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SUSTAINABLE DEVELOPMENT OF VIETNAM THROUGH KOREA-VIETNAM COOPERATION

-Based on the introduction of eco-friendly factories in Vietnam through ODA-

Hwapyeong Lee & Hyunsu Kim

Handong Global University

Abstract

This project aims to joint growth between Korea and Vietnam through the smart factory in Vietnam and the establishment of a new renewable energy production plant in Vietnam, and the effectiveness of the above strategies was analyzed based on the KOICA and the Ministry of Strategy and Finance. Vietnam's industry has high investment value and infinite development potential, but at the same time, it has not been able to solve the risks of environmental pollution and economic loss caused by the carbon border adjustment system.

This project looked at the practical feasibility of the project, with the aim of converting existing factories in Vietnam into smart factories and establishing new and renewable energy production plants such as green hydrogen in Vietnam to provide a way to solve the problems of the Vietnamese industry. The project is expected to help the Vietnamese factories overcome external pressure and continue to grow by reducing carbon emissions. It is also expected that Korea will be able to increase the effect of mutual growth through the expansion of economic cooperation.

Keywords: Vietnam Industry, Smart Factory, Green Hydrogen, Public Development Assistance, Sustainable Development

Contents

I. Introduction

Recently, as the international situation and global economic structure have changed significantly, such as de-globalization and economic blocking due to the COVID-19 and Russia's Ukraine War, voices calling for Korea to broaden the horizons for economic cooperation are growing. Since COVID-19, countries around the world acted for their own interests rather than strengthening the global cooperation system, and the Russia-Ukraine war has led Russia and China to confront the Western camp with friendly relations. Accordingly, Korea needs to expand economic cooperation centered on Northeast Asian countries, and diversify its economic structure dependent on major countries such as the United States and China.

The Southeast Asian economies have been experiencing industrialization since the end of the 20th century, encouraging manufacturing and IT industries and diversifying its industrial structures thanks to growth through industrialization, and increasing cooperation with advanced countries in the process (Choi Won-ki et al. 2021). The Korean government has identified the needs of ASEAN, established the New Southern Policy in 2017, and is providing large-scale official development assistance (ODA) to Southeast Asian countries. In particular, given that Vietnam is a key partner in Korea's ODA and recipient of Korea's credit and public development assistance, it is believed that both Korea and Vietnam will be able to move forward on the path of joint growth through cooperation.

When exploring the areas for cooperation between two countries for the joint growth between Korea and Vietnam, it was considered that cooperation between the two countries was necessary in Vietnam's manufacturing sector. Vietnam is currently undergoing industrialization, and accordingly, industrial complexes and factories are continuously increasing. This situation can be evaluated positively in that Vietnam's industrialization is accelerating as the country’s manufacturing sector expands, but there are also negative aspects. First, Vietnam's industrial complex expansion can exacerbate Vietnam's environmental problems because it proceeds without the installation of an environmental purification system in terms of cost reduction. In addition, the expansion is likely to increase the carbon emissions of factories in Vietnam, which could cause Vietnamese manufacturing companies to face external barriers such as the carbon border adjustment mechanism (CBAM). In this respect, it was determined that cooperation in the Vietnamese manufacturing sector is necessary for sustainable growth between Korea and Vietnam, and based on this, we would like to propose a plan for cooperation in the manufacturing sector between Korea and Vietnam through ODA.

Specifically, Korea-Vietnam cooperation in the manufacturing sector through ODA is expected to contribute greatly to solving environmental problems that Vietnam is facing both internally and externally by developing Vietnam's manufacturing industry and reducing carbon emissions from Vietnam's manufacturing industry. In addition, the above cooperation will be able to increase the effect of Korea's economic growth by providing Korean eco-friendly companies with a new market and a platform to cooperate with

foreign companies. Accordingly, we would like to propose an ODA support strategy to develop Vietnam's manufacturing industry and solve Vietnam's environmental problems at the same time. In addition, the effectiveness of the above strategy will be confirmed based on the review methods of grant and loan aid provided by KOICA and the Ministry of Economy and Finance.

