

4차 산업혁명시대의 한국 녹색 물류 활성화 정책에 관한 연구

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A Study on Korea's Green Logistics Activation Policy in the Age of the Fourth Industrial Revolution

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Received 01 April 2021, Revised 03 May 2021, Accepted 28 June 2021

Abstract

The purpose of this study is to contribute to the revitalization of the green logistics of Korean companies by presenting the current status and problems of Korean logistics as influenced by government policies. This paper analyzes green logistics from a legal and institutional perspective. Analysis focuses on low-carbon green growth measures and government policy, especially for CO₂ reduction. It considers how policies can be enacted to promote green logistics. This study reports several findings on green logistics in Korea. First, it reports the theoretical considerations of the Republic's green logistics. Second, the study details the current status and problems of green logistics. Third, it considers ways to implement a green economy, green technology, and green transportation, while also considering arguments for avoiding these eco-friendly solutions. Fourth, it argues that revitalization measures are needed to establish an advanced logistics system for eco-friendly green logistics facilities. To achieve this revitalization, Korean logistics should be competitive in the global logistics market. This study may contribute to the expansion of the industrial cooperation of Korean logistics companies by presenting necessary review tasks for governmental green logistics policies, although the issue has long been important to Korean logistics.

Keywords: Green Logistics, Green Growth, Green Logistics Policy

JEL Classifications: F10, F13

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I. Introduction

With climate change adversely affecting our environment, recent research efforts are focusing on ways to reduce carbon emission. In addition, these efforts conduct eco-friendly logistics activities by suppressing global warming and maintaining sustainable green growth without destroying the environment. Efforts to the environment have a significant impact on the high profit and efficiency of market share in the company's logistics system (Rao and Holt 2005).

This realistic trend is related to green logistics strategies that represent eco-friendly, eco-friendly production, and green operation strategies. Due to the nature of eco-friendly companies and the correlation of modern transportation systems, green logistics technology serves as an important link in supply chain management and eco-friendly logistics systems.

In other words, green logistics should be implemented in a way that is economically, environmentally and socially beneficial. In July 2008, only 55 ports around the world declared that they would cut carbon dioxide emissions by 50% by 2050 through the World Port Climate Declaration. Korea has set a goal of reducing greenhouse gas emissions by 30 percent by 2029. In particular, the logistics transportation sector is pushing ahead with the goal of reducing greenhouse gas emissions by more than 33% compared to the Business As Usual (BAU). However, 8% of energy CO₂ emissions come from cargo transportation due to the impact of eco-friendly supply chains and eco-friendly logistics transportation. In addition, the target greenhouse gas management system is targeted only at large-scale greenhouse gas emission sites. In other words, it's not easy to achieve the current target of 4%. (Korea

Industrial Complex Corporation, 2010).

The environmental revenue of logistics is to reduce greenhouse gas emissions by reducing the amount of carbon dioxide emitted when transported in various ways. Such green research will contribute to Korea's future green growth and eco-friendly logistics industry. As a result of examining the current status of green growth and greenhouse gas emissions in Korea, the current reality of green logistics in Korea is very scarce. Therefore, this study is essential for environmental protection and carbon dioxide reduction. This study aims to ensure low carbon green growth and competitiveness of green logistics in order for green logistics to be eco-friendly. We are developing strategies and policies for the development of the fourth industrial revolution of green logistics, but Korea still lacks discussions on strategies and policies. First, measures to revitalize green logistics, which require new awareness and value creation of green logistics. Second, with the advent of the Fourth Industrial Revolution, needs a legal system also to improve it.

Furthermore, this study seeks to clarify the concept of Korean green transportation and existing green logistics and examine the problems to find ways to revitalize green logistics. It was intended to describe the necessity and purpose of research in Chapter 1 to achieve the low carbon target by 2050, and to examine the theoretical background research and the current status and problems of Korea's green logistics in Chapter 3, and to explore ways to revitalize green logistics in Chapter 4. Finally, we would like to provide implications and present limitations and conclusions so that environmentally friendly logistics, which companies perceive as important, can be used for green growth.

II. Theoretical Background Study

Green logistics serve to protect the environment, improve energy efficiency, eco-friendly packaging, and secure competitiveness in the global market through green logistics with green growth.

Considering domestic and foreign studies related to green logistics, the following are considered:

Kim Hong-Seop (2009) insisted green logistics as the source of the logistics process to save resources and promote the recycling of supplies, and introduced strengthening international conventions such as strengthening environmental and safety regulations, strengthening international logistics standards, and climate agreements. It also argued for the case study and environmental logistics introduction and expansion strategies necessary for the introduction and expansion of environmental logistics suitable for Korean life.

