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Designing New Climate Regime: An Integrated Solution with Mitigation and Finance Mechanisms

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1. Introduction

A new climate regime is expected after 2020. At COP17 in 2011, Parties of UNFCCC agreed to launch a new process, called Ad Hoc Working Group on the Durban Platform (ADP), to negotiate a new agreement by 2015. The most distinguishable feature of the expecting new agreement is that it will be "applicable to all" Parties. Although "applicable to all" does not imply applicable to all in a *symmetrical* fashion, the Parties' positions on legal form will not fall along developed and developing country lines any more. This critical change puts one more dimension on the challenges the Parties face: the reduction gap and the financial gap. Yet it is not certain whether this dimension will be a restriction or a chance to find out a solution. It is clear, however, that we need to expand the size of the set for problem solving approaches. That is, it is time to consider another aspect we have not thought of so far. For this purpose, this article begins from operating mechanisms under the UNFCCC as building blocks of the new regime. We argue that it has been neglecting the aspect of integrating market mechanism and financial mechanism in the design process. Before Durban, after Bali, most of negotiation efforts were spent on individual issues (namely, mitigation, adaptation, finance, technology) separately.

Finishing LCA and establishing ADP may provide a much more favorable environment to discuss issues in an integrated way. The aim of this research is to shed a light on the importance of "integrated mechanism" and to lay out some theoretical and logical foundations that may help to design key mechanisms in a more integrated way. The remaining structure of this article is organized as follows. First, we look at some backgrounds and at the main issues in each operating mechanism in section 2. In section 3, a rigorous analysis is followed to show what difficulties the "old" approach face and to discuss what is needed to overcome them. Section 4 provides a concept how mechanisms for mitigation and finance are interdependent. And then, we provide several policy suggestions.

2. UNFCCC Mechanisms: Background and Key Issues

2.1. Financial Mechanism

(a) Background

Article 4.3 of UNFCCC describes the commitment of developed countries to provide

Table 1. Major COP Decisions Related to the Financial Mechanism

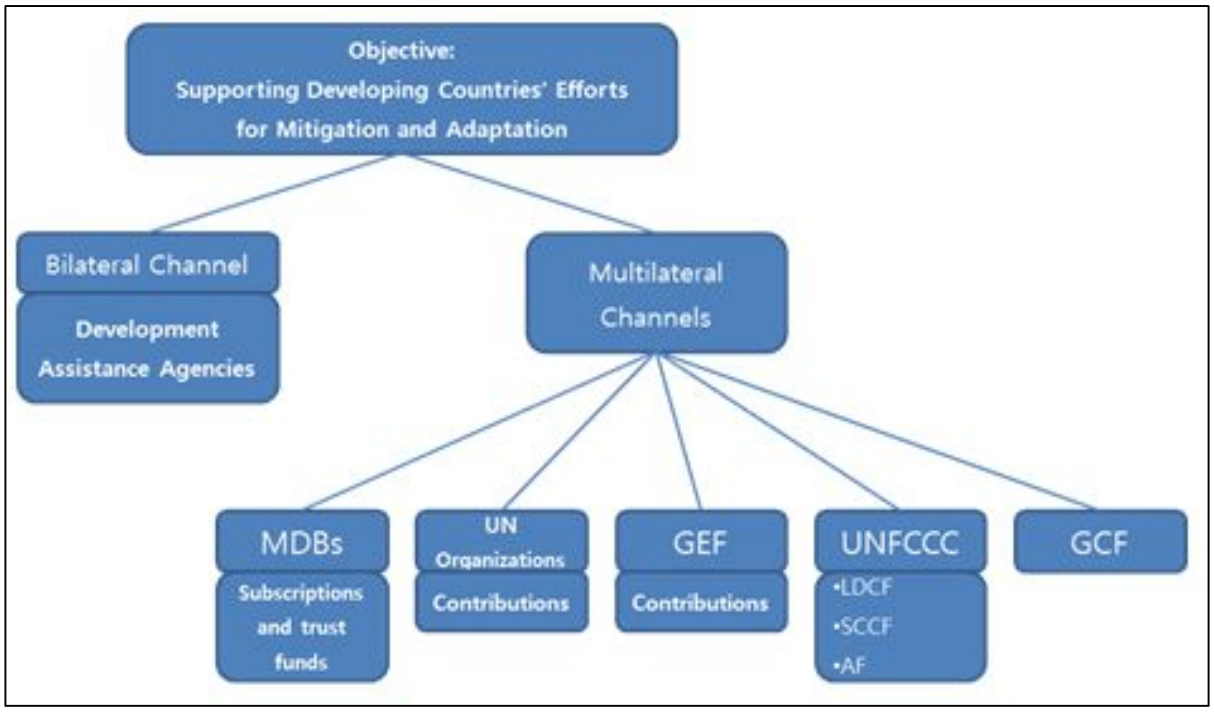
Year	Description
1992	UNFCCC was open to a signature at the Rio UNCED. - Article 4.3, 4.4, 4.5, and 4.7 state that the commitment of developed countries in Annex II to support the action of developing countries in response to climate change. - Article 11 describes the financial mechanism. - In Article 21, the Global Environment Facility (GEF) is designated as an operating entity of the financial mechanism.
1996	COP2 in Geneva - An MOU was arranged between the GEF Council and the COP.
1998	COP4 in Buenos Aires - The interim arrangement of GEF as an operating entity was agreed to be sustained with a review process every four years.
2001	COP7 in Marrakech - Special Climate Change Fund, Least Developed Countries Fund, and Adaptation Fund under the Kyoto Protocol were established.
2007	COP13 in Bali - Finance became one of the major issues in the negotiation of long-term cooperative actions.
2009	COP15 in Copenhagen - The COP took note of the Copenhagen Accord (provision of $30 billion in 2010–12 and $100 billion per year by 2020, and the establishment of a new fund).
2010	COP16 in Cancun - The Green Climate Fund (GCF) was officially established and a transitional committee was organized for the design of the Fund.
2011	COP17 in Durban - A work program for long-term finance was launched to make an effort to mobilize the long-term finance from a wide variety of sources.