II. Factories and environmental problems in Vietnam

2.1. Vietnam's industrial structure and current status of factories

Before examining the current status of factories in Vietnam, if we first analyze the industrial structure of Vietnam, it can be seen that Vietnam traditionally represents a primary industry-centered industrial structure, and is in the process of industrialization as the composition ratio of secondary and tertiary industries has recently increased (Yangmi Gu, 2017). As of 2015, Vietnam still has a primary industry-oriented industrial structure with 44% of the primary industry, 23% of the secondary industry, and 33% of the tertiary industry. The Vietnamese manufacturing industry has been steadily increasing since the early 1990s, recording 15.3% in 2015, indicating that Vietnam's manufacturing base is gradually strengthening. In addition, as of 2015, out of the total 402,326 companies in Vietnam, only 63,251 manufacturers accounted for 15.7%, but out of the total 12,134,985 workers in the manufacturing industry accounted for 47.6%. In this regard, Vietnam is currently experiencing full-scale industrialization, and among various industries, the growth of the manufacturing industry seems to stand out.

Next, looking at the current status of factories in Vietnam's manufacturing sector, Vietnam has 395 industrial complexes as of 2022. According to statistics from early 2022, Vietnam has 395 industrial complexes in 61 states, with a total size of 123,000 hectares. As such, Vietnam still has many industrial complexes and industrial sites, but the Vietnamese government announced a plan to increase the industrial complex by 1.5 times by 2030 to industrialize Vietnam. The Vietnamese government has announced plans to expand the industrial complex site by 115,000 hectares and increase the number of industrial complexes to a total of 558 by 2030. Therefore, Vietnam's factories are expected to continue to expand and increase.

2.2. Impact of Vietnam Plants on Vietnam Environment

However, there are concerns within Vietnam about the expansion of the Vietnamese factory. The reason is that the Vietnamese industry is not prepared for environmental pollution. More than 60% of Vietnamese industrial complexes do not have industrial water treatment facilities. Industrial wastewater, which has not undergone a separate process, is directly discharged through canals, rivers, or waterways, adversely affecting citizens' daily lives and physical health. In addition to the industrial wastewater problems, industrial waste also causes environmental pollution. Only about 60-70% of solid waste is collected in Vietnam's industrial areas. The remaining uncollected solid waste is not systematically treated and pollutes Vietnam's soil and water quality.

Air pollution due to the high dependence on fossil fuels in industrial facilities for

power generation is indispensable for polluting Vietnam's environment. In particular, the air quality level in Hanoi and Ho Chi Minh City is very serious.

Table 1: The air quality level in Vietnam

PM-2.5	Max/Min	188/15	42/13	137/21
PM-10	Max/Min	108/15	32/3	71/15
NO2	Max/Min	5/1	6/1	10/1
SO2	Max/Min	50/7	3/2	3/1
CO	Max/Min	5/1	7/6	0/0

Source: 1) Real-time Air Quality Index (aqicn.org)

Direct air pollution is also a problem, but the secondary damage caused by it cannot be ignored. About 4-5% of Vietnam's total GDP per year is wasted due to air pollution. In addition, due to the decrease in the work productivity of Vietnamese workers, overall production is decreased and Vietnam's external image is damaged, adversely affecting foreign investment. A more serious problem is that people die from air pollution. Severe air pollution kills 50,000 people in Vietnam each year, three times the number killed in traffic accidents

In this regard, there are voices of concern in Vietnam about the plan to expand Vietnam's industrial complex, and public opinion that Vietnam's factories may adversely affect the Vietnamese environment is growing. Recently, the Vietnamese government has recognized the seriousness of environmental pollution and has strengthened environmental standards such as environment protection laws and environmental impact assessment, but in most cases, the level of related infrastructure and professional manpower falls short of this level. The need for substantial environmental pollution improvement alternatives is the cause for change in Vietnamese industry.

