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Impact of COP18 Decisions on Use of Kyoto Mechanisms by Japan

Key Messages

A series of decisions made at COP18 to the United Nations Framework Convention on Climate Change (UNFCCC) imposes considerable restrictions on use of the Kyoto mechanisms by countries that do not submit greenhouse gas (GHG) reduction targets for the second commitment period of the Kyoto Protocol, including Japan. As a result, a substantive decrease in the amount of Kyoto units[1] that can be acquired by these countries post-2012 seems to be unavoidable. Taking into account the impact of these COP18 decisions on Japan, the following points have been found.

- The amount of Kyoto units for the second commitment period of the Kyoto Protocol that Japan can acquire would considerably decrease to about 40% of the actual figure acquired by Japan in the first commitment period.
- Moreover, about 80% of these units would be supplied by a single country, China, in a considerably biased market structure.
- With the view to promote further reduction of GHG emissions in the post-2012 era, new market mechanisms to supplement the Kyoto mechanisms, including JCM/BOCM, would become increasingly important as new supply sources for external credits, both for substantive procurement of external credits and for diversification of supplying countries.
- Based on the estimated amount of Kyoto units for the second commitment period of the Kyoto Protocol acquirable by Japan, GHG reductions in Japan in 2020 would be between 11% and 15% compared to the 1990 level.

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[1] "Kyoto units" is a general term for the emission allowances (or emissions credits) used for compliance assessment for GHG reduction targets under UNFCCC such as the Kyoto Protocol. There are six types of Kyoto units, namely CERs, AAUs, ERUs, RMUs, tCERs and lCERs.

I Introduction

The first commitment period of five years under the Kyoto Protocol (hereafter, KP-CP1) came to a close at the end of 2012[2]. Use of the Kyoto Mechanisms was designated by the Japanese government as one of the key countermeasure options which accounted for 1.6% out of 6% greenhouse gas (hereafter, GHG) emissions reduction target for Japan compared to the base year GHG emissions[3] during KP-CP1. As such, both Japan's private and public sectors took a range of actions to effectively utilise the Kyoto mechanisms. Consequently, Japan contributed to the development of the Kyoto mechanisms (MOE, 2012), as financial mechanisms for bringing about the diffusion of low-carbon technologies on a global scale, and simultaneously played a key role in the global carbon market.

However, in contrast to the large role performed in KP-CP1, a series of decisions were made at COP18 in late 2012 that put substantial limits on Japan's utilisation of the Kyoto mechanisms after 2012. There are various factors in the background, including the fact that Japan has not submitted any GHG reduction commitment for the second commitment period of the Kyoto Protocol (hereafter, KP-CP2). There have already been several reports about possible influences on GHG mitigation policy by Japan in a future climate regime[4].

The next section will be an overview of the limits to Japan's use of the Kyoto mechanisms due to the COP18 decisions, followed by a quantitative estimation of the impacts of these decisions on the Kyoto units that Japan can acquire. Subsequently, policy implications of these impacts will be briefly discussed.

2 Use of the Kyoto mechanisms by Japan

2.1 Plan for use of Kyoto mechanisms for KP-CP1

For KP-CP1 (five years from 2008 to 2012), Japan promised to reduce its annual average GHG emissions by 6% compared to the base year GHG emissions. The menu of countermeasures in the Kyoto Protocol Target Achievement Plan (Government of Japan, 2008) includes use of the Kyoto mechanisms. The plan explicitly states that the government of Japan acquires Kyoto units equivalent to 1.6% compared to the base year GHG emissions (about 100 million t-CO_2). In addition, use of Kyoto mechanisms by private companies to achieve the targets of the Voluntary Action Plan on Environment (Keidanren, 1997) is encouraged as a reduction measure for the industrial sector. Consequently, the electric utilities and steel industries planned to acquire 320 million t-CO_2 of Kyoto units over the five-year period (METI, 2011). Therefore, Japan as a whole planned to acquire 420 million t-CO_2 of Kyoto units in order to achieve the 6% reduction target of KP-CP1.

2.2 Achievement of KP-CP1 target confirmed by use of the Kyoto mechanisms

With sufficient amounts of Kyoto units acquired to date, Japan has already achieved a 9.2% reduction compared to the base year emissions for the annual average of the first four years (2008 to 2011) of KP-CP1 (Nitta, 2013). Accordingly, even if GHG emissions for 2012 increase to the largest ever level of about 1,400 million t-CO_2 (IEEJ, 2011), it is expected that the 6% reduction target would be achieved via use of the Kyoto mechanisms. As such, the Kyoto mechanisms play a critical role for Japan to achieve its reduction target for KP-CP1.

[2] Strictly speaking, a special exception is made for Japan in calculation of emissions of three types of greenhouse gases (GHGs), carbon dioxide (CO_2), methane, and nitrous oxide (N_2O) by fiscal year instead of calendar year. Thus, GHG emissions in Japan for KP-CP1 are those through the end of March 2013, at the end of Japanese fiscal year 2012.

