

A Study on Inclusive Green Growth of South Korea: Focusing on Sustainable Development Goals, Climate Change, and Ecosystem Services

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ABSTRACT

Current international negotiation and cooperation for sustainable development are focused on three main themes. The first theme is implementation of Sustainable Development Goals (SDGs). The second theme is development of measures for climate change. The third theme is sustainable management of biodiversity and ecosystem services. In South Korea, responses of government policies and academic studies have been predominantly to one of these three themes. There have not been many integrated efforts to develop countermeasures considering all three international themes. In addition, while “green growth” policies have been setting national agendas for Korea’s sustainable development, they must be scrutinized such as why they have not dealt with some parts of these three themes and whether they have ignored one of these themes due to lack of integrated responses. This study finds critical issues in South Korea on how to harmoniously respond to the three themes of international efforts and improve green growth policies. First, to achieve SDGs, the domestic statistical system must be reorganized to track the achievement of “inclusiveness” and “green growth”. Second, the climate change response policy should seek inclusion between countries and between social groups. Third, in the field of biodiversity and ecosystem services, it is necessary to establish Korea’s identity in global geopolitics and enhance its own traditional ecological knowledge. Fourth, it is necessary to consider how to solve discrepancy between climate change response policies and biodiversity–ecosystem service management policies. Finally, proactive improvement of laws and institutions must occur to promote inclusive green growth.

Keywords: Biodiversity, Climate change, Ecosystem services, Inclusive green growth, Sustainable development goals

Introduction

The ‘sustainable development’ concept stems from the awareness of the issue that sustainable economic growth is difficult to achieve without environmental or resource supports, or a breakdown of its foundation (Daly, 1993; Meadows *et al.*, 1972). With recent stable management of traditional environmental issues such as water, air, and waste, especially in developed countries, the international community has proposed a concept of ‘green growth’ as a theoretical framework in which the community can respond

to problems such as climate change risks and biodiversity losses while simultaneously achieving economic growth. In addition to the emphasis on green growth, there has been another trend focusing on ‘inclusiveness,’ recognizing that sustainability should be discussed while taking into account starvation, basic human rights, social justice, and solicitude.


This relationship between green growth and inclusiveness is schematically illustrated in Fig. 1. It shows how the concept of ‘sustainable development’ has evolved over time into other concepts such as green growth and inclusive green growth. Considering that sustainability can be achieved when economic, environmental, and social elements are fundamentally balanced, concepts have been developed focusing on different aspects. Discussions on sustainability started with an emphasis on the environment at the early stage. After environmental issues were

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handled to some extent, the demand for economic growth was reflected in discussions. The current trend has more emphasis on social inclusiveness. The concept of ‘green growth’ focuses on ‘economic growth’ considering environmental impacts. ‘Inclusive green growth’ is a strengthened concept retaining the former concept and social factor.

In fact, since all concepts argue the balance of economy, environment, and society, it is difficult to see that there is a particular pillar of emphasis. This paper inevitably showed pillars of emphasis for the convenience of analysis and understanding.

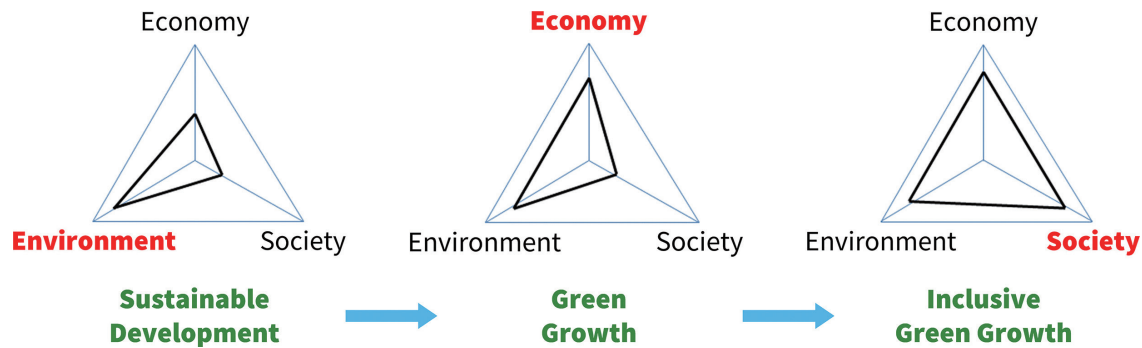


Fig. 1. Changes in pillars of emphasis in sustainability. Red text indicates pillars of emphasis.

In line with this international discussion trend, this paper first examined the theoretical background of concepts of ‘green growth’ and ‘inclusiveness.’ It then analyzed how these concepts were reflected in international agendas such as the Sustainable Development Goals (SDGs) and reviews what kinds of approaches South Korea should take to handle these agendas. Lastly, based on such new understanding, we proposed new principles that could be helpful for policy-making processes in the country.

Materials and Methods

This paper examined the theoretical background of green growth and inclusiveness based on the history of discussions in the international community. It also examined how South Korean and international laws and institutions supported these theoretical developments.

Theoretical background: ‘Green Growth’ and ‘Inclusiveness’

The term and concept of ‘green growth’ were first known in the international community through the Fifth Ministerial Conference on Environment and Development in Asia and the Pacific held in Seoul in 2005. In the conference, the term ‘green growth’ could be found in ‘the Seoul Initiative on Environmentally Sustainable Economic Growth’ (Green Growth) announced by the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP, 2005a) as well as in ‘the Ministerial Declaration on Environment and Development for Asia and the Pacific’ (UN ESCAP, 2005b). However, in the then-relevant documents, green growth was not yet officially

defined. It was used only as a synonym for environmentally sustainable economic growth.

