FY2022 Infrastructure Development Research Project
for Joint Credit Acquisition

Research on International Trends on Market Mechanism Negotiations Report

March 2023

The Institute of Energy Economics, Japan

Introduction

At the 26th Conference of Parties of United Nations Framework Conventions on Climate Change (COP26) held in Glasgow, the United Kingdom, in November 2021, the Paris Rulebook, the implementing rules for Article 6 of the Paris Agreement, was adopted.

It was originally scheduled to be adopted at COP24 held in Katowice, Poland, in 2018, but was finally adopted three years later.

The Rulebook was not agreed at COP24, and the adoption was not finalized at COP25 in 2019. This made it doubtful whether an agreement could be reached, and further, the unexpected events occurred (including the postponement of COP26, which was originally scheduled to be held in 2020) due to the COVID-19 pandemic.

Despite the delay in negotiations, Democrat Joe Biden won the U.S. presidential election in 2020, and immediately after the assumption of the presidency, he took steps to rejoin the Paris Agreement and took other aggressive steps to combat global warming. In addition, there has been a growing interest in market mechanisms, as seen in the widespread use of voluntary credit by private companies.

Under these circumstances, the adoption of the implementing rules for Article 6 of the Paris Agreement at COP26 was expected to provide major impetus for the implementation of Article 6. In response to these expectations, COP27, held in Sharm el-Sheikh, Egypt, in November 2022, adopted a decision based on the technical findings on Article 6 of the Paris Agreement, and the institutional arrangements for the full implementation of Article 6 are steadily being made.

In this research, we investigated the trend of market mechanism negotiations under the Paris Agreement, various related trends (voluntary credit, etc.), and the trend of market mechanism in each country, and analyzed the issues.

We hope that this report will serve as a reference for future studies on market mechanisms under the Paris Agreement.

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Glossary

- Assigned Amount unit.

  Initial quantified quotas allocated to Annex I countries.

- AILAC

  The Independent Alliance of Latin America and the Caribbean. The UNFCCC negotiating group including Chile, Colombia, Costa Rica, Honduras, Guatemala, Panama, and Peru.

- ALBA

  Bolivarian Alliance for the Peoples of our America (ALBA). The UNFCCC negotiating group including Bolivia, Venezuela, Cuba, Nicaragua, Ecuador, and others.

- AOSIS

  Alliance of Small Island States. The UNFCCC negotiating group including St. Lucia, Maldives, Tuvalu, Fiji and others.

- BAU

  The case with no special measures taken (Business As Usual).

- CCS

  Carbon dioxide Capture and Storage. A generic term for technologies to store carbon dioxide separated and recovered from power plants, factories, and other sources in geological formations. Separation methods include chemical absorption, physical absorption, membrane separation, physical adsorption, deep cold separation, and hydrate separation. Storage methods include underground sequestration, ocean sequestration, and plasma decomposition.

- CDM

  Clean Development Mechanism. A generic term for a scheme whereby developed countries, which have numerical targets for greenhouse gas emissions under the Kyoto Protocol, implement emission reduction projects in developing countries where no numerical targets have been set, and transfer the resulting emission reduction credits to developed countries.

- CER

  Certified Emission Reduction. Credits issued through the CDM.

- CH_4

  Methane. A type of greenhouse gas that is produced from final disposal sites of organic waste, swamp bottoms, livestock manure, and anaerobic decomposition processes of sewage sludge.

- CMA (Conference of the Parties serving as the meeting of the Parties to the Paris Agreement)

  Conference of the Parties serving as the meeting of the parties to the Paris Agreement.

- CMP

  Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol. Meeting of the parties to the Kyoto Protocol. Along with the COP, it is held annually.

- Cooperative Approach

  Collaborative approach. The market mechanism as stipulated in Article 6.2 of the Paris Agreement.

