.34	2.74	2.33	1.63	2.83

Based on the average lead score in the organized matrix program, product sequencing and global market entry were selected as the best strategy since they have the highest average score, 3.34. Even though Chinese manufacturing products were all over the world, some customers were still doubting the quality of their products over the past years. Due to its large population, most manufacturing companies in China only target their population and its surrounding neighbors. There is a need to revitalize the whole system by integrating new market strategies to conquer the global market and lead the manufacturing industry. However, we recorded a low average research and marketing development score (1.63), indicating that companies must adopt new marketing strategies to boost their global market by adopting new marketing techniques. For instance, they can use international students studying in China to attract more customers from their various countries by being the bridge between China and their countries. The participation in global trade fare will significantly boost the Chinese manufacturing market as they can display their products and attract more customers. The Chinese manufacturing industry faces several challenges; China's industrial and manufacturing sector accounted for nearly 38% of China's GDP in 2020. However, China's industrial production has declined in recent years, reaching 3.8% in November 2021. These challenges include unreliable products, lack of scientific programming and marketing methods, and lack of definition of requirements. There is also a need to boost R&D by attracting more talents who can significantly impact the manufacturing industry. With the help of the government and alliances, new talents can be invested in the manufacturing industry to boost its production and adopt new technologies that can reduce the cost of production effectively. Carbon emission represents another major problem faced by the Chinese manufacturing industry as they constitute the world's first emitter of CO_2; there is a need to adopt new technologies to reduce the emission of CO_2 efficiently.

Achieving the goal of carbon neutral by 2030

China has the largest emitter of CO_2 in the world. As the largest consumer of oil and CO_2 in China, the manufacturing sector plays a key role in meeting China's reduction targets. Based on our SWOT analysis, we were able to identify the contaminants affecting the Chinese manufacturer's CO_2 windows. CO_2 production in China will increase from 6.25 billion tons in 2015 to 10.67 billion tons of carbon dioxide in 2020, with an annual increase of 6% (Statista, 2020). The fusion of iron with copper and oxygen resulted in the release of carbon dioxide, followed by raw materials, chemicals, and non-metallic minerals. The impact of industrial activity is the main reason for the increase in CO_2 emissions compared to production. Energy efficiency has been the main factor in reducing CO_2 emissions with respect to production. The rapid development of industrial facilities will inevitably lead to an increase in carbon dioxide emissions. Furthermore, the drivers of CO_2 emissions in various parts of the manufacturing sector are reducing CO_2 emissions, developing a low-carbon economy, and increasing green production as quickly as possible. Large investments were the second most important factor in the increase in CO_2 emissions from Chinese manufacturing companies, with even a greater impact on companies in some cases.

Effect of carbon emission on the environment

Strength training offers great environmental benefits. In particular, it reduces GHG emissions, directly linked to the combustion or consumption of toxic fuels, and gradually eliminates the production of electricity. Implementation capacity is an important factor in tackling climate change, an action that is increasingly needed due to the recent rebound and the time it takes to complete destructive projects, as pointed out in the recent report by the International Intergovernmental Panel on Climate Change (IPCC) above 1.5 °C temperature (Jermsittiparsert, 2019). Energy efficiency

is one of the most important ways in the world to meet the demand for energy efficiency and low energy consumption, which is crucial for many of the IPCC's GHG distribution methods to limit the global warming of 1.5 °C (IPCC, 2018). Greenhouse gas energy increased to 1.4% from 32.5 Gt of CO_2 equivalent (Gt CO_2-eq) in 2017, the first increase since 2014, after strong global economic growth due to an increase in consumption of crude oil performance (Cheng et al., 2020b; Zhang et al., 2020). At the same time, efficiency has helped slow emission growth: had efficiency improved since 2000, emissions would have been nearly 4 Gt CO_2-eq or 12%, higher in 2017. Based on a model developed within the framework of Energy Efficiency 2018, if the world implements global energy efficiency actions, based on existing technologies, this will lead to an increase to a peak in energy-related GHG before 2020 and 2040. According to this plan, studied in our global scenario (SAP), the reduction in annual energy emissions of 3.5 Gt CO2-eq (12%) could continue to be effective compared to 2017 standards, which represents more than 40% of the reduction necessary to comply with the Paris Agreement (Schneider & La Hoz Theuer, 2019). Therefore, in addition to renewables and other systems, efficient energy is essential for achieving global energy goals.

