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Review

Trends and issues on the Japan Verified Emission Reduction (J-VER) scheme and carbon offset in Japan

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A carbon offsetting credit of Japan Verified Emission Reduction (J-VER) was developed in November 2008 by the Ministry of the Environment, Japan (MOEJ). By the end of June 2011, J-VER had been certified 126,390 t-CO2 with 83 projects in total (4CJ, 2011a), which gained the second share in the domestic carbon offsetting markets. This paper looks back over the development of J-VER scheme and corresponding carbon offset to date, and discusses trends and current issues to be hurdled for further development.

Carbon offset in Japan

Carbon offset is defined as the action composed of four steps (MOEJ, 2011): First, all members of society aware of their emissions of GHG. Second, the individuals/businesses make an effort to reduce greenhouse gas (GHG) emissions caused by their activities. Third, the individuals/businesses recognize the amount of unavoidable GHG emissions in spite of their efforts to reduce them. Fourth, the individuals/businesses compensate the GHG emissions by purchasing credits equivalent to the total or part of the emissions or by investing directly to GHG emission reduction (ER)/removal by sinks (RM) projects.

MOEJ has taken several initiatives to promote carbon offset since 2008, which have been published in the series of guidelines and standards like followings.

"Guidelines for Carbon Offsetting in Japan" (MOEJ, 2008a) was published in February 2008, which was the first milestone initiative introducing the general guidance of carbon offset. This guideline shows the aim of carbon offset is to encourage ER/RM activities of GHG and to promote investments for the projects concerning those activities as well. The types of carbon offset can be roughly classified into two categories and closely classified into five categories according to this guideline: 1. "Market-oriented offset" uses the credits with monetary value traded in markets to offset the total or part of GHG emissions resulting from 1-a. manufacture, use and dispose of the products and services, 1-b. hosting of events such as conferences, concerts and sports matches and 1-c. daily lives and corporate activities by individuals and businesses. In addition, 1-d. "indirect offset of daily lives and activities" was established in March 2009 to offset the GHG emissions resulting from individuals' daily lives by purchasing the offsetting products and services embedded credits. 2. "Offset among designated individuals and businesses" does not use the credits traded in markets but uses such as deeds to removal by forest sinks (RMF) projects issued by local governments or directly do ER/RM projects to compensate

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unavoidable GHG emissions resulting from their activities. These kinds of projects include ER such as fuel exchange from fossil to woody biomass, collection and use of waste heat, etc. and RM such as afforestation and thinning in a forest sector.

"Guidelines for Calculation of GHG Emissions Activities to be Offset" (MOEJ, 2008b) was first published in October 2008 and updated on April 2011 latest, which referred to calculation methods for GHG emissions including the concept of project boundaries, the list of GHGs targeted and default parameters for calculation formulae.

"Guidelines for Information Provision of Carbon Offsetting Activities for Establishing Credibility" (MOEJ, 2008c) was first published in October 2008 and updated on April 2011 latest, which referred to the information to be provided to ensure transparency and foster reliability in a carbon offset.

"Certification Standards by Third Party for Carbon Offsetting" (MOEJ, 2009a) was first published in March 2009 and updated on April 2011 latest, which referred to the standards project bodies were required to meet in a certification process by third parties. This initiative led to the establishment of "Public Certification Scheme for Carbon Offsetting" organized by the Certification Center on Climate Change, Japan (4CJ) in April 2009. 4CJ certified totally 62 carbon offsetting projects by the end of June 2011 (4CJ, 2011b) including 41 projects of 1-a type, 9 of 1-d, 8 of 1-b and 4 of 1-c on condition that type 2 project is out of the certification scheme. This scheme provides transparent and credible certification through third-party verification based on the ISO 14064 that handles the requirements for organizations or persons to quantify and verify GHG emissions. In addition, certified projects are allowed to use the official labels of carbon offset (Fig. 1) on their products or in their advertisements to better advantage.

"Guidelines for Offsetting among Designated Individuals and Businesses for Establishing Credibility" (MOEJ, 2010a) was published in July 2010, which referred to the general concepts and matters to be attended about the type 2 project recently increasing its share. MOEJ estimated type 2 projects gained nearly 40% share of cases in totally 997 carbon offsetting projects by the end of the year 2010 (MOEJ, 2011)

Carbon offsetting credits in Japan

Carbon offsetting credits are required to fulfill the following conditions (MOEJ, 2008a): 1. Corresponding ER/RM must be conducted. 2. RM must be assured of its permanency. 3. One

Fig. 1. Official certification labels of carbon offset provided by the Public Certification Scheme for Carbon Offsetting.
This picture is cited from the web page by 4CJ (http://www.4cj.org/label/about_label.html).

credit must not be double-counted for different offsets. 4. Credits should be verified by third parties conformable to the international standards such as ISO 14065 that handles the requirements for GHG validation and verification bodies for use in accreditation or other forms of recognition .