[3] The base years for Japan are 1990 for CO_2, methane and N_2O, and 1995 for HFC, PFC and SF_6.

[4] For instance, "COP18: Restrictions on Japan's access to emissions credits: narrowing options for businesses" Nikkei, 22 December 2012.

2.3 Presumed use of the Kyoto mechanisms after 2012

While Japan has not submitted a GHG reduction target for KP-CP2, it has declared the potential use of the Kyoto mechanisms in a post-2012 international framework for climate change following KP-CP1. For example, in order to achieve the 25% reduction target by 2020 compared to the 1990 level under the Cancun Agreement (UNFCCC, 2010), it is assumed that Japan will continue to use the Kyoto mechanisms as well as the bilateral offset credit mechanism, often called the JCM/BOCM, proposed by the Japanese government (Government of Japan, 2012). However, policies and measures to achieve the reduction target under the Cancun Agreement have not taken shape, and at present, the level of usage of the JCM/BOCM and the Kyoto mechanisms is unclear[5].

3 Limits to Japan's use of Kyoto mechanisms based on COP18 decisions

3.1 Issue of eligibility for participation in Kyoto mechanisms by countries not participating in KP-CP2

Rules for using the Kyoto mechanisms in KP-CP1 are specified in the Marrakech Accords (UNFCCC, 2001). Therein, differences in rules for KP-CP1 and CP2 are not specified, aside from some minor exceptions. This is because of the unexpected change in status from CP1 to CP2, for countries such as Japan, New Zealand and Russia that remain parties to the Kyoto Protocol without submitting GHG reduction targets for KP-CP2. Accordingly, the issue of whether or not these countries reserve the right to participate in the Kyoto mechanisms during KP-CP2 remained to be addressed. In the series of decisions made at COP18 in December of 2012, a clear answer was set forth in regards to this issue. An overview of parts related to this paper is presented below.

3.2 Acquisition of Kyoto units for KP-CP2 limited to primary acquisition of CERs

The most notable decision enables international transfer and acquisition of Kyoto units (CERs, AAUs, ERUs, RMUs, tCERs, and lCERs) for KP-CP2 only between countries that have submitted GHG reduction targets for KP-CP2 (UNFCCC, 2012). With this decision, it has become impossible for Japan to acquire Kyoto units for KP-CP2 from the international carbon market (so-called "secondary acquisition"). The only remaining way for Japan to acquire Kyoto units for KP-CP2 is "primary acquisition" of CERs that can be directly forwarded from the CDM registry to the holding accounts of the participants of the CDM projects.

3.3 Carry-over of Kyoto units for KP-CP1 also not permitted

In addition, it was determined that only countries that have submitted GHG reduction targets for KP-CP2 can carry over Kyoto units for KP-CP1 to CP2 period (UNFCCC, *ibid*.). For this reason, the Kyoto units for KP-CP1 held in any holding accounts within Japanese national registry will be forcibly cancelled upon the completion of the additional period of KP-CP1. Based on the series of decisions made at COP18, it would be difficult for Japan to avoid the following impacts:

Impact 1: Substantive decrease in acquirable Kyoto units for KP-CP2

The absolute amount of Kyoto units for KP-CP2 that can be acquired by Japan would substantially decrease. In KP-CP1, in addition to primary acquisition of CERs, Japan maintained supply routes for a variety of Kyoto units acquired secondarily via the international carbon market. However, acquisition of Kyoto units for KP-CP2 has been limited to primary acquisition of CERs only.

Impact 2: Depreciation of retained Kyoto units for KP-CP1

The value of Kyoto units for KP-CP1, acquired by Japanese companies through investments over

[5] Revision by the Abe administration of Japan's 25% target under the Cancun Agreement is expected (Headquarters for Japan's Economic Revitalisation, 2013). Therefore, use of external credits such as Kyoto mechanisms and the JCM/BOCM may also be revised.

nearly ten years, would further decline. Kyoto units for KP-CP1 held in holding accounts within Japanese national registry have a very limited use; they can literally only be used for "KP-CP1 compliance" or for cancellation of voluntary carbon offset activities. GHG emissions of the already-concluded KP-CP1 period through 2012 considerably decreased compared to expected levels due to economic stagnation after 2008, and any future large increase in demand for Kyoto units for KP-CP1 is inconceivable. If Kyoto units for KP-CP1 were indeed able to be carried over to KP-CP2, utilisation of these units would have extended to compliance for the KP-CP2 period, thereby bringing about the potential for a new value to be obtained. However, that potential has already been dismissed. As stated above, the Kyoto units for KP-CP1 held in any holding accounts within Japanese national registry will be forcibly cancelled upon the completion of the additional period of KP-CP1 and will become worthless[6].

3.4 Need for KP-CP2 Kyoto units after 2012

Japan has already set its sights on acquisition and use of Kyoto units in a post-2012 international framework for climate change, as already mentioned. In other words, the need remains for Japan to acquire Kyoto units for KP-CP2[7]. Accordingly, an estimation of the acquirable amount of Kyoto units for KP-CP2 by Japan under the COP18 decisions has significant policy implications.