Kim Tae-Hwan and Yoo Seung-Kyun (2012) stressed that government policy should strongly support green growth and green logistics. They argued that policy should provide a framework to solidify the technological base, manpower training, and eco-friendly markets that are necessary to a nationwide green logistics system. Though this system would be a new growth engine, financial support would be necessary to establish it.

Kang Sung-man (2011) attempted to study cases of advanced foreign companies to promote green logistics for domestic logistics companies. It said that synergy effects across SCM should be maximized by improving the business process for realizing green logistics and creating a green logistics environment such as guidance and campaigns for realizing green logistics to suppliers and customers, including executives and employees.

In the consideration of the Korean logistics

policy for green logistics efficiency, Jeon Dong-Han and Kang Sang-Gu (2014) stressed that the overall consideration of a green logistics policy is needed as the changes in the logistics environment emphasize work segmentation and information technology development. In a study on the derivation of greenhouse gas emission reduction strategies in industrial complexes through semi-conductor, geostationary type, Ju Gi-Hoon, and Lee Tae-ho (2014), the case study was conducted to draw up a greenhouse gas reduction strategy in industrial complexes by considering technology level, policy status and feasibility.

Lee Choong-Bae, Kim Jung-Hwan, and Kim Min-Kwan (2011) compared and analyzed the cases of green logistics policies in advanced countries in a comparative study of green logistics policies for low carbon green growth. It also derived policy implications for building green logistics to realize low carbon green growth in Korea.

Therefore, in order to revitalize green logistics, we would like to examine the current status and problems of green logistics in Korea and green logistics policy measures for future environments.

Lastly, this study aims to present the tasks and implications of the Korean government's Green New Deal project, which companies need by improving low-carbon, high-efficiency industrial technology and building sustainable green growth.

III. The Current Status and Problem of the Korea Green logistics

1. The Current Status of the Korea Green logistics

Green logistics minimizes the adverse environmental effects caused by logistics

activities and to establish eco-friendly logistics activities. In other words, most of the studies considered only economic aspects, such as streamlining the logistics system, strengthening the competitiveness of the logistics industry, and creating value-added products. Green logistics is an advanced logistics system that minimizes energy use and carbon emissions in logistics activities by breaking away from the current logistics concept. After declaring low-carbon green growth as a national vision on August 15, 2008, the Korean government announced 27 core projects on February 25, 2009, including eco-friendly SOC green life, green growth, green economy, green industry creation, climate energy growth, green management, and low carbon high efficiency industrial technology. Both the government's management strategy and market role are important for reducing pollution, economic growth, and stable production growth. In addition, the Seoul Metropolitan Government supports green IT sectors such as smart grid development and intelligent transportation systems related to energy conservation. Environmental areas include pollution management such as air, waste, and water quality, and activation of green cities. In other words, green cities will support eco-friendly SME's such as resource circulation and eco-friendly technology development to explore overseas markets and enter overseas markets. Overseas market development and exchange of green technology through green products and green logistics will be carried out in two directions for China, India, Southeast Asia, and Japan.

In addition, the government recently decided to launch in Durban, South Africa, in December 2011 under a climate change agreement in which both developed and developed countries will be obliged to

reduce greenhouse gas emissions after 2020. Specific negotiations on the new climate system were finalized on December 2015

To counteract this, we have announced a new scenario for greenhouse gas reduction in 2030. According to the government's Intended Nationally Determined Contribution (INDC), the new greenhouse gas reduction goal is a 37% reduction from the 2030 emissions forecast, which is strengthened from the previous Business As Usual (BAU) in 2020. The targets for this reduction were negotiated at the 21st General Assembly of the Parties (COP-21) to be held in Paris in December this year. In addition, greenhouse gases and environmental pollution should be reduced and new growth engines should be created. As part of measures to cope with climate change, new policies on carbon dioxide reduction and sustainable green growth in the transportation sector are also needed. In addition, it is imperative to transfer eco-friendly transportation technology to cope with climate change for green growth in the future. Developing countries should actively participate in international greenhouse gas reduction efforts. We need to play a role between developed and developing countries and support from all countries in the world. Therefore, we will look at the greenhouse gas emissions discussed so far.

