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China's Green Transition Policies and Its Implications for Korea

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I. Introduction

China's total emissions of carbon dioxide (hereinafter referred to as carbon) by sector in 2020 were approximately 10.12 billion tons, about 19 times the total emissions of Korea (546 million tons). In China, carbon emissions from the energy and heat producing sector account for 53.4% of total emissions, with industry (28.6%) and transportation (8.9%) also major carbon emission sectors.

In particular, it is necessary to pay attention to the city as a space where green conversion policies are promoted in the above three areas. Cities are places where most economic activities occur in modern society where the population lives densely. In addition, major traditional manufacturing industries are concentrated in Chinese cities. Therefore, this study analyzes the green transition policy in the energy, industry, and transportation fields of Chinese cities.

Table 1. Carbon Emissions by Major Sectors in China

Unit: Mt CO_2(%)

Sector	2010	2015	2020
Energy and heat producer	3509(7.8)	4298(4.1)	5399(4.7)
Industry	2846(8.0)	2996(1.0)	2890(-0.7)
Transport	575(7.4)	836(7.8)	904(1.6)
Other energy industries	354(14.6)	327(-1.6)	308(-1.2)
Residential	298(1.7)	366(4.2)	333(-1.5)

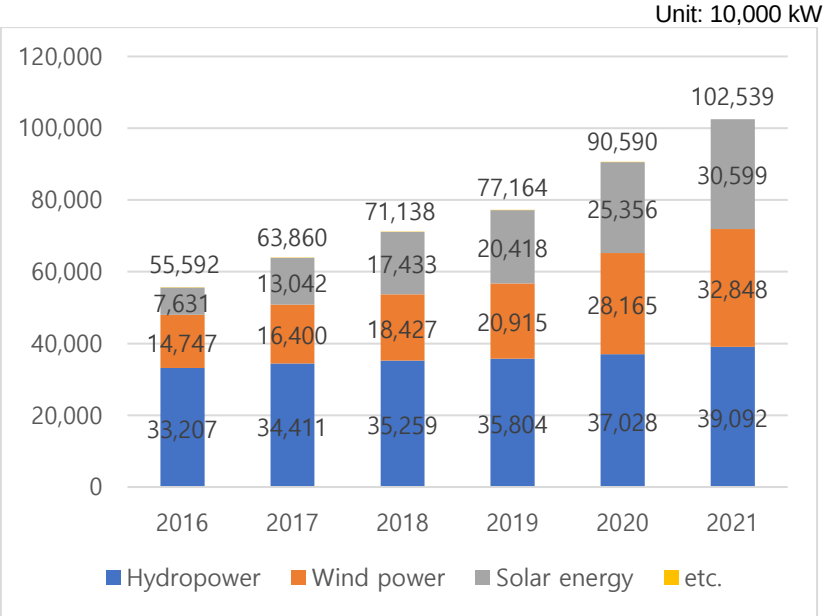
Note: ( ) is compound annual growth rate for 5 years.
Source: IEA Energy Statistics Data Browser (updated: 2022.8.18).

II. Policy Implementation by Field (Sector)

1. Energy Sector

As of 2021, China's renewable energy generation facilities already exceed 1 billion kW in capacity, accounting for more than 40% of the total power generation facilities, and the combined capacity of hydro, wind, solar, and biomass power generation facilities already rank first in the world. China plans to focus on low-carbon conversion and supply guarantees in the energy sector during the 14th Five-Year Plan period, and to promote the scale and development of renewable energy through the reorganization of its energy system. During this period, China's key to “expanding production of non-fossil energy” is to expand wind, solar, and nuclear power projects in coastal areas. Accordingly, in Chinese cities the promotion of rooftop-distributed photovoltaic power generation, among renewable energy sources, is evaluated to be capable of intensive development, reducing power peak load and inducing residents to consume green energy.

Figure 1. Renewable Energy Power Generation Facilities in China (2016-2021)



Source: CEIC DB (accessed on 2022. 5. 9).