- CO_2

  Carbon dioxide. A type of greenhouse gas that is generated by the combustion of carbon-containing materials such as oil, coal, and wood, as well as by the respiration of plants and animals and the decomposition of organic matter by microorganisms. On the other hand, it is fixed into various organic compounds by plant photosynthesis.
- COP

  Conference of the Parties to the United Nations Framework Convention on Climate Change. This is the conference of the parties to the United Nations Framework Convention on Climate Change, and is currently held once a year.
- EIG

  Environmental Integrity Group, a negotiating group under the UNFCCC. Switzerland, South Korea, Mexico, Luxembourg, and other countries participated.
- ERU

  Emission Reduction Unit. Credits issued through joint implementation.
- ETS

  Emission trade or Emissions Trading Scheme. It is an economic method used to reduce emissions of environmental pollutants. In order to control overall emissions, emission caps are allocated among emitters such as countries and companies, and the allowances are traded between entities that emit in excess of their allowances and those that emit below their caps. Various methods exist for allocating emission caps, including grandfathering, in which caps are allocated free of charge based on past performance, and auctioning, in which the necessary caps are procured from the government or other entities for a fee.
- EUA

  EU Allowance. Emission allowances traded under the EU ETS.
- EUETS

  European Emissions Trading Scheme. It was initiated in 2005 for the 15 EU countries in the European region with the aim of achieving the commitments of the EU Member States under the Kyoto Protocol in an economically efficient manner at the smallest possible cost. The number of countries covered has been gradually expanded and now it covers 27 EU countries.
- GHGs

  Greenhouse Gases. A general term for gases that produce a greenhouse effect by absorbing some of the infrared radiation emitted from the earth's surface. Under the Kyoto Protocol, carbon dioxide, methane, dinitrogen monoxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride are subject to control.
- HFC

  Hydrofluorocarbons. Gas covered by the Kyoto Protocol.
- IPCC

  Intergovernmental Panel on Climate Change. An intergovernmental mechanism that aims to compile

and assess the latest scientific, technological, and socioeconomic findings on the risks of artificial climate change and to provide policy makers with the information. The need for comprehensive scientific information on climate change has grown since the extreme weather events in 1970s, and the idea of establishing the IPCC was proposed at the 1987 WMO General Assembly and UNEP Executive Board meeting and approved in 1988, when the IPCC was established

- ITMOs

  Internationally Transferred Mitigation Outcomes as defined in Article 6.2 of the Paris Agreement. Unit of the mitigation outcomes to be transferred under Article 6.2.

- JI

  Joint Implementation. A generic term for a scheme under which projects for emission reductions, etc. are implemented among developed countries for which numerical targets for greenhouse gas emissions are set in the Kyoto Protocol, and the credits for the emission reductions resulting from such projects can be transferred to project participants in the investing country.

- LMDC

  Like Minded Developing Country Group. A negotiating group at the UNFCCC consisting of emerging and developing countries such as China and Saudi Arabia.

- LULUCF

  Land use, land use change and forestry. So-called absorption sources.

- MRV

  Measurement, Reporting and Verification.

- Modalities and Procedures

  Modalities and Procedures. Modalities and Procedures of the CDM and the Paris Agreement Article 6.4 mechanism.

- NF_3

  Trifluorinated nitrogen. Gas covered by the Kyoto Protocol. Added from the second commitment period.

- Non-market Approach

  Non-market approach. Efforts stipulated in Article 6.8 of the Paris Agreement.

- N_2O

  Nitrous oxide. Greenhouse gases produced by combustion, use of nitrogen fertilizers, chemical industry (production of nitric acid, etc.), and microbial decomposition of organic matter.

- PFC

  Perfluorocarbons. Gas covered by the Kyoto Protocol.

- REDD

  Reducing Emissions from deforestation and forest degradation in developing countries.

- RMU

  Removal Unit. Credits issued as net absorption from sink activities.

- SB

  Subsidiary Body of the COP and CMP. There are auxiliary bodies for scientific and technical advice

(SBSTA : Subsidiary Body for Scientific and Technological Advice), as well as for implementation (SBI: Subsidiary Body for Implementation).