Looking at Korea's greenhouse gas emissions, demand for the industrial sector is gradually increasing from 97.2% in 2006 to 105.8% in 2010, 115.8% in 2015, 134.2% in 2020 and 55.7% in 2025. The transportation sector's demand is forecast to increase to 55.4% in 2025. In the home and commercial sectors, it is expected to continue to increase from 36% in 2006 to 40.9% in 2010, 45.8% in 2015, 50.7% in 2020, and 59.1% in 2030. Looking closely at the outlook for greenhouse

Table 1. Final Energy Demand Forecast by Sector in 2030

(Unit: Dollars)

Sector	2006	2010	2015	2020	2025	2030	Ratio
Industry	97.2 (56.0)	105.8 (55.6)	115.8 (55.7)	134.2 (55.6)	55.7 (2.1)	54.7	2.1
Traffic	36.5	38.9	41.5	44.1	45.8	1.6	1.6
Home/ Mercatile	36	40.9	45.8	50.7	55.4	59.1	3.3
Supply/Etc	3.8	4.5	4.9	5.3	5.7	6.0	4.2
Total	173.6	190.2	208.1	225.4	241		2.3

Source: National Energy Commission, The 1st National Energy Basic Plan (2008–2030), Ministry of Trade, Industry and Energy, 2008

Table 2. Forecast of Greenhouse Gas Emissions by Transportation Sector in Korea

Devision	Road	Railroad	Marine Transfer	Flight	Total
Passenger	62,850,397	620,450	237,601		
Freight (logistics)	32,356,074	192,378	3,025,847	1,293,064	100,576,766
Total	95,206,471	812,783	3,263,448	1,293,064	

Source: National Energy Commission, The 1st National Energy Master Plan (2008–2030), Ministry of Trade, Industry and Energy 2008

gas demand, it is predicted that supply and other sectors will be 3.8 percent in 2006, 4.5 percent in 2010, 4.9 percent in 2015, 5.3 percent in 2020, 5.7 percent in 2025, and 6.0 percent in 2030.

In terms of greenhouse gas emissions by the transportation sector in 2020, the total number of passengers was 100,576,766, with 95,206,471 on roads, 812,783 via railroad, 3,263,448 through marine transfer and 1,293,064 through aviation, respectively.

In the case of cargo (logistics), roads were counted as 32,356,074 and railroads 192,378, shipping 3,025,847 airlines 1,293,064 (Table 2). Also, the government's 2014 basic energy plan has changed conditions for reducing greenhouse gas emissions. First, the originally expected proportion of nuclear power generation in power generation facilities decreased from 41% to 29%. This is

a good thing for the environment because nuclear power encourages fine dust and global warming, causes fish to die and destroys the deep-sea environment. Second, the time to supply 11% of renewable energy in 2030 was delayed five years to 2035. New renewable energy, high efficiency, and eco-friendly products should be expanded, and facility stability should be strengthened. Third, as the electrification of energy consumption accelerated, the proportion of electricity increased from 19% in 2012 to more than 27% in 2035. The commercial isation of Carbon Capture & Storage (CCS), which was partially applied by 2020, has become unclear. Looking at these changes in domestic conditions, it can be seen that there is no room for greenhouse gas reduction in Korea.

Table 3. Next Generation Energy Technology Innovation Program

Program	Detailed Contents
Energy supply Technical program	<ul style="list-style-type: none"> - Development of Polar Land and Strategic Minerals - High Efficiency Clean Thermal Power Plant - National Safe Nuclear Power Generation - New and Renewable Energy Hybrid Power Generation - Next Generation Clean Fuel - Next Generation Transmission and Distribution
Energy Demand Management Technology Program	<ul style="list-style-type: none"> - Smart Home Building - Smart Factory - Distributed Power Network - Energy Megawatt System
Energy Innovation Technology Program	<ul style="list-style-type: none"> - Future Energy Generation - Wireless power transmission and reception - High-efficiency chemical energy conversion storage - State-of-the-art manufacturing process technology in the energy sector - Energy Internet of Things + Big Data Platform

Source: 1. National Energy Commission, 2nd National Energy Master Plan (2014–2035) Ministry of Trade, Industry and Energy, 2014.

2. Jeon Sung-hoon, "Making a roadmap for next-generation energy technology," Yonhap News Agency, 2014.

Table 3 describes Korea's next-generation energy technology innovation program. Energy supply technology programs will have to develop eco-friendly energy and boost smart home buildings and smart factories to develop energy systems and future energy.

According to a government official at the Ministry of Industry, the government should foster practical technology development projects that fit the reality in the future if processes such as research and development projects have been important so far. In other words, the development of green science and technology should be fostered by revitalizing the eco-friendly automobile industry and the energy industry. Also, the development of the fourth industry and the eco-friendly automobile industry will have a lot of influence on green logistics. Starting new energy services and fostering the energy industry promote energy innovation.