Given that the concept of ‘green growth’ was first introduced at the international conference held in South Korea, Seoul led the conceptual discussion earlier than other countries. ‘Low Carbon Green Growth’ was first advocated by former President Lee Myung-bak at the Liberation Day ceremony in 2008. It is a mixed term of low carbon and green growth. Low carbon refers to “lowering dependence on fossil fuels, expanding the use and distribution of clean energy, and reducing greenhouse gases to an appropriate or lower level by expanding carbon sinks”. Green growth means “growth achieved by saving and using energy and resources efficiently to reduce climate change and damage to the environment, securing new growth engines through research and development of green technology, creating new job opportunities, and achieving harmony between the economy and environment” (Article 2 of the Framework Act on Low Carbon, Green Growth). The announcement became the basis for the Framework Act on Low Carbon, Green Growth which came into force in early 2010.

Meanwhile, the global economic downturn began with the 2008 U.S. financial crisis. Several countries embarked on revitalizing their economies through investments in green industries to overcome the crisis. The most representative cases were the 2009 enactments of the Framework Act on Low Carbon, Green Growth in South Korea and the American Recovery and Reinvestment Act in the United States. As most developed countries introduced similar policies, the Organization for Economic Co-operation

and Development (OECD) came to redefine the concept of green growth in 2011.

The OECD, a group of advanced economies, defined ‘green growth’ as “fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies” and suggested it as one of common development goals for all in 2011 (OECD, 2011). The organization defined it based on previous discussions. It can be regarded that South Korea has led the international community’s full-scale discussions on green growth.

However, there were criticisms that the green growth theory in advanced economies did not sufficiently consider unfavorable economic, social, and environmental condition-sin developing countries. It was necessary for the United Nations to re-define the concept of sustainable development corresponding to the green growth concept. In this sense, the United Nations Environment Programme (UNEP) announced ‘green economy’ as a unified concept in 2010. It refers to “one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (UNEP, 2010). This concept did not intend to replace the Sustainable Development concept of the World Commission on Environment and Development (UN Secretary-General, World Commission on Environment and Development (WCED), 1987), but was presented as its sub-concept. Compared to the OECD’s concept of green growth, social equity was added and denoted in the concept.

Fig. 2 indicates the development and context of green growth-related concepts. ‘Green growth’ is a concept emphasizing economic growth. The OECD, an international ‘economic organization,’ adopted this concept to replace the sustainable development concept. The international ‘environment organization’ UNEP defined green economy as a sub-concept of sustainable development with an emphasis on the economy.

Second, it can be broadly seen that ‘inclusiveness’ is in line with ‘social’ sustainability, one of three pillars of ‘sustainable development’ (e.g., economic, social, and environmental). The term ‘inclusive growth’ was first denoted internationally after it was presented as one of three long-term complementary strategic agendas (i.e., inclusive growth, environmentally sustainable growth, and regional integration) by the Asian Development Bank (ADB) (2008). As aforementioned, considering that concepts of ‘green growth’ and ‘green economy’ adopted such words as well-being and social equity, it seemed that social dimension or inclusiveness was considered even if they were less explicated. The concept of ‘inclusiveness’ has continued to be specified since then. A paper of the United Nations Research Institute for Social Development (UNRISD) has stated that “an inclusive society that entails respect for human rights, cultural diversity and democratic governance, and upholds principles of equality and equity” (Dugarova, 2015).

WCED report in 1987 – *Our Common Future*, also known as *the Brundtland Report* - summarized the most widely known concept of sustainable development. It has also pointed out that the intra-generational equity in developing and developed countries is an essential factor for sustainable development (UN Secretary-General, WCED, 1987). ‘The inter-generational equity’ was highlighted in the report, meaning that “it meets the needs of the present without compromising the ability of future generations to meet their own needs.” It plays a key role in achieving the inclusiveness of national development (UN Secretary-General, WCED, 1987). In South Korea, the 2006 ‘National Strategy for Sustainable Development’ and the 2007 ‘Sustainable Development Act’ were also greatly influenced by WCED’s concept of sustainable development.

In the 2012 United Nations Conference on Sustainable Development (UN CSD), world leaders and representatives agreed on the concept and role of ‘green economy’ and ‘inclusiveness,’ culminating in finalizing the non-binding document *The Future We Want*. It also decided to set SDGs by 2015, which had the greatest impact on the hierarchical establishment and adjustment of the green growth concept in South Korea. Millennium Development Goals (MDGs) targeted for delivery by 2015 focused on supporting developing countries to eradicate poverty. Its follow-up program, SDGs was expected to present a common direction for development for all countries from 2016 to 2030.

In the 2015 United Nations Sustainable Development Summit, leaders and representatives of its member states adopted the ‘2030 Agenda for Sustainable Development,’ which included ‘SDGs consisting of 17 goals and 169 targets (Fig. 3). Eight indicators, including poverty eradication among

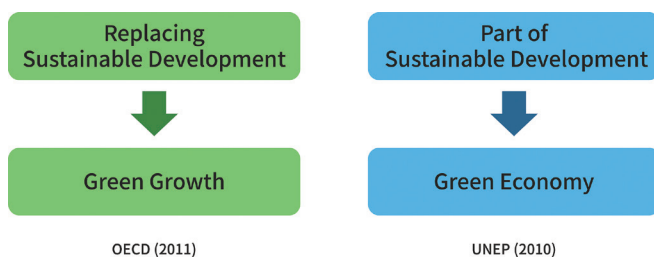


Fig. 2. Conceptual diagram of green growth and green economy.

these 17 goals, are directly or indirectly related to inclusiveness. Accordingly, existing concepts of green economy or sustainable development need to be revised or differently em-

phasized. For example, UNEP has revised the existing green economy concept to the 'inclusive green economy' concept by reflecting the setting of SDGs (Fulai *et al.*, 2015).