III. Carbon Border Adjustment Mechanism and Growth in Vietnam

In addition to the environmental pollution problem, there is another reason why Vietnam's industry needs to change. Carbon Border Adjustment Mechanism (CBAM) is a trade tariffs system that is applied when exporting goods and services from countries with loose carbon dioxide emission regulations to countries with strong carbon dioxide emission regulations. These carbon border taxes will be levied on all carbon-intensive products and will be applied from large companies to small and medium-sized companies.

Vietnam is a country highly dependent on trade. According to a report by the Statistics Service Planning Department of the Republic of Korea, Vietnam's export-to-GDP ratio in 2021 was about 93%. This suggests that if Vietnam maintains its current industrial environment, the entire country's economy will be hit hard by the taxes generated by the CBAM. Information related to the influence of the CBAM will be

covered in detail in the part of "III-2. Effects of the Carbon Border Adjustment Mechanism (CBAM) on the growth of developing countries."

3.1. Background and Status of Carbon Border Adjustment Mechanism

There is a strong correlation between trade and climate change. Since the establishment of the WTO, countries have begun to recognize the importance of environmental protection and have tried to reduce carbon emissions from all processes of trade.

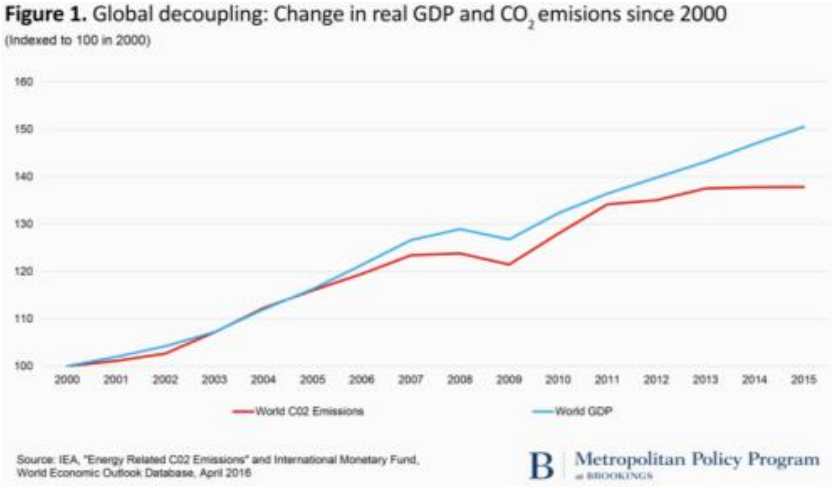

Figure 1. Change in real GDP and CO2 emissions since 2000

Source: *1) World Economic Outlook Database, 2016*

However, one thing to note about regulations or compensation related to carbon emissions is that laws related to carbon emissions can be effective domestically, but cannot exist internationally. This is because one country cannot impose sanctions on another. As a result, each country must introduce greenhouse gas reduction policies to prevent carbon leakage, but there was a limitation to introducing greenhouse gas reduction policies in a voluntary manner. In other words, there are countries that are active in reducing their own carbon emissions while others are passive, raising the issue of equity for carbon emissions reduction.

Europe has recently materialized the carbon border tax discussed earlier, centering on the European Union (EU), as part of a plan to address the issue of equity in reducing carbon emissions. It seems to be intended to impose the same target tax on companies that emit greenhouse gases from abroad in the same way as on products within the EU.

The executive committee, which plays the same role as the European Union's administration, introduced Fit for 5, a package of climate legislation in 2021, and announced the implementation of a full-fledged carbon border tax. At the same time, a resolution on the introduction of a carbon border tax was also introduced. The resolution included the EU's goal to reduce net greenhouse gas emissions by at least 55% from 1990 to 2030, by introducing a carbon border tax in 2026. It also included banning the sale of new gasoline and diesel vehicles in European Studies from 2035, raising carbon

emissions taxes in the manufacturing, transportation and heating sectors, and taxing high-carbon ships and aviation fuel in the course of operation.

