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Financial strategy to accelerate green growth

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ADB Working Paper Series

**FINANCIAL STRATEGY TO
ACCELERATE GREEN GROWTH**

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Abstract

Green growth simultaneously seeks economic development and environmental enhancement. In order to support green growth financially, the green finance sector needs to be developed.

Funding and investment mechanisms of green finance are different from that of non-green finance, because green finance needs to consider green value in its financial activities.

The role of public finance is important, but limited in its support of green growth because a huge amount of money is needed. Because of this large requirement, the role of private finance is essential. However, under the current private financial mechanism, green fields are difficult to invest in because the risk and return profile of the fields are different from those of traditional industries. Therefore, green finance is needed. Throughout this chapter, strategies for developing green finance are suggested. They include improving rules and regulations of green finance to seek green growth, establishing green financial institutions, utilizing the Green Climate Fund designing a code of conduct for green finance, developing new green financial products, integrating a global cooperative system, and setting up infrastructure.

Keywords: green growth, green finance, Green CAPM, public-private partnership, emission trading system

JEL Classification: G2

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1. INTRODUCTION

Green growth seeks economic development and environmental enhancement simultaneously. In order to support green growth financially, the green finance sector needs to be developed.

According to continuous research conducted by the Intergovernmental Panel on Climate Change (IPCC) to examine the relationship between human activities and climate change, we can, without a doubt, conclude that the current and potential climate change results from anthropogenic activities. The main drivers of climate change are greenhouse gases (GHG) such as carbon, methane, etc.

IPCC (2013), Stern (2006), and KEI (2012) estimated the economic loss from climate change (see Table 1-1).

Table 1-1: Estimation of Global and Domestic Climate Change and Economic Loss by Scenarios

		World		Republic of Korea	
Degree of greenhouse gas (GHG) emission reductions		If the current trend continues:	If significant reductions are achieved:	If the current trend continues:	If significant reductions are achieved:
Projections	Temperature	– will go up 3.7°C on average in the late 21st century (2081~2100).	– will go up 1.8°C on average in the late 21st century (2081~2100).	– will be 5.7°C warmer in later part of the 21st century.	– will be 3.0°C warmer in later part of the 21st century.
	Sea level	– will rise 63 cm by the end of the 21st century.	– will creep up 47 cm by the end of the 21st century.	– will rise 65 cm in the south and west coast of the country, and 99 cm in the east coast, respectively.	– will rise 53 cm in the south and west coast, and 74 cm in the east coast, respectively.
	Precipitation	– will see widening difference in the amount of seasonal rainfall between arid and humid regions. – is likely to increase in the high latitudes and the equatorial Pacific Ocean.		– will increase 17.6% in the later part of the 21st century.	– will rise 16.0% in the second half of the 21st century.
Economic loss		– Economic losses caused by global warming are expected to be 5% to 20% of the world's GDP.		– If temperature rises more than 4°C in 2100, economic losses will reach about 3% of the Republic of Korea's GDP the same year. – By 2100, the accumulated losses are estimated to be W2,800 trillion in total.	

Source: IPCC (2013); Stern (2006); KEI (2012); KMA (2012).

Therefore, green growth policy needs to be focused on how economic development can be achieved by reducing carbon emissions. It will be meaningful enough to review the details of Stern's review in order to understand the impact of climate change to the fullest and the guidelines of the United Nations (UN) Principles for Responsible Investment (PRI) for better understanding of general investment principle considering ESG factors.

Stern (2006) has shed light on the green climate economics and finance. Actually, he opened a new field of climate change economics and urged policy makers worldwide to act right now. According to his extensive and intensive research, it is projected that without proactive actions to mitigate GHGs and adapt to climate change, it will cost us more than 5% of GDP, and within 20 years the global economy could shrink by 5~20%.

However, with a proper and anticipative response, the cost involved with mitigation actions can be confined to 1% of total global GDP, which shows there is asymmetry between proactive and reactive actions. Early actions to mitigate GHGs can make a big difference, according to Stern (2006).

The UN-supported PRI Initiative is an international network of investors working together to put the six Principles for Responsible Investment into practice. Its goal is to understand the implications of sustainability for investors and support signatories to incorporate these issues into their investment decision-making and ownership practices.

The UN PRI guidelines are based on six principles to investors and stakeholders of firms in an attempt to urge them to invest more ESG responsibly.

In order to facilitate the ecology of green firms and industry, which hopefully would be our next generation growth engine, financing green technology and industry with abundant funds would be the most important and critical factor. However, due to high uncertainty within the green field and a lack of a track record of historical high returns on investment related to SRI or green funds, investors are still somewhat reluctant to invest aggressively in green industry and firms.

It is natural that investors – both institutional and individual – seek maximization of their financial profit gains from their investment. For private investors so far, going green is difficult in that it is inherently associated with high risks and low returns at the initial R&D stage. However, once a green market is formed and developed with positive market expectations, likely within the next 10 years, the overall market view will be totally changed. But only well-prepared market players can survive in that time. Once again, those who dominate the new market in advance will take it all, as history has always proved.

Although investing money in the green field at the moment seems like a bottomless pit, it is an inevitable process to form and boost the market. Taking a long-term view is therefore essential in green finance. Policy makers themselves already know that they cannot force the private sector to invest in green energy without a concrete belief and assurance that the market will be formed sooner or later. That is why the Green Climate Fund was established. The role of the public institution is to internalize uncertainties and externalities, which means hedging the risks involved with green investment.

Green growth policy can be attractive to developing countries, which seek economic growth by developing green technologies and green projects. Based on the Paris COP 21, not only developed but also developing countries must participate in the global efforts to reduce carbon emission. However, developing countries' policy priorities will be put on economic development.

As a result, a green growth policy will be needed in developing countries. In order to implement green growth policies, financial support is needed, which can be named as green finance. Through this chapter, financial strategies to accelerate green growth are suggested.