- SBI

  Subsidiary Body for Implementation.

- SBSTA

  Subsidiary Body for Scientific and Technological Advice.

- SF_6

  Sulfur hexafluoride. Gas covered by the Kyoto Protocol.

- UNFCCC

  United Nations Framework Convention on Climate Change. A treaty that sets an international framework for the global warming problem.

- Kyoto Protocol

  Kyoto Protocol to the United Nations Framework Convention on Climate Change。 It sets legally binding numerical targets for greenhouse gas emissions in developed countries for each country. It establishes mechanisms (emissions trading, Clean Development Mechanism, joint implementation, etc.) to achieve the target in an internationally coordinated manner. On the other hand, no new obligations, such as numerical targets, have been introduced for developing countries.

- Kyoto Mechanism

  A generic term for greenhouse gas reduction projects (joint implementation, Clean Development Mechanism) and emissions trading to achieve the targets set in the Kyoto Protocol.

- Annex I Parties

  Countries listed in the Annex to the UNFCCC (mainly developed countries).

Chapter 1. Trend Survey of Market Mechanism in the United Nations

1. Negotiation Trends on Issues Related to Market Mechanism Under the Paris Agreement (Trends of Article 6, etc.)

(1). Background and history of negotiations

① History of negotiations up to COP26

Article 6 of the Paris Agreement provides for three measures as a market mechanism and requires that the following documents be developed to implement each measure. Table 1 summarizes the content of each measure and the documents required.

Table 1. Market Mechanisms and Assumed Documents as Stipulated in Article 6.

Provisions	Descriptions	Adoption schedule documents
Article 6.2.	**Collaborative Approach** A provision that allows each country to implement its own market mechanism initiatives under the Paris Agreement. Specifically, bottom-up and decentralized efforts by each country, such as linking Japan's JCM and Europe's EU ETS to other emissions trading schemes.	Guidance on accounting to avoid double counting
Article 6.4.	**Article 6.4 Mechanism** Market mechanisms are implemented in a centralized manner under the control of the Paris Agreement. A top-down and centralized approach similar to the Kyoto Protocol's CDM.	Rule, Modalities and Procedures (Rule, Modalities and Procedures, RMP)
Article 6.8.	**Nonmarket Approach** Assistance to developing countries by means other than market mechanisms.	Operation plan

(Source) Prepared by the Institute of Energy Economics, Japan.

At COP22 in 2016, it was agreed that all implementing rules, including Article 6, should be consulted with a view to adopting them at COP24 in 2018. Based on this agreement, consultations were held in 2017 and 2018 and had continued through various forums, including subsidiary agency meetings, UNFCC-sponsored meetings such as the COP, and informal consultations held voluntarily by each country. In addition, in response to a request to each government to submit written opinions three times, each country presented ideas on market mechanism of own country and proposed specific systems.

At COP24 in 2018, agreement was reached on the implementing rules for most of the provisions of the Paris Agreement, with the exception of Article 6. However, with regard to Article 6, each country failed to resolve the conflict of opinions and failed to adopt implementing rules, agreeing only to continue consultations until COP25 in 2019. Vigorous consultations were also held in 2019, but no agreement was reached at COP25.

At COP25, it was decided to continue discussions with a view to reaching an agreement at COP26, which was to be held in Glasgow, the United Kingdom, in 2020, but due to the COVID-19 pandemic in 2020,

COP26 was not held in 2020 and the conclusion was deferred until 2021.

There are various reasons behind this protracted debate, but political conflicts among countries (application of double count avoidance procedures to credits derived from mechanisms in Article 6.4, transition of CDM to mechanisms in Article 6.4, application of SOP and OMGE for approaches under Article 6.2) affected the debate in various ways, and technical complexities (double count avoidance procedures for various forms of NDC, specific methods of corresponding adjustment, etc.) stemming from the fundamental nature of the Paris Agreement caused the debate to drag on.