What follows in the next section will be an attempt to quantitatively estimate the Kyoto units for KP-CP2 that can be acquired by Japan, in keeping with the limitations for use of the Kyoto mechanisms based upon the COP18 decisions.

4 Estimation method for Japan's acquirable Kyoto units for KP-CP2

4.1 Summary of methodology

As repeatedly been stated, according to COP18 decisions, acquisition of Kyoto units by Japan for KP-CP2 is limited to primary acquisition of CERs that are forwarded only to the participants of the CDM projects. For this reason, projects in which Japanese corporations participate were selected from the approximate 10,000 CDM projects on which information is available, including those currently undergoing the validation process. By summing up emissions reductions likely to be realised after 1 January 2013 in a cumulative manner based on each project design document (PDD), the total amount of Kyoto units primarily acquired by Japan through 2020 can be estimated. This is a brief description of the estimation methodology employed in this paper.

The data used for the estimations is the IGES CDM database (IGES, 2012) prepared based on data related to CDM projects made public by the UNFCCC secretariat. Specific procedures are described below.

4.2 Specific procedures for estimation

Step 1: Selection of projects in which Japanese corporations participate

Covering both, "registered CDM projects" and "projects already in the stage of validation process" as of the end of 2012, projects in which Japanese corporations participate were selected.

Step 2: Estimation of "institutional-based risk CER yield"

The calculation is made by multiplying the

[6] One possible way to carry over the Kyoto units for KP-CP1 held in Japanese national registry to KP-CP2 period is by transfering such Kyoto units to the national registries of other countries that have fulfilled the requirements for carry-over of units as per the COP18 decisions, such as by submitting GHG reduction targets for KP-CP2, by the end of the additional period of KP-CP1. Then a carry-over to KP-CP2 within the national registries of these countries may be requested.

[7] It is at present unclear as to how countries that have not submitted GHG reduction targets for KP-CP2 would utilise Kyoto units for compliance under a post-2012 framework. However, it is conceivable that restrictions will not extend to voluntary cancellation of accounts in the national registry of a country. For example, by cancelling primarily acquired CERs, it is conceivably possible to declare the said amount as a contribution to GHG emissions reduction. Likewise, even if such use were possible, from the perspective of time consistency, in order to declare the contribution towards an emissions reduction after 2012, cancellation of Kyoto units for KP-CP2, rather than for KP-CP1, would be required.

emissions reduction entered on the individual PDD of future projects by the "institutional-based risk yield ratio". This ratio is the yield ratio that can be attained by the stage of CER issuance between the years 2013 and 2020, overcoming risks originating mainly on the institutional side, such as delay in/suspension of validation process, delay in registration process, rejection of application for registration, insufficient implementation of registered projects, and delay in CER issuance. This was estimated through analysis of the registered results of CDM projects, up through the most recent, based on IGES (2010). According to the above calculation, the "institutional-based risk CER yield" of each project can be estimated.

Step 3: Estimation of "technology-based risk CER yield"

To the "institutional-based risk CER yield", the "technology-based risk yield ratio" is further multiplied to estimate the final amount of CERs issued for each individual project. The "technology-based risk yield ratio" is the ratio of CERs actually issued in relation to the emissions reduction amount described in the PDD. It is a yield ratio based not on system-related aspects, but on technological constraints inherited in each project type, such as wind power generation, biomass power generation or waste management. This "technology-based risk yield ratio" was estimated through analysis of the CER issuance results, up through the most recent, based on IGES (2010).

Step 4: Cumulating the estimated value for CER issuance from 2013 to 2020

By summing up the CER issuance amounts of all individual projects estimated in Step 3, the cumulative estimated value for CER issuance between 2013 to 2020 can be obtained.

4.3 Points to consider concerning estimations

The five points compiled in Table 1 should be given consideration in regards to the estimations of CER issuance between 2013 and 2020.

Table 1 Summary of points to consider concerning estimations

Point 1	Impact of new projects for which validation is conducted after 2012
Point 2	Impact of *ex post facto* registration of participating Japanese corporations
Point 3	Impact of falling CER prices on CER issuance amount
Point 4	Impact of distribution rate of CERs among project participants
Point 5	Impact of revisions to methodology applied to HFC projects

Point 1: Impact of new projects for which validation is conducted after 2012

Registration of CDM projects in which Japanese corporations participate is possible after 2012 as in the past (UNFCCC, 2012). Accordingly, the amount of primary acquisition CERs from the participation of Japanese corporations in potential new projects, which have not reached the stage of registration or validation process to date, can be excluded from the estimations. However, for a number of reasons, a substantial decrease in new registrations of CDM projects is expected post-2012 (CDM EB, 2013). Moreover, through the CDM process from preparatory stages to CER issuance, it takes about three years (IGES, 2012). Thus, it is assumed that the impact is not substantial enough to alter the estimation results.