A. UN Sustainable Development Goals



B. Inclusiveness-related SDGs

- SDG1: No Poverty
- SDG2: Zero Hunger
- SDG3: Good Health and Well-Being
- SDG4: Quality Education
- SDG5: Gender Equality
- SDG6: Clean Water and Sanitation
- SDG7: Affordable and Clean Energy
- SDG8: Decent Work and Economic Growth
- SDG10: Reduced Inequalities
- SDG16: Peace, Justice and Strong Institutions

Fig. 3. Seventeen Sustainable Development Goals (UN, 2016) and inclusiveness-related goals.

Fig. 4 illustrates that the inclusiveness concept is introduced to emphasize social sustainability, evolving into the 'inclusive green economy' concept after its combination with the green growth or green economy concept.

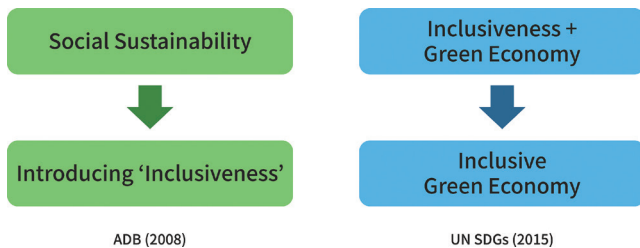


Fig. 4. Integration of inclusiveness into green economy.

Theoretical conflicts and legal progress

There might be conceptual and theoretical conflicts of green growth between developing and developed countries. Developing and less developed countries have criticized that the green growth concept in South Korea and the OECD is dominated by the development logic of rich countries. In other words, developed countries can achieve such economic growth or 'green growth' via low-carbon-intensity methods based on their accumulated capital and technology, whereas developing countries still need to pursue economic expansion using fossil fuels. If developing countries pursue

green growth, they can hardly catch up with developed countries.

Considering that sustainable development concepts have been historically established through 'consensus and coordination' among UN member states, it is necessary to consider the stance of developing countries as well. From this perspective, the necessity to establish and adjust the existing concept of green growth and its hierarchy has been highlighted, while considering changes in the international community's consensus and reorganization of its academic concepts since 2008.

The emphasis on inclusiveness is becoming increasingly evident in the international community's understanding of ecosystems. Ecological understanding of the Earth based on indigenous and local knowledge (ILK) has led to legislation. In South America, for example, as an alternative to existing ecological theories suggested in the debate on the theoretical framework of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), the concept of 'Living-Well in balance and harmony with Mother Earth' learned from thoughts of indigenous peoples (the words are expressed as "Buen Vivir" in Ecuador and "Vivir Bien" in Bolivia) has been suggested as an alternative development path that promotes economic inclusiveness. This concept has already influenced biodiversity and ecosystem policies as well as climate change response policies. The 2015 Paris Agreement, which was adopted after the IPBES introduced this concept in 2013, stated and highlighted

that some cultures recognized the natural environment as “Mother Earth.” Several South American countries have begun to grant Mother Earth ‘the basic rights.’

Basic rights of Mother Earth were included in Ecuador’s 2008 constitution (i.e., *Constitución de la República del Ecuador*) and Bolivian law in 2010 (i.e., *Ley de Derechos de la Madre Tierra*; its 2012 amendment *La Ley Marco de la Madre Tierra y Desarrollo Integral para Vivir Bien*) (Espinosa, 2014). Such legislative trends have expanded to other countries with U.N. support (Harmony with Nature, 2020). Meanwhile, the New Zealand Parliament has granted nature a legal personality for the first time in the world by passing a bill that recognizes the Whanganui River as a living entity with legal personality (BBC, 2017).

‘Inclusiveness’ in South Korea

How has the South Korean government handled SDGs? It has been pointed out that South Korea’s green growth and green economic system have hindered inclusive growth by focusing on economic growth rather than on poverty alleviation and enhancement of social equity (Bell, 2016). However, considering that former President Park Geun-hye pledged to “democratize the economy” during her 2012 election campaign, Seoul has shown more interest in inclusiveness. In addition, ‘the 3rd Basic Plan for Sustainable Development (2016 – 2035)’ released in 2016 highlighted that there should be more political interest in achieving goals such as gender equality (SDG 5), reduced inequalities (SDG 10), and decent work and economic growth (SDG 8) among 17 SDGs (Government of South Korea, 2016).

South Korea partially reflected inclusiveness-related SDGs in the the 4th Basic Plan for Sustainable Development (2021–2040) (Government of South Korea, 2021). However, the current level of concept application or administrative slogans does not guarantee inclusive development, especially for environment-focused SDGs such as SDG13, SDG14, and SDG15. Deeper theoretical research of inclusive development would secure policy consistency and allow the country to negotiate more efficiently in the international community with operational theoretical concepts (Gupta *et al.*, 2015). Therefore, it is necessary to introduce various indicators related to inclusive development suggested by the ADB (2014) at the government level or develop customized indicators for South Korea to timely evaluate and improve merits and demerits of an inclusive development policy (Anand *et al.*, 2013; OECD, 2016).

Results

Based on conceptual and theoretical understanding of inclusive green growth as aforementioned, applications of

relevant concepts were analyzed about SDGs, responses to climate change impacts, and biosphere conservation as key agendas in South Korea and other countries. As a result, discussions about sustainable development and green growth in the international community are in progress with a focus on the following three themes (Table 1). The first theme is about SDGs implemented in 2016 and mainly led by the UN. The second theme is about responses to climate change with an international governance through the United Nations Framework Convention on Climate Change (UNFCCC) and scientific analysis provided by the Intergovernmental Panel on Climate Change (IPCC) as the center of the discussion. In response to climate change impacts, since the 2015 Paris Agreement, countries have been in hurry to reduce greenhouse gas emissions and develop climate change adaptation policies. The third theme is about the management of biodiversity and ecosystem services. There have been international cooperations through the Convention on Biological Diversity (CBD). IPBES established in 2012 started thematic and regional evaluations in earnest.