In addition, since wind and solar power are greatly affected by the climate, nuclear power generation projects with low carbon emissions and stable power supply will be operated in pilot cities and expanded to other regions according to the results. In particular, development of the latest technologies such as small modular reactors (SMR) and the comprehensive use of nuclear power are an area emphasized within the 14th Five-Year Plan. In addition, in order to lay the groundwork for increasing the utilization of renewable energy, the Chinese government plans to promote maintenance of the transportation power grid

system, strengthen inter-regional power grid connectivity, build smart distribution networks for decentralized renewable energy power, as well as encourage the construction of smart energy systems and small power grids. It aims to stabilize energy supply and expand new and renewable energy supply by promoting “small independent power grid + distributed energy source” projects in cities, along with existing large renewable energy plants. The green conversion in China's fossil energy sector is aimed at exiting coal mines or coal-fired power plants as before, but rather than rapidly removing fossil energy for stable power supply, it focuses on low carbonization and high efficiency of power generation.

2. Industrial Sector

First, to reduce pollution and carbon emissions, China intends to control the total amount of emissions to reduce emission intensity (pollutants 10%, carbon 18%). Major policies include reducing pollutant emissions in production processes and innovating related technologies, reducing emissions according to product life cycles, low carbonization of low-cost CCUS and industrial energy sources, strengthening production capacity control and evaluation of high-emission industries, fostering specialized institutions related to emission calculation systems and emission management information systems, and tax and financial support.

Increasing energy utilization efficiency in the industrial sector is a major means of reducing carbon emissions in China, as the sector accounts for about 65% of total energy consumption. Accordingly, China plans to reduce the energy consumption per value added of industrial enterprises (annual sales of 20 million yuan or more) by 13.5% up to 2025, compared to 2020 levels. It also aims to improve the energy efficiency of major energy-intensive industries such as steel, petrochemical, non-ferrous metals, and building materials. To this end, the 14th Five-Year Plan focuses on the development and application of energy consumption reduction technology, the introduction of high-efficiency energy-saving general-purpose facilities throughout the industry, and energy-saving measures at data centers and base stations.

To improve the level of resource utilization, China plans to increase the level of comprehensive use of manufacturing resources over the next five years by enhancing the comprehensive utilization rate of industrial solid waste and expanding the recycling and remanufacturing of major renewable resources. It plans to increase the recovery rate of waste non-ferrous metals and establish a management system for waste-powered batteries as a way to secure strategic metal resources such as copper, aluminum, cobalt, and lithium.

China wants to further develop its green manufacturing system. As a policy goal, the government plans to distribute 10,000 green products and build and develop green low-carbon factories, supply chains, and industrial terminals to promote the green transformation of

SMEs and raise the level of clean production. In particular, it plans to focus on establishing a green standard system and a green manufacturing public service platform, strengthening the role of leading companies in driving small and medium-sized enterprises and strengthening green manufacturing-related market functions. China continues to expand financial support for pilot projects (products, factories, industrial complexes, supply chain management companies) selected on the green manufacturing list, and is pushing for internationalization of standards and certification of green factories, supply chains, and products.