Point 2: Impact of *ex post facto* registration of participating Japanese corporations

As participants in CDM projects can voluntarily be added on *ex post facto*, depending on future circumstances, there may be an increase of cases where Japanese corporations register as participants in the existing CDM projects *ex post facto* for the purpose of

primary acquisition. However, as approval from other participants is required for new registration as a project participant, and considering the costs involved in negotiations and procedures to this effect, this factor is also expected to wield only limited impact on overall estimation results.

Point 3: Impact of falling CER prices on CER issuance amount

Along with the recent falling prices of CERs, trends may develop linked to decreases in CER issuance due to suspension of CDM projects or insufficient implementation of monitoring, reporting and verification of GHG reduction.

Reaction to price changes on the CER supply side can be quantitatively explained by the price elasticity of CER supply. Supposing that this price elasticity is large, falling CER prices will immediately be manifested in a decrease in supply (in this case CER issuance amount). Conversely, if price elasticity is small, there will be almost no effect on supply. Kuriyama and Ninomiya (2013) analyses CER price elasticity in relation to CER issuance from 2009 to 2012 by econometric model, giving a conclusion of zero price elasticity for projects that account for about 80% of CER issuance amounts as of December 2012, which are HFC-23 destruction projects (hereafter HFC projects), N_2O reduction and avoidance projects (hereafter N_2O projects), hydro and wind power projects. Accordingly, estimations were conducted under the assumption that falling CER prices do not bring significant impact on issuance of CERs.

Point 4: Impact of distribution rate of CERs among project participants

When there are multiple participants in projects, the amount of CERs that can be obtained by Japanese corporations is dependent on the CER distribution rate determined in the contract among participants. However, these CER distribution rates are not made clear in publicly accessible information. In the case of projects with small-scale CER issuance, the impact on estimation results is limited even if the distribution rate to Japanese corporations is assumed to be 100%. However, for HFC projects and N_2O projects where CER issuance for one project substantially exceeds one million t-CO_2 annually, the degree of this distribution rate considerably affects estimation results. For this reason, the CER distribution rate was estimated as follows.

If the total CER amounts from 2008 to 2011 acquired by primary acquisition on the Japanese national registry[8] are compared to the CER issuance from CDM projects in which Japanese corporations participated during the same period, the latter is greater. The difference in the two is assumed to be the portion of CERs generated from HFC and N_2O projects that was not distributed to Japanese corporations, and from here the distribution rate to Japanese corporations is inferred[9]. Assuming these distribution rates will be maintained from 2013 onwards, estimated values are gained by multiplying distribution rates by CER amounts generated from the post-2012 HFC and N_2O projects.

Point 5: Impact of revisions to methodology applied to HFC projects

The impact of CDM methodology revisions (CDM EB, 2011) to be applied to HFC projects should be noted. In keeping with the fact that these revisions changed the rate of generation of HFC-23 as a by-product of HCFC-22 manufacture from 3% to 1%, the GHG reduction described in the PDD following renewal of the crediting period was discounted by one-third when estimating CER issuance amounts for HFC projects.

[8] For the purpose of simplification, the approximate 13 million tons of CER acquired primarily over a period of about a month and a half from mid-November to the end of December 2007, when the connection between Japanese national registry and the CDM registry was established, are regarded as and included in the acquisition amount for 2008.

[9] In this case, the entire amount of CERs issued for project types other than HFC and N_2O is assumed to be distributed to Japanese corporations.

5 Estimation results: by project type

The estimated results for the amount of Kyoto units for KP-CP2 acquirable by Japan between 2013 and 2020, namely the total amount of CERs Japan can obtain through primary acquisition, are shown as an annual average on the right side bar of Figure 1 by acquisition type (primary or secondary acquisition, and further by project type for primary acquisition). Moreover, for the purpose of comparison with KP-CP1, the left side bar of Figure 1 shows the annual average for the total amount of Kyoto units actually obtained by Japan between 2008 and 2011[10]. Rather than an accumulated value, the annual average is shown to facilitate a comparative examination for the two periods, 2008 to 2011 and 2013 to 2020, with differing numbers of years[11].