They said that they were considering imposing a carbon tax directly, taxing all products collectively, or giving refunds to companies with low carbon emissions. For three years from 2023, the carbon emissions from products imported into the EU will be reported, and actual taxes will be imposed from 2026. The price of the tax is expected to examine the carbon content of EU exports prior to taxation and to impose a separate price of carbon linked to the EU's carbon trading system. Importers in the EU subject to carbon border tax collection must purchase carbon border adjustment certificates in advance for an amount equal to the annual imports. One certificate corresponds to a ton of carbon, and carbon emissions by item calculate the direct emissions from the production process. Certificate prices are not arbitrarily set by the EU, but are linked to European carbon credits, and as carbon credits increase in Europe, carbon taxes for companies exporting their goods or services to Europe also rise.

3.2. Effects of the Carbon Border Adjustment Mechanism on the Development of Developing Countries

The impact of the carbon border adjustment system on developing countries, especially Vietnam, is expected to hinder Vietnam's continued economic growth. One of the main reasons is excessive coal consumption for electricity production.

According to the "World Energy 2020 BP Statistical Review," Vietnam has the highest growth rate of coal consumption among the world's top 10 major coal consumers. Vietnam's coal consumption in 2019 increased by 30.2% year-on-year, making it the world's 10th largest consumer of coal after China, India, and the United States.

Compared only among ASEAN countries, Vietnam's coal consumption ranks second after Indonesia. As an alternative to solve the problem, the Vietnamese government tried to use renewable energy and liquefied natural gas as alternative power, but its high dependence on coal-fired power plants led to an increase in coal imports from abroad.

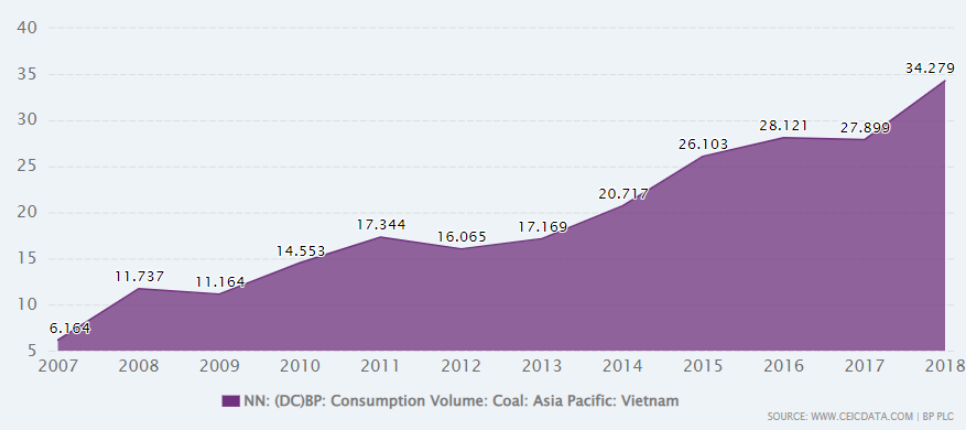

Figure 2. Vietnam's coal consumption from 2007 to 2018

Source: *1) Statistical Review of World Energy, 2020*

In this situation, if the CBAM is implemented, Vietnam will become the 12th highest country in the world in terms of carbon-related exports, seriously hurting exports. The tax burden caused by the high proportion of the carbon-intensive manufacturing industry is a great loss to Vietnam, which is growing as a "factory of the world."

Developing countries, including Vietnam, argue that the "responsibility of advanced countries," which benefited from industrialization in the past should pay more to cope with the climate crisis because they are responsible for the current greenhouse gas emissions. However, their arguments will not be easy in implementing the carbon border adjustment system.