The efficient usage of energy offers great environmental benefits. In particular, it reduces GHG emissions, directs emissions from the combustion or consumption of toxic fuels, and reduces emissions from energy sources. Performance resilience is an important factor in managing climate change, and action is even more necessary with the recent increase in cleanup times and delays in dealing with layoffs, as confirmed in the previous report. A special report by the Intergovernmental Panel on Climate Change (IPCC) on the 1.5 °C warming stated that energy efficiency is one of the primary ways the world can meet the demand for energy efficiency and low power consumption, which is essential to many of the IPCC's greenhouse gas distribution methods to warm the world to 1.5 °C (IPCC, 2018) (Huppmann et al., 2018). Greenhouse gas energy increased by 1.4% to over 32.5 Gt of CO_2 equivalent (Gt CO_2-eq) in 2017, the first increase since 2014, after strong global economic growth and greater fuel efficiency. At the same time, good performance has helped to curb recent growth: if quality had not improved since 2000, yields of around 4 Gt CO_2-eq, or 12%, would have been higher than those of 2017. Based on models developed within the framework of Energy Efficiency 2018, if the world implemented all profitable energy policy actions, based on existing technologies, this would lead to an increase in the network's GHG emissions. According to a plan by Energy for 2020 and 2040, analyzed in our global warning system (EWS), the annual energy reduction is compared to a capacity of 3.5 Gt CO_2-eq (12%) of a potential result in 2017 in good health, representing more than 40% of the reduction needed to comply with the Paris Agreement. Therefore, high energy efficiency is essential to achieving global goals alongside renewables and other systems.

China's involvement in terms of carbon neutralization

Carbon neutrality means balancing carbon emissions and removing carbon from the atmosphere in a carbon sink. It captures carbon monoxide from the atmosphere and then stores it. Global greenhouse gas emissions must be balanced with carbon sequestration to achieve net-zero emissions. A carbon sink is a system that absorbs more carbon than it emits. Soils, forests, and oceans are the main natural carbon sinks. It is estimated that a natural sink removes between 9.5 and 11 Gt of CO_2 per year. Global annual CO_2 emissions reached 38.0 Gt in 2019 (Qin et al., 2021). To date, human carbon-zinc has failed to remove carbon from the atmosphere on the scale needed to combat global warming. Carbon stored in a natural sink such as forests is released into the atmosphere through forest fires, land-use changes, or logging. Therefore, reducing carbon emissions is essential to achieving climate neutrality.

Another way to cut emissions and try to balance carbon independence is to shut off gas emissions in one area while reducing them in others. This can be achieved through the use of renewable energies, or other clean and low-carbon technologies. The EU Emissions Trading System (ETS) is an example of a carbon offset scheme. The European Union is committed to a sound monetary policy. Under the Green Treaty, the European Union is expected to be the first continent to eliminate CO_2 emissions by 2050. This target will be regulated by law if the European Parliament and the Legislative Assembly adopt new rules. The EU's growth limit for 2030 will shift from the current 40% reduction to a more ambitious target. On October 7, 2020, the European Parliament adopted climate neutrality in 2050 to reduce emissions by 60% by 2030 from 1990 levels above the Commission recommendation and by 55%. MEPs call on the Commission to set a series of additional targets for 2040 to ensure definite progress towards target setting. In addition, members of all EU countries have advised horses, and by 2050 more CO_2 will have to be released from the air than expected. Likewise, direct or indirect links with oil prices beyond 2025 should be eliminated. MEPs call for the creation of the European Council on Climate Change (ECCC) as an independent scientific expert to examine relevant arrangements and monitor progress. Parliament then begins a debate with the Council. Currently, five EU countries have established climate neutrality: Sweden plans to achieve net gross inflation by 2045 and Denmark, France, Germany, and Hungary by 2050.

