A Study on the Inspiration of China's "Blue Carbon Ecosystem" for the Development of Coastal Areas in Korea

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ABSTRACT
In a speech to the National Assembly on 28 October 2020, South Korean President Moon Jae-in announced that South Korea would become carbon neutral by 2050. Since then, how to achieve carbon neutrality has become a common topic of discussion among Korean scholars. This paper focuses on the policies related to the construction of blue carbon ecosystems in China. Through a review of the main contents of China's policies, the focus of policy formulation and development direction is collated. It is ultimately proposed that in the process of developing a blue carbon ecosystem. Korea needs to pay attention to the development and utilisation of mudflat resources as the mainstay of the blue carbon ecosystem, and to carry out regional pilot projects on carbon sinks in marine ecosystems in line with Korea's local context. As to lay a solid foundation for Korea to achieve carbon neutrality by 2050 in the future.

Keywords: *China policy, Blue carbon ecology, Carbon neutrality, South Korea mudflats.*

1.INTRODUCTION

1.1. Purpose and need for the study

In a speech to the National Assembly on 28 October 2020, South Korean President Moon Jae-in announced that South Korea will become carbon neutral by 2050.[1] Since then, how to achieve carbon neutrality has become a common topic of discussion among Korean scholars. Carbon neutrality[2] is the process by which companies, organizations or individuals measure the total amount of greenhouse gas emissions they produce directly or indirectly over a certain period, and offset their own CO2 emissions by planting trees, saving energy and reducing emissions, to achieve "zero" CO2 emissions.[3] At the same time, the IPCC's fifth report[4] notes that carbon emissions are on the rise due to changing human fossil energy use and land use patterns, making research into carbon sequestration and storage essential. Improving the fixation of emitted carbon dioxide by converting brown carbon to green and blue carbon. Green carbon[5] is the carbon that is removed by photosynthesis and stored in natural ecosystems and is an important part of the global carbon cycle; 55% of this carbon is captured by marine organisms, so it is also known as "blue carbon". As a country surrounded by the sea on three sides, Korea has a long coastline and abundant marine resources, so the development of blue carbon ecosystems is one of the main forces in addressing carbon sequestration for Korea to reach its carbon neutrality target by 2050. But despite the long coastline, the number of coastal wetlands is decreasing, from 3,204 km² in 1987 to 2,482 km² (including eye swamps) in 2018, a decrease of about 23% in 30 years. Therefore, this article hopes that the study will bring relevant insights to the blue carbon ecosystem in Korea and provide a solid foundation for reaching the carbon neutrality target in the future.

1.2. Methodology and scope of the study

This article uses a case study approach to analyse policies related to the construction of blue carbon ecosystems in China as a focus. By sorting out the main elements of the policies, the focus of policy formulation and development direction is collated as a theoretical basis for building a blue carbon ecosystem in Korea.

1.3.Preliminary studies

In the article "The Blue Carbon Content and Implications of the Special Report on Oceans and the

Cryosphere in a Changing Climate", published in Marine Science in 2021, Zhao Peng analyzed the content of the Special Report on Oceans and the Cryosphere in a Changing Climate issued by the United Nations Intergovernmental Panel on Climate Change (IPCC) and offered constructive comments. The article focuses on the international report rather than the national policy, which is not as valuable as the national policy for Korea to explore and establish a "blue carbon" policy.[6]In the paper "New Blue Carbon Candidates for Carbon Neutrality by 2050", presented at the joint conference of the Korean Association of Marine Science and Technology in 2021, Kunsan University scholar Kwon Bongoh stated that Korea is not rich in the three major blue carbon resources recognized by the IPCC due to geography and climate, and therefore explored new blue carbon by looking at the potential resources that Korea currently has that could achieve the same carbon reduction effect. This article, while in line with Korea's national context, is a good example of a new blue carbon resource. Although this article is relevant to the Korean context, it lacks references to other countries on this topic and the resulting solution is somewhat limited.[7]

Therefore, to ensure the reliability of the conclusions, this article examines the relevant policies of China, a major blue carbon ecosystem country, as a reference object, and examines a suitable blue carbon development path for Korea, considering the national conditions of Korea.