The global economic order, that is being reorganized around carbon neutrality and emerging markets, will be a crisis and an opportunity for many countries and companies. Vietnam also needs to pursue sustainable development through responses such as investment in carbon-neutral technologies in line with the changing global paradigm. From now on, we will present specific Korea-Vietnam manufacturing sector cooperation plans for changes in the Vietnamese industrial environment.

IV. Revitalization of Environment-friendly Plant in Vietnam through ODA

4.1. Status of Korea's ODA support to Vietnam

Before looking at the plan to revitalize the eco-friendly factory in Vietnam through ODA in detail, let's first look at the current status of ODA support to Vietnam, which is the source of the plan. First, in the case of grant aid, the Korean government is providing $38,323,800 to Vietnam through KOICA in 2020, and 45 projects are being carried out in Vietnam based on the aid. Next, in the case of paid aid, the Korean government is providing $2,634,000,000 to Vietnam through the Export-Import Bank of Korea EDCF as of 2021, and 27 projects were carried out based on the aid.

Table 2: Status of ODA Support in Vietnam in Korea

KOICA ODA (Grant aid)	
Approved amount	Number of Approved Projects
$38,323,800	45
EDCF ODA (Loan aid)	
Approved amount	Number of Approved Projects
$2,634,000,000	27

Source: 1) KOICA Open Data, 2020

2) Korea EXIM Bank, 2021

More specifically, KOICA is promoting Vietnam's energy efficiency investment market vitalization, green growth support, establishment of the Korea Institute of Science

and Technology in Vietnam, strengthening of Vietnam's marine environment management base and demonstration projects. And the Export-Import Bank of Korea EDCF is representatively carrying out projects such as the solar power generation project in Quang Binh Province, the construction project of the College of Pharmacy in Hanoi, Vietnam, and the renovation project of old bridges in Vietnam.

Table 3: Cases of Korea ODA Project in Vietnam

Grant and Loan ODA Project	
KOICA ODA (Grant aid)	EDCF ODA (Loan aid)
1. project to revitalize the energy efficiency investment market in Vietnam and support the green growth plan. (2021-2025)	1. Solar Power Generation Project in Quang Bin Province, Vietnam (2012-2022)
2. Project to support the establishment of the Korea-Vietnam Institute of Science and Technology (V-KIST) in Vietnam (2014-2022)	2. A project to build a pharmacy university in Hanoi, Vietnam (2016-2024)
3. Capacity Enhancement and Pilot Project for Establishing the Foundation for Marine Environment Management in Vietnam (2018-2022)	3. Old Bridge Renovation Project in Vietnam (2020-2024)
4. Investment information system establishment project to promote investment in the private sector in Vietnam (2018-2023)	4. Haiphong General Hospital construction project (2020-2024)

Source: 1) Joint with related ministries, 2022 Vietnam support project list by department

As such, Korea is providing a lot of grant and loan aid to Vietnam, and based on this, various ODA projects are underway.

4.2. Review of eco-friendly factory establishment project in Vietnam through ODA

1) Presenting a project to establish a smart factory in Vietnam and a new and renewable energy plant

As we have seen before, Korea is providing a lot of grant aid and loan aid to Vietnam, and through this, various ODA projects are being carried out. Based on this fact, the "Smart Factory of Vietnam Plant and Establishment of New and Renewable Energy Plant" project was conceived as a way to solve domestic and foreign problems in Vietnam through ODA and achieve sustainable development in Vietnam. In particular, Vietnam's renewable energy power plant is expected to serve as a platform to solve environmental

problems in Vietnam's manufacturing sector as a benchmark for the green hydrogen production power plant of Korean renewable energy companies.