There are several kinds of offsetting credits that fulfill these conditions (KOBAYASHI, 2005; MOEJ, 2010a, 2011), which are 1. Kyoto Mechanism credits for the Emissions Trading composed of Assigned Amount Unit (AAU) by the Marrakesh Accords, Emission Reduction Unit by the Joint Implementation, Certified Emission Reduction (CER) by the Clean Development Mechanism (CDM) and Removal Unit according to the Article 3.3 of the Kyoto Protocol, 2. Allocated Emission Allowance known as the Japan Allowance in Japan's Voluntary Emissions Trading Scheme, 3. J-VER and 4. other credits with certification standards equivalently transparent and credible with the formers. The first credits are certified and issued by the United Nations, and the second and third are by the Government of Japan. The fourth credits suppose to be certified and issued by private organizations such as the FORESTOCK scheme (Forest Management Association of Japan, 2009). In the case of 1-a type projects, CER credits gained the largest share with 83.4% over the cumulative volume of credits offset by the end of the year 2010, J-VER with 10.8% and others such as AAU and FORESTOCK with 5.9%, respectively (MOEJ, 2011). The share of CER decreased by nearly 10% after 2008 when the J-VER scheme started (MOEJ, 2011).

Development of J-VER scheme

J-VER scheme was developed by MOEJ in November 2008 to verify the credits generated by domestic ER/RM projects. Before the development of J-VER, it was common that domestic carbon offsetting was compensated with the Kyoto Mechanism credits, particularly CER, generated by the projects in developing countries, which meant the revenue from credits went overseas substantially. In this respect, the J-VER scheme circulates the revenue domestically, so that it is expected to accelerate domestic investment in local environmental protection, local economic development, etc. as co-benefits (MOEJ, 2007). In addition, there were public needs to establish a reliable scheme for certifying carbon offsetting credits in voluntary VER markets (MOEJ, 2007). To meet those needs based on the global standards, MOEJ referred to the CDM scheme operated by the United Nations in establishing J-VER scheme (KOBAYASHI, 2010a, 2010b).

MOEJ has published the series of guidelines and rules about J-VER scheme. Among them, only five important publications are introduced to overview the scheme in the followings.

"General Rules of the Offsetting Credit (J-VER) Scheme" (MOEJ, 2008d) was first published in November 2008 and revised latest on June 2011, which referred to the general concept of J-VER scheme such as aims, principles, a framework, credibility in line with ISO standards and explanations of procedures in monitoring, reporting, validation and verification processes. These rules show projects must be planned and implemented according to the following six principles. Namely, projects are required their "Relevance" to the Methodologies (detailed later) and

corresponding standards in the Positive List (detailed later), "Completeness" with ER/RM activities and resulting GHG without any leakage, "Consistency" in calculation of GHG throughout the project period using the same method and data, "Accuracy" by minimizing the bias and uncertainty in measurements and calculations, "Transparency" to the information disclosed enough and adequately to those who concern the projects and "Conservativeness" about the parameters and procedures in calculation of GHG to prevent overestimation. These rules also stipulate the scheme framework (Fig. 2) composed of 1. "steering committee" to make decision on revision of rules, guidelines, positive list and relevant Methodologies, etc., 2. "technical panel" to discuss revision of rules, guidelines, Methodologies and corresponding standards according to commission from the steering committee, 3. "certification committee" to make decision on registration of projects and certification and issue of J-VER and to advance opinions to the steering committee and the technical panel in independent authority and 4. a secretariat by 4CJ to manage general operations of the scheme and to support the committees and panel. For reference, Fig.2 includes the relationship among these framework, project implementing body (hereafter just shortened to "project body") and third party companies as a validation confirmation agency and an accredited verifier. This relationship is detailed in the following sentences.

These rules also specify that J-VER scheme performs certification of projects in line with the international standards of ISO14064-2 and 14064-3 with help of the third parties conformable to ISO14065. These rules also explain the procedures that project bodies, third party companies and J-VER committees need to take in the validation and verification process: The flow chart of the process is illustrated in Fig. 3 (MOEJ, 2011).

First, J-VER steering committee announces the Positive List, Methodologies and corresponding standards. The latest Positive List at the end of June 2011 includes 26 ER projects and 3 RMF

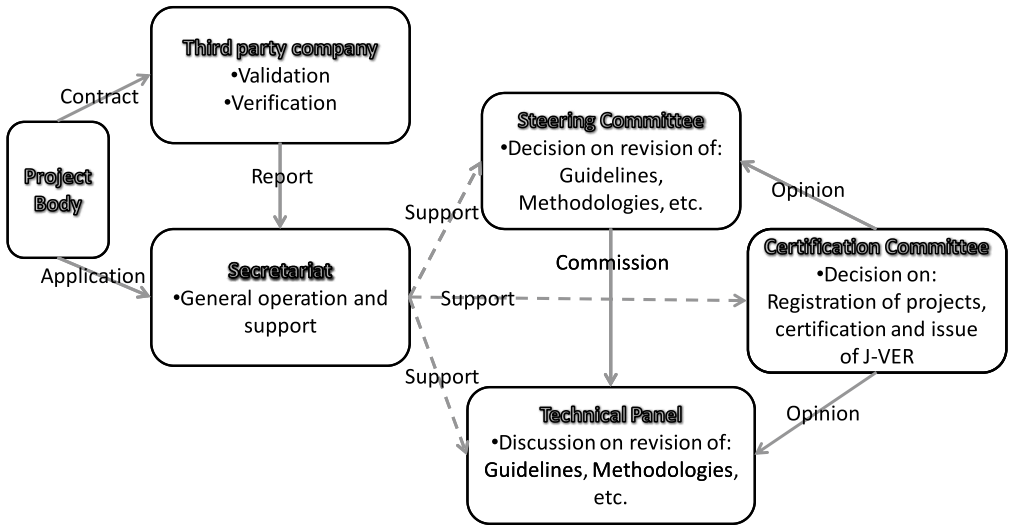

Fig. 2. Framework of the J-VER scheme.

projects (4CJ, 2011c) (Fig. 4).