2. Korea's green logistics policies

The following is a summary of Korea's green logistics policies

1) Low Carbon Green Growth Aspect

The Framework 「Act on Low Carbon Green Growth」 shall reduce climate change and environmental pollution and harmonize the economy and environment. According to Chapter 2 of this Enforcement Decree, Article 3 of the 「Low Carbon Green Growth National Strategy Act」 was implemented to promote climate change, global warming, and renewable energy generation measures. The term "modification of minor matters prescribed by the Presidential Decree" in the proviso to Article 9 (3) means any change in the composition and details of implementation tasks, annual promotion plans, organizations,

Table 4. Framework Act on Low Carbon Green Growth

Matters under the jurisdiction of the Ministry of Government Legislation	Related Acts and subordinate statutes (Bills)
Establishing national strategies for low carbon, green growth	Article 9
Fostering and supporting the green economy and industry	Article21
Environmentally Friendly Detergent Operation	Article27
Countermeasures against climate change, establishment and implementation of basic energy plans	Article38, Article 39
Establish and operate a comprehensive information management system for reporting greenhouse gas emissions	Article41, Article42
Consultation when developing plans for green growth	Article24, Article48

Source: 「Framework Act on Low Carbon Green Growth」, Ministry of Legislation, National Legal Information Center

or related agencies, etc. within the scope of policy direction.

The 「Energy Basic Plan」 was established to establish mid to long-term goals for reducing greenhouse gas emissions, step-by-step measures, energy demand management, and stable energy security policies.

Greenhouse emission companies were required to report greenhouse gas emissions to the government every year by energy non-commercial companies. In addition, the act stipulated the method of allocating and managing emission rights to effectively reduce greenhouse gases and set the total amount of greenhouse gas emission allowance in the greenhouse gas emission trading market by using carbon market functions.

2) The aspect of establishing a new business operation model for the 4th Industrial Revolution of Green Logistics Competitiveness

It is a green logistics platform with a major operating model and a logistics system construction due to the network effect of

digitalization. We have already experienced the emergence of digital platforms in the third industrial revolution. The 4th Industrial Revolution is a channel where digital platforms and the global logistics world are directly connected. Platform strategies are highly profitable. This is changing from product sales to service delivery by increasing the value of products through data utilization and marketing of customer-centered thinking. The number of consumers who purchased products offline and wanted to own actual products is decreasing, and the number of consumers who receive services through digital platforms and pay with virtual currency or cards is increasing. The fourth industrial revolution is transforming companies into intelligent, high-value-added methods that cooperate with product production systems through cross-fusion of advanced digital technologies and automation.

In fact, many companies are demanding that they coexist in the offline and online world in the global market with virtual and physical systems needed to produce products. Smart companies formed like this

and factories equipped with smart production processes are rapidly transforming into production systems that meet various needs of consumers. As a result, changes in logistics systems are underway throughout the socioeconomic and logistics industries to enable innovation in green products, green production processes, and green service provision. This change is called the Fourth Industrial Revolution because its speed, scope, and ripple effects are differentiated from the existing industrial revolution. (Schwab 2016). In other words, the green technology of the Fourth Industrial Revolution also affects the price measurement of products, providing new opportunities and services. For example, a combination of sensor and data analysis allows truckers to observe their driving style, fuel consumption, and commodity flow conditions to provide complete service in real time from beginning to end. Through smart applications, it is possible to check not only the current location of logistics delivery but also how many other shipments to customers remain.

This smart business model requires logistics companies to invest heavily in digital infrastructure and data security systems through differentiated service delivery rather than simply securing volume. It is necessary to establish a differentiated business model according to the characteristics of each city by utilizing IoT, Cloud, and Big Data technologies. Looking at the business model using data, it is a software information system that analyzes logistics data systems and has a shared mobility and service platform to combine new revenue sources and insights using customer information. Companies tailored towards product automation systems around risky industries and locations are becoming increasingly common.

3) Green Technology Industry Aspects of Implementing a Green Economy System

Ko, Byung-Yeol (2010) defined the industry's greenness index as an indicator that can generate green technology. IT-related industries saw relatively low acceptance of 27 green technologies, or industrial greenness. In order to establish an effective investment strategy for green technology, it is very important to measure the ripple effect to related industries. The technology acceptance index for industries with this green economic system is not limited to the green technology sector but can also be used for other technology sectors. As for the implementation of the green economic system under Article 22, Korea's green technology will be evaluated with a total of 70 points for technology, marketability, green IT, green vehicle, high-tech green housing city ① Renewable energy ② Carbon reduction ③ Advanced water resources ④ Green IT ⑤ Green vehicle ⑥ Advanced Green Housing City ⑦ New materials ⑧ Cleaner Production ⑨ Eco-friendly agricultural products ⑩ Environmental protection and conservation, etc.