2. CONCEPT AND NEED FOR GREEN FINANCE

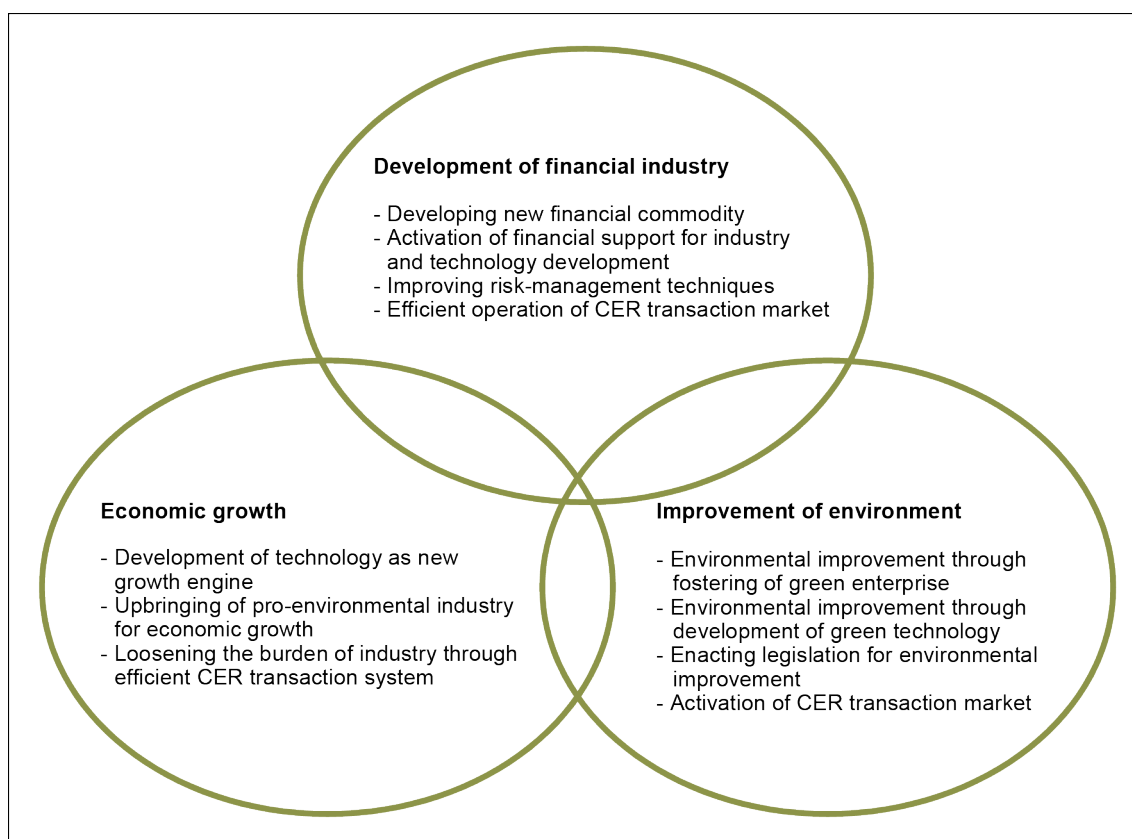
2.1 Concept of Green Finance

There is no single agreed-upon definition that can clearly explain what green finance is. There is not only the term “Green Finance,” but other similar terms also appear these days, and the importance of green finance is increasing. In this chapter, we will define Green Finance in relation to Green Growth and clarify relevant concepts: sustainable finance, environmental finance, carbon finance, and climate finance.

Green Finance

Green finance is a type of future-oriented finance that simultaneously pursues the development of financial industry, improvement of the environment, and economic growth. Green finance should incorporate new technologies, financial products, industries, and services that consider environment, energy efficiency, and reduction of pollutant emissions, according to Rakić and Mitić (2012), to support low-carbon green growth (see Figure 2-1).

Figure 2-1: Definition of Green Finance



Source: Hee Jin Noh (2010).

2.2 Financial Concepts Related to Green Finance

There are several related concepts to Green Finance: Sustainable Finance, Environmental Finance, Carbon Finance, and Climate Finance. The relationship of these concepts can be illustrated in Figure 2-2.

Sustainable Finance

Sustainable Finance is the practice of creating economic and social value through financial models, products, and markets that are sustainable over time, according to University of California, Berkeley (2017). It takes into account investments which are more expansive, comprehensive, and inclusive, considering not only the environmental aspect, but also the social aspect and governance issues.

Environmental Finance

Environmental Finance is finance and investment regarding the ecological environment (Air, water, soil, etc.) Environmental Finance regards environmental damage as financial risk. Under environmental finance, projects that harm or potentially damage the environment are prohibited from being funded or financed. This concept is broader than Green Finance in that it focuses on environmental protection, which may not contribute to economic growth.

Carbon Finance

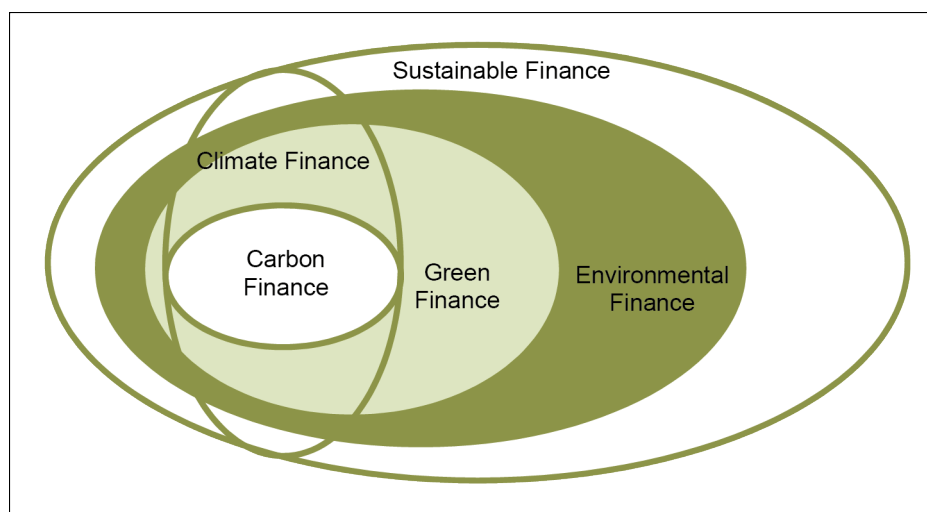
Carbon Finance provides resources to a project which aims to reduce emissions of carbon dioxide and other GHGs.

Through the Emission Trading Market, carbon finance can be designed in versatile ways in spot and derivative markets. Additionally, through a carbon fund, investment for the emission trading market can be made.

Climate Finance

Climate finance supports the activities of climate change adaptation and mitigation to achieve low-carbon economy and implement climate resilient development. Climate finance also supports projects for adaptation that are not included in carbon finance.

Figure 2-2: Relationships with Green Finance and Other Related Finances



Source: Hee Jin Noh (2014b).

3. FUNDING AND INVESTMENT MECHANISM OF GREEN FINANCE

3.1 The Rationale of Green Finance

Green finance can be considered from two approaches. First, green finance can play a role in mitigating environmental damages, especially the consequent impact of climate change on the economic system and human society. According to IPCC, climate change will amplify existing risks and create new risks for both nature and human habitats. As the magnitude of the climate change problem is emphasized by several scientific analyses and forecasts, specific plans involving financial support have been discussed to solve this matter.

Secondly, green finance can play a role as targeted financing that supports green growth. Since green growth is a new paradigm of economic growth, which combines environmental sustainability and economic growth, a financial role that meets capital funding requirements from industries is necessary to facilitate it.