Second, a project body makes application documents and relevant materials according to project requirements. For instance, "forest management project accelerating thinning" requires the following documents and materials for validation purpose: They are a project plan, a monitoring plan, company brochures including organization charts, a forest management plan and either its authorization by the local government or its certificate by FSC or SGEC, forest stand maps showing compartment and sub-compartment boundaries, ortho-photographs of a forest, location maps of the Monitoring Plots (detailed later), a list of parameters in GHG calculation

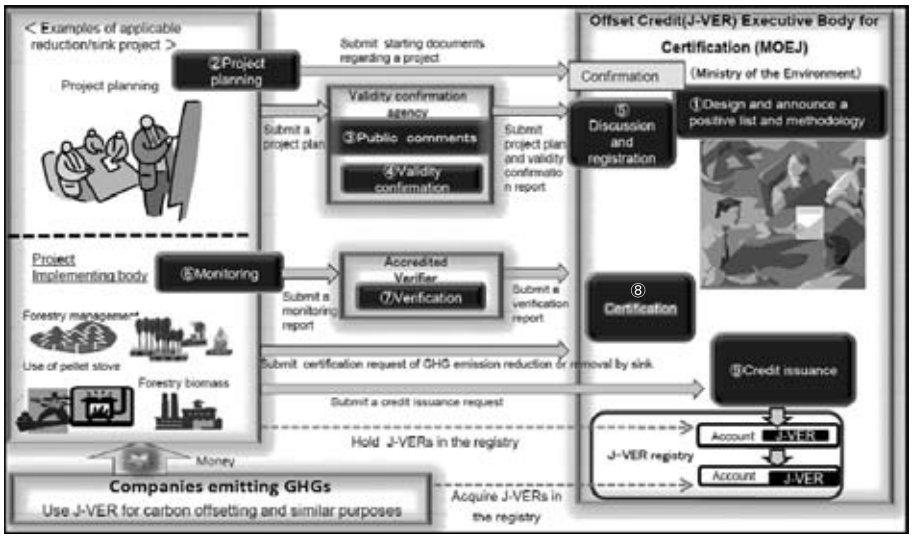

Fig. 3. Flow of the J-VER scheme from announcement of methodology to issue of offsetting credits. This picture is cited from the brochure published by MOEJ on the web page. (http://www.j-cof.org/cof/knowledgepool/l_list.html)

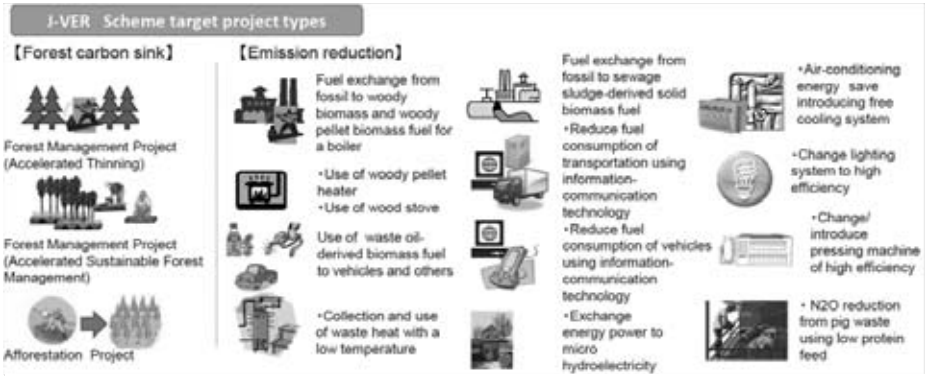

Fig. 4. Summary of emission reduction/removal by forest sink projects in the J-VER scheme. This picture is cited from the brochure published by MOEJ on the web page. (http://www.j-cof.org/cof/knowledgepool/l_list.html)