financial resources for developing countries so as to implement their obligation under the Convention. A mechanism for the provision of financial resources was established and the Global Environmental Facility (GEF) was designated as an operating entity of the financial mechanism. The GEF administers and manages its own trust fund, and two special climate-related funds set up by the COP decisions. There also exists the Adaptation Fund under the Kyoto Protocol. However, the available financial resources do not meet the needs of developing countries for climate change mitigation and adaptation. In 2009, developed countries presented a long-term goal of mobilizing financial resources to support the action of developing countries with a specific number of 100 billion dollars per year by 2020. In addition, a new fund was proposed to be established as another operating entity of the financial mechanism, namely, the Green Climate Fund. Table 1 summarizes the major COP event related to the financial mechanisms of the Convention.

(b) Issues on the Financial Mechanism

The discussion is on, going around the following issues: first, various channels of climate finance exist. It is important to maintain consistency and coordinate without an overlap among the channels to achieve the long-term goal of mobilizing financial resources effectively. Figure 1 shows the channels that a donor country would consider when making decision of the provision of financial resources to developing countries.

Figure 1. Various Channels of Climate Finance



The second issue is the role of the private sector in mobilizing the significant amount of long-term financing. The tight financial situation in the developed world due to global economic recession makes it hardly possible that 100 billion dollars will be mobilized solely from the public sources. That is the why many people believe the contribution from the pri-

vate sector crucial in achieving long-term goals. Third, although the issue of tracking and verification of the support has been addressed, the recent assessment of the results of the fast-start finance during the last three years indicates that a tracking system needs to be set up to compare the performance of each developed country and picture the global climate finance architecture.

To achieve the long-term goal of mobilizing climate financing, developing countries are expected to do their own homework. The Cancun agreement adopted at the COP16 states that "… developed country Parties commit, in the context of meaningful mitigations and transparency on implementation, to a goal of mobilizing jointly USD 100 billion per year by 2020 …" It means that the provision of financial support from developed countries is conditional, but it depends on how developing countries act in a new climate change regime The negotiation process could not move any further if the finance and mitigation commitments and actions were separately considered.

2.2. Mitigation

(a) Background

Mitigation mechanism is one of the crucial building blocks as a climate change framework. Each country could achieve emission reduction by means of its own domestic reduction initiatives. However, it may incur huge abatement costs. Indirect mitigation (offset) by trading credits has been introduced to relax such burdens. The Kyoto Protocol established three market-based mechanisms. These mechanisms using tradable allowances or credits can increase the cost-effectiveness of mitigation and enable ambitious mitigation action by putting a price on carbon. Despite the remarkable performance of the Clean Development Mechanism (CDM), which is the representative mechanism, it also has several limitations. Table 2 summarizes weaknesses of CDM.