Table 2. History of Negotiations on Article 6 of the Paris Agreement

May 2016	**SB 44**	Start of discussions: Agreed to submit written opinions.	
November 2016	**COP22**	Agreed on a work plan. (Up to SB 46)	Round table held.
			Submission of written opinions.
May 2017	**SB 46**	Work plan agreed (by COP23).	Round table held.
			Submission of written opinions.
November 2017	**COP23**	Agreed on a work plan. (Up to SB 48)	Round table held.
			Submission of written opinions.
May 2018	**SB 48**	Discussion on informal documents.	
September 2018	**Additional meeting**	Discussion on informal documents.	
December 2018	**COP24**	Adoption of the implementing rules of the Paris Agreement (Market mechanism could not be adopted. Agreed only to continue talks.)	
June 2019	**SB 50**	Adoption of negotiation documents.	
December 2019	**COP25**	Agreed on the implementing rules of Article 6 of the Paris Agreement and continued consultation.	
2020	**SB52/COP26**	Postponed due to the Corona disaster.	
June 2021	**SB52**	Online meetings.	
July - October 2021		Ministerial consultations and technical discussions.	
November 2021	**COP26**	Adopted the implementing rules of Article 6 of the Paris Agreement.	

(Source) Prepared by the Institute of Energy Economics, Japan.

For the reasons above, various initiatives were undertaken by the host country and the United Kingdom to reach an agreement at COP26 in 2021. First of all, on political issues, a ministerial meeting was held to reach a compromise among politicians. The meeting was co-chaired by the environment ministers of Norway and Singapore, and a series of discussions were held to seek a compromise. Furthermore, technical discussions were held in the Subsidiary Body for Scientific and Technological Advice (SBSTA) under the United Nations Framework Conventions on Climate Change, where discussions among negotiators were held online multiple times to deepen discussions on technical issues such as specific procedures and standards. The deepening of technical discussions and discussions aimed at resolving such political conflicts led to the adoption of the implementing rules for Article 6, the Paris Rulebook, at COP26.

② Outline of the agreed Article 6 Rulebook of the Paris Agreement

The guidance on Article 6.2 (Hereafter, Article 6.2 Guidance), the rule, modalities and procedures in Article 6.4 (hereafter, RMP) and the work plan in Article 6.8 of the Paris Rulebook were adopted as decisions of the Third Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA3). At the same time, it was decided that further works about technical matters would be continued after 2022.

In the adopted decisions, a compromise was reached on issues that had previously been politically divisive, and a certain level of comprise was reached on the basic idea of technically complex discussions, although some areas still require further technical examination (see Table 3).

Table 3. Implementing rules of Article 6 of the Paris Agreement agreed at CMA3

Article 6.2	Article 6.4	Article 6.8
① For ITMOs, unit of CO_2 and unit other than CO_2 are used. ② The procedure of Article 6.2 is also applicable to CORSIA and voluntary credit. ③ Double count avoidance procedures begin with authorization of the host country. ④ Double count avoidance procedures (corresponding adjustment) are applied to all ITMOs. ✓ CO_2 is for an adjustment of emission amount (transfer is addition, and acquisition is subtraction). ✓ Non-CO_2 gas is for an adjustment of non-CO_2 index (transfer is subtraction, and acquisition is addition). ⑤ Report the contents of approaches under Article 6.2, such as transfer of ITMOs, and evaluate the contents by experts. ⑥ Development of infrastructure to record and disclose information such as the transfer of ITMOs ⑦ Voluntary contributions to adaptive funding and mandatory reporting. At the same time, work voluntarily on OMGE.	① Article 6.4 Composition of supervisory body (representative from the regional divisions of the United Nations) ② Roles and procedures of the host country (approval and permission of projects, etc.) ③ Baseline setting method approach ✓ BAT ✓ Ambitious benchmark ✓ Gradual decrease in past emission amount ④ Considering basic concept for judgement of additionality and related political measures, it is necessary to decide whether it will not be implemented without incentives of mechanism. ⑤ Methods of SOP and OMGE ✓ For SOP, 5% subtraction is applied. ✓ For OMGE, 2% cancel is applied.	① The Glasgow Committee on non-market approaches is established to implement the work plan. In 2027, consider whether new system is necessary. ② Work plan starts in 2022. Review the work plan in 2026.