including an yield table, receipts of thinning subsidies and other deeds and authorizations for relevant forest laws. Next a project body makes a contract with a third-party company as a validator. At the end of June 2011, 14 companies are available as validators, where 6 companies can deal with emission reduction projects, 4 with removal by forest sinks projects and rest 4 with both types of projects (4CJ, 2011d). After a validator accepted application documents from a project body, third, public comments are accepted for the project if any, then fourth, the validity of project plan and monitoring plan are checked based on the "Guidelines for Validation and Verification in Offsetting Credit (J-VER) Scheme" (detailed later). A validation is conducted by paper-based review, on-site check and interview. It is common that the plans are revised several times according to validator's advices. If project plans are successfully validated, fifth, the certification committee approves them based on the validator's report. The validated project is registered in the project list in 4CJ. At the end of June 2011, totally 135 projects are registered in the list (4CJ, 2011e). Once ER/RMF activities are carried out in the project, sixth, a monitoring is conducted according to "Monitoring Method Guidelines" (detailed later). After monitoring, a project body makes a contract with a third-party company as a verifier and then sends the company a monitoring report. The above 14 companies are also available as verifiers. Seventh, the monitoring report is checked based on the "Guidelines for Validation and Verification in Offsetting Credit (J-VER) Scheme" (detailed later). This verification is conducted by paper-based review, on-site check and interview similarly to the case of validation. To prove project activities and monitoring results, a verifier requires several evidences such as field notes, assets inventories and management records in this process. If project activities and following monitoring are successfully verified, eighth, the certification committee approves them based on the verifier's report. Thus ER/RMF of GHG, particularly CO2 in most project types, are certified and registered in the list by 4CJ (4CJ, 2011a). Finally ninth, certified amounts of GHG are converted to the offsetting credits of J-VER at an even rate, i.e. 1 ton of GHG is converted to 1 ton of J-VER, and issued to the account opened by the project body in the J-VER registry. The project body trades issued J-VER with companies emitting GHG via offset providers according to "Operation Rules of the Registry System for the Offsetting Credit (J-VER) Scheme" (detailed later). "General Rules of the Offsetting Credit (J-VER) Scheme" also refers to the additional J-VER scheme called the Prefectural J-VER program. This scheme provides a kind of program certification system to examine whether offsetting credit scheme independently managed by prefectural governments fulfill the general rules of J-VER scheme by requests from the prefectures. Once they are certified as prefectural J-VER programs, their issued credits are traded on the same registry with J-VER scheme. By the end of June 2011, Niigata and Kochi prefectures operate the Prefectural J-VER programs and certified totally 7 projects with 2,256 t-CO2.

"Monitoring Method Guidelines for emission reduction projects" (MOEJ, 2008e) was first published in November 2008 and revised latest on April 2011 and "Monitoring Method Guidelines for removal by forest sinks projects" (MOEJ, 2009b) was first published in March 2009 and revised latest on April 2011, which referred to the methods and rules in monitoring the project results and in calculating the amount of GHG by ER/RMF. In case of RMF projects, the

guidelines detail each monitoring activity and calculation method like followings. First, a project body needs to identify target forest stands called "Monitoring Points" that consist of 1. thinned stands after the year 2007 based on a forest management plan authorized by a local government or certified by FSC or SGEC for "forest management project (thinning)", 2. reforested, thinned and harvested stands after 1990 based on a forest management plan for "forest management project (sustainable forest management)" and 3. afforested stands after 2008 for "afforestation project". Second, after the project is carried out, a project body identifies monitoring items for each Monitoring Point, which are stand area measured by land survey satisfying the closing error of 5%, calculation parameters such as biomass expansion factor (BEF), root-to-shoot ratio (R), basic wood density (D) and carbon fraction of dry matter (CF) cited from the domestic default values under the Kyoto Protocol report (MOEJ, 2009c), yield table authorized by local governments or designated Local Yield Table Construction System (LYCS) (SHIRAISHI, 1986), site index estimated from sample plots called "Monitoring Plots" and annual volume growth corresponding to stand age. In this process, identification of site index is particularly complex: Monitoring Plots need to be established in density of more than one plot per 30 ha for each tree species in shape of circle or square with diameter or side lengths of greater than the maximum tree height of a target stand. In addition, the plots must be placed in representative stands of those 30 ha area in terms of stand and terrain conditions, i.e. all stands in the area are assumed to have same site indices with the one estimated from the plot. Then every tree in the plot is numbered and its diameter at breast height (DBH) is measured in a unit of 1cm. Furthermore, the heights of trees with DBHs greater than their median are measured so that the site index of the stand is determined by comparing the mean of these tree heights with the site index curves relevant to a yield table in the end. Third, a project body needs to take photos of each Monitoring Point in a fixed manner such as taking photos at upper-left corner of stand looking down to bottom-right and at center of stand looking upward crowns and looking downward floor. Finally fourth, a project body calculates the amount of CO2 removed by target stands and corresponding uncertainties according to the Methodologies.

"Methodologies" calculating GHG were published separately for each ER/RMF project. Currently there are 29 projects in the Positive List as mentioned above. For instance, the first established Methodology named E001 for "fuel switch from fossil fuels to woody biomass fuels for a boiler" was published November 2008 and revised latest on November 2010 (MOEJ, 2008f). In the following, we explain the case of the Methodology R001 for "forest management project (thinning)", which was first published March 2009 and revised latest on January 2011 (MOEJ, 2009d). In this Methodology, a project needs to meet three standards: 1. Target forest must be lawful under the article 5 and 7.2 of the Forest Law in Japan. 2. Target stands are the ones thinned between April 2007 and March 2013 in line with the thinning intensity prescribed in regional forest management policies, and are not final-cut/land-use-changed during project period. 3. A forest management plan of target forest must be authorized by a local government or certified by FSC or SGEC under the guarantee of reforestation after final-cutting. Then the target GHG of CO2 can be calculated for each target stand by

$$\Delta CO_2 = A \times G \times BEF \times (1+R) \times D \times CF \times 44/12,$$

where ΔCO_2: annual CO2 increment in target stand, tons-CO2 yr^{-1}, A: area of target stand, ha, G: annual stem volume increment in target stand, m^3 ha^{-1} yr^{-1}, BEF: biomass expansion factor, dimensionless, R: root-to-shoot ratio, dimensionless, D: basic wood density, tons m^{-3} and CF: carbon fraction of dry matter, tons-CO2 $tons^{-1}$. This formula is compatible with the gross-net calculation of the Good Practice Guidance for Land Use, Land-Use Change and Forestry (IPCC, 2003). Finally, total CO2 increment is calculated by aggregating ΔCO_2 for every stand and every year during the project period.