Noh (2012) points out the reasons why the importance of green finance is growing. First, risks from environmental destruction and depletion of natural resources are increasing. Therefore, firms have to be prepared to handle those risks to avoid potential economic losses. Second, stakeholders require firms and financial agencies to be socially responsible. Third, the seriousness of the problem has recently been magnified. In other words, there has been a change in social awareness of crises such as climate change, lack of natural resources, and environmental destruction. Fourth, international agreements and regulations on the environment are gradually being reinforced. Global Reporting Initiative (GRI), ISO 26000, and Principles for Responsible Investment (PRI) are good examples. Fifth, there is a trend of firms' management paradigms shifting to emphasize sustainability.

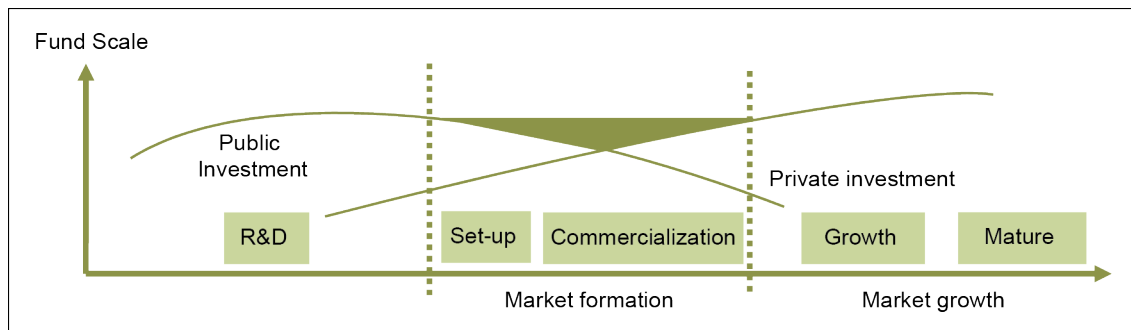
However, according to Hee Jin Noh (2014a), there are some difficulties preventing the smooth funding of green industries. First, investing in green industries has a high level of uncertainty. This is because most green industries have intangible assets rather than tangible assets. Second, investing in green industries is based on future growth potential from a long-term perspective. Third, there is information asymmetry between investors and green industry companies, which may consequently cause imbalance of power in transactions and capital market failures. Therefore, a new approach that is different from traditional finance is required to support green growth.

3.2 Funding Mechanisms of Green Investment

The role of government is very important. Government should financially support green industry at the initial stages of business. Nonetheless, governments have budget constraints and inefficient working systems (red tape), so that continuous and efficient funding from governments is hardly feasible. In this respect, Hee Jin Noh (2014a) claims that governments should introduce and encourage private fund investments in green industries. Moreover, from the perspective of private financing, debt-financing from banks is not an appropriate form of private investment. This is because banks are responsible for guaranteeing principals of deposits, which means they cannot invest in highly risky investment vehicles. Therefore, green finance requires various kinds of financial instruments, and governments should create capital market environments and systems to support green finance. There exist two approaches to induce private investment.

The first approach is to set up an investable market through private investment. At the initial stage, public investment is needed because at this stage, private investment is not feasible due to there being high risks involved. After green market formation and commercialization, private investment can be natural in the market.

Figure 3-1: Green Investment Mechanism



The second is to seek public-private partnerships. There exist several models of this partnership, such as the Fund of Funds model (the Republic of Korea), and Yozma model (Israel).

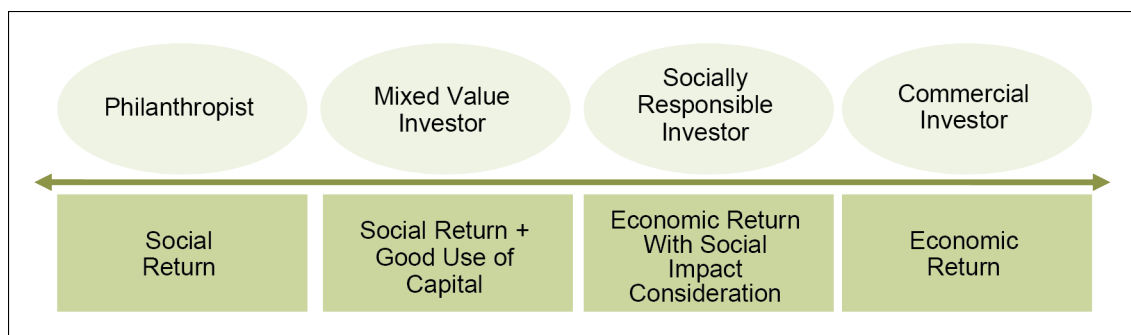
In applying for green finance and attracting more private investors, the public side needs to initiate development of green projects and to provide strong incentives to private investors.

3.3 Revised Capital Asset Pricing Model for Green Investment

3.3.1 Investor Types

The Investor Spectrum is diversified.

Figure 3-2: Investor Type



Source: Hee Jin Noh (2015).

The CAPM model with traditional economic return based on CAPM theory can be revised with the consideration of green value. A new investment approach can be made if the economic return is the same but the green value is different; green investors pursue both economic return and green value.

3.3.2 Expected Rate of Return for Green Investment

The rate of return from a green investment is the sum of economic return [R] plus green return [GR] that derives from green value, which can also be expressed as total return [TR] of green investment.

Economic return is price [P] change of the investment object plus dividend [D].

Green return is the enhanced green value. For example, if a green project reduces carbon emissions, the reduced volume of emissions will be the green return.

$$\tilde{R}_{t+1}(\tilde{P}_{t+1} - P_t + \tilde{D}_{t+1})/P_t + GR_{t+1}$$

Green return [GR_{t+1}] is considered as non-probability variable assuming green value is preceptively recognized.

Expected total green rate of return can be written as follows.

$$E(\tilde{R}_{t+1}) = E[(\tilde{P}_{t+1} - P_t + \tilde{D}_{t+1})/P_t] + GR_{t+1}$$

3.3.3 Utility Function and Utility Indifference Surface Including Green Value

Green utility function can be suggested as

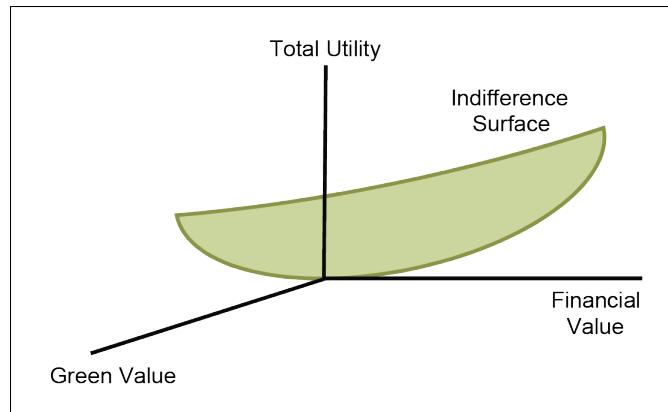
$$U(\tilde{R}) = a + b\tilde{R} + c\tilde{R}^2 + dGR$$

Utility of green investor depends on total rate of return and volatility risk

$$E(U(\tilde{R})) = E[a + b\bar{R} + c(\sigma^2\tilde{R}) + \bar{R}^2] + dGR$$

Green investors' indifference surface can be depicted by combining financial and green value. Points that utility gains from green and financial values can be connected to draw indifference surface. Green investors that are financially oriented will place an importance on economic return utility, whereas those with green oriented value will place an emphasis on green return utility gains.