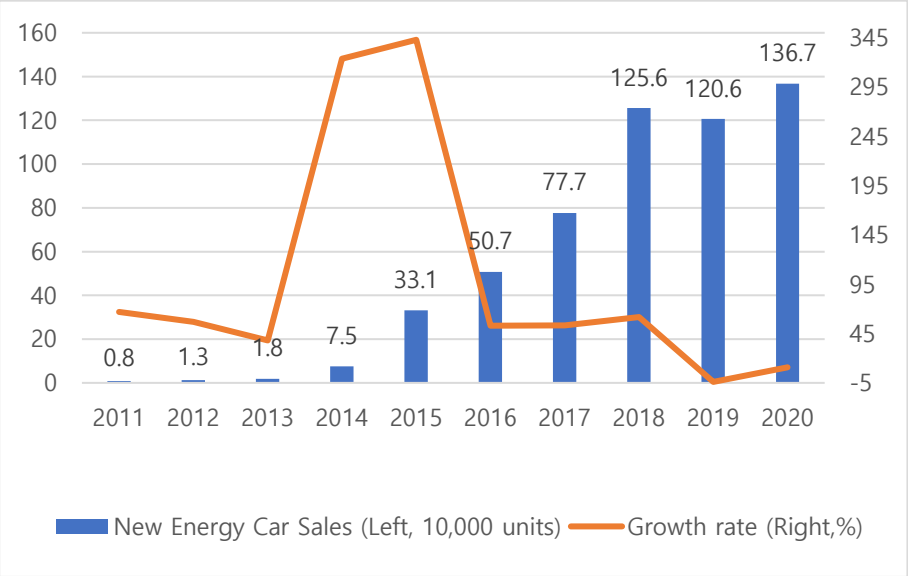
3. Transportation

To reduce emissions, China is pushing ahead with regulations on internal combustion locomotives at the level of advanced countries by raising its emission standards beyond European standards and requiring related government agencies to transmit exhaust information during actual internal combustion locomotives in real-time. It is also promoting a “dual credit” policy as a means of controlling the supply of internal combustion locomotives in China. This dual credit system is enforced with strong administrative regulation, such as banning automakers from producing internal combustion locomotives when they fail to meet the NEV credit level designated by the Chinese government for a year.

Above all, large Chinese cities are promoting the purchase of new energy vehicles through various support policies such as subsidies along with restrictions on the use of internal combustion locomotives. In order to expand the supply of new energy transportation vehicles, China has focused on the mandatory conversion of electric vehicles in the public sector, subsidies for new energy vehicles, and charging infrastructure. The Chinese government has gradually reduced the size of purchase subsidies by increasing the standard for electric mileage of new energy cars and suspending payments to companies with annual sales of less than 10,000 units, but is extending current subsidy policies to boost sluggish consumption due to COVID-19. In particular, major cities such as Tianjin, Suzhou, and Shenzhen were selected as pilot cities for the supply of new energy vehicles, and are in the top ranks in terms of the number of new energy vehicles owned. In the future, many pilot policies necessary for green conversion in the transportation sector are expected to be implemented.

The development of green transportation technology is mainly focused on accelerating the expansion of new energy and clean energy transportation equipment, energy saving, accelerating the use of key environmental technologies, and completing the green transportation standard system. In particular, various integrated transportation services are being promoted in large cities such as Beijing and Shenzhen, and Guangdong Province is also promoting pilot operations in the area of power market construction using vehicle-to-grid (V2G) technology and the development of hydrogen battery automobile technology.

Figure 2. Sales of New Energy Vehicles (NEVs) in China by Year



Source: https://www.statista.com (accessed on 2023.2.7).

III. Implications

Based on these analyses, we propose the following policy implications for Korea. First of all, in the energy sector, Korea should also establish an institutional foundation for the use of new nuclear technology such as small reactors in Chinese pilot cities. And when conducting cooperation projects between Korea and China, it is important to maintain and operate interactive channels on nuclear safety. To counter potential risks in this area, it will be important to secure raw materials for solar production.

In the industry sector, Korea needs to foster the professional service industry related to the green transformation of SMEs. And in the area of cooperation between Korea and China, it is important to pursue joint development of emission reduction technologies in industries such as steel/cement. As for associated risks, Korea should be prepared to respond to enhancements in China's green manufacturing capacity.

In the transportation sector, Korea must design a roadmap and related policies for reducing internal combustion locomotives. And when it comes to cooperation between Korea and China, it is important to cooperate in Tianjin, Suzhou, Shenzhen, and Guangdong in green transportation technologies such as hydrogen and V2G systems. Preparing for risks in this sector, Korea should strengthen its competitiveness in electric vehicles. KIEP

Table 2. Key Implications by Sector

Field		Implications for Korea
Energy	Policy	- Establishment of an institutional foundation for the use of new nuclear technology such as small reactors
	Cooperation	- Maintaining and operating interactive channels on nuclear safety
	Risk	- Preparing for risks related to the supply of materials used in solar production
Industry	Policy	- Fostering the professional service industry related to green transformation of SMEs
	Cooperation	- Cooperation in emission reduction technologies in industries such as steel/cement
	Risk	- Risk preparedness due to China's green manufacturing capacity enhancement
Transportation	Policy	- Roadmap and related policies for reducing internal combustion locomotives need to be implemented
	Cooperation	- Cooperation in Tianjin, Suzhou, Shenzhen and Guangdong in green transportation technology such as hydrogen and V2G
	Risk	- Strengthen the competitiveness of electric vehicles