"Guidelines for Validation and Verification in Offsetting Credit (J-VER) Scheme" (MOEJ, 2010b) was first published in July 2010 and revised latest on April 2011, which referred to the details about validation and verification processes. Basically this guideline is described for a validator and a verifier to perform their duties in line with ISO 14064-3 such as evidence assembling, activity recording, uncertainty evaluating and judgment reporting in the examination of J-VER projects. But this guideline is also instructive for project bodies to understand the important check points in validation and verification processes.

"Operation Rules of the Registry System for the Offsetting Credit (J-VER) Scheme" (MOEJ, 2009e) was first published in March 2009 and revised latest on April 2011, which referred to the general concept and rules of registry system. This publication shows there are three types of accounts, which are 1. "Holding account" to keep issued and traded credits operated by project bodies, offset providers and interested companies, 2. "Retirement account" to transfer credits already offset GHG and to make those credits inactive any longer operated by the J-VER committee and 3. "Buffer account" to keep supplementary credits initially levied 3-5% on issued credits by the J-VER committee for supplying deficiency of planned ER/RMF of GHG owing to unexpected accidents and disasters. In addition, there are two types of transaction in the registry, which are "Transfer" of credits between the Holding accounts as a result of credit trading and "Retirement" of credits between the Holding account and Retirement account as a result of offsetting GHG.

MOEJ has published some other guidelines and rules concerning committee regulations, requirements for establishing new Methodologies, standards for approving validators and verifiers in line with ISO 14065, etc. though their introductions are omitted in this paper.

Issues on J-VER scheme

It is said that J-VER scheme consumes so many labor and time in validation and verification processes to prepare documents, materials and evidences and to conduct field surveys (OKADA, 2010a, 2010b; KOBAYASHI, 2010a, 2010b; SATO, 2010; HIROSHIMA and FUJIMOTO, 2010; HIROSHIMA, 2011). For reference, one case of the R001 project by the University of Tokyo (4CJ, 2011b: certification ID of 0045001) cost totally 118 person-day for paper preparation and field survey except thinning practices implemented by agents, which resulted in certificate for 495 t-CO2 with target stand area of 25 ha in three years project period. Generally, the higher credibility of scheme gets, the severer its examination standards become, which inevitably lead to

high requirements for documents and materials to be proven and corresponding labor and time. It is certain, therefore, that J-VER scheme requires more labor and time than many other domestic voluntary credit and deed schemes. The severity of J-VER scheme is, however, almost in the same level with the other international VER schemes such as the Verified Carbon Standard (formerly known as the Voluntary Carbon Standard) (VCS Association, 2007), the Climate Action Reserve Protocols (Climate Action Reserve, 2010) and the Gold Standards (Ecofys, 2009), which obtain large shares in global carbon offsetting markets (TAKEDA, 2008; MOEJ, 2011). These schemes are all designed based on the Kyoto Mechanism in common. Considering these circumstances, current level of severity in J-VER scheme is necessary for establishing high credibility in respect of global standards.

In regard to monetary cost, a project body needs to spend approximately one million Japanese yen in a certification process as results of taking estimated fees for validation and verification to several third party companies by the author. Basically, these fees are subject to change according to the examination policy of each third-party company, but they will be substantially adjusted or discounted around one million yen which is the upper limit payment of subsidy for supporting J-VER certification by MOEJ. In addition, these fees are almost fixed regardless of the size of target forest and volume of credits also as results of taking estimated fees for five projects with different sizes and volumes to one third-party company by the author. For reference, the above project by the University of Tokyo cost totally 1,010,000 yen which consisted of 539,000 yen for validation and 471,000 yen for verification respectively.

Moreover, carbon offset by J-VER is a voluntary activity with no compliance such as CER of the Kyoto Mechanism. So many other voluntary credits can get into the carbon offsetting markets with a relatively low barrier and compete with J-VER to obtain shares. For instance of other VER scheme distinguished in Japan, FORESTOCK was developed by the Forest Management Association of Japan in February 2009 (ref. later the authority of the scheme was transferred to the FORESTOCK Association in April 2010). This scheme is almost same level in its standard severity with J-VER, and costs higher than J-VER including one time certification fees and annual monitoring fees (Forest Management Association of Japan, 2009; FORESTOCK Association, 2010, 2011; Forest sinks advisory board, 2010). Furthermore, FORESTOCK has the clear advantage to obtain many credits easier than J-VER because its target stands can include whole management unit, i.e. whole stands in a forest management plan, while targets of J-VER are only the stands implemented planting, thinning and final-cutting. In addition, the offsets not by VER but by voluntary deeds such as local governments issued can perform with easier standards and lower costs compared with J-VER.

Furthermore, it is also a problem that current governmental supports in J-VER scheme are partial to J-VER suppliers, i.e. project bodies, through such as the above one million yen subsidy by MOEJ. This is one of the reasons for the current state of oversupply of J-VER (detailed below).