Therefore, the government should gradually shift to green industries in the existing logistics industry and improve economic conditions with Korea and China for the development of the national economy. In addition, in order to promote the logistics green industry, green growth should be achieved by setting goals in the mid- to long-term in a step-by-step manner. It should also support the development of the green logistics industry. It shall be converted into an eco-friendly green structure of state institutions, such as information and communication and green transportation

facilities, for driving new green growth. In addition, eco-friendly advisory services shall be fostered for low-carbon green growth, economic development, and green management, and green industries shall be promoted.

4) Green Transportation Aspects

Transportation is one of the most important factors in Green logistics functions. It is also the biggest source of pollution for the environment. Cargo transportation not only consumes resources, but also produces waste gas.

Therefore, in order to reduce carbon dioxide emissions, eco-friendly transportation measures are needed along with reducing logistics costs. To this end, first, support for the promotion of modal shift, strengthen the consistent transport system, streamline operation and increase transportation, strengthen the green logistics foundation. In addition, it is the establishment of an eco-friendly green freight transport system and the formation of a shipping center. It is to streamline the selection of various transport tools. Second, in preparation for changes in the transportation logistics system, such as technology transportation process, consumption of emissions, climate change, energy crisis, and environmental protection needs, the transportation logistics system was transformed into an eco-friendly low-carbon transportation logistics system, and a basic plan was established. According to Article 28 of the Sustainable Transport and Logistics Development Act, the criteria for designation and management of countermeasures areas were established to promote eco-driving and eco-friendly transportation(public trans portation, railways).

According to the Korea Transportation Research Institute (2021), green energy

transportation should include logistics facilities and logistics services such as unloading and storage in an eco-friendly manner. It is expected to minimize environmental pollution by reducing carbon emissions. Third, the Ministry of Land, Infrastructure and Transport's Green Logistics Conversion Project developed an eco-friendly electric freezer that does not generate greenhouse gas by using electric energy instead of diesel. As the development of eco-friendly vehicles using eco-friendly fuels and combining high-tech technologies begins in earnest, social infrastructure, which is a green highway, will become a reality with high-tech technologies such as artificial intelligence (AI) and the Internet of Things (IoT).

5) Green Technology Concepts and Policy Aspects

Green renewable energy, carbon savings, Green IT, Green automobiles, eco-friendly agricultural and fishery products, environmental protection, green technology, green marketability, and green growth. In other words, the plan is to reduce greenhouse gas emissions and establish a green road certification system. The Korea Institute of Science and Technology (2012) defines green technology as "a concept that can quickly respond to future environmental changes in sustainable development of the environment, society, and economy."

Green technology is a technology that saves energy and resources and uses them efficiently to minimize emissions of greenhouse gases and pollutants. Green technologies include greenhouse gas reduction technologies, energy utilization efficiency technologies, clean production technologies, clean energy technologies, resource circulation and eco-friendly technologies (including related

Table 5. The Concept of Green Technology and Policy Development

Sortation	Keywords
Korea Institute of Science and Technology Policy (2012)	<ul style="list-style-type: none"> - The social, environmental and economic sectors - Sustainable Development - Respond to changes in the environment
Green Growth Committee (2014)	<ul style="list-style-type: none"> - Sustainable growth - Environmentally Friendly Resource Utilization Technology - Greenhouse gas reduction technology - Biotechnology, Nano, and Cultural Industrial Technology

Source: 1. Lee, Sung-jin and Ko Il-ho, "Green Technology Concept and Policy Development Direction", Korea Institute of Science and Technology Policy, 2012.09
 2. Green Growth Committee, <http://www.greengrowth.go.kr/>, 2014.
 3. Choi Sang-hee · Lee Eon-kyung · Jeon Hyeong-mo, Study on improvement plan for eco-friendly technology certification (green certification) in the port logistics field 2014.12. Korea Ocean Fisheries Development Institute

convergence technologies). Green technology may create or support integrated sites and complexes for projects, such as joint research and development, joint utilization of facilities equipment, and establishment of industry, academia, and association networks. Therefore, the concept of green technology and the direction of policy development are presented as shown in Table 5.