In particular, the second and third themes are noticeable. Among nine changes (i.e., climate change, biosphere integrity [genetic diversity and functional diversity], land-system change, freshwater use, and biochemical flows [phosphorus and nitrogen], ocean acidification, atmospheric aerosol loading, stratospheric ozone depletion, and novel entities) that have the greatest impact on the survival of the modern human society, scientists have cited climate change and deterioration of biosphere integrity as the two most important “core” changes (Steffen *et al.*, 2015).

There have been government policies and academic theories regarding countermeasures for these three themes. However, there have been few discussions on how South Korea should set sustainability policies while simultaneously considering these themes. Furthermore, South Korea has suggested a ‘green growth’ policy within the sustainable development framework. It is necessary to figure out whether green growth policy has failed to address these three themes in an integrated approach or whether it is covering one theme but neglecting another. In particular, it is inevitable to face a sharp conflict of interest between developing and developed countries due to the nature of the international community. South Korea should alter its SDGs depending on the direction in which the country establishes its identity when dealing with these three themes. In this regard, this paper analyzed issues and principles necessary to improve the existing green growth policy and policies addressing the three themes in South Korea.

Table 1. Chronology of milestone concepts, documents, decisions, and meetings on three themes: sustainable development, climate change, and biodiversity/ecosystem services.

Year	(1) Sustainable Development		(2) Climate Change	(3) Biodiversity and Ecosystem Services
	Overall	Inclusiveness	Green Growth and Green Economy	
1948				International Union for Conservation of Nature (IUCN)
1972	United Nations Conference on the Human Environment (UNCHE), Stockholm Declaration			
1979				Thomas Lovejoy, "biological diversity"
1987	World Commission on Environment and Development (WCED), "Our Common Future"			
1988			Intergovernmental Panel on Climate Change (IPCC)	
1990			IPCC, "First Assessment Report" (FAR)	
1992	United Nations Conference on Environment and Development (UNCED), "Rio Declaration on Environment and Development" Establishment of the United Nations Conference on Sustainable Development (UN CSD; ~2012)	UNCED, "Agenda 21"	United Nations Framework Convention on Climate Change (UNFCCC)	Convention on Biological Diversity (CBD)
1995			IPCC, "Second Assessment Report" (SAR)	
1997			UNFCCC, "Kyoto Protocol"	Costanza <i>et al.</i> , "The value of the world's ecosystem services and natural capital"
2000		UN Millennium Summit, "Millennium Development Goals" (MDGs)	IPCC, "Special Report on Emissions Scenarios" (SRES)	
2001			IPCC, "Third Assessment Report" (TAR)	
2002	World Summit on Sustainable Development (WSSD), "Johannesburg Declaration on Sustainable Development"			
2005			UN ESCAP, "Seoul Initiative on Environmentally Sustainable Economic Growth (Green Growth)"	UNEP, "Millennium Ecosystem Assessment"
2006			Nicholas Stern, "Stern Review on the Economics of Climate Change"	
2007			IPCC, "Fourth Assessment Report" (AR4)	
2008		Asian Development Bank, "Inclusive Growth"	Korea, "Low-Carbon, Green Growth"	
2010			UNEP, "Green Economy"	UNEP, "The Economics of Ecosystems and Biodiversity" (TEEB) CBD, "Nagoya Protocol on Access and Benefit Sharing" (ABS)
2011			OECD, "Green Growth"	
2012	UN CSD, "The Future We Want" Resolution to establish the United Nations High-level Political Forum on Sustainable Development (HLPF)			Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)
2013	HLPF replaces UN CSD			IPBES, "Conceptual Framework"
2013-2014			IPCC, "Fifth Assessment Report" (AR5)	IPBES, "Nature's Contributions to People" (NCPs)
2014		Small Island Developing States (SIDS), "Green Economy in a Blue World" (Blue Economy)		
2015	UN Sustainable Development Summit, "Sustainable Development Goals" (SDGs)	UNEP, "Inclusive Green Economy"	UNFCCC, "Paris Agreement"	
2015-2016		IPCC, "Shared Socioeconomic Pathways" (SSPs)		
2017				IPBES, "Nature's Contributions to People" (NCPs)
2019				IPBES, "Nature Futures Framework" (NFF)

Setting policy directions to implement SDGs

SDGs are international development goals that are highly related to the inclusive green growth concept. Among 17 SDGs, ten indicators are directly related to inclusiveness. This means that inclusiveness is emphasized relatively. In this sense, the South Korean government can set inclusiveness and green growth-related policies based on these 17 goals and 169 targets. However, as reaffirmed in the national specificity, that is, “the principle of common but differentiated responsibilities” of states in the 2012 UN CSD agreement (i.e., *The Future We Want*), international environmental agreements have been negotiated over a long period and significant compromises have been made. However, final outcomes are often not legally binding or their binding force is weak (Rühs & Jones, 2016).

SDGs are not that different. However, it may not be appropriate for South Korea to respond loosely due to the absence of legally binding force. Although those Goals are currently not legally binding, it is possible to become an international agreement with a legally binding force if achievement levels of the Goals can be measured quantitatively (like the compulsory performance evaluation index for climate change mitigation such as GHG emissions) in the future and verified with each other (i.e., Measuring, Reporting and Verification [MRV]).

The European Union has implemented the Emissions Trading System (EU ETS) and the Europe 2020 Strategy (the aim of reducing GHGs by 20%, from 1990 levels, supplying 20% of energy from renewables, and improving 20% in energy efficiency by year 2020). Through this, it has led climate change policies in the international community, gaining a greater say during the Paris Agreement negotiations than other developed countries. Likewise, if South Korea raises its performance levels of SDGs, it is possible for South Korea to take a leading position in future international negotiations. States that play a responsible role in the international community can lead international negotiations.