Trends and issues on J-VER trading

Fig. 5 shows the time series changes in cumulative volumes of credits certified and cumulative numbers of projects certified in ER/RMF of J-VER scheme by the end of June 2011 (4CJ, 2011a; 2011b). Note that years and months on horizontal axis show irregular interval because projects are not necessarily certified every month. As mentioned at first, J-VER had been certified totally 126,390 t-CO2 by 83 projects, which consist of ER with 12,791 t-CO2 by 30 projects and RMF with 113,599 t-CO2 by 53 projects by the end of June 2011. Credits and projects constantly increased after latter 2010 when J-VER scheme become popular. Large increase of RMF credits in April 2011 resulted from the R001 thinning project in Yamanashi prefectural forest with 26,168 t-CO2, largest credits ever certified for single project. Furthermore, increases of credits and projects by RMF were larger than those of ER partly because forest managers were eager for extra revenue from non-timber forest products under the depression in forestry sector and partly because available credits per project was higher in RMF with average of 1,681 t-CO2/project except for the above Yamanashi project than in ER with 426 t-CO2/project. Anyhow, supply of J-VER credits seems constant and steady in recent months.

Fig. 6 shows the time series changes in cumulative sales volumes of credits in ER/RMF by the end of February 2011 (Japan Carbon Offset Forum, 2011a). This data is the latest one officially announced at the end of June 2011. Sales volume seems to reach the ceiling in the last three months in both ER/RMF credits. Furthermore, total cumulative sales volume of 8,753 t-CO2 in February 2011, which consist of ER with 4,454 t-CO2 and RMF with 4,299 t-CO2, are much lower than the total cumulative volume of 41,732 t-CO2 certified at the same period. This fact implies oversupply of credits in the offsetting market even if a few credits may be directly offset without trading. Though data of sales volume has not been announced since February 2011, demands for offsetting credits may shrink after the earthquake in March. On the other hand,

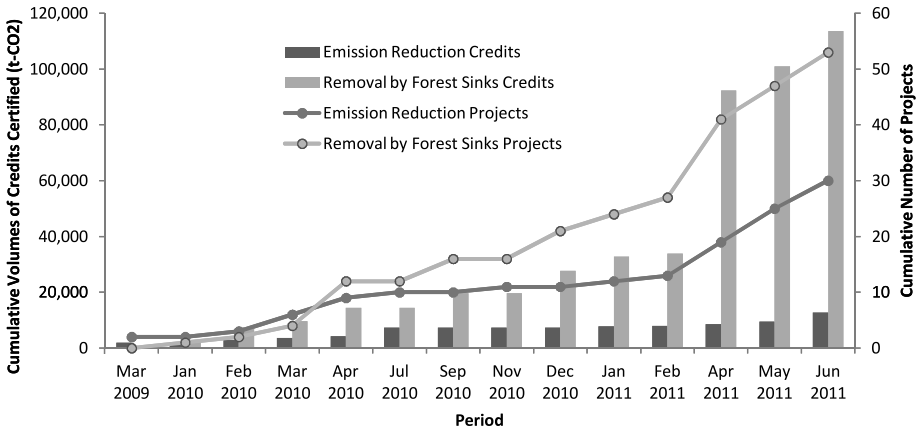

Fig. 5. Changes in cumulative volumes of credits certified and number of projects certified in emission reduction and removal by forest sinks.
Original data are cited from 4CJ web page. (http://www.4cj.org/jver/project/anken03.html)

potential supply of credits got tripled from 41,732 to 126,390 t-CO2 after several months of the earthquake as shown in Fig. 5, which were mainly produced from the projects started before the earthquake. Thus, it is highly conceivable that oversupply of credits was accelerated after the earthquake.

Figs. 7a and 7b show the time series changes in indicative prices by sellers and buyers in ER/RMF credits by the end of June 2011 (Japan Carbon Offset Forum, 2011b). Both prices of seller and buyer are generally higher in RMF credits than in ER ones probably because former credits have higher appeal to public relation than latter in respect of corporate social responsibility (CSR). In addition, indicative price gaps between seller and buyer are so wide that it seems difficult to complete actual deals with the middle price of them. The above mentioned state of oversupply and this price gap indicate inevitable falls in sales prices in near future.

As a simple cost-benefit analysis in case of the above project by the University of Tokyo, it cost totally 1,010,000 yen and 118 person-day as mentioned above. The monetary costs include 539,000 yen for validation and 471,000 yen for verification, and the labors include 45.5 person-day for paper works such as project documents preparations and contract affairs, 30 person-day for staff training such as office meetings and in-service group training to understand J-VER scheme and 42.5 person-day for monitoring survey such as plot survey and photo taking. In this project, the author made up all of project documents and also was a lecturer for staff training, and all field surveys are conducted by own staffs of the university. These labors are consumed only for the purpose of J-VER project. In addition, thinning practices for 16 stands with 25 ha in three years project period consumed totally 37 person-day for land surveys by own staffs to identify the target stand areas and cost totally 1,349,558 yen to commission logging agencies to conduct tree selection and thinning except governmental subsidies of totally 6,580,885 yen. Note that labors and monetary costs for thinning practices were part of regular expense in the forest management, not just consumed for the J-VER project. Considering these items, a unit cost to