(Source) Prepared by the Institute of Energy Economics, Japan based on the documents adopted at CMA3.

③ Work plan for 2022 agreed at CMA3

At the CMA3 agreement, the Paris Rulebook on Article 6 was adopted, and a work plan for 2022 onwards was also decided. In this work plan, it was required to decide various technical matters to implement Article 6 on a full scale at the COP27/CMA4 to be held in November 2022.

In 2022, technical works were conducted on the issues that were required to be addressed in the decision at CMA3.

Starting with an online workshop in May 2022, the 56th subsidiary body meeting (SB 56) was held face-to-face in Bonn, Germany, in June, and negotiators from each country exchanged views and requested the secretariat to prepare a technical paper. Based on this, it was agreed that further technical discussions would be held before COP27. Since September 2022, a series of technical papers have been published, and based on this, online workshops and hybrid workshops were held for deeper discussion of technical issues.

With regard to the mechanism in Article 6.4, some of the issues were also discussed in the supervisory body in Article 6.4, as well as consultations among negotiators of each country. Specifically, issues such as the level of fees (administrative SOP) under the mechanism in Article 6.4, methodological guidance under the mechanism in Article 6.4, and the development of guidance on removal were studied by the supervisory body in Article 6.4.

In addition to these consultations, there were other consultations related to Article 6 of the Paris Agreement under the Kyoto Protocol at SB56. This is because the transition of projects and credit that meet some conditions of the Clean Development Mechanism (CDM) under the Kyoto Protocol will be allowed to the mechanism in Article 6.4. At SB56, technical work was conducted on how to proceed with the transition in the CDM registry, and it was agreed to request the secretariat to prepare a technical paper for further discussion.

Table 4. Documents required to be adopted at CMA4 (decision at CMA3)

Article 6.2	Article 6.4	Article 6.8
a. Special circumstances of LDC and SID b. Further guidance on corresponding adjustment (single-year and multi-year adjustments, etc.) c. Positioning of Avoidance d. Form of report (initial report, AEF, annual report) e. Review guidance f. Infrastructure (registry, CARP, etc.)	a. Approval procedures in the host country b. Transition of CDM c. Use of CER by NDC d. Report submission by the host country e. Article 6.4 registry f. Process of SOP g. (The amount is discussed by 6.4SB.) h. Implementation process of OMGE i. Positioning of Avoidance	a. Implementation schedule of the work plan (work schedule and expected outcomes)

(Source) Prepared by the Institute of Energy Economics, Japan based on various materials

(2). Outline of the background of CMA4 consultations and agreement

Based on these consultations, further discussions were held at COP27/CMA4. As a result of the consultations, a certain level of agreement was reached on Article 6.2, mainly on the infrastructure (registry

for tracking ITMOs, Centralized Accounting and Reporting Platform (CARP), Article 6 database), the guidance for the review, and the format of the report (Initial report, annual information), and it was decided that initiatives would be continued for full-scale implementation from next year. Agreement was reached about the mechanism on Article 6.4 mechanism, including the CDM transition procedure, and application methods of SOP and OMGE. These agreements were adopted as CMA4 decisions.