As seen above, Korea should reduce greenhouse gas emissions as part of its green technology concept and policy development. South Korea is the ninth largest producer of greenhouse gases among members of the Organization for Economic Cooperation and Development. In order to reduce greenhouse gases, low-carbon policies such as the introduction of a green road certification system are needed to foster green facilities such as green construction and green road construction. The Green Technology Certification System was introduced to provide companies with various government support for financial support, marketing, and technology commercialization in order to achieve the policy objectives of green business.

6) Green Business Aspects

Green projects include the spread of renewable energy, low carbon plant system, advanced resource development processing management, green IT distribution, green transportation system, green housing eco-friendly urban infrastructure, clean products, eco-friendly agricultural products, environment protection and environment conservation.

Choi Sang-hee, Yi Eon-kyung, and Jeon Hyeong-mo of the Korea Maritime and Fisheries Development Institute (2014) stated that the biggest reason for the green business certification in the port logistics sector was low (30.0%) and that there was no special benefit even if green business certification was certified. This is because there is no port logistics sector in the green business classification list (20.0%).

Therefore, in order to encourage green business certification of port operations, the most necessary benefits are "tax benefits (90%) when introducing equipment with green certification technology." In other words, the method of granting additional points (20.0%) when bidding for a project was high.

7) Logistics Policy Aspects of the Fourth Industrial Revolution

As the fourth industrial revolution became an issue, various terms such as 3D printers, IoT, and artificial intelligence are pouring out of various media. AI sometimes carries out logistics missions that only humans thought could do. Amazon's drone logistics system in the U.S. is a typical example. In addition to Amazon, UPS, an international logistics carrier, succeeded in delivering drones that sent drones from the roof of the delivery vehicle to the destination and returned while the delivery driver was transporting the vehicle.

The emergence of new business models and the fourth industrial revolution are undergoing huge changes throughout the industry due to the destruction of the existing systems, production and consumption, and the reorganization of transportation and delivery systems. One of the main technologies that enabled the Fourth Industrial Revolution to link real-life and digital is the Internet of Things. It is described as a human relationship to objects (products, services, places, etc.) based on interconnected technologies and various platforms. Various equipment and sensors that connect real life and virtual networks are pouring in at an alarming rate. Smartened sensors are not only manufacturing processes, but also urban transportation and energy networks, making them widely used in our real lives. It is widely used in the Internet, various manufacturing processes and real life such as smartphones, tablet PCs, and computers worldwide. Perhaps it will be used numerous times in future industries to monitor our assets and economic activities in detail and have a significant impact on the utilization of the logistics industry. The supply chain

management method also brought about many changes in the fourth industrial revolution. It has had a significant impact on manufacturing, infrastructure, and all industries.

As part of the fourth industrial revolution, many policies and integrated data management systems that combine AI artificial intelligence systems and IoT automation technologies are emerging around us one after another. In 2016, the Organization for Economic Cooperation and Development (OECD) surveyed members on the availability of technologies based on the fourth industrial revolution, and Korea scored 5.6 out of 10, lower than the overall average (5.9). It is hard to be proud as an ICT powerhouse. It is time for the government to stop its policy practice of raising technology levels in a short period of time by spending large amounts of budget. We need to focus on the role of assisting the research in the field of the Fourth Industrial Revolution so that there are no obstacles. Based on AI artificial intelligence, policies utilizing low-carbon logistics technology improvement and energy-saving availability are needed.

2. Problems of Green Logistics in Korea

Based on the general status and policies of green logistics in Korea as discussed earlier, the problems of green issues in Korea are as follows.

First, there is a shortage of high-quality personnel who recognize green logistics. Green logistics is important to foster distribution, and IT industries. However, as part of various projects based on this, it is necessary to support the green logistics efficiency of e-commerce and educate and

foster e-commerce green logistics experts. Only when these various high-quality jobs are created will high-quality manpower be trained. In addition, part-time jobs for the elderly population and university students should be created.

Second, advanced logistics facilities and establishment of IoT smart logistics system are insufficient. Advanced logistics consultants and logistics devices should be preceded to increase the efficiency of the green logistics system. It is expected that this will be more effective if Samsung Electronics seeks advanced logistics through the introduction of AI logistics prediction system. In other words, it is a current trend to combine not only logistics IoT smart homes but also various industrial areas and user convenience. This is typical of the green logistics industry. IoT chips can be planted in containers or logistics industries to monitor logistics movement status in real time and reduce sudden variables in the transportation process. As the core issues of the four-dimensional industrial revolution, such as smart homes and smart city smart logistics, are highlighted, the IoT smart logistics industry, which is the device base of these technologies, will also grow.