In order for South Korea to increase its performance levels, first of all, it is necessary to make efforts to reorganize survey items to find inclusiveness in the national statistics. In other words, it should be possible to monitor performances for the 17 SDGs (or 169 targets), especially those related to inclusiveness. The United Nations Statistical Commission presented the Sustainable Development Goal indicators established in 2016 recommends reporting indicators as subdivided as possible based on income, gender, age, race, ethnic group, immigration status, disability, and geographic location (Statistical Commission, 2016). Among subdivisions, South Korea is urgently required to segment statistical data related to race, ethnic group, and immigration status. The country is no longer a single-ethnic nation due to an increase of

multicultural families through international marriage and the influx of foreign workers. However, national statistics still do not fully reflect such diversity except for several items related to household population (Korean Women’s Development Institute (KWDI), 2015), showing that there is a lack of inclusiveness. It is necessary to come up with measures that can numerically embrace inclusiveness related to SDG indicators such as ethnic minority, race, immigration status, and disability in South Korean statistical data. As the UN also recognizes that there are several difficulties in statistical segmentation and indicator development at a practical level, joint research is actively in progress (Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs), 2016).

Setting climate change adaptation policy direction

As South Korea belonged to the ‘Non-Annex 1’ Parties to the UNFCCC, it is a ‘Non-Annex B’ country that has no obligation to reduce greenhouse gas emissions under the Kyoto Protocol. This was because the country was not an OECD member state in 1997 and defined itself as a developing country. It did not have the obligation to reduce emissions under the Kyoto Protocol. However, the international community has raised its interest in climate change impacts and risks, along with the 2006 Stern Report warning of economic impacts of global warming and the IPCC’s 4th Assessment Report in 2007. Under such situation, in line with levels of economic power and GHG emissions and reductions after the commitment period of the Kyoto Protocol in 2012, there would be more international pressure on South Korea to fulfill its responsibilities corresponding to advanced countries. Therefore, government response policies (e.g., the 1st–4th Comprehensive Measures on Climate Change [1999, 2001, 2004, and 2007], Comprehensive Basic Plan for Climate Change [2008], etc.) were established and implemented. At the 2009 Copenhagen Conference of Parties (COP 15), the international community failed to reach an agreement, which gave some time for South Korea to prepare for climate change responses. At the 2015 Climate Summit (COP 21) in Paris, a legally binding treaty on climate change was adopted. South Korea also had voluntary obligations to achieve its emission reduction targets (i.e., Nationally Determined Contribution [NDC]). South Korea’s NDC aims to reduce greenhouse gas emissions by 24.4% by 2030 compared to 2017 (709.1 MtCO₂eq) (Government of South Korea, 2020).

However, the Paris Agreement stipulated different obligations for developing and developed countries. Unlike the Kyoto Protocol, it did not specify which country belonged to which category. The positive aspect is that South Korea can submit/update its NDC document with its GHG reduction targets and climate change adaptation policies that best suit national interests without defining whether it is a

developed or developing country. On the other hand, it is also burdensome. In the long run, it is necessary to clarify its national identity for sustainable development. As a responsible member of the international community, the country is required to fulfill its obligations. In addition, its climate change response policies must be consistent with strategies for other sectors (e.g., implementation of SDGs or management of biodiversity and ecosystem services).

In a similar context, South Korea needs to determine its future development pathway, that is, setting its national identity. The IPCC's Fifth Assessment Report introduced new development pathways not only considering GHG emissions (as adopted by Representative Concentration Pathways [RCPs] in proceeding reports), but also emphasizing socioeconomic aspects of development termed as Shared Socioeconomic Pathways (SSPs) (IPCC, 2014). After first mentioning SSPs in the Fifth Assessment Report, the IPCC modeling consortium officially published pathway-related academic papers in 2017. The SSP pathways have a total of five scenarios. These categorized scenarios based on relative burdens of climate change adaptation and mitigation are predicted to have different consequences in relation to inclusiveness and green growth. For example, as shown in Fig. 5, SSP 1, the most sustainable development pathway, is desirable as it reduces social inequality (inclusiveness) and lowers carbon intensity (green growth). However, since it can hinder optimization of economic growth in some countries, policies favorable for this pathway might be difficult to gain public support. On the other hand, the SSP 5 pathway, which is expected to bring strong economic growth, can be regarded as an inclusive pathway because it resolves inequality issues among countries. However, this pathway is far from green growth in that it neglects environmental issues (O'Neill *et al.*, 2017).

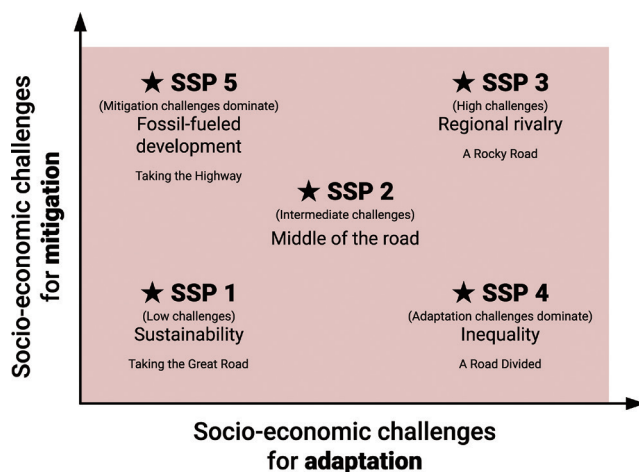


Fig. 5. Shared Socioeconomic Pathways (SSPs). (O'Neill *et al.*, 2017).

Setting the direction of biodiversity and ecosystem service management Policy

The term 'biodiversity' was first described in an academic journal in 1979 (Lovejoy, 1979). It refers to a diversity of organisms and their genetic resources (Lovejoy, 1979). Ecosystem service is a concept that literally understands what kinds of service an ecosystem renders to human beings. Its economic values were noted in 1997 (Costanza *et al.*, 1997). Since then, it has received worldwide attention. This field also requires policy directions to consider inclusiveness.