2. BLUE CARBON ECOSYSTEM DEFINITION AND VALUES

The concept of "blue carbon" comes from the United Nations Environment Programmer's 2009 Blue Carbon Report and refers specifically to the carbon that is fixed in ecosystems such as mangroves, salt marshes and seagrass beds. They will play a vital role in mitigating global warming and reducing greenhouse gas emissions and are a viable alternative to "emissions reductions".[8]

Blue carbon ecosystems can help reduce the impacts of climate change, support adaptation, and secure social, economic, and environmental outcomes. Healthy blue carbon ecosystems store and sequester carbon to help mitigate climate change, support biodiversity, and provide valuable ecosystem services to coastal communities, while they also fix and store carbon from the atmosphere and oceans, reducing the negative impacts of global climate change in this way.

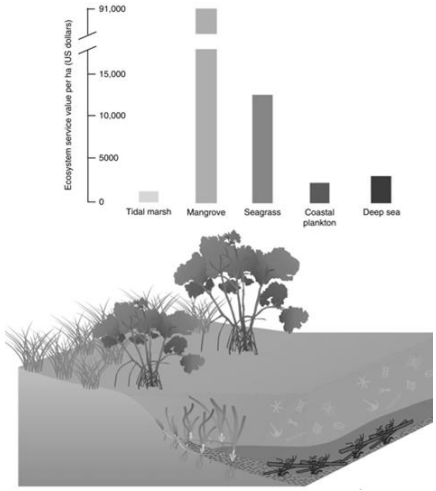

Figure 1 Estimates of the economic value of blue carbon ecosystems per hectare（2009）

3. STATUS OF BLUE CARBON ECOSYSTEMS IN COASTAL AREAS OF KOREA

Currently, the sources of carbon sequestration (blue carbon) for marine ecology included in the IPCC GHG infrastructure are limited to mangroves, salt marshes and seagrass beds. In Korea, however, there are no mangrove resources, while salt marshes are scarce and only seagrass beds are available as a source of blue carbon.

Figure 2 Mangrove Resources World Distribution Map（2001）

Figure 3 Salt marsh resources world distribution map（2008）[9]

Figure 4 Map of the world distribution of seagrass bed resources（2009）

Although Korea lacks mangroves and salt marshes, it has an abundance of mudflats that serve as habitats for salt plants and planktonic algae, which, through photosynthesis, absorb and reduce the carbon dioxide present in the atmosphere, also having the effect of reducing emissions, in line with the concept of blue carbon.

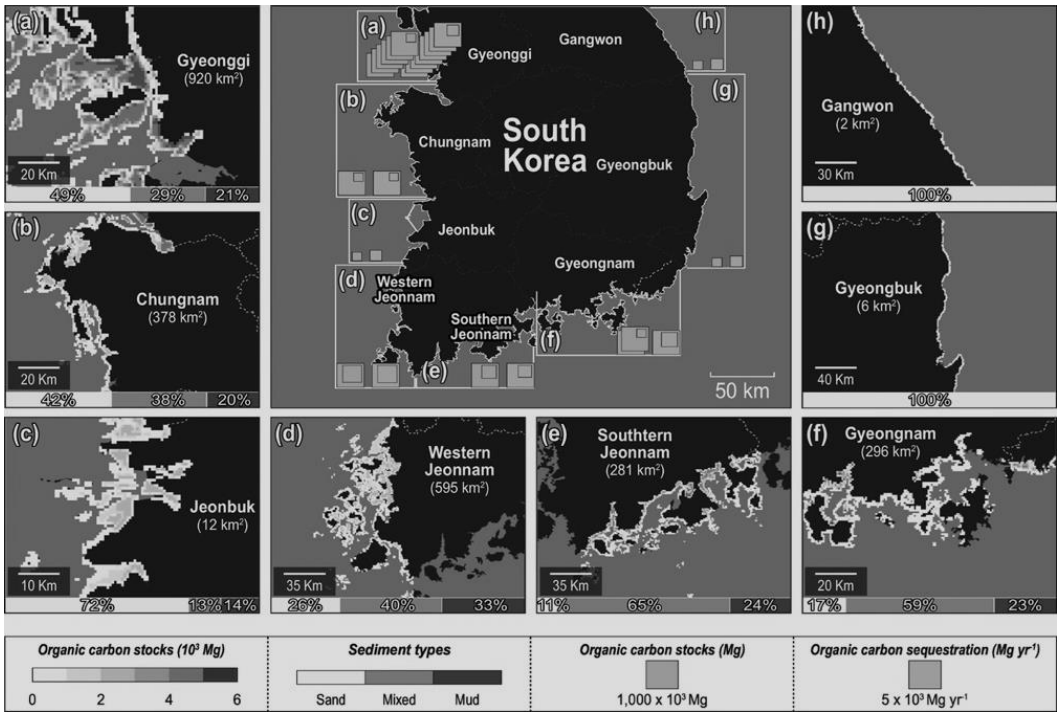

Figure 5 Korean beach reserves（2021）[10]