Figure 3-3: Utility of Green Investment



3.3.4 Revised CAPM for Green Investment

The basic assumptions are that green investors pursue utility maximization both from financial and green values, that green investors recognize green value preemptively at the time of investments, and other assumptions similar to those in CAPM theory.

Green Security Market Line

Green Security Market Line (GSML) expresses the linear relationship between the expected total green rate of returns and its covariance with the market returns. Supposing the green value can be measured and quantified, the GSML can be expressed as,

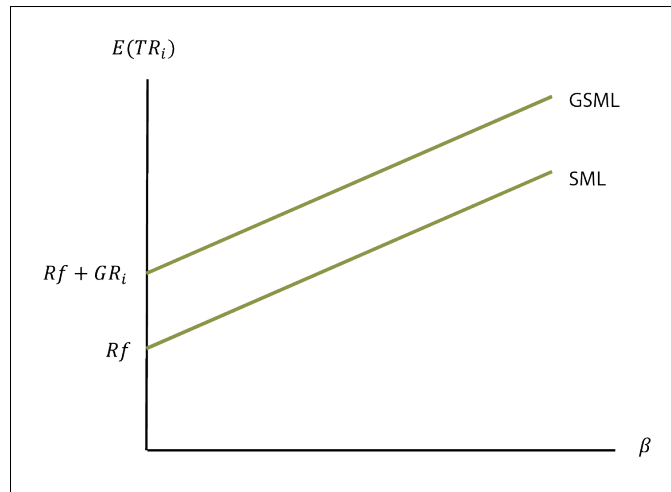
$$E(TR_i) = GR_i + E(R_i) = GR_i + [Rf + \beta_i(E(R_m) - Rf)]$$

Green investors' investment decision depends on where the investment object lies:

When the investment object is above GSML: Buy

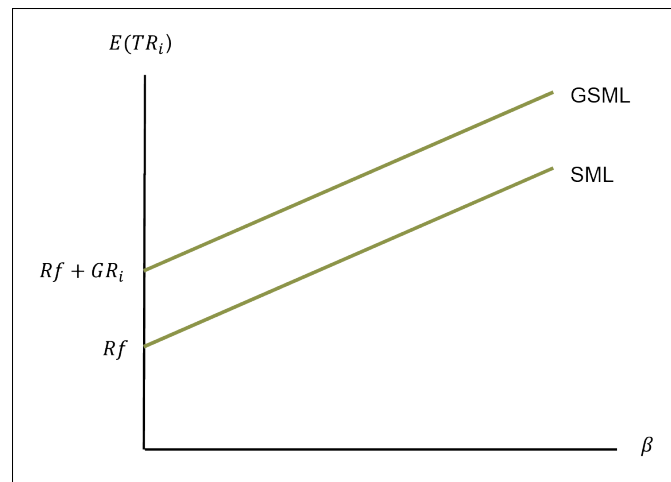
When the investment object is below GSML: Sell

Figure 3-4: Green Security Market Line



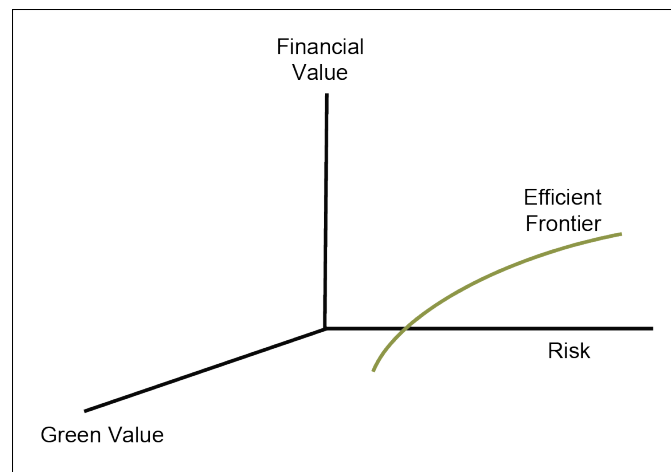
When green values cannot be measured and quantifiable, forming a green value evaluation committee and rating green value grades per each respective company, and assuming green value created is proportional to that of financial value.

$$\begin{aligned} E(TR_i) &= E(R_i) + R_i \cdot E(R_i) \\ &= (1 + GR_i) \cdot E(R_i) \\ &= (1 + GR_i) \cdot [Rf + \beta_i[E(R_m) - Rf]] \\ &= (1 + GR_i) \cdot Rf + (1 + GR_i \cdot \beta_i)[E(R_m) - Rf] \end{aligned}$$

Figure 3-5: Green Market Line (2)

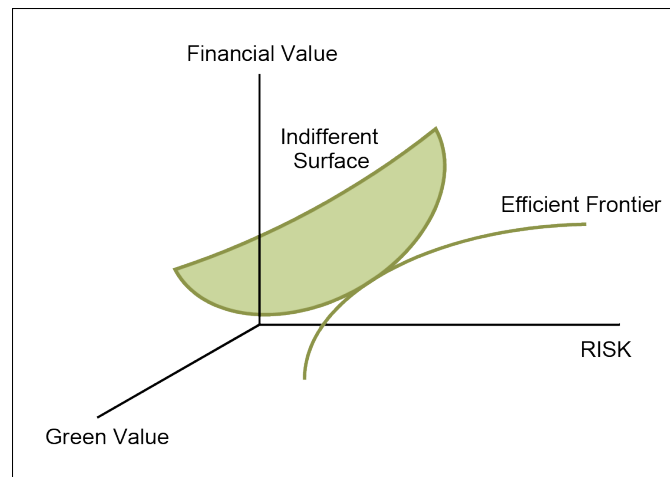
Efficient Frontier of Revised CAPM for Green Investment

Supposing the same risk level, the efficient frontier can be withdrawn by first sorting out securities with high financial value, then the one that has a high green value among them.

Figure 3-6: Efficient Frontier of Revised CAPM for Green Investment

Determination of Optimal Green Portfolio

The optimal green portfolio is determined at the point where utility indifference surface and efficient frontier meet. Unlike traditional investors, green investors gain utility from green value. The most financing opportunities exist for the firms that create green value. Also, the utility of green investors is increased more by green value than traditional investments. Thus, in order to vitalize green investment activities, related policy efforts, including incubation of green investors, should be undertaken.

Figure 3-7: Determination of Optimal Green Portfolio

4. GLOBAL GREEN FINANCE

4.1 Green Financial Products

4.1.1 Introduction

Currently, green financial products are becoming more and more diverse and can become an opportunity for financial institutions to improve their market share; to increase profit; to create customers' loyalty with new products; to improve employee satisfaction and retention; to enhance their brand image; to catch positive media attention; to improve licenses to operate delivered by governments; and to strengthen relationships and partnerships with external eco-friendly stakeholders.