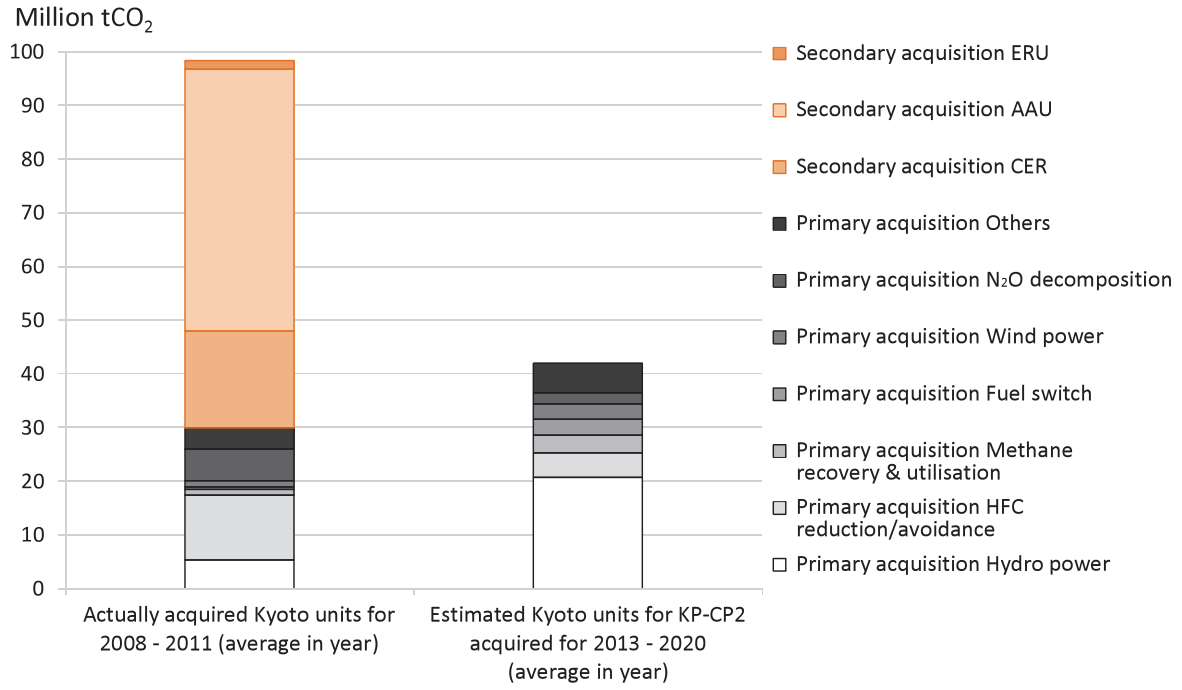

Figure 1 Kyoto units acquired by Japan: by project type

5.1 Acquirable Kyoto units reduced to about 40 percent of KP-CP1

According to Figure 1, the amount of Kyoto units for KP-CP2 that Japan can acquire primarily from 2013 to 2020 is estimated to be about 42 million t-CO_2 annually. Compared to the annual approximate 98 million t-CO_2 shown in Figure 1 that Japan actually obtained between 2008 and 2011[12], this figure is reduced to

[10] These values were calculated based on publicly accessible information (information on holding amounts and transactions based on Paragraph 47 of the Annex to Decision 13/CMP.1) on Japanese National Registry System (http://www.registry.go.jp).

[11] Annual averages for each period were obtained by dividing the accumulated CERs by 4 for the period 2008-2011, and by 8 for the period 2013-2020 respectively.

[12] See footnote 9.

about 40 percent (43%). Of the annual approximate 98 million t-CO_2 obtained by Japan during KP-CP1, an annual approximate 68 million t-CO_2 are secondary acquisition Kyoto units obtained in the international carbon market. Primary acquisition CERs were merely an approximate 30 million t-CO_2 annually, or less than half. Of the annual approximate 98 million t-CO_2 obtained, an annual approximate 61 million t-CO_2 are those that have been retired by Japan to achieve the 6% reduction target[13]. Supposing that restrictions had been imposed in KP-CP1 (as they have been post-2012) limiting acquisition to primary acquisition CERs, an excess in emissions of 150 million t-CO_2 in relation to the GHG reduction target would have occurred, very likely resulting in non-compliance for KP-CP1[14].

5.2 Increasing trend when comparing primary acquisition CERs only

A very interesting trend is evident when primary acquisition only is compared. The annual approximate 30 million t-CO_2 for the years 2008 to 2011 increases by nearly 1.4 times to an annual approximate 42 million t-CO_2 for the years 2013 to 2020. One factor explaining this trend is the considerable time lag from the preparatory stages of CDM projects to CER issuance. In addition, CDM projects in which Japanese corporations have made business investments through 2012 have accomplished their purposes and are successively reaching the stage of CER issuance post-2012.

5.3 Substantial decrease in HFC and other industrial gas-related projects

The content of primary acquisitions for the periods 2008-2011 and 2013-2020 are considerably different. For the former, HFC projects alone accounted for 40% of the whole, whereas for post-2012, this share shrinks substantially to 11%. Reasons being that reduction amounts have shrunk to one-third due to the revised methodology for application discussed above, and further that about 30% of HFC projects initiated during KP-CP1 have reached the end of the crediting period. Likewise, the share of N_2O projects falls from 19% to 5%.

5.4 Energy-related projects become mainstream

Instead of HFC and N_2O projects, hydropower generation projects account for a large proportion of primary acquisition post-2012. While their share in KP-CP1 was 18%, this share increases to an overwhelming 49% in KP-CP2. As such, for post-2012, shifts in project types are progressing, including a shift from industrial-gas related projects such as HFC and N_2O projects to renewable energy-related projects like hydropower, methane recovery and wind power, as well as projects to switch from coal to natural gas.