4. POLICY ANALYSIS ON CHINA'S BLUE CARBON ECOSYSTEM

Table 1 China Blue Carbon related policy documents

File name	Date of issue	Related content
《Opinions of the State Council of the Central Committee of the Communist Party of China on Accelerating the Construction of Ecological Civilization》	2015.4	Increasing ocean carbon sinks as a means of effectively controlling greenhouse gas emissions
《The National Plan for the Main Marine Function Areas 2015-2020》	2015.8	Actively develop and utilize marine renewable energy to enhance the function of marine carbon sinks
《Outline of the Thirteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China》	2016.3	Strengthening coastal protection and restoration, implementing the "Southern Red and Northern Willow" wetland restoration project, the "Ecological Island Reef" project, and the "Blue Bay" improvement project
《"The 13th Five-Year Plan" for the Control of Greenhouse Gas Emissions》	2016.11	Explore piloting carbon sinks for ecosystems such as oceans

China's coastal wetlands cover an area of about 6.7 million hm2, making it one of the few countries in the world with three major blue carbon ecosystems: seagrass beds, mangroves, and coastal marshes. Of these, seagrass beds cover more than 20,000 hm2 (unpublished data) and are widely distributed along the country's coast; mangroves cover about 25,000 hm2 and are in the waters south of Zhejiang; and coastal marshes cover about 12,000 to 34,000 hm2 and are widely distributed throughout the country. China's mariculture production accounts for about 70% or more of the worlds. Shellfish and algae aquaculture are the largest marine aquaculture objects in China in terms of production. In 2015, China's marine shellfish aquaculture production reached 13.584 million tons, with a culture area of 1.526 million square kilometers, accounting for 73% of China's marine aquaculture production. Macroalgae amounted to 2.098 million tons, with a culture area of 130,000 km², accounting for 11.1% of China's mariculture production.

The above policy documents show that in recent years, the Chinese government has placed an unprecedented level of importance on the construction of ecological civilization, and the important role of blue carbon in addressing climate change and improving the marine ecological environment has been increasingly emphasized. Blue carbon has been deployed in several important documents, including the Opinions of the State Council of the CPC Central Committee on Accelerating the Construction of Ecological Civilization, the 13th Five-Year Plan for Controlling Greenhouse Gas Emissions, and the National Plan for the Main Function Zones of the Ocean. The outline of the 13th Five-Year Plan also proposes to implement the "South Red and North Willow" ecological project. The "development of blue carbon sinks" has also been included in the First Biennial Update on Climate Change of the People's Republic of China, which was submitted to the Secretariat of the United Nations Framework Convention on Climate Change on 12 January 2017.

5. CONCLUSION

In this paper, we have reviewed the value of the concept of blue carbon and the current situation of blue carbon ecosystems in the coastal areas of Korea and found that although Korea lacks the sources of carbon sequestration in marine ecology that are included in the IPCC greenhouse gas infrastructure, it has abundant mudflat resources, which are also compatible with the concept of blue carbon and create equivalent value.

With reference to China's policy and the current situation of blue carbon resources in Korea, we can conclude that in developing a blue carbon ecosystem, Korea needs to emphasize the development and utilization of mudflat resources as the mainstay of a blue carbon ecosystem and strengthen the protection and restoration of coastal resources. In addition to this, a regional pilot project on carbon sinks in marine ecosystems in line with Korea's local needs should be carried out to lay a solid foundation for Korea to become carbon neutral by 2050.

AUTHORS' CONTRIBUTIONS

These authors contribute equally to this paper and should be considered as co-first author.

ACKNOWLEDGMENTS

This work was supported by a grant from Brain Korea 21 Program for Leading Universities and Students (BK21 FOUR) MADEC Marine Designeering Education Research Group.

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