Table 2. Limitations of the Kyoto Mechanism (CDM)

Strength of Incentive	Environmental Integrity	Sustainable Development
· Need for pre-financing · High-transaction costs · High risk of revenue · Strongly focuses on emerging market. · Important sectors, such as transportation and demand-energy efficiency, are difficult to address with CDM. · No incentive of sectoral transformation	· Zero-sum game (pure offsetting) · Difficult to prove "additionality"	· Gives monetary value only to emission reductions, not other benefits · Important sectors, such as transportation and demand-energy efficiency, are difficult to address with CDM. · No incentive of sectoral transformation

In climate change negotiations, parties have explored the possibility of introducing new market mechanisms that would overcome the limitations of the existing mechanisms and enhance the global carbon market in support of a future international climate change regime. Discussion about the establishment of new

market mechanisms as part of new climate change regime has been formally carried out since 2007. At the COP13, the *Bali Road Map* called for the consideration of "various approaches, including new market mechanisms", and COP17 in Durban adopted the text on new market mechanisms. The recent COP18 in Doha was the final session for the negotiation track on long-term cooperative action (LCA), established as part of the Bali Action Plan. Under this LCA, Parties discussed and agreed on work programs to further elaborate the new market mechanisms under the UNFCCC and to develop a framework of mechanisms established outside the UNFCCC. Table 3 shows the main events of COPs on NMM.

Table 3. Major COP Decisions on New Market Mechanism

Year	COPs	Description
2007	COP13 in Bali	·"Bali Road Map" included the development of "Various Approaches, including NMM" · Decided to discuss NMM in the Ad Hoc Working Group on Long-term Cooperative Action(AWG-LCA)
2010	COP16 in Cancun	· AWG-LCA provided the initial text on NMM · AWG LCA decided to consider the "establishment of one or more market-based mechanisms" at the 2011 climate summit in Durban
2011	COP17 in Durban	· Decided to establish market-based parties and observers to submit their views on such mechanisms and to hold workshops
2012	COP18 in Doha	· Final session of LCA · Agreed on work programs to further elaborate the new market mechanism under the UNFCCC and to develop a framework of mechanisms established outside the UNFCCC

(b) Issues on New Market Mechanisms

Currently, there are two issues on NMM. The first issue is setting up the framework and principles and elaborating the modalities and procedures for the new market mechanism. In COP17 in Durban, Parties agreed on several principles of NMM: voluntary participation, complementary relationship between each mechanism, environmental integrity, achievement of net decrease, encouraged participation of the developing countries as well as the advanced countries, and contribution to the stable carbon market. However, in order for NMM to be implemented successfully, several implemental challenges (new institutions, aligning government, and private sector interests, dealing the overlap problems with the CDM) should be solved.

The second issue is the design options for future NMM. This issue is about "rules" of new market mechanisms, including the structure and stringency of targets, governance, MRV, and whether and how to give credits. While several options were discussed at the beginning, sectoral approach and NAMA are emerges to be broadly supported.

Consequently, given that mitigation mechanism does not work independently, it should interact with other mechanisms and factors of New Climate Change Regime. Therefore, it has to comply with the objectives and principles of New Climate System.

3. Limitations of Conventional Approach

The difficulties of the climate negotiation come from the fact that greenhouse gas (GHG) is a typical global pollution with negative externality. Thus, countries may have an incentive not to join the agreement to reduce GHGs and to free-ride on other country's abatements. Under the model in which the countries decide whether or not to participate in the agreement to improve the social welfare, it is expected that there is an equilibrium in which only some, not all, of the countries cooperate to improve the social welfare.

We develop a model of a new climate agreement that satisfies a key characteristic of Durban Platform, an "applicable to all" agreement. Then, we identify limitations of an old approach that can be summarized into (a) national reduction target and (b) international emission trading. Country *i*'s payoff is given by

$$u_i(a_1,\ldots,a_n) = b_i \ln\left(\sum_{k\in N} a_k\right) - \frac{1}{2}c_i a_i^2$$

where a_i is country *i*'s abatement of greenhouse gas emission. Here, b_i and c_i capture the heterogeneity of the countries in their benefits from the abatement of greenhouse gas emission and in their costs to reduce the greenhouse gas emission. Without cooperation, each country maximizes its payoff given that the other country's abatements. A Nash equilibrium $(a_i^N)_{i\in N}$ will be obtained as a non-coope-rative outcome. With cooperation, the countries have to choose $(a_i^M)_{i\in N}$ to maximize a social welfare defined as the sum of the country's payoffs. Is it possible for the self-interested countries to attain the social optimum? The answer is no. Although the social welfare is improved under cooperation, there can be a country that is worse off and so does not join the cooperation. In other words, $u_i(a_1^N,\ldots,a_n^N) > u_i(a_1^M,\ldots,a_n^M)$ is possible. Indeed, this can happen for country *i* for which b_i and c_i are relatively small.