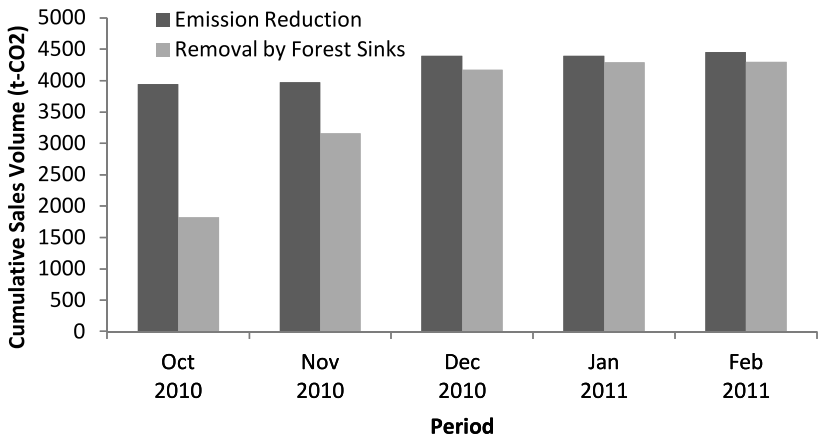

Fig. 6. Changes in cumulative sales volumes of credits by emission reduction and removal by forest sinks. Original data are cited from the Japan Carbon Offset Forum (2011a).

obtain CO2 credit is 2,040 yen t-CO2^{-1} (=1,010,000/495) if only validation and verification fees are considered or 4,424 yen t-CO2^{-1} (={1,010,000+1,180,000}/495) if labors are included in addition to the former assuming that a labor wage is 10,000 yen person-day^{-1}, which is still profitable if credits are sold by the latest indicative buyer price of 7,333 yen t-CO2^{-1}. For reference, a unit cost becomes 7,898 yen t-CO2^{-1} (={1,010,000+1,180,000+370,000+1,349,558}/495) if thinning costs are included in addition to the former, which is unprofitable compared with the latest buyer price but profitable if credits are sold by the latest indicative middle price of 10,356 yen t-CO2^{-1}.

Prospects for further development of J-VER scheme

As mentioned above, J-VER obtained only 10.8% of carbon offsetting market of 1-a type projects while CER 83.4%. These shares are deduced from the facts that CER was developed

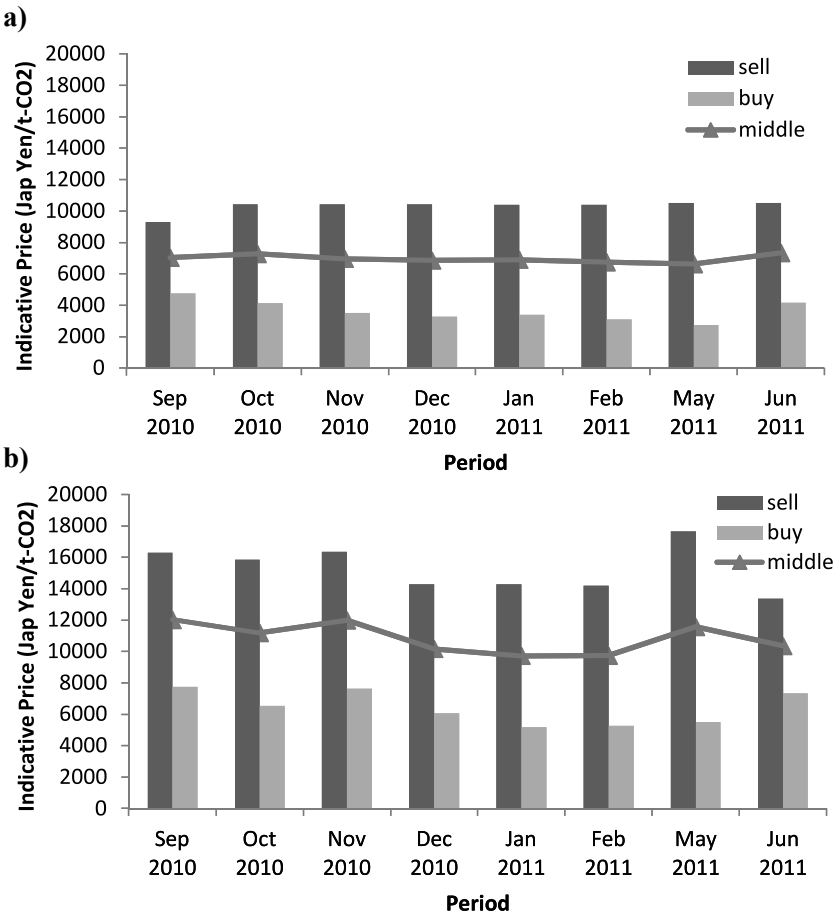

Fig. 7. Changes in indicative prices of seller and buyers: a) Emission reduction credits and b) Removal by forest sink credits.
Original data are cited from the Japan Carbon Offset Forum (2011b).

earlier and currently more popular than J-VER and that interested companies feel higher appeal in their CSR or sales promotion by purchasing CER in respect of contribution to the compliance with national emission target in the Kyoto Protocol. To accelerate the current depressed circumstance of J-VER trading, it is essential to increase current share of J-VER in carbon offsetting market by replacing CER.