Table 4: Smart Factorization of Vietnam Plant and New Renewable Energy Plant Establishment Project Stage

ODA (Grant + Loan aid)		public-private partnership (The Vietnamese government connects Korean smart factories and renewable energy companies with Vietnamese manufacturing factories.)	Vietnam factory conversion into a smart factory and establishment of renewable energy factory

Source: 1) Self-produced

The smart factory conversion project of the existing factories in Vietnam and the construction of new renewable energy factories are carried out in the following steps. As a first step, KOICA Vietnam Office and the Korea Export-Import Bank provide grant ODA and loan ODA (EDCF/EDPF) to finance the smart factory conversion and new renewable energy plant establishment, respectively. In the case of the smart factory conversion project in Vietnam and the new and renewable energy plant establishment project, large-scale funds are required due to their nature, so they receive funds between 5 billion and 15 billion won from KOICA and more than 100 billion won from the Export-Import Bank of Korea.

As a second step, the Vietnamese government, Korean smart factories, renewable energy companies, and Vietnamese manufacturing plants will cooperate to implement a public-private joint project. The Vietnamese government will connect factories with relatively high carbon emissions to Korean smart factories and renewable energy companies, and the two connected parties will cooperate to make smart factories and establish new renewable energy plants. This enables efficient execution of the above projects by resolving inefficiency that may arise due to information asymmetry problems

during project implementation.

As a final step, funds provided from KOICA and the Export-Import Bank of Korea will convert existing Vietnamese factories into smart factories, and new and renewable energy production plants such as green hydrogen production plants will be built in Vietnam. As part of KOICA's "Vitalization of Vietnam's Industrial Energy Efficiency Investment Market and Green Growth Plan Support Project," which runs from 2021 to 2025, it will receive information on factories with high carbon emissions and sites needed to establish renewable energy plants. Moreover, based on this, the Vietnamese factory's smart factory conversion project and renewable energy plant establishment project will be implemented.

2) The Expected Effect of eco-friendly factory establishment projects

The expected effects of the Vietnam factory eco-friendly project, which will be implemented based on ODA and promote sustainable development in Vietnam, are as follows.

First, Vietnam's smart factory and renewable energy production plant built as a result of the project are likely to reduce Vietnam's carbon emissions by enabling factories in Vietnam to reduce their carbon emissions. As mentioned earlier, existing factories in Vietnam have been established without installing smoke treatment facilities and carbon treatment facilities to reduce costs in the production process. In this situation, eco-friendly services, such as smart factories and green hydrogen production plants to be provided by the above project could reduce the carbon emission in Vietnam by reducing the carbon emission in the manufacturing process and using renewable energy sources in the production process.

Next, Vietnam's manufacturing industry, which has reduced carbon emissions through Vietnam's smart factories and renewable energy production plants, is likely to overcome foreign pressure and realize continuous growth. In Vietnam, most Vietnamese factories with high carbon emissions are facing difficulties in paying carbon border taxes due to the current CBAM in the EU and the United States. Under these circumstances, the eco-friendliness of Vietnamese factories, such as smart factories and renewable energy production plants, is expected to reduce carbon emissions in Vietnamese factories and pave the way for them to overcome external obstacles.

Finally, the reduction of carbon emissions in Vietnam and avoidance of carbon border taxes in Vietnamese factories can realize sustainable growth in Vietnam. Vietnam's smart factory and renewable energy production plant will not only reduce Vietnam's carbon emission and improve Vietnam's environmental pollution problem internally but also help Vietnam avoid environmental regulations externally. In this respect, Vietnam is expected to achieve sustainable growth by breaking away from the pitfalls of middle-income countries through eco-friendly factories in Vietnam.

4.3. Korea International Cooperation Agency (KOICA) Review of the Effectiveness of ODA

Earlier, in order to review the effectiveness of the building a smart factory and new renewable energy production plant in Vietnam, the effectiveness of the current project was reviewed according to the KOICA's project review method. Based on the KOICA's review of the energy efficiency investment market in Vietnam and the green growth plan support project, the eco-friendly project of the Vietnamese factory was found to have sufficient effects.