(a) Imposing National Reduction Target

One may think that this problem can be resolved by assigning abatement obligation to the countries. Let $\bar{a}_i$ be the amount of abatement obligation for country *i*. Then, the countries choose $(a_i^R)_{i\in N}$ to maximize the social welfare subject to $a_i \geq \bar{a}_i$ for each *i*. Since the assignment of the abatement obligation can redistribute the payoffs from the counties that prefer the social optimum to the non-cooperative outcome to the countries that prefer the non-cooperative outcome to the social optimum, the assignment of the abatement obligation may help the countries cooperate. However, if the countries are significantly heterogeneous in their benefits and costs, the assignment of abatement obligation by itself cannot ensure all countries to join the cooperation. This implies the necessity of reducing the heterogeneity of the countries through another mechanism.

(b) Introducing International Emission Trading

Additionally, we consider a case where the emission trading system is introduced. Country *i*'s payoff is given by $v_i(a_1,\ldots,a_n) = u_i(a_1,\ldots,a_n) + p(a_i - \bar{a}_i)$ where $\bar{a}_i$ is the assignment of emission per-

mits to country i and p is the price of emission permits. In the equilibrium, each country i chooses a_i^E to maximize its payoff given the price p^E, which is determined to satisfy the market clearing condition, $\sum_{k\in N} a_k^E = \sum_{k\in N} \bar{a}_k$. The analysis shows that the social welfare can be improved but the social optimum cannot be attained under the emission trading system. For intuition, in order to attain the social optimum, it is necessary to equalize the marginal costs to reduce the greenhouse gas emission among the countries. However, if there is heterogeneity in b_i, the marginal costs cannot be equalized across the countries in the equilibrium. In addition, it is possible that all countries are better off under the emission trading system compared to the non-cooperative outcome. Thus, the countries may reach an agreement to implement the emission trading system if the emission permits are appropriately distributed to the countries.

The implications are as follows. First, the social optimum may not be desirable for some countries. The heterogeneity of the countries in their benefits and costs in reducing greenhouse gas emission can explain the recent slow pace of the negotiation on the climate change. Thus, in order to reach an agreement on reducing the greenhouse gas emissions, it is necessary to give favor to the countries that are worse off under the social optimum. Second, it is recently discussed in UNFCCC to assign the abatement obligation to the countries. Our results show that, if the countries are significantly heterogeneous in their benefits and costs, assigning the abatement obligation is not enough to reach an agreement to improve social welfare. In addition, even if the countries succeed in reaching an agreement, there is efficiency loss in terms of social welfare. This implies the necessity of fiscal transfers among the countries to attain the social optimum with all countries joining the agreement. Third, the emission trading system is useful to encourage all countries to join the agreement on the climate change. However, because the emission trading system also fails to attain the social optimum, another way of monetary transfers should be implemented to improve the social welfare.

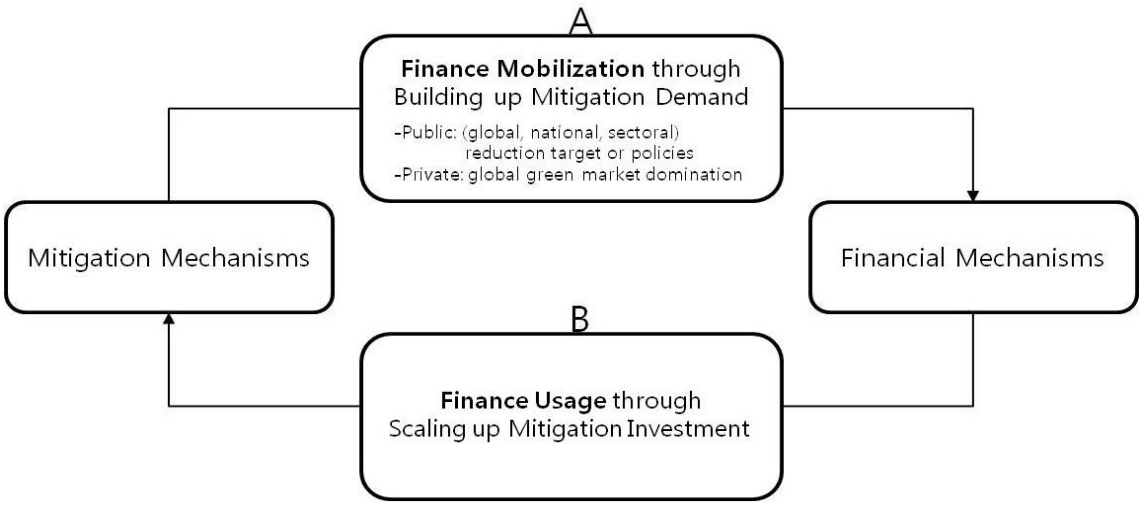
In summary, when a degree of heterogeneity in benefit from mitigation among countries is high enough, the old approach cannot achieve a social optimal mitigation level, although emission trading contributes to a broad participation. In this sense, relaxing the heterogeneity will be the key for the new regime. That is the reason financial and/or technology transfer is necessary, other than mitigation efforts.