For that purpose, it is basic but effective to promote public relation of carbon offsets by J-VER. In this promotion, it should be emphasized that J-VER has the advantage of circulating revenue domestically while CER flowing out revenue overseas, which is a merit for interested companies to appeal their contributions to domestic investments for rural area development by purchasing J-VER. In regard to the promotion, MOEJ holds several activities regularly around the country such as guidance for the interested parties, trainings for breeding regional leaders and matching events called "Carbon Offset EXPO" for sellers and buyers (MOEJ, 2011).

It is also effective to discriminate between J-VER and other voluntary credits such as FORESTOCK. For that purpose, MOEJ relates J-VER with several public frameworks based on national laws: For first instance, companies can deduct J-VER from their own GHG emission in the reporting obligation based on the Promotion of Measures to Cope with Global Warming Law (MOEJ, 2011). For second instance, the Government recommends companies to purchase the products with carbon offsetting label in Fig. 1 based on the Promotion of Procurement of Eco-Friendly Goods and Services Law (MOEJ, 2011).

Furthermore, it is also important to reform the current partial support to J-VER supplier. For that purpose, the author proposes that the tax concession should be given to the companies who purchased J-VER in addition to the above deduction in the reporting obligation.

Though domestic carbon offsetting market is currently depressed, further development of J-VER scheme will lead to extend potential needs and demands for carbon offsetting by companies. It is certain that carbon offsetting and J-VER scheme play an important role in mitigating global warming in near future particularly after 2012 in the regime of post Kyoto Protocol.

Summary

This paper looked back over the development of the J-VER scheme and corresponding carbon offsets, and discussed current issues to be overcome for its further development. The J-VER scheme required more labor and time than many other domestic voluntary credit and action schemes, but these high requirements were almost at the same level as the international VER schemes such as VCS and CAR based on the Kyoto Mechanism and this has led to the high credibility of these schemes. Although project bodies pay relatively high fees of around one million Japanese yen in the J-VER certification process, in the case of the University of Tokyo Chiba Forest with credit unit costs of 4,424 yen t-$CO2^{-1}$ including labor and certification fees, it was still profitable if credits were sold at the latest indicative buyer price of 7,333 yen t-$CO2^{-1}$. Other voluntary credits were traded in the domestic carbon offsetting markets and competed with

J-VER to obtain market share. As a result, the government discriminated between J-VER and other credits by relating J-VER to several public frameworks using national laws. Currently J-VER trading is in a state of oversupply considering the constant increase of certified and issued volume of credits despite a decrease of sales volumes in recent months. In addition, indicative price gaps between seller and buyer are wide, so that the oversupply and price gap indicate an inevitable fall in prices in the near future. To accelerate the current depressed circumstances of J-VER trading, it is essential to increase the current share of J-VER in the carbon offsetting market by replacing CER. For this purpose, it is considered important to promote the use carbon offsets with J-VER by emphasizing that J-VER has the advantage of circulating revenue domestically while CER means revenues flow overseas. This has the merit of stimulating companies to purchase J-VER so their contributions can go to domestic investments for rural area development. It is also important to reform the current partial support only to J-VER suppliers by features such as tax concessions given to the companies who purchase J-VER.

Keywords: carbon offset, J-VER

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日本におけるJ-VER制度とカーボンオフセットの傾向と課題

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要　　旨

本論では J-VER 制度と日本国内のカーボンオフセットについて，これまでの設立過程や制度の内容を概説した。そして市場における動向や制度をとりまく状況を整理した上で，いくつかの課題を見いだし，制度の発展に向けた解決策を議論した。J-VER 制度の認証水準は，国内の他の VER 制度に比して厳しいものであるが，京都メカニズムに倣った国際的な他の VER 制度とは同水準にあり，高い信頼性の担保に寄与している。また J-VER 制度の認証費用は百万円程度と安いものではないが，2011 年 4 月に認証を取得した東京大学千葉演習林・間伐推進プロジェクトの例では，認証費用と作業に要する人件費を見込んだ場合でも，クレジットの取得費用は 4,424 円／CO2 トンとなり，最近のクレジットの買い手気配値 7,333 円／CO2 トンを下回る。また日本国内のカーボンオフセット市場では他の自主的クレジットも取引されており J-VER とのシェア争いが起きているが，環境省は J-VER を差別化するために，たとえば地球温暖化対策推進法に従い企業が温室効果ガス排出量を報告する際に調整後排出量として J-VER の活用を認めるといった対策を講じている。また昨今 J-VER は，認証・発行量の増加に反して取引量の減少が顕著で，供給過剰の状態にある。さらに J-VER の取引における売り手と買い手の気配値に大きな開きがあることから近い将来，J-VER の販売価格は下落することが予想される。停滞した J-VER の取引を今後，活性化してゆくためには，カーボンオフセット市場において大きな比率を占める CER のシェアを奪う必要がある。そのためには企業に対してカーボンオフセットを普及・啓蒙する際に，J-VER 活用による国内排出削減／森林吸収プロジェクトへの投資といった CER 活用にはない，企業 CSR 上のメリットを強調する必要がある。さらに現状で J-VER プロジェクト事業者に偏った支援制度を是正し，たとえば J-VER 購入企業に税制優遇をはかるといった措置をとることも有効と考えられる。

キーワード：カーボンオフセット・J-VER