What does it mean to consider 'inclusiveness' in a subject that appears to belong to natural science? First, it is necessary to 'fit' recent international discussions about the 'ecosystem service' concept into South Korean policies while accepting or reflecting diverse approaches of other countries 'inclusively.' South Korea has not yet fully implemented the concept of ecosystem services into its environmental policies while focusing more on biodiversity conservation. For example, the government translated IPBES into 'Biodiversity Science Organization' in Korean, neglecting the importance of 'ecosystem services' (ES). There are various opinions as to what services mean and how to evaluate services quantitatively and qualitatively because the knowledge about ecosystem services is still low. If such services are fully understood, policymakers can easily interlink or understand the correlation between science and society or policy rather than merely focusing on biodiversity research (Jax *et al.*, 2013). In other words, less attention to ecosystem services is highly likely to weaken the link between science and policy as a result.

What do ecosystem services mean in South Korea? How to measure their deterioration or improvement levels? If South Korean academia and policymakers who have prioritized Anglo-American theories are willing to accept other perspectives in the future, there is room for improvement in inclusiveness. As for the conceptual framework to analyze biodiversity and ecosystem services (IPBES, 2013) confirmed in 2013, some scholars have focused on 'scientific thinking' of developed countries while other researchers have prioritized indigenous and ILK from developing countries. They have not reached agreements on a unified conceptual framework. Thus, there are different conceptual opinions in the framework. As shown in the analytical conceptual framework of IPBES (Fig. 6), concepts from the West are indicated in green and ILK concepts are presented in blue (Borie & Hulme, 2015). The seemingly value-neutral concept 'ecosystem services' is also a result of conflicts and negotiations between developing and developed countries.

South Korea must decide how to understand ecosystem services and manage the ecosystem. If it does not just follow established or familiar scientific theories of the West, but actively understands and introduces new theories from developing countries, it is possible to develop inclusive biodiversity and ecosystem services-related policies. However, it is encouraging because several Korean scholars have already begun to study the ecological significance of traditional Korean thoughts (Lee, 2003; 2004; 2008; Lee *et al.*, 2007; 2012).

Second, it is necessary to establish South Korea's identity in order to accept and reflect 'inclusiveness' in ecosystem services-related policies. 'Inclusiveness' levels can vary depending on national identity and its position towards ecosystem services evaluation. IPBES published a report evaluating global biodiversity and ecosystem services in 2019 (IPBES, 2019). This report was expected to be equivalent to the IPCC's Climate Change Assessment Report in that it attempted to predict ecosystem changes by 2050 in the

short term and 2100 in the long term, along with a reassessment of the current global ecosystem state using the latest knowledge and data (IPBES, 2016). However, since this report laid greater emphasis on inclusiveness than the IPCC report, it would be more helpful to re-define the concept of inclusive green growth. Regarding the question of how South Korea will pursue inclusive green growth, it is necessary to re-examine scenarios at the time in that the IPBES report is a successor of the Millennium Ecosystem Assessment published in 2005.

Fig. 7 shows that two scenarios (i.e., Adapting Mosaic and TechnoGarden) are expected to improve ecosystem services compared to the other two scenarios (i.e., Global Orchestration and Order from Strength). Then, is it possible to realize these two scenarios if countries around the world make efforts in collaboration? Unfortunately, it is hard to achieve that if we look into other aspects as summarized in the following table (Table 2).

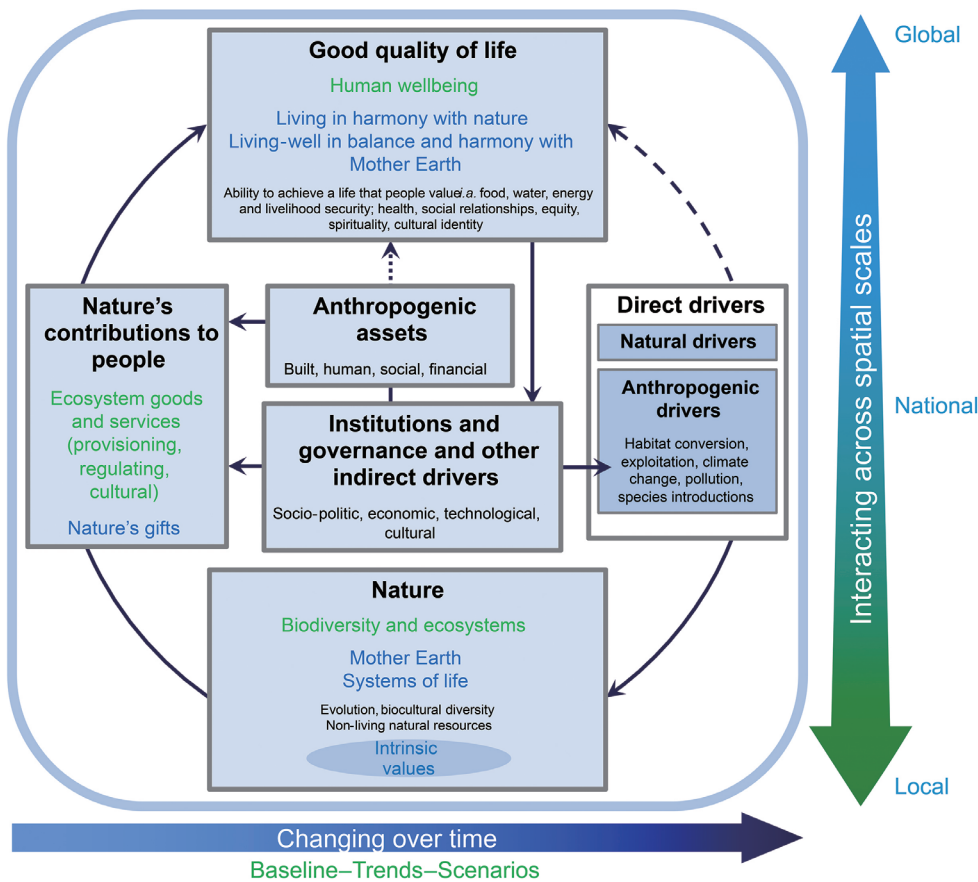


Fig. 6. Analytical conceptual framework of IPBES. Own drawing based on IPBES (2013; 2017).