4. Designing the New Regime in an Integrated Way

(a) Interdependency of Finance and Mitigation Mechanisms

In this study, we focus on a specific issue among possible alternatives in designing the new regime, which is integrating market mechanism and financial mechanism. A relationship between two mechanisms can be simplified as follows. The most fundamental element of market mechanisms is the demand for mitigation, such as reduction targets and energy security. The demand induces climate finance inflows and they enable mitigation actions to be scaled up.

Figure 2. The Interaction between Finance and Mitigation Mechanisms



(b) Integrated Approach as a Solution to Country Heterogeneity

It is noteworthy that improving the effectiveness of each mechanism through improving their interdependency can dedicate the relaxation of heterogeneity among countries. That is, elaborating interdependency enables each mechanism to be more effective; both mitigation and finance to be scaled-up. It may facilitate the enabling environment for developing countries' low carbon development, which contributes in solving the problem of heterogeneity. From the heterogeneity in the benefits side, the economic development helps the economy to put more weight on environmental concerns according to the environmental Kuznets hypothesis. Low carbon development fueled by scaled-up mitigation and finance can shorten the time to reach a turning point of the country's environmental Kuznets curve, which means the length of timing for the country's marginal environmental benefit to start to increase. Consequently, it will lead to the convergence of marginal benefits in countries over the world. From the heterogeneity in the costs side, scaled-up mitigation/finance boost more foreign direct investment (FDI) in climate change-related industries, encourage more climate change-related technology spillover, hence lower marginal mitigation costs in developing countries. Moreover, FDI will continue until the marginal return of investment equals across everywhere in theory. In this sense, scaled-up mitigation/finance dedicates to the convergence of marginal mitigation costs to countries in the long-run.

(c) Issues to Tackle and Possible Tasks to Try Out

Based on these observations, we explore what expecting challenges to overcome will be. For the developing countries in general, lack of voluntary mitigation incentive is the central problem. Supported-NAMA type financial mechanisms, which require corresponding mitigation actions, may be the right direction to solve such incentive problems. The developed and the advanced developing countries may have voluntary mitigation incentives that seek a new economy growth engine. For them, the key question is how to scale up the private resources in mitigation investments. A solution can be found in answering how to connect

effectively the mitigation incentive into financial incentive and vice versa. A prerequisite condition to construct those incentive schemes is to have transparent and objective MRV systems.

We can present several possible tasks to develop both market and finance mechanisms in an integrated way. First, it needs to expertise best practices of the "inter-mechanism" MRV system, which is about coordination between a market mechanism and a financial mechanism. Various mechanisms in each market and finance sphere are expected to appear within and outside of the UNFCCC in the near future. In the short run, more attentions will be paid to develop "intra-mechanism" MRV system, which is about coordination among mechanisms within each sphere. However, having inter-mechanism MRV system will be very effective in the long run. Before a certain system without the integrating consideration becomes status quo, noting its importance and pursuing the best practice of them will be desirable. The other two are about how to provide more incentives toward more environmentally friendly private investments while the developed countries fulfill their financial contribution obligations. Depending on a type of private financial flows, its impacts on recipient country's mitigation efforts are different. Thus, a more environmentally favorable type of private financial flows needs to be more appreciated. To reflect this on incentive mechanisms, a more volatile financial flow can be discounted more in accounting financial contributions by developed countries, besides evaluation on environmental consequences of each investment. Also, we may consider developing the technology spillover effect index, which can differentiate private investments into the degree of mitigation technology spillover. Treating private investments with a higher index as the one with a more marginal contribution can help to create incentives. KIEP