6 Estimation results: by supplying country

Figure 2 shows the same estimation results by supplying country of Kyoto units for KP-CP2. To repeat, whereas secondary acquisition was included in addition to primary acquisition for 2008-2011, the figures for 2013-2020 are primary acquisition only.

[13] To be exact, this is the amount transferred to the government's holding account for the purpose of retirement. This figure was obtained by adding the 100 million t-CO_2 obtained by the Japanese government (Government of Japan, 2008) and the 203 million t-CO_2 obtained by 12 affiliated utility companies of the Federation of Electric Power Companies between 2008 and 2011 (Federation of Electric Power Companies, 2009-2012), for a total of 303 million t-CO_2, which was divided by five years. This figure is equivalent to 4.8% compared to the base year GHG emissions.

[14] Japan's GHG emissions for 2012 are expected to increase to nearly 1.4 billion t-CO_2, in part due to the impact of the suspension of nuclear power plants (IEEJ, 2011). In contrast, presuming that restrictions are also imposed limiting Kyoto units to primary acquisition, the maximum emissions allowance for 2012 would be about 1.25 billion t-CO_2. For this reason, non-compliance with the target of KP-CP1 is highly probable.

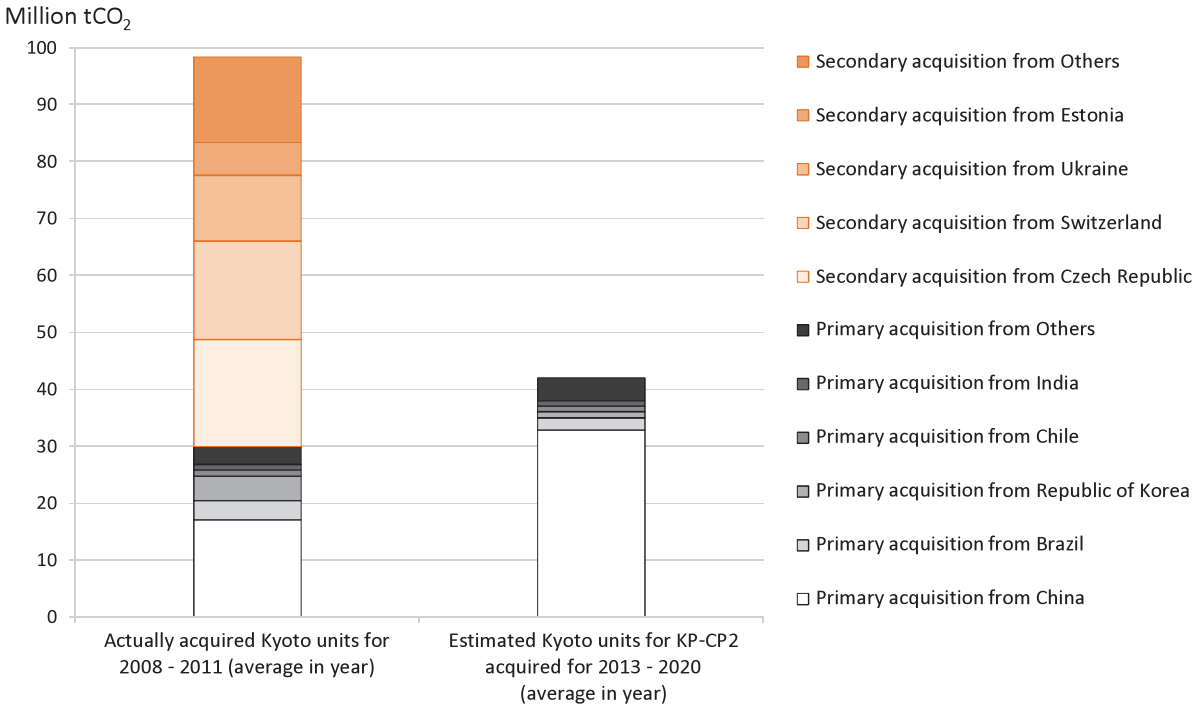

Figure 2 **Kyoto units acquired by Japan: by supplying country**

6.1 Supply structure heavily concentrated on China

One point that needed particular attention in Figure 2 is that while Kyoto unit supply countries for 2008 to 2011 were comparatively diverse, for 2013 to 2020, the one country of China accounts for around 80% (78.2%) of the whole in an extremely biased supply structure. While China's share for 2008 to 2011 was 17% of the whole, after 2012 the supply source of Kyoto units shifts to a strikingly new state of affairs. Brazil, the Republic of Korea, Chile and India follow after China, but their supply amounts are extremely small compared to China.

6.2 Even heavier concentration on China due to COP18 decisions

Actually, this biased CER supply structure would basically not change even without the restrictions of the COP18 decisions. A look at CER issuance from all CDM projects, including CDM projects without the participation of Japanese corporations, shows that even here supply from China accounts for 68% of the whole. CER supply from 2013 to 2020 would in any case be inclined toward China. However, for Japan, the lost opportunity for secondary acquisition due to the COP18 decisions has led to China's share rising to about 80%, near the level of a monopoly, thereby resulting in a marked narrowing of options for credit supply countries.