Table 5. Decision on Article 6 at CMA4

Article 6.2	Article 6.4	Article 6.8
a. Infrastructure guidance i. Registry for tracking purposes only (registry developed by each country and international registry) ii. Central Accounting Reporting Platform (CARP) iii. Guidance of Article 6 database b. Guidance for review (review procedures and form of review report) by a team of experts on Article 6 c. Form of report (outline of initial report and biennial report, and draft form of AEF)	a. Transition procedures of CDM (project, CER) b. Utilization methods of CER for NDC c. Procedures for submitting report by the host country d. Application procedures for SOP and OMGE on pending accounts for procedures of registration in Article 6.4 (6.4 credit contributing to non-authorized mitigation is also issued.) e. Implementation procedures for SOP and OMGE	a. Implementation schedule of the work plan (work schedule and expected outcomes) b. Specific contents of the web-based platform

(Source) Prepared by the Institute of Energy and Economics, Japan based on various materials

Along with consultations in the CMA, consultations on the operation of the CDM were held at the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP). As a result of the consultations, an agreement was reached on the preparation of a technical paper on the operation of the CDM after the end of the second commitment period of the Kyoto Protocol, procedures for the transition of the CER, and management of financial resources for CDM, which was adopted as a decision of the CMP.

Thus, various decisions were taken in relation to Article 6 of the Paris Agreement and the CDM. Outline of each decision is shown below.

① Decision on Article 6.2

With regard to Article 6.2, agreement was reached on three main points as noted above: infrastructure, review and reporting format. On infrastructure, CMA adopted the guidance of the registry for tracking ITMOs, measures to support reviews and ensure transparency, guidance for CARP, and the format of the report, especially the initial report. For the annual information that each country is required to provide annually under Article 6.2 guidance, a draft form is also attached to the decision document as Annex V.

As for the registries, guidance was adopted on the tracking infrastructure and the registries, which were provided in paragraph 29 of Article 6.2 guidance, and on the international registry to be developed for countries that are unable to set up their own registries. Based on this, a registry will be developed in each country and the UNFCCC (details will be explained in 3).

As for the CARP, Article 6.2 guidance stated that the CARP would be developed as an infrastructure to support reviews and ensure transparency through the publication of information obtained by the submission of reports, and the specific implementation methods were provided as the CARP guidance at CMA4. It is stipulated that the CARP should provide a form, such as a table or outline of information to be reported by each country, act as a point of contact for the submission of reports, provide a process for the submission of reports, become a secure depository of information provided, assist each country in preparing to submit reports, and permit a review team of Article 6 to access information related to the review (including confidential information). It is then required to manage a list of the meanings of the characteristics and attributes of the individual pieces of information used when reporting in the submission of reports, as well as common nomenclatures.

The Article 6 database shall record information such as corresponding adjustment of ITMOs, balance of emissions and transfer of ITMOs, as well as record unique identifier of ITMOs, create a database based on the agreed electronic format (AEF), and organize and compile information provided in the AEF and biennial reports. It also stipulates that it should have an automatic check function to ensure consistency.

The review guidance for the Article 6technical expert review on determines the scope and information of the review, implementation time and order, implementation methods, the procedures, the respective roles of the parties involved (countries under review, the secretariat and expert team) and the composition of the expert team. The review will check the consistency of the initial report, annual information and biennial reports submitted by each country, and make recommendations on how to address inconsistencies, how to improve them in the future and the need for capacity development. In addition, the actual review will take place either in the form of a desk review by experts or gathering experts in one place.

Along with how to conduct such a specific review, a report form for the review and a training program for experts are prescribed.

As for the format for submitting the report, the format for the initial report is defined and the information and items required to be provided in the initial report are indicated. At the same time, the outline of report required to be provided under the biennial report is shown. The draft format of AEF has also been adopted, although it has not been formalized.

② Decision on Article 6.4

With regard to Article 6.4, the decision specified procedures for the transition of the CDM and the applicable rules after the transition (specific transition procedures for projects and CER, crediting period after transition, utilization methods of CER after transition for NDC, etc.). Specifically, for both the transition of projects and CER, the process begins when the project participants who hope transition make an application. The transition of the project is applied for to the UNFCCC secretariat and the designated national authority (DNA) of the Article 6.4 mechanism in the host country, and with approval from the host country, it is forwarded to the supervisory body in Article 6.4, whose approval of the transition completes the procedure. The projects after transition to the mechanism are required to follow the rules required by Article 6.4.