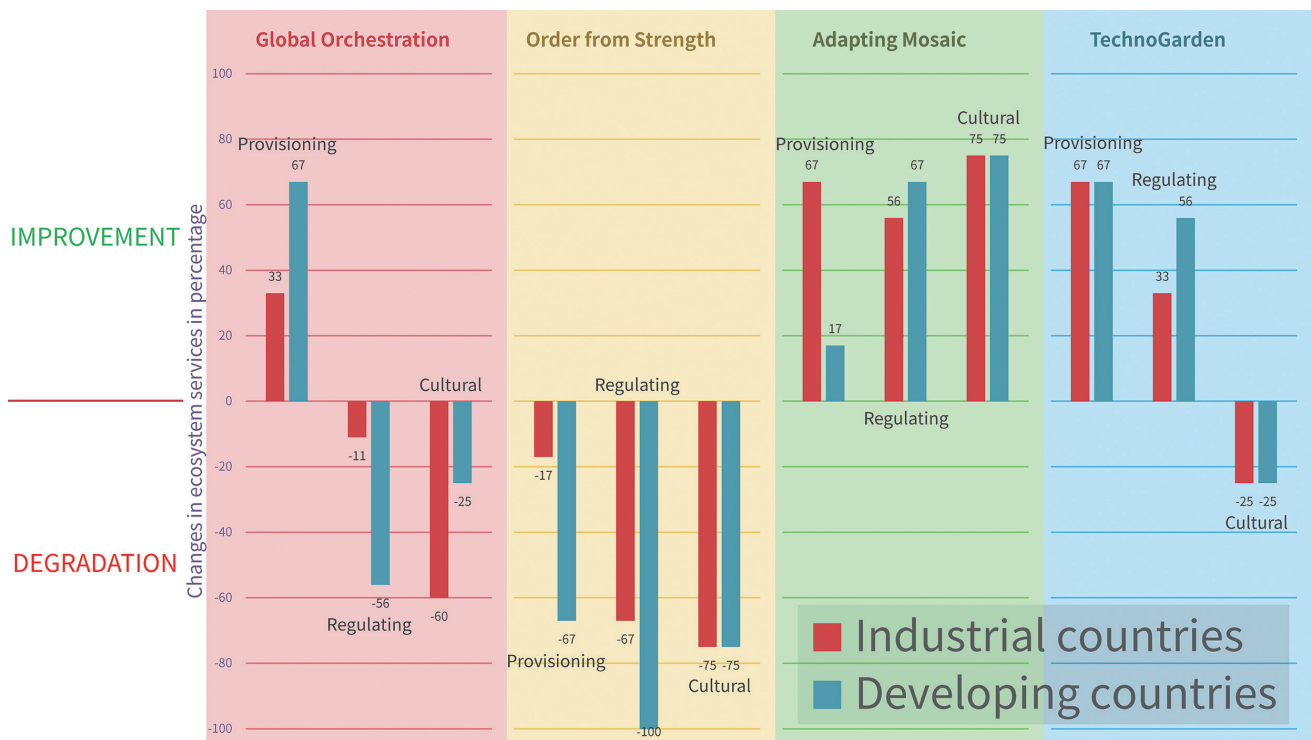


Fig. 7. Change of ecosystem services in 2050 (relative to 2000) according to different scenarios. Source: Millennium Ecosystem Assessment (2005, p. 80).

Table 2. Change of human wellbeing in 2050 (relative to 2000) according to different scenarios.

Services	Global Orchestration		Order from Strength		Adapting Mosaic		TechnoGarden	
	Industrial countries	Developing countries	Industrial countries	Developing countries	Industrial countries	Developing countries	Industrial countries	Developing countries
Material well-being	▲	▲	▲	▼	◄►	▲	▲	▲
Health	▲	▲	▲	▼	▲	▲	▲	▲
Security	▲	▲	▼	▼	▲	▲	▲	▲
Social relations	◄►	▲	▼	▼	▲	▲	▼	▼
Freedom and choice	◄►	▲	▼	▼	▲	▲	▲	▲

Note: ▲ = increase, ◄► = remains the same as in 2000, ▼ = decrease
 Source: Millennium Ecosystem Assessment (2005, p. 78).

As shown in Table 2, rich and poor countries each have different sectoral impacts under ecosystem services scenarios. Under the Adapting Mosaic scenario, there is a general improvement of human welfare. If the material welfare in developed countries is stagnant, it is likely for them to avoid the scenario. The TechnoGarden scenario can

be regarded as a scenario with insufficient ‘inclusiveness’ as it predicts that social relationships would deteriorate regardless of national income levels. Such difference triggers two problems. First, if differences in expectations follow predictions of the model, it reveals that SDGs based on compromises and agreements between richer and poorer

or between developed and developing countries are not common goals for all countries. Second, South Korea should define itself as an advanced/rich country or a developing/poor country before setting policy targets related to biodiversity and ecosystem services. Depending on whether South Korea adopts development/environmental policies favored by developed countries or policies preferred by developing countries such as South America, resultant national welfare levels and social and ecological indicators will be different. Scenarios of the Millennium Ecosystem Assessment explicitly show differences.

Conflicts between policies and legislation

Conflicts between climate change response policy and biodiversity-ecosystem services policy

Climate change response policies could conflict with biodiversity and ecosystem services policies. In other words, policies where there are improved biodiversity and ecosystem services with better inclusiveness may fail to prevent climate change. Table 3 shows estimates of greenhouse gas emissions for a sustainable future agreed in the Paris Agreement. They were compiled by the UNEP.