Third, there is a lack of a joint hub-type delivery system through the establishment of an electronic logistics information system. In other words, blind spots for logistics and electronic services, such as mountainous remote areas and islands, will be more effective in electronic logistics systems by utilizing local resources and local logistics. In addition, it would be more effective to integrate distributed overseas market information into national institutions (KOTRA, KMI, etc.) by establishing an "information network for overseas logistics markets." The company should establish

logistics information systems in emerging logistics markets such as Southeast Asia, Latin America, and Central Asia, and make efforts to resolve the lack of logistics information systems for green companies in Korea that want to expand into global markets.

Finally, it is showing a wide gap with developed countries. If Korean companies reduce logistics costs and improve eco-friendly green logistics capabilities by developing new technologies and launching new products through R&D investments, they will be able to be on par with advanced countries. In addition, companies can develop as much as advanced countries if they seek to build capabilities with logistics companies that are willing to enter green logistics overseas. It would be more effective to connect the appropriate shipper and green logistics companies to enter the enterprise through analysis of high-quality services for consumers requiring green logistics.

IV. Activation of Green Logistics

1. The Korean Government's Green Growth

As we have seen above, this study aims to describe the activation of green logistics, despite the problems of green logistics in Korea.

First, Korean companies should avoid effective environmental regulations and green logistics due to the government's green growth. Greenhouse gases, fine dust, and packaging wastes emitted by environmental loads shall be reduced. Recently, advanced countries such as the U.S. and the EU are developing and applying technologies to regulate production and consumption and reduce greenhouse gas and CO₂.

This may be done by companies and governments to support cooperation between customers and suppliers for green logistics. Green logistics should be activated for low carbon and green growth to secure emission rights. In response to the Framework Act on Low Carbon Green Growth, green logistics conforming to environmental regulations and green growth regulations shall be identified in advance based on data such as green product manufacturing, production, purchase and sale of raw material products. Greenhouse gases and energy reduction goals should be established and implemented.

Second, in the Framework Act on Low Carbon Green Growth, policies that effectively reduce greenhouse gases by using carbon market functions seem a little difficult to apply. Therefore, specific measures should be devised.

Third, it is a project to support the introduction or conversion of environmentally friendly equipment such as many LNG trucks and power-powered gantry cranes in the past to reduce environmental pollution from logistics equipment that discharged pollutants due to low pollution. Environmentally friendly equipment shall comply with global standards and standards. It is necessary to meet global standards for green logistics by establishing systems suitable for logistics organization and logistics process such as ISO14001 (International Standard for Environmental Management System), ISO26000 (Social Responsibility Standard), ISO50001 (Energy Saving Certification Standard), and OHSAS (Safety and Health Management System). Currently, there are few companies complying with global standards for green logistics, so the government should inform companies well to comply with global standards and standards related to environment.

2. Green Logistics during the Fourth Industrial Revolution

The fourth industrial revolution, which is suitable for the future society, is now necessary in green logistics. Therefore, the Korean government shall endeavor constantly to implement a green technology powerhouse and to create a foundation for green logistics development.

First, the government should accelerate green development projects by supporting the project costs of state-run finance for the new green logistics city. This needs to lead the green logistics market by establishing a Smart City Integration Center. The construction of a green logistics city that incorporates AI will help to plan a new logistics city while establishing a smart logistics market. In addition, if you plan a new green city that combines AI green environment and IoT, foreign governments and companies that have paid attention will use Korea's know-how. It is questionable whether the national strategy is being established efficiently, whether it is possible or a policy that the people want.

Second, cargo cars that enable self-development and autonomous driving through analysis of logistics data using artificial intelligence robots and big data and machine learning are needed. This may affect the creation of green logistics industries, climate change energy growth and high-efficiency industrial technologies. Cargo cars, which enable artificial intelligence and autonomous driving, are essential to revitalize green logistics companies by improving the Korean green logistics industry.

Third, for green logistics, energy use or the growth potential of the greenhouse gas logistics industry should be recognized. Therefore, the government shall preferentially

support green logistics facilities such as environmentally friendly complex logistics terminals, financial loans and land security support, and green logistics conversion projects.

Fourth, the government should stop operating coal-fired power plants located near large cities like China, strongly regulate coal use, and actively develop clean coal technology and carbon capture technology (CCS) through cooperation with the United States.