Customers seem to be more aware of the impact of their actions on the environment after understanding the imminent effect it will have on nature and we also observe a rising number of agreements different countries have been making. As a result, the demand for green products has seen a significant increase, including financial products and services. We can divide the drivers of this trend into three categories:

- 1) Environmental Knowledge and Media coverage: The easy access to information and high levels of media coverage has enabled a better understanding of the sources and implications of environmental challenges.
- 2) Environmental Awareness and Public Opinion: A rising level of government support for environmental sustainability and awareness about environmental issues.
- 3) Environmental Regulation and Legislation: Legislative actions to prohibit unsustainable practices or provide more price certainty in environmental markets.

4.1.2 Green Financial Products

Due to this trend and rise in demand for these products, banks have started to enlarge their offer to include them. These can be divided into four banking categories: Retail Banking, Corporate and Investment Banking, Asset Management, and Insurance.

Retail Banking

Green Mortgages	They offer retail customers lower interest rates than those on the market for clients that purchase new energy efficient homes and/or invest in retrofits, energy efficient appliances, or green power. Banks can also offer coverage of the cost of switching a house from conventional to green power, as well as allowing the inclusion of this benefit when marketing the product.
Green Home Equity Loans	They also provide clients with a lower rate that can motivate households to install residential renewable energy technologies. In order to do so, different banks have partnered with technology providers and environmental NGOs.
Green Commercial Building Loans	Arrangements are given to green commercial buildings that have lower energy consumption, reduced waste, and less pollution than traditional buildings. Some appraisers are now identifying reduced operating expenses, improved performance, and longer lifetimes.
Green Car Loans	These loans encourage customers to purchase cars with high fuel efficiency by offering low interest rates. Most green car loans are being offered by credit unions.
Green Cards	Credit cards companies offer to make NGO donations equal to approximately one-half percent of every purchase, balance transfer, or cash advance made by the card owner.

Corporate and Investment Banking

Green Project Finance	Banks have started to create service divisions or teams devoted to large-scale renewable energy finance projects. They have also started to employ groundbreaking financing measures for large-scale clean fuel and renewable energy projects.
Green Securitization	Different environmental securitization techniques have begun to appear. Example: Forest bonds.
Green Venture Capital and Private Equity	More importance is being given to environmental issues when financing companies through the capital market. Banks can be a profitable assistant to IPOs for clean technology providers, carbon credit developers, and firms promoting environmental products and services. Banks can also establish a capital base for environmental projects through specialized private equity units.
Green Indices	Banks have developed indices that take into account the future environmental opportunities and threats. Example: Merrill Lynch has developed an energy efficiency index that focuses solely on energy conservation and demand side management.
Carbon Commodities	Due to the EU Emissions Trading Scheme (EU ETS), an arrangement has put over 12,000 European industrial sites under a carbon constraint. In order to serve their clients' compliance needs, or to supply a tradable product to the banks' desks, most banks obtain carbon credits.

Asset Management

Green Fiscal Funds	Dutch banks benefit from an initiative launched in 1995: By purchasing shares in a green fund, or investing money in a green bank, citizens are exempted from paying capital gains tax and receive a discount on income tax. As a result, investors can accept a lower interest rate on their investment and banks can offer green loans at a lower cost.
Green Investment Funds	Investment funds have evolved through three levels: <ol style="list-style-type: none"> 1. Funds solely employ exclusionary social and/or environmental criteria; 2. Funds use positive criteria that concentrate on progressive social and/or environmental policies and practices; 3. Funds apply both exclusionary and positive criteria to assess and select potential investments.
Carbon Funds	A carbon fund receives money from investors to purchase CO ₂ emission-reduction credits from existing emission-reduction projects, or invest in new projects that will generate a stream of CO ₂ emission-reduction credits. As for countries that have Kyoto objectives driven carbon funds, private carbon funds offer companies a cost-effective compliance instrument, and also provide investors with the possibility of profit returns, marketing, and CSR opportunities.

Insurance

Green Insurance	This type of insurance covers two areas: <ol style="list-style-type: none"> 1. Insurance products which differentiate insurance premiums according to their environmental characteristics; 2. Insurance tailored for clean technology and emission reducing activities. <p>Example: Green home insurance where attractive rates are provided for energy efficient buildings.</p>
Carbon Insurance	This insurance aims to reduce the risk in emission-reduction transactions, low-carbon project assessments, and to manage carbon credit price volatility.

Weather Derivatives

A range of derivative products have also been created to help companies whose activities are highly dependent on weather-related conditions to cope with variability in their revenues. Weather derivatives, currently offered by Goldman Sachs, are financial instruments that can be used to reduce risk associated with adverse or unpredictable weather conditions. Wind power derivatives are similar instruments, which enable wind power producers to hedge against unfavorable wind conditions. Payments are eventually made to either the wind producer if revenues fall below a pre-determined level or the derivative providers if performance exceeds expectations. ABN AMRO, Rabobank, and Goldman Sachs are all active in these markets.

4.1.3 Implications

Due to the young age of these products, it is still early to tell if they are successful or not. On the other hand, this can also be seen as an opportunity, as there are still many unserved areas and countries that are still skeptical about the efficiency and profitability of these products and services. It is then left to closely observe how they evolve throughout the years. In this sense, we should try to use utmost efforts in order to turn them into opportunities with a bright future.

4.2 Green Financial Institutions

4.2.1 The Role of Financial Institutions in Promoting a Green Economy

Overseas financial institutions are beginning to be aware of the moneymaking reality of delivering sustainability to corporate and retail clients. With a remarkable eco-friendly way to appeal to the public and corporate imagination worldwide, financial institutions want to enter the market with new or re-packaged products and service offerings from green auto insurance to innovative eco-friendly mortgages and new sustainability-backing investment funds. Taking into account their intermediary role in the economy and far-reaching customer base, global financial institutions are well-positioned to benefit from the design and marketing of new green products and services. It is also a way for them to contribute to sustainable development.

These green financial offerings are breaking into many regions and banking sectors. New products are being launched very rapidly and have a range of different designs and features. Owing to this, the quick evolution within financial institutions has made it challenging for stakeholders.

The growth of green products is mainly due to better environmental regulation and legislation in Western countries. Regulatory actions, especially those that provide price certainty in environmental markets and those that prohibit unsustainable practices can boost demand for green products and services among bank clients. In Europe, proactive governmental policies, such as the European CO₂ Emissions Trading Scheme, German feed-in-tariffs for renewable energy, and Dutch Green Funds, have helped to trigger demand and development of greener consumer options.

There are two categories of green financial institutions. First are traditional financial institutions which are entering a green financial field. Second are the green-only financial institutions, such as GIB.