6.3 Potential for secondary acquisition if "COP18 restriction" had not been made for Japan

This section briefly considers the potential for secondary acquisition of Kyoto units that Japan would probably have been able to acquire without the "COP18 restrictions". As is shown in Figure 2, about 40% of Kyoto units acquired by Japan between 2008 and 2011 were in fact surplus AAUs from Eastern European countries. However, COP18 decisions introduced a mechanism to whenever possible eliminate surplus AAUs, called "hot air" (UNFCCC, 2012). Thus, it is conceivable that the generation of such surplus AAUs will substantially decrease post-2012. The same is true for ERUs generated from joint implementation (JI). Accordingly, even if the "COP18 restrictions" had

not been made for Japan, it is assumed that nearly all Kyoto units that Japan could acquire would have been limited to CERs. Ultimately, the difference lies in the limitation to only primary acquisition of CERs and the added potential for secondary acquisition.

7 Policy implications of the estimation results

7.1 Use of external credits remains necessary post-2012

While Japan has not submitted a GHG reduction target for KP-CP2, it has made clear that it will continue to engage in GHG emissions reduction under UNFCCC. Although reconsideration of the "25% reduction by 2020 compared to 1990" under the Cancun Agreement is underway, taking into account costs of domestic emissions reduction and reduction potential, utilisation of external credits to a certain degree is unavoidable. In this case, conceivable external credits involve use of Kyoto mechanisms and new mechanisms, particularly JCM/BOCM.

7.2 Substantially reduced maximum potential and heavy concentration on China

It has been estimated that acquirable Kyoto units for KP-CP2 for the period of 2013 to 2020 would be an annual approximate 42 million t-CO_2 of primary acquisition CERs. Compared to actual results on use of the Kyoto mechanisms for the period of 2008 to 2011, this figure is only 43%. Additionally, it was pointed out that about 80% of the 42 million t-CO_2 would be dependent on the one country of China in an extremely biased supply structure. This is the result of the restrictions emerging from COP18 decisions. For Japan, cut off from the secondary acquisition path, this amount is likely to be the maximum potential for acquirable Kyoto units for KP-CP2.

7.3 The credit-supplying power of CDM cannot be ignored

Although Japan is limited to primary acquisition, the reality is that aside from the CDM, no other international crediting scheme exists that can supply an annual approximate 42 million t-CO_2 of credits. While debate surrounding new market mechanisms, including JCM/BOCM, unfolded at COP18, it remains at the stage of discussion of fundamental principles. Initiation of full-scale employment would conceivably require at least several years. A considerable number of years are required for these new mechanisms, including JCM/BOCM, to reach a level of credit supply power on par with the CDM. For this reason, despite its various problems, the importance of the CDM mechanism, with nearly ten years of operation experience, and in particular its credit supplying power, can by no means be ignored.

7.4 Estimation of Japan's GHG reduction in 2020 based on the estimation results

Supposing that an annual approximate 42 million t-CO_2 of CERs for KP-CP2 can be acquired primarily, what level of contribution will be made to Japan's GHG emissions reduction in 2020. According to the "Innovative Strategy for Energy and the Environment" (National Policy Unit, 2012) of September 2012, Japan's domestic reduction amount in 2020 can be 5% to 9% compared to 1990[15]. Moreover, it is postulated that the 3.5% compared to the 1990 emission level of carbon removals by sinks resulting from domestic forest management activities would be recognised based on COP17 decision (UNFCCC, 2011). As the annual approximate 42 million t-CO_2 is equivalent to 3.3% compared to 1990, when all these figures are added up, calculations show that roughly 11% to 15% compared to the 1990 level in GHG emissions reduction can be expected[16]. This figure is a

[15] As the Abe administration has declared that it will reconsider this government decision from square one (Headquarters for Japan's Economic Revitalisation, 2013), this domestic reduction amount is also expected to be revised.

[16] For the purpose of simplification, calculations were carried out assuming that GHG emissions in 1990 are of equal value to the base year emissions for KP-CP1 (1.261 billion t-CO_2).

rough estimate of Japan's reduction amount in 2020 taking into consideration the amount of Kyoto units for KP-CP2 acquired between 2013 and 2020. Whether or not the JCM/BOCM will sufficiently function as an additional reduction amount will depend on its future progress.

7.5 The unstable CER supply structure and the importance of establishing new mechanisms

Again, a point of concern is the near complete dependence on one country, China, for the annual approximate 42 million t-CO_2 of CER supply post-2012. In the event that CDM projects in China should under some circumstances be extensively suspended, Japan could potentially lose around 80% of acquirable CERs for KP-CP2 all at once in the fragile and unstable supply structure. The estimation results again highlight the importance of creating new mechanisms, such as the JCM/BOCM.