In his speech to the 75th session of the United Nations General Assembly (UNGA 75) on September 15, 2020,

President Xi Jinping said China will aim "to achieve CO2 emissions by 2030 and achieve neutrality carbon by 2030. 2030. 2060." He was surprised more than once in the international community but was also called upon at a crucial time in the global fight against climate change. Although Covid-19 started in 2020, China was the first country to completely eradicate the virus in 2021; so far, no cases have been reported. Since then, he has focused on protecting public health and promoting rapid economic recovery, including spending $27.5 billion in the clean energy sector. According to the Energy Policy Regulator developed by ODI and its partners, only Germany spends more. These figures confirm President Xi Jinping's recent commitment to pursue carbon neutrality. There is no doubt that China's new commitments are based in part on scientific evidence of the catastrophic consequences of climate change (Cheng et al., 2021).

Implementation of policies for carbon neutralization

To understand China's "green" plans, it is important to identify the main challenges facing the country and the priorities of its government. After 30 years of waste and heavy waste, China is now seeking to develop a new growth model that responds to economic and environmental pressures. The idea of protecting the environment could harm the economy by lowering the country's GDP. Instead, the Chinese government views low-carbon zones as reasons for future growth. As the Chinese government says every day, "unlike Western countries which started solving environmental problems when they got rich from their huge sewage system in developing countries."

In late 2014, President Xi unveiled the term "new normal" which describes China's shift to slower, more sustainable, and more efficient economic growth transformation by avoiding the "income trap" and the status quo is maintained. Environmental concerns are also believed to improve energy security, for example by reducing greenhouse gas emissions.

The current system for submitting climate plans obliges all governments to choose a definition of equality. The only way for everyone to see their emission reduction plans, development needs, and key development goals is to have in-depth emission reduction capabilities and capabilities. For example, China is currently a major air pollution problem. An immediate response to this problem would be greenhouse gas emissions in China, and the same for other countries. For example, when it comes to energy security in Japan, India also has important development target countries. New changes in low-carbon technologies may also be introduced, for example, reducing the cost of technologies to be used by developing countries. One will have a better ability to reduce productivity; risk management is very important and requires a lot of work. It is estimated that we can achieve a 2% C forecast of 50% in two birds, but changes in the price of options can be the worst-case scenario. What do people look like at their worst? Can we assume a 3 or 4% probability of a temperature rise of 4 °C or 5 °C? Humans must take control of small but potentially influential actions.

China's process of decarbonization

There are three aspects to this: the first is the increase in an operational capacity, such as the increase in the use of technology and structural changes to achieve an increase of 4% in the energy efficiency of GDP each year. The second is the purification of electricity by increasing the amount of renewable energy and mixing it moderately with the use of carbon and storage in the electric field to reduce production. The achievement of these targets will ensure that the increase in electricity per unit of electricity is 90% less than in 2010. The third is the increase in electricity, especially in industry, and transport in the general family. There is a need to replace coal electric stoves with industrial coal stoves, increase the use of electricity generators, and use more electricity to heat and heat water.

The second and third approaches are closely related. First, we need to cut the electricity, then we need more electricity to reduce the production (of the heavy work). All three are essential for deep disarmament, and none can be lacking. In the coming years, China will continue to experience economic growth. We expect GDP growth to slow from 7% today to almost 5% in 2030, and then from 2.5 to 3% in 2050. GDP growth will increase, which means that more renewable energy will be needed and more energy when China needs to increase its performance by 2030. After 2030, as growth slows GDP and satisfies exercise and increases energy efficiency, so does consumption.

Transitioning to green energy

The rapid growth of renewable energies in China began in 2005 with the enactment of the first Renewable Energy Law 17 (amended in 2009). The basic rules of communication and transportation lines have been established, which regulate energy consumption, the flow of costs, and the efficiency of financing green energy innovation. Today, China is the largest investment market in the world, attracting approximately $54.2 billion.

New investments costing 35.4 billion pounds were achieved in 2013; US$89.5 billion (about 58.4 billion pounds) in 2014. That year, China received 73% more than USA, the second-largest country in the world, in terms of investment. Then an appropriate rapid growth was observed, driven by a strong policy and market environment. In 2005, China's wind capacity was 0.126 gigawatts (GW), but it reached 96 GW 19 by the end of 2014.