4.2.2 “Green-Only” Financial Institutions

GIB (Green Investment Bank) was established by the UK in order to activate the green part of the UK government investment and solve the investment constraints of the green field. A goal of the GIB is to increase the efficiency of the public and private investment model and minimize the burden on market failures, energy consumers, and tax payers.

Vitalization of green investments, efficient operation of the fund, support for government policy, and global cooperation have been the main goals.

As for the investment strategies, GIB prepared a plan to invite venture capital funds by reducing the uncertainty of future profits through assurance for technology risk and commercialization. Also, GIB sought for the joint investment in green projects with the private capital market.

GIB tried to support small and medium business, projects to improve energy efficiency of the existing houses, and technology development. In particular, investment was planned in the field of development of wind power generation technology by £ 60 million each year, and to vitalize inflow of the private investors' fund.

GIB started with an initial capital of £3 billion. Raising capital for the establishment of the GIB utilizes the existing tax system and state-owned asset sales, auction revenue of carbon credits, student loan debt, radio frequency licenses, and service charges for accounts receivable. Below are the support plans of GIB for green projects.

First, subsidies are given for green projects. Second, joint investments with private capital investment are made in the green area. Third, a funding plan through loans and structured products is made. Fourth, GIB entered into a partnership with private banks. Fifth, support is provided for renewable energy generation projects through mezzanine financing. Recently, GIB was sold to Macquarie of Australia.

4.2.3 Implications

Many existing financial firms are entering into the green field. However, they are reluctant to invest in a field of high uncertainty. New “green-only” financial firms will more easily invest in green industry. Therefore, more “green-only” financial firms need to be established.

4.3 Green Climate Fund

4.3.1 Characteristics of the Green Climate Fund

Climate change threatens the sustainability of the earth and causes huge economic losses, and given the urgency and seriousness of climate change, the purpose of the GCF is to make a significant and ambitious contribution to the global efforts toward attaining the goals set by the international community to cope with climate change.

Compared to other climate finance schemes, the GCF has the potential to develop into a mechanism that can comprehensively and systematically operate the largest climate change fund (if successful, the size of the fund will be significant). Climate change requires the joint efforts of developed and developing countries, but it is prone to conflicts of interest between the two sides because of the one-way financing flow from developed to developing countries.

If the conflicts of interest are effectively controlled, the GCF could advance to a body that adjusts various environmentally related issues between developed and developing countries. The GCF pursues two goals – mitigation and adaptation of climate change – while keeping its operation focus on recipient countries. Hence, it can help recipient countries devise national development strategies for economic growth as they deal with climate change.

In particular, the GCF is currently discussing the need to expand funding pools beyond public funds. In order to boost private investments, it set up a private sector facility (PSF) that: acts as a conduit for initial funding to climate change mitigation and adaptation; encourages private participation especially from local SMEs and financial institutions; and enables small island nations and the poorest nations to participate in the fund. The PSF will operate within the boundaries of each nation’s policies.

If the PSF successfully boosts private participation in developing countries’ projects, this will contribute significantly to GCF’s fund raising. Currently, the GCF is broadening its investment targets to diverse projects that pursue greenhouse gas emission cuts, climate change mitigation, and sustainable growth. Going beyond assistance or concessional loans, the GCF will use investment incentives to tap into various financial tools. This approach is expected to expand market participant pools, help create an ideal business environment for market making, and eventually enlarge the market size. In summary, the GCF is characterized by its important feature of using public funds to promote private participation.

4.3.2 Resource Mobilization and Reshaping

The GCF is a comprehensive and systematic financial mechanism when compared to existing climate funds, thus, this feature should also be incorporated into criteria for sharing the burden of funding among developed countries. However, developed countries are likely to have different views because of the high correlation between the size of national GDP and the volume of emissions. Thus, adjusting the proportion of the funding should be considered for countries with a clear willingness to reduce GHG emissions through reduction targets after the base year.

The GCF board has ongoing discussions about the functions and structure of the PSF and promotes private sector participation by defining the role of the PSF that will act as a bridge for cooperation with private capital. And it needs to build a PSF structure that attracts private sources as much as possible. There are a lot of potential areas that GCF can collaborate with the PSF. For example, investment in projects through matching funds, establishment of infrastructure, guarantees of financial support, and investment in emission allowances. We can refer to the investment model involving private capital to adapt to construct PSF structure.

4.3.3 Implications

GCF was inaugurated to support developing countries' green field. GCF needs to collect sufficient money to help developing countries. Additionally, recipient countries need to develop a wise strategy to utilize GCF.

5. FINANCIAL STRATEGIES TO STIMULATE GREEN GROWTH

5.1 Improve Rules and Regulations of Green Finance

As a way of contributing to individual firms or economic growth, green finance can support development of green technology, growth of related firms, and so forth. Therefore, an emission trading system and related system with green finance that is derived from the law should be designed to be able to perform a reasonable function. There are four ways to improve the Republic of Korea's current regulation, which can also be applicable to some other countries' regulation of green finance.

The first way is the improvement of the cap-and-trade system. In the Republic of Korea, the cap-and-trade system started officially from 2015. The most important consideration is that it must be designed to run allocations and transactions efficiently and transparently in the system, and to help green growth of the firms. For this, trade emission rights should be allocated to economic players fairly and rationally. We can suggest several ways to improve the cap-and-trade system. Initially, by strengthening the capital allocation, which is a process of how businesses divide their financial resources and other sources of capital to different processes, people, and projects, we should make policies that utilize those resources. To design the free allocation rate and criteria that can help the effectiveness of reducing greenhouse gas and contribute to individual firms or economic growth, we should reinforce the allocation of allowances. Additionally, carbon exchange, which is the actual operator of the cap-and-trade system, should work more actively. Subsequently, we need to increase trading participants, which means we should allow the participation of private financial institutions as soon as possible. Or, we can induce them to participate by conducting the trading of carbon emission derivatives quickly. Finally, we should plan to support

the participating firms. For example, we can give incentives as financial or tax support to firms to develop green technologies.

The second way is the improvement of the traditional green finance supporting system. Through this, we need to boost the inflow of funds from the private financial sector. In other words, we should expand a range of green certifications and tax support. The examples include prime rate to green loan, relaxed regulation, tax exemption, etc.

The third is the improvement of accounting and the credit assessment system. The firms that get the emission rights should be recognized in the assets, and the firms that have a duty to pay emission rights should be recognized in the liability. But there are several problems with this accounting system. Legal definitions of emission rights are unclear. Therefore, we should revise existing provisions and create new ones. Additionally, when we evaluate the credit of firms, we should consider the carbon emissions of the firms.

Lastly, we must improve of the disclosure policy of carbon emissions. If we mandate the disclosure of carbon emissions, market players will get higher levels of information quantitatively and qualitatively. And through this, firms can be motivated to invest more than ever in green industry.

In conclusion, to improve the regulation of green finance, we should revise the cap-and-trade system, traditional green finance supporting system, accounting and credit assessment system, and the disclosure of carbon emissions. With these efforts, we can revitalize the ecosystem of green industry.