With regard to the CER, it was decided that the administrator of the CDM registry would coordinate with

the administrator of the Article 6.4 registry based on the application from the project participants and implement the transition procedure. When CER after transition is used for NDC, it is used in light of Article 6.2 guidance, which specifies that procedures for avoiding double counting do not apply.

Along with the rules for the transition of the CDM, the specific operating methods and functions of the Article 6.4 registry were decided. Specifically, in the Article 6.4 registry, it was decided that various accounts would be established, such as a pending account for which credit is issued, a holding account for which credit is held, retirement account for which credit is retired, an account for credits subtracted for SOP, a cancellation account for OMGE, and a cancellation account for voluntary actions. The procedure for issuing and transferring credits was established, and it was also decided that credits would be issued to the pending account and subtraction for SOP and cancelation for OMGE would be made in the pending account. At the same time, it was specified that all credits issued would be subject to corresponding adjustment.

The decision　then determined on the specific amount of SOP for administrative expense to be collected for the operation of the Article 6.4 mechanism and the specific funding method for SOP for adaptation funding. In addition, with regard to the report submission procedures of the host country, reporting methods were also decided in terms of the status of ratification of the Paris Agreement and the status of renewal of the NDC.

③ Decision on Article 6.8

In the discussion on Article 6.8, the schedule for the implementation of the work plan was adopted. According to the adopted implementation schedule, it was required that the elements related to the work plan should be clarified and the work plan should be developed in the first phase (2023 to 2024), and the work plan should be implemented in the second phase (2025 to 2026). At the same time, the Glasgow Committee was requested to assess the progress of the work at the end of the first phase.

The specific contents of the web-based platform have been decided. The platform broadened opportunities, including connecting participating countries based on information provided by countries on non-market approaches and their needs for assistance, and also allowed participating countries to voluntarily submit information on non-market approaches (details of the entities implementing the non-market approach, information on its relevance to non-market approach standards, the progress of the non-market approach, and a description of what needs assistance (funding, technology and capacity development, etc.)) to the secretariat through the UNFCCC national contact point, including clarification, development and implementation of non-market approaches, and the exchange of records and information. In addition, the platform will also feature an information hub, where people can access a variety of information, including information about assistance.

Furthermore, the CMA has decided to further continue discussions in the Glasgow Committee on “additional focus areas of the work plan”, to encourage the participation of various relevant bodies and international authorities to “improve networking and cooperation on non-market approaches” and to discuss these in spin-off groups where necessary, and to encourage government, private sector and other stakeholders to actively engage in non-market approaches as “cross-cutting issues”.

④ Decision on CDM at CMP

In its decision on the CDM, the CMP allows the CDM Executive Board (CDM EB) to continue the application of the temporary measures agreed at the 108th CDM board meeting[1]. It was then decided to request the secretariat to prepare a technical paper on the functions after the end of the second commitment period of the Kyoto Protocol. Specifically, the secretariat will study from a technical point of view what functions could be in place for the issuance of credits for emission reduction prior to 2020, the voluntary cancellation procedure, the formulation of methodologies and related documents and the approval of revisions, and the accreditation　DOEis to discuss these at CMP18 scheduled to be held in 2023. At the same time, it was decided to request the CDM EB to consider the technical feasibility of applying the temporary measures to reforestation and afforestation projects.

The decision　also made the procedure for transition of credit to the Article 6.4 mechanism. It was decided that credit eligible for transition would be re-issued in the mechanism registry in Article 6.4 after the cancellation procedure in the CDM registry. It wasthen decided　that the CDM EB, in coordination with the supervisory body in Article 6.4, would prepare the application procedure for the transition and the written notification procedure to the host country (if there is no objection from the host country, the transition procedure would proceed), and report the progress of the transition. It further urges the administrator of CDM registry to efficiently implement the transition of credit and to take the various steps required for the transition.