Fifth, in Article 8 of the Sustainable Transport Logistics Development Act, how will the criteria for designating and managing areas for environmentally friendly transportation activation be established? It is urgent to expand the supply of electric vehicles and expand the nation's high-speed railways. Sixth, the greenhouse gas reduction policy said that large-scale investments should be involved to curb the use of passenger cars and expand public transportation operations, but it is questionable whether the greenhouse gas reduction effect will be easy to quantify. Therefore, the Korean government should come up with specific measures to nurture eco-friendly logistics companies to reduce eco-friendly carbon.

Finally, it is urgent to train smart green logistics education that combines our green logistics system and AI artificial intelligence and to train manpower for IoT green logistics automation. Some point out that smart technology and logistics policies of the fourth industrial revolution should also be competitive. However, open and flexible companies are creating value in the eco-friendly logistics industry based on innovation. Many companies are increasing energy savings based on sustainable materials and procedures, efficient resource preservation of product flows, reduced logistics costs, and eco-friendly effects. New forms of cooperation are

needed to measure customer experience, data-based green services, and green product performance through data analysis.

This is especially true for companies that are firmly established with existing companies and start-up venture companies that are dynamic. Start-up venture companies should actively enter overseas markets by establishing a logistics infrastructure that connects the entire Asian region. In addition, there is a need to improve the weak logistics cooperation system due to the constraints of the platform policy environment. Therefore, I hope that the environmental regulations that are effective for the green logistics industry in the future will help a lot. We hope to innovate the logistics market, improve the complex logistics competition structure, and bright future of the logistics industry.

V. Conclusion

With the recent emergence of environmental problems, interest in green logistics is growing. It is a reality that more research is being done abroad than at home. Green logistics will help revolutionize green logistics thanks to government policies of eco-friendly, low carbon. Therefore, this study looked at the current status and problems of green logistics. It is necessary to develop the economy of government policies, reduce environmental pollution, and operate harmoniously in the natural environment and logistics system.

First, we systematically studied green logistics status and problems and green growth, low carbon, and green economy. Second, we looked at Korea's green logistics policy. Third, the revitalization of green logistics will bring about a lot of changes in the logistics system with energy reduction in the eco-friendly logistics industry and AI and

the fourth industrial revolution. One of the policies for green logistics is to set and evaluate targets for reducing energy use or greenhouse gas emissions. It can also affect the creation of green industries, climate change energy growth and high-efficiency industrial technologies. We will improve Korea's green logistics industry to revitalize green companies.

Fourth, the Korean government will preferentially support logistics facilities such as environmentally friendly complex logistics terminals, financial loans and site securing support, and green logistics conversion projects. Innovating the logistics market, improving complex distribution structures and eco-friendly logistics competition structures, and conducting bright future research in the green logistics industry.

Finally, there is a lack of experts who are well aware of green logistics, so each logistics company and distributor urgently need to introduce eco-friendly forklifts or low-carbon cargo trucks. In addition, it is necessary to improve the system for green logistics shippers. This shall promote green logistics education programs for public officials of relevant administrative agencies, eco-friendly logistics workers, and distribution operation personnel through the education of government agencies. It is necessary to institutionalize organic eco-friendly education and eco-friendly service education by distributor manufacturers of logistics companies. Logistics advancement programs utilizing 2050 IoT of recent government policies should be further expanded.

Although discussed earlier, this study has some limitations. First, we looked at the current status of green logistics and its problems based on low carbon reduction measures due to energy consumption of green logistics in Korea. However, it was not

enough to find overseas cases or data. Second, we looked at Korea's green logistics policy, but it was difficult to include all the green logistics policies abroad in this paper. Third, most of Korea's existing green logistics provided eco-friendly solutions that applied logistics functions in the logistics sector. Finally, looking at green logistics policies, the role of the policies used in this study could not be generalized because they are ongoing government policies.

Therefore, it is necessary to expand the scope of Korea's green logistics research, and these limitations remain as future challenges. Finally, as part of the green logistics policy, it is absolutely necessary to revitalize the green area and foster the green environment. In future studies, it is necessary to conduct empirical research by writing a survey of problems within manufacturing, logistics, and distribution companies that arise in green logistics policies.

We should take the lead in revitalizing green logistics, which can be felt directly by local distributors and manufacturers, away from eco-friendly logistics. In addition, new logistics cities should be constantly developed to simplify administrative processing of specialized industries traded in the region and foster the green logistics industry. In addition, it is believed that differentiated measures for eco-friendly green growth (such as the introduction of eco-friendly green logistics technology startup investment methods, etc.) should be prepared. Eco-friendly green logistics is not limited to government policies, but companies' efforts and the entire nation needs to voluntarily revitalize low-carbon logistics. Continuous expansion of green logistics and constant interest from manufacturers, distributors, and logistics companies are required.

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