5.2 Establish Green Investment Corporation

5.2.1 The Need for Green Investment Corporation

There are some special features of green industry compared to traditional industry. That is why specialized financial corporations that reflect the characteristics of the green industry are needed. In order to cooperate with GCF more actively, a green financial institution is required.

Due to the lack of support for green growth, the actual participation of private financial corporations is low. When investment is made in green industry, there is a long payback period and high uncertainties. In addition, due to the lack of standards for green financial and green business, private financial corporations find it difficult to recognize the new business area.

In addition, business conduct standards are based on the profitability; with respect to green finance, this is insufficient. Some financial corporations are reducing the loan-to-deposit margin of green finance, and deposits on the green project have higher interest rates and lower loan rates for green loans. So, it is difficult for long-term sustainable green finance.

5.2.2 How to Establish This?

GIC provides a comprehensive one-stop service for green finance and facilities are equipped with personnel who specialize in this field. An insufficient analysis system for low-carbon technologies exists and, there is a limit to support smooth funding for green industries, due to the lack of skilled workers to link environment and finance. So, the institution of a public character to support the sector is needed. The commercial bank needs to protect depositors. Therefore, a financial investment type like GIB is desirable. Green specialized financial corporations basically develop and support BAT (Best Available Technology), the commercialization of low-carbon technologies, and

financial support for SMEs with green technology. But it is necessary to perform an integrated management for existing government green funds in the efficiency levels of investment. The government's role of establishing the specialized green financial corporations is important.

Financial, energy, and environmental departments should cooperate to achieve the goal of green growth. Green Finance is a concept related to pursuing economic growth and improving the environment. Thus, green financial institutions should be designed to perform these functions.

5.3 Utilize the Green Climate Fund

The fact that the Republic of Korea was selected as a host to the GCF has a very important meaning to the Republic of Korea. First, GCF is the first international climate financial organization that was set up in Asia. Second, the government can promote the Republic of Korea's workforce through the green industry. For example, the government expects that they can not only achieve positive economic effects, but also largely promote the MICE (Meeting, Incentive, Convention, and Exhibition) Industry. Third, through the foundation of the GCF, the international status of the Republic of Korea was significantly raised. In the situation of severe conflict between developed and developing countries, as a host country of the GCF, the Republic of Korea is expected to be empowered by the international community.

In order to utilize GCF, we need to take a creative approach. First, each country's business industry can create new opportunities for financial institutions and the financial services industry. Through efficient utilization of GCF, domestic financial institutions can find opportunities to enter the markets of developing countries and find new business opportunities. They can explore new areas of business for domestic financial institutions by paying attention to privately financed SOC investment or PPP projects in the field of climate change project development for developing countries. And they can take advantage of participating in profitable or economically viable projects supported by the GCF's guarantee of risk sharing.

Second, we can also build an industrial cluster for low-carbon technologies in the Republic of Korea. Through working with the GCF, we can deliver developed technologies to developing countries. Also, it will pursue zero pollutant emissions by recycling byproducts, resources, and energies from wastes in the industrial cluster. Other factories and companies may use recycled wastes as raw materials or energy sources.

Third, through the link to GCF with carbon-trading regimes, we can vitalize the carbon-trading market. A given portion of the cap-and-trade auction proceeds may be contributed to international funds and a proportion of CER sales proceeds also may be contributed to global funds upon international approval of CDM projects. Under an international agreement, incentives may be provided to countries that create and operate a carbon-trading market, thereby voluntarily reducing carbon emissions.

Finally, we can find ways to provide assistance to the Democratic People's Republic of Korea through using GCF Funds. It is possible to seek investment opportunities in mitigation and adaptation projects in the Democratic People's Republic of Korea. As an international fund, GCF can find a way to provide financial support to the Democratic People's Republic of Korea, and alternative energy plants and adaptation projects may be targeted in the investment process. However, it will be necessary to take international political situations into consideration.

5.4 Design Code of Conduct in Green Finance

To describe in detail, the basic principles of business conduct standards related to the green banking sector, will have to be set in a direction that contributes to green growth. The design of green financial products needs to be in accordance with the principles.

5.4.1 Fundamental Principle

The fundamental principle of green finance is to contribute to green growth and it complies with the purpose and principle of green growth policy. In compliance with the green finance fundamental principle, we need to suggest an appropriate code of conduct in green finance such as green deposits, green lending, and green investment.

5.4.2 Purpose

As the Republic of Korea already enacted the “Green Growth Basic law,” other countries can get some meaningful implications from the Republic of Korea’s effects. The purpose of the law is to build the green growth foundation, and the government considers green business and green technology as a new growth engine.

5.4.3 Fundamental Principles

Government should design and drive the national development strategy.

Government should stimulate market function.

Government should build a new economic system to create and expand the green job market.

Government should invest in and support green technology and the business field.

Government should increase energy efficiency.

Government should reorganize SOC infrastructure to adopt green growth.

Government should reorganize the tax and finance system to adopt green growth.

Government should cooperate with local government, companies, civic organization, etc. to adopt green growth.

Government should survey the global green growth trend and adopt national policy appropriately.

5.4.4 Fairness of Code of Conduct in Green Finance

Code of conduct in green finance should be designed to benefit all parties fairly, which can lead to a smooth introduction of green finance.

5.4.5 Depositor Aspect

Depositors should receive higher net interest benefits from tax benefits, even though depositors receive low interest rates from financial instruments. If net interest benefits of green finance are lower than traditional finance, there is no motivation to invest in green finance for depositors. In order to bolster green finance growth, we should suggest diverse benefits to depositors.

5.4.6 Financial Institution Aspect

The financial institution should receive a higher margin between green deposits and green loans. And we need autonomous guidelines to utilize conduct in green finance.

5.4.7 Beneficiary Aspect

Most of the beneficiaries are green business companies and entrepreneurs. So, most green businesses need subsidies and finance support due to the projects' uncertainty and low profitability. So, beneficiaries should receive interest rates on favorable terms and financial institutions should ease loan conditions.

5.5 Develop New Green Financial Products

Unprecedented awareness of severity, sources, and various environmental challenges, such as air pollution, water scarcity, and soil erosion, has been increasing all over the world. Consumer demand for "eco-friendly" products and services based on government support is on the rise, especially in European countries. Legislative and regulatory actions and some constraints on unsustainable practices and operations have also become overspread in developed countries.

Developing diverse green financial products will be indispensable for providing money to the green field. Green financial products, such as the CERs Fund; Carbon related index; and ETF, CERs Futures, and Guarantee Insurance, will be needed.

In particular, green financial products that will support energy efficiency and companies involved in developing alternative energies are recommended.

New financial products related to the weather also need to be introduced to financially adapt to climate change. Weather-derivative products involve a contract that promises the receipt of money at a fixed time among traders by quantifying the date relevant to the weather phenomenon such as temperature, rainfall, amount of snowfall, frost, and typhoon. Based on this, such financial instruments can be introduced, according to capital market law.