First, in the validity review, it was judged that the Vietnamese factory's smart factory and renewable energy production plant establishment project was valid in that it met the Vietnamese government's goal of enhancing national competitiveness through the construction of a new renewable energy plant. Vietnam's smart factories and renewable energy production plants develop Vietnam's manufacturing industry by supporting companies in the manufacturing sector, which are Vietnamese flagship industries. This is likely to ultimately lead to an increase in Vietnam's manufacturing exports, which can enhance Vietnam's national competitiveness.

Next, in terms of the need for support, it was judged that the conversion of a smart factory in Vietnam and the construction of a renewable energy production plant would be effective in enhancing the innovative power of the Vietnamese manufacturing industry. Since Vietnam's smart factories and renewable energy production plants are built based on advanced technologies of Korean companies, they are expected to lead to increased innovation in the Vietnamese manufacturing sector by strengthening the eco-friendly capabilities of Vietnamese factories.

Finally, in terms of policy linkage, it was judged that the Vietnam plant's smart factory and renewable energy production plant establishment project was satisfied with policy linkage in that it was linked to the New Southern Policy and the UN SDGs goal. The above projects can achieve affordable clean energy (Goal 7), high-quality jobs and economic growth (Goal 8), resilient infrastructure construction, inclusive and sustainable industrialization promotion, innovation promotion (Goal 9), and Climate Change Response (Goal 13) goal. In that aspect, some of the UN SDGs goals can be achieved.

Therefore, it was judged that the project to establish a smart factory and a renewable energy production plant in Vietnam could be promoted as a project of KOICA ODA because it was significant in terms of validity, need for support, and policy linkage.

4.4. Ministry of Economy and Finance Review of the Effectiveness of ODA

According to the Ministry of Strategy and Finance review method, we reviewed the effectiveness of the Vietnam plant's smart factory and new and renewable energy production plant establishment project. As a result of reviewing the effectiveness of the current project based on the Ministry of Strategy and Finance's 2022-2024 EDCF medium-term operation direction, the eco-friendly project of the Vietnamese plant was found to be effective.

First of all, considering the improvement of development effectiveness, it was judged that the conversion of the smart factory of the Vietnamese plant and the establishment of

a new and renewable energy production plant were in line with the expansion of the EDCF business and the strengthening of the all-round partnership. The above project not only leads to the enlargement of the EDCF project in that it is a large project to convert existing factories in Vietnam into smart factories and establish renewable energy production plants on the site of Vietnam, but also leads to strengthened partnership in development cooperation as it is the project carried out with Korea.

Next, in terms of strengthening quality competitiveness, it was judged that the Vietnam plant's smart factory and renewable energy production plant establishment project was effective in strengthening EDCF's quality competitiveness by establishing a convergence model. The above establishment project is supported by free ODA from the Korea International Development Cooperation Agency and paid ODA from the Export-Import Bank of Korea, and is expected to strengthen the quality competitiveness of aid through joint business planning and business information sharing with the two organizations.

Finally, in terms of preemptive response to changes in the development environment, the Vietnam plant's smart factory and renewable energy production plant establishment project were considered to meet the preemptive response to changes in the development environment, given that it is not highly binding. In the case of the above project, binding is applied only to the stage of establishing a new renewable energy production plant, and binding is not applied at the stage of converting the existing factory in Vietnam to a smart factory. Therefore, it is judged that the above project is a project that responds well to changes in the development environment where non-binding aid is expanding. Therefore, the Vietnam plant's smart factory and renewable energy production plant establishment project are significant in terms of enhancing development effectiveness, strengthening quality competitiveness, and preemptive response to changes in the development environment, so it could be implemented as a project of the Export-Import Bank of Korea.