8 Conclusion

This paper provided an overview of the limits to Japan's use of Kyoto mechanisms due to the COP18 decisions, followed by a quantitative estimation of the impact these limits will have on the Kyoto units that Japan can likely acquire. Based on estimation results, the policy implications of these impacts were also briefly discussed.

Based on the COP18 decisions, acquisition of Kyoto units for KP-CP2 by Japan for the years 2013 to 2020 would be reduced by about 40% compared to the actual results of years prior to 2012. Moreover, about 80% of these must rely on one country, China, in a fragile and unstable supply structure. However, at present no other international crediting scheme with substantive supply power to replace the existing CDM. Accordingly, with the view to promote further reduction of GHG emissions in the post-2012 era, new market mechanisms to supplement the Kyoto mechanisms, including JCM/BOCM, would become increasingly important as new supply sources for external credits, both for substantive procurement of external credits and for diversification of supplying countries.

Appendix Glossary of terms

AAU	Abbreviation of Assigned Amount Units, one type of Kyoto unit. Distributed to developed countries with GHG reduction targets for the Kyoto Protocol according to respective the target values.
BOCM	Abbreviation of Bilateral Offset Credit Mechanism. See item on JCM.
CDM	Abbreviation of Clean Development Mechanism, one type of Kyoto mechanism. Issued as CERs per confirmation of emissions reduction/removal amount from CDM projects implemented in developing countries.
CDM Registry	IT system for issuance and temporary holding of CERs generated from CDM projects. Managed by the UNFCCCC.
CER	Abbreviation of Certified Emission Reduction, one type of Kyoto unit. Monitored, reported, verified and issued *ex post facto* for emissions reduction/removal amount realised in CDM projects.
ERU	Abbreviation of Emission Reduction Unit, one type of Kyoto unit. Monitored, reported, verified and issued for emissions reduction amount/removal amount realised in joint implementation (JI). Converted and issued from AAU.
JCM	Abbreviation of Joint Crediting Mechanism. A new market mechanism under the UNFCCC proposed by the government of Japan, also called BOCM or Bilateral Offset Credit Mechanism.
JI	Issued as ERUs per confirmation of emissions reduction amount/removal amount from JI projects implemented by collaboration between a developed country and another developed country or countries.
ICER	Abbreviation for Long-term CER, one type of Kyoto unit. Monitored, reported, verified and issued for removal amount from afforestation or reforestation CDM projects.
PDD	Abbreviation of Project Design Document. Documents in a set format explaining the details of a CDM project.
RMU	Abbreviation of Removal Unit, one type of Kyoto unit. Issued based on calculation of removal amount from afforestation, reforestation and forest management activities conducted domestically in developed countries.
tCER	Abbreviation of Temporary CER, one type of Kyoto unit. Monitored, reported, verified and issued for removal amount from afforestation or reforestation CDM projects.
UNFCCC	Abbreviation of United Nations Framework Convention on Climate Change.
Carbon Offset	Companies measure their own GHG, and purchase Kyoto units for the portion of emissions that are difficult to reduce, thereby compensating for a portion or all of these emissions.
Cancun Agreement	Document on agreements at COP16 (Cancun, Mexico) in 2010. Under this agreement, major developing countries and developed countries declared the implementation of emissions reduction actions in each country through 2020.
National registry	IT system for conducting maintenance (holding, acquisition, transfer, issuance etc.) of Kyoto units for compliance assessment with GHG reduction targets under the Kyoto Protocol. Developed countries with GHG reduction targets for the Kyoto Protocol are required to establish and maintain own national registries.
First commitment period of the Kyoto Protocol (KP-CP1)	2008 to 2012
Second commitment period of the Kyoto Protocol (KP-CP2)	2013 to 2020
Kyoto mechanisms	Market mechanisms for transactions (acquisition, transfer) of the Kyoto units for achievement of GHG reduction targets under the Kyoto Protocol. There are three types, CDM, JI and international emissions trading.

Kyoto units	General term for emissions allowances (or emissions credits) used for evaluation of compliance assessment with GHG reduction targets for GHG emissions under the Kyoto Protocol of the UNFCCC. There are six types: CERs, AAUs, ERUs, RMUs, tCERs and lCERs.
Primary acquisition (of CERs)	Participants in CDM projects directly acquire CERs generated by that project by forwarding from the CDM registry.
Retirement (of Kyoto units)	Use of Kyoto units by developed countries to demonstrate their compliance for GHG reduction targets under the Kyoto Protocol. Once retired, Kyoto units cannot be used again for other purposes.
New mechanisms (under the UNFCCC)	Market mechanisms to be used under a new international framework for climate change, not the Kyoto Protocol. Details are yet unclear.
Cancellation (of Kyoto units)	Action to revoke the validity of Kyoto units. Different from retirement and unrelated to compliance with GHG reduction targets under the Kyoto Protocol. Once cancelled Kyoto units cannot be used again for other purposes.
Bilateral Offset Credit Mechanism	See item on JCM.
Secondary acquisition (of Kyoto units)	Kyoto units obtained from other countries via the international carbon market.

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