Table 3. Future global greenhouse gas emissions according to scenarios of the 5th Assessment Report of IPCC and later studies

Limiting warming in 2100	Annual emissions of global total greenhouse gases [GtCO ₂ e/yr]				
	2020	2025	2030	2050	2100
1.5 °C (>50% in 2100)	56	47	39	8	-5
2 °C (>66% in 2100)	52	48	42	23	-3
2 °C (50-66% in 2100)	53	50	47	28	-1

Source: UNEP (2015).

However, according to scenarios of the Millennium Ecosystem Assessment (MEA), it does not seem easy to respond to climate change impacts. As for global GHG emissions in 2050, according to the IPCC, it cannot reach the RCP 2.6 emissions scenario satisfying the target level of climate change agreed in the Paris Agreement. Yet the

TechnoGarden scenario of the MEA predicts that emissions satisfying the scenario with temperature rise limited to 2°C have a probability of 50–66 percent (Table 4). Under other scenarios, it is difficult to expect a sustainable climate system. Yet, the TechnoGarden scenario is highly likely to have insufficient inclusiveness as shown earlier.

Table 4. Global greenhouse gas emissions in 2050 according to scenarios (Gt CO₂ equivalent)

(1) IPCC 5 th Assessment Report					
Scenario	CO ₂	CH ₄	N ₂ O	Others	Total
RCP 2.6	12.4	4.0	1.9	1.0	19.3
RCP 4.5	41.4	7.0	2.7	0.8	51.8
RCP 6.0	46.1	7.5	3.3	0.8	57.6
RCP 8.5	76.2	14.2	4.0	1.7	96.1
(2) Millennium Ecosystem Assessment					
Scenarios	CO ₂	CH ₄	N ₂ O	Others	Total
TechnoGarden	17.2	5.9	2.2	0.7	26.0
Adapting Mosaic	48.8	11.7	3.3	2.2	66.0
Order from Strength	56.5	12.1	4.0	1.8	74.4
Global Orchestration	73.7	13.6	4.0	2.6	93.9

If there is no development pathway that satisfies climate change mitigation and biosphere conservation at the same time, South Korea should clarify its own identity, promoting consistent inclusive green growth policies in the long term. For instance, inclusiveness can be improved by considering measures such as enhancing climate change adaptive capacity for all social classes and their settlement areas rather than technology development. On the contrary, if South Korea chooses optimal GHG mitigation policies to alleviate climate change in line with the international community's expectation, there should be inclusive policies considering developing countries while preparing countermeasures against advocates that prioritize economic growth and competitiveness.

Legal issues

Considering such international community's discussions, it is necessary to take into account of legal issues of inclusive green growth policies from a long-term perspective. For example, when defining ecosystem services, its value judgment of human beings is inevitable. It is difficult to give a definition that all society members or all countries agree on. Thus, a complicated process is required to confirm the definition between researchers in biodiversity and ecosystem services (Borie & Hulme, 2015). In addition, even though a particular organization defines some terms, there is another difficulty in diffusing the knowledge about such terms into diverse sectors of the society. In this regard, the creation or revision of laws and systems regarding ecosystem services is inevitably more difficult than handling environmental issues with clear characteristics and scopes such as 'climate change' (Maczka *et al.*, 2016).

In response to these issues, as seen in the above-mentioned theoretical background, if South Korean constitution or law guarantees basic rights of Mother Earth, it would have a stronger say in the international community and help implement inclusive policies. It will also help institution support proactive environmental policy measures classified as desirable by IPCC's modeling scientists among pathways to green growth (van Vuuren & Carter, 2014) while gaining less attention than reactive measures (Vanhulst & Beling, 2014).

Discussion

The Republic of Korea has led green growth agenda in the international community and received a good reputation at early stages. As developing countries have criticized that green growth policies in richer countries have insufficient 'inclusiveness,' the UN advocated 'inclusive green economy' and confirmed SDGs in 2015. Under such circumstances, South Korea has adopted 'inclusive green growth' (Government of South Korea, 2016).

When South Korea joined the Kyoto Protocol in 1997, no country reacted against Seoul's categorization as a developing country. However, in the last two decades, South Korea has economically grown, leading to higher expectation from the international community. In this sense, South Korea is bound to face limitations if it responds to international agendas and establishes domestic policies from a developing country's perspective.

In particular, South Korea should revise or reset the direction of its 'inclusive green growth policy' if it considers three agendas of sustainable development such as SDGs, Response to Climate Change, and Management of Biodiversity and Ecosystem Services.

International discussions on sustainable development of the Earth system began with the concept of 'sustainable development' which emphasized environmental importance. These discussions have evolved into 'green growth' in which environmental issues (e.g., climate change responses) and economic growth are simultaneously considered in South Korea and OECD member states. Furthermore, these discussion have led to the 'inclusive green growth' concept, while developing countries have claimed that developed countries have historic responsibilities of causing climate change and their duties.

In response to international discussion trends, South Korea must determine policy responses. That is, whether it will take a position as a developed country or a developing country. Based on results of this paper, the following principles or directions of several countermeasures are suggested.

First of all, in order to preemptively achieve SDGs, the South Korean statistical system must be reorganized so that performance levels of 'inclusiveness' and 'green growth' in main government policies and implementations could be tracked. Second, climate change response policies should encompass (cross-sectoral) inclusiveness at levels of countries and social classes. Third, in fields of biodiversity and ecosystem services, the country must clarify its national identity, particularly regarding the concept ecosystem services, while conducting systematic research on traditional ecological knowledge. Fourth, it is necessary to consider how to solve conflicts between climate change policies and biodiversity/ecosystem services management policies. Finally, it seems that legal discussions should be initiated to promote inclusive green growth proactively and preventively. This study is expected to contribute to discussions on how to improve sustainability in the formulation and implementation of main South Korean policies and on how to set the national status in the international community as a developed or developing country or an intermediate position.

Conflict of Interest

The authors declare that they have no competing interests.

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