V. Conclusion

Amid the changing international situation, Korea needs to expand its economic cooperation relationship, which has focused on Northeast Asia, and diversify its economic structure that relies on major countries of the powerful. In this respect, Vietnam can be a good partner country with the value of shared growth. For the sustainable development of Vietnam and mutual growth of Korea, we emphasized the importance of Korea-Vietnam cooperation in the Vietnamese manufacturing sector and proposed measures.

Vietnam's industrial structure has shown a primary industry-centered industrial structure from the past, but recent growth of the manufacturing industry is remarkable. The Vietnamese government has announced that it will further expand the site of the industrial complex for Vietnam's industrialization, and accordingly, factories in Vietnam are expected to increase. However, there are voices of concern rather than the prospect that the expansion of the Vietnamese plant will simply enable sustainable growth in Vietnam.

One reason is environmental pollution caused by Vietnamese industry. Vietnam's industry is not prepared for environmental pollution and is damaging nature. The secondary adverse effects of environmental pollution are causing serious damage to Vietnam's economy again. Another reason is the Carbon Border Adjustment Mechanism (CBAM). According to a recent report on CBAM released by the EU, the Carbon Border Adjustment Mechanism is expected to take effect as early as 2026. This CBAM is expected to deal a major blow to Vietnam's economy, which is highly dependent on coal-fired power plants. In line with the changing global paradigm, Vietnam's industry also needs to change in an eco-friendly direction.

Korea-Vietnam cooperation in the manufacturing sector through ODA is expected to contribute greatly to Vietnam's sustainable growth from this perspective. The South Korean government has provided non-exchange aid to Vietnam through KOICA and the Export-Import Bank of Korea EDCF, and it has confirmed that it is working on various ODA projects based on this. Based on this, we envisioned a project called "Smart Factorization of Vietnamese Factories and Establishment of New and Renewable Energy Factories". As the first step of the project, free ODA and paid ODA (EDCF·EDPF) will be provided from KOICA Vietnam office and the Export-Import Bank of Korea, respectively. As a second step, the Vietnamese government, Korean smart factories, renewable energy companies, and Vietnamese manufacturing plants will cooperate to implement a public-private joint project. As a final step, the existing Vietnam plant will be converted into a smart factory through funds provided by KOICA and the Export-Import Bank of Korea, and new renewable energy production plants such as green hydrogen production plants will be built in Vietnam.

The effectiveness of receiving funds necessary for the project was also reviewed according to each project review method. First, the effectiveness of ODA was examined according to the KOICA's project review method. In terms of validity, it was judged that the project to make a smart factory of a Vietnamese factory and establish a new and renewable energy production plant was effective in satisfying the Vietnamese government's goal of enhancing national competitiveness. In terms of the need for support, the effectiveness of the project was confirmed in that it increased the innovative power of the Vietnamese manufacturing industry. Next, the effectiveness of the Export-Import Bank of Korea (EDCF·EDPF) ODA was reviewed according to the project review method of the Ministry of Strategy and Finance. In terms of improving development effectiveness, it was judged that the Vietnamese factory's smart factory conversion and renewable energy production plant establishment project were reasonable in that it met the enlargement of the EDCF project and strengthened the all-round partnership. When reviewed in terms of strengthening quality competitiveness, it was confirmed that it is effective in strengthening the quality competitiveness of EDCF by establishing a fusion model with presence or absence. Finally, when examining the effectiveness of the project in terms of preemptive response to changes in the development environment, the validity was confirmed in that it was not a highly binding project.

The smart factorization of Vietnamese factories and the establishment of new and renewable energy production plants will help Vietnamese factories reduce carbon emissions, which is expected to greatly help Vietnam overcome foreign pressure. It is also expected that Vietnam will be exempted from internal and external environmental pollution regulations, enabling continuous growth from middle-income countries to advanced countries. In addition, it is considered suitable to sustain the remarkable growth that has been achieved so far through environmental improvement. In addition, Korea is also expected to enhance its economic growth by providing its own eco-friendly companies with a platform for cooperation with new markets and other companies.

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