Power growth was much higher, from 0.009 GW in 2010 to 28 GW in 2010. In 2014, wind energy and the largest waterfall in the world supply in China were reported. In 2013, China added more solar photovoltaic (PV) capacity to all of Europe; it is one of the largest wind and branched turbines in the world, which has reduced the cost of each technology in recent years.

The rapid growth of renewable energy in China began in 2005 with the enactment of the first Renewable Energy Law 17 (amended 2009). The basic rules of communication with the line have been established, which govern electronic payment, the flow of costs, and the efficiency of financing. Today, China is the world's largest market for financial investment, attracting around $54.2 billion.

New investments costing 35.4 billion pounds were achieved in 2013, reaching 89.5 billion US dollars (about 58.4 billion pounds) in 2014. That year, China received nearly 73% more than USA. USA, the second largest country in the world, then had an appropriate rapid growth, driven by a strong policy and market environment. In 2005, China's wind capacity was 0.126 GW, but it reached 96 GW 19 at the end of 2014. Solar power growth has been much greater, from 0.009 GW in 2010 to 28 GW in 2010. In 2014, the largest wind power in the world and a water supply system located in China were reported. In 2013, China added more solar photovoltaic (PV) capacity to all of Europe; it is also one of the largest wind turbines and subsidiaries in the world, which has significantly reduced the cost of all technologies in recent years.

Conclusion

In recent years, China's manufacturing industry has gone through three stages of development, namely, restructuring, the growth of private and foreign manufacturing enterprises, and the promotion of Chinese manufactured products in international markets. † Today, China's manufacturing industry faces both development opportunities and challenges. At the same time, it has the most complete trading system and a wide range of retail markets. Encouraging the transfer of knowledge from different sectors within national borders will provide an important opportunity for other productive and supporting sectors to develop their skills. Due to the importance of the local market, the imbalance between rural and developed areas is likely to provide growth opportunities for large areas of the country to establish production and circulation systems. Moreover, with the introduction of energy saving and emission reduction in China, the amount of renewable energy is gradually increasing due to the reduction of CO_2 emissions. The data from this study therefore provide suggestions for fostering dynamic development.

Based on the SWOT analysis, our study examined both the internal and external factors that are influencing China's manufacturing industry to achieve its 2025 goals. The results show that the national choice of making new changes by transforming the manufacturing industry sector and regulating carbon emission has a positive influence on the economic growth of the country. The findings state that the Chinese government is strengthening its manufacturing industry based on sustainable environmental policies, reforming laws, and regulations governing the manufacturing industry. Based on these results, choices in the manufacturing industry can improve performance, productivity, and efficient energy consumption by adopting green energies that are friendly to the environment. Policy-based strategies on new outcomes should take into account the strength of these policies and seek to minimize carbon emission and promote a carbon-neutral goal. The results show that the impact of industrial activity is the main driver of the increase in CO_2 emissions in the Chinese manufacturing industry. However, we cannot achieve the goal of reducing emissions at the expense of the economic development. Therefore, priority should be given to energy conservation and emission reduction in CO_2-emitting industries, such as smelting and rolling of ferrous metals, raw materials, and chemicals, as well as for non-metallic minerals. By developing different CO_2 emission or energy saving standards, we can improve the production process and reduce the intensity of energy consumption to achieve the goal of higher energy consumption and less CO_2 emissions. In addition, efforts should be made to develop new energy-saving and highly efficient manufacturing industries, promote industrial restructuring, and strengthen the economic development of the manufacturing sector. We recommend the following principles: (a) Educational organization of key development tools: educational issues such as national law, exports, quality, and modern management for the head of production units can all contribute to the development of the industry. (b) There are many small units that cannot participate in the global and local markets. The creation of sales entities and the collaboration of these units will allow them to participate in these markets. (c) In terms of identifying unit product weaknesses in the market, international production is well integrated so that Chinese manufacturers can understand these markets. Sales representatives and departments in other countries can provide useful information about marketing conditions in other countries. Moreover, the presence of tourists and travelers in China is another opportunity to explore these markets. (d) Government patents are called to handle more research, advertising, and sales in target markets to help these companies market locally and globally.

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