Yoshino and Taghizadeh-Hesary (2017) explain that recently in Japan, the hometown investment trust fund became a national strategy in Japan, as successful community-based financing for risky sectors, including green field.

Community-based private financing products, such as a hometown investment trust fund, can be developed, especially for small- and medium-sized green energy projects.

5.6 Integrate a Global Cooperative System

Generally, businesses object to emission trading schemes (ETS) because of cost concerns, whereas environmental groups welcome these schemes. Nevertheless, an emissions trading bill became law recently in the Republic of Korea with strong bipartisan support. This will form the legal basis for policy consistency and include active participation from various industries. And it will help the Republic of Korea to enhance its global presence and become a carbon-trading hub in Asia. It will be important for the Republic of Korea to have its ETS well in place and for economic players to prepare for global trends before the introduction of a single international regime for climate change, involving some 190 countries in 2020. The more time the Republic of Korea has to prepare, the better it can adapt to changes in the low-carbon era.

Regardless of whether a new exchange is established or a current exchange is selected for carbon trading, an operator's ability is critical for future carbon market development. Trading intermediaries must be chosen according to rational and objective criteria that rule out the interests of individual organizations or political considerations. Selection criteria should include liquidity (to facilitate trades), soundness (to prevent unfair trading), stability (to ensure settlement security), convenience (to provide participants with easy access to the market), and international connections (to grow the Republic of Korea's ETS into the Asian ETS).

Support for ETS in Asia's major developing countries is needed. Development of the relevant policy, arrangement of laws and system, design of a trading mechanism, and establishment of a trading system can be structured based on the experience of the Republic of Korea.

If an Asian ETS is established, there is some possibility to make it a global ETS, together with the EU and US carbon market.

Additionally, a hub-base of green finance in Asia will be considerable by providing not only CERs trading, but also relevant financial services, such as investment and mediation of green financial products.

5.7 Set Up Infrastructure

5.7.1 Set up Statutory Infrastructure

Environmental requirements need to be reflected in Statutes for Investment, lending, credit rating, and accounting. Financial institutions are required to address environmental concerns, including the fiduciary and lender's liability on environment. Also, environmental factors are needed to be requested into credit rating and accounting procedures.

A Corporate Disclosure of Carbon information is required. Environmental information needs to be obligatory for listing and disclosure. Shifting from voluntary to mandatory disclosure will gradually be required. FI's in developed countries are already required to disclose comprehensive environmental information pursuant to voluntary guidelines, e.g. GRI.

A Certification of Green Technology, Enterprise, and Industry will be needed to guide investment and lending.

5.7.2 Develop a Government-Backed Credit Guarantee Scheme

Green projects are considered risky from the point of view of many financial institutions. Therefore, development of a government-backed credit guarantee scheme can ease the flow of funds from the private sector to the green field.

Yoshino and Taghizadeh-Hesary (2016) explain the credit guarantee scheme (CGS). This is for the SME and venture business sector; however, it is applicable to the green field.

Globally, MIGA (Multilateral Investment Guarantee Agency) promotes foreign direct investment by providing political risk insurance and credit enhancement to investors and lenders against losses caused by non-commercial risks.

If government takes the role of MIGA for green investment risk and the credit guarantee is provided to green investors, private investors can invest more easily in green projects.

5.7.3 Establish a Technical Infrastructure

Carbon Indices can be created. Developing a Green Enterprise Index to promote green investment will be needed and designing a Green (Carbon) Risk Index to promote investment in green bonds is recommended.

JP Morgan & Innovest co-developed the JENI Carbon Beta Index, the world's first bond index that reflects the climate change risk of businesses.

The System for Carbon Information Provision needs to be restructured. Building a mechanism to access carbon information will be helpful for IB's credit and investment decisions. License/approvals by MOE and other authorities, regulatory compliance, green enterprise designation, and participation in voluntary agreements are necessary. Updates of online information on carbon financial products are recommended.

Additionally, a Green Enterprise Rating Agency can promote green ratings. There are three major rating agencies that specialize in corporate environmental performance: Innovest (US), EIRIS (UK), SAM (Swiss).

Information on green companies needs be shared between public organizations and private rating agencies involved in green growth or green finance.

5.7.4 Educate Human Resources

Carbon Financial Professionals need to be nurtured. Training professionals on how to research, review, and invest to provide carbon financial services is essential. Introduction of professional training programs and promotion of expertise is recommended for strengthening green finance education.

Green Financial Consumer Education is also needed. Through public and consumer education, heightening awareness of green growth can prevent development of a green bubble, environmental risk, and other key risks in green finance.

Opening an annual conference on Carbon Finance in Asia similar to "SRI in the Rockies" in North America is recommended.

6. CONCLUSION

The role of public finance is important, but limited in its support of green projects because a huge amount of money is needed. Therefore, the role of private finance is indispensable. However, under the current private financial mechanism, green fields are difficult to invest in because the risk and return profile of the fields are different from those of traditional industries.

Therefore, green finance is necessary. We need to design strategies for developing green finance. These include improving rules and regulations of green finance to seek for green growth, establishing green financial institutions, utilizing GCF, designing code of conduct in green finance, developing new green financial products, integrating a global cooperative system, and setting up infrastructure.

By improving carbon-trading regulations, we can provide incentives of financial or tax support to firms to develop green technologies, which will contribute to the development of new green technology. Through expansion of green certification and tax support, the inflow of funds from the private finance sector can be boosted. Including green factors in accounting and credit assessment systems and improving disclosure policy of green factors can let private investors participate more easily in green projects.

By establishing green financial institutions, long-term sustainable finance can be provided, and cooperation with GCF can be more actively made. GCF is the largest fund supplier to developing countries' green field. Asian countries need to develop a wise strategy to utilize GCF.

In order to provide money continuously to the green field, the basic principles of business conduct standards related to the green financial sector must comply with the purpose and principle of green growth approach. An appropriate code of conduct in green finance, such as green deposit, green lending, and green investment needs to be designed.

Developing diverse green financial products in the fields of banking, investment, and insurance will be needed. For example, community-based private financing, such as a hometown trust fund can be developed for small- and medium-sized green energy projects.

Support for ETS in Asia will be needed. Development of the relevant policies, arrangement of laws and systems, design of a trading system can be structured for the establishment of an Asian ETS. If an Asian ETS is established, there is some possibility to make a global ETS, together with EU and US carbon markets. A hub-base of green finance in Asia will be also considerable by providing not only CERs trading, but also relevant financial services, such as investment and mediation of green financial products.

Infrastructure of green finance is also important for developing green finance. Setting up a statutory infrastructure to reflect fiduciary and lenders' liability on the environment will be required. Also, development of a government-backed credit guarantee scheme can ease the flow of funds from the private sector to the green field. Additionally, a technical infrastructure, such as development of a green enterprise index and education of green human resources, will be important for developing green finance.

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