[1] At the 108th CDM board meeting, it was decided that the registration procedure for new projects and POA with the issuance of credits for emission reductions from 2021 and the renewal procedure of the crediting period should be tentatively positioned (provisional status) without making a final decision, although administrative procedures would be taken. Similar measures apply to application for issuance of credit for emission reduction after 2021.

2. Background of the Consultation on Infrastructure in Article 6.2 Guidance of the Paris Agreement

(1). Infrastructure under Article 6.2 guidance of the Paris Agreement

Article 6.2 guidance adopted at CMA3 provides guidance on the voluntary implementation of market mechanisms and cooperative approaches by each country.

In Article 6.2 guidance, specific procedures were decided for avoiding double counting required in the implementation of cooperative approach and in the transfer of units in the Article 6.4 mechanism, as well as it was decided that reports and reviews of the status of each country's activities should be implemented. On that basis, it was decided to set up an infrastructure to ensure transparency about the status of each country's activities regarding a cooperative approach.

Detailed provisions on infrastructure are set out in Chapter 6 "Recording and Tracking" of the Article 6 guidance, which provides for the establishment of three infrastructures: a registry (hereafter, the registry), Article 6 database, and Centralized Accounting and Reporting Platform (hereafter the CARP). The CARP is established as a framework to ensure the transparency of Article 6, under which the international registry and the Article 6 database will operate. With regard to the details of these infrastructures, it was decided in 2022 to clarify the options and prepare recommendations to the CMA accordingly in the technical work at SBSTA[2]. Therefore, it is one of the main topics of Article 6 of the Paris Agreement in 2022.

This section clarifies what provisions have been made regarding the infrastructure set out in Article 6.2 guidance, with particular attention to provisions for the registry.

As will be described later, there are various views among countries regarding the registry as defined in Article 6.2, and some view it not only as an infrastructure for projects, such as the CDM registry and JCM registry, and for the issuance of credit, transfer, and retirement, but also as an infrastructure for tracking information on transfers. Here, we describe and explain it as a registry whichever view is taken.

The RMP in Article 6.4, which was adopted at the same time as the Article 6.2 guidance, also provides for a registry for the Article 6.4 mechanism to register projects and issue credit to be implemented in the Article 6.4 mechanism (hereafter, Article 6.4 registry).

The RMP stipulates that the Article 6.4 registry relates to the infrastructure under Article 6.2, and the relationship with the Article 6.4 registry will also be analyzed here looking at the provisions of the RMP.

(2). Provision of infrastructure in Article 6.2 guidance

The Article 6.2 guidance provides for infrastructure such as registry, Article 6 database and CARP. Here, we will explain an overview of each provision.

① Outline of provisions for registry

The registry is provided in A. Tracking section (paragraphs 29 to 31) in Chapter 6 "Recording and Tracking" of the Article 6.2 guidance described in the Annex 2/CMA.3. Each paragraph specifies the following four main points.

First, in paragraph 29, the purpose of the registry and its required functions are defined. The purpose is to

[2] 2/CMA.3 para 8 to para 10

“record” and “track” the transfer and use of ITMOs, and the functions are required to be “intended to track” and therefore serve the function of keeping a record of the “first transfer,” transfer, acquisition, use, etc.

Second, paragraph 29 sets out the purpose and functions of the registry, while at the same time stipulating that countries participating in the cooperative approach can access the registry in some way or another. This does not necessarily mean that they are obliged to establish and maintain their own registries, but to make them available (access is ensured) to registries run by others.

Third, in light of these points, paragraph 30 requires the UNFCCC secretariat to maintain the international registry. For securing participation to the cooperative approach, the decision calls on the UNFCCC secretariat to develop an international registry for countries that are not able to own the registry, mainly developing countries, since not all countries can maintain the registry by themselves.

The last point has already been mentioned above, but it is the provision of paragraph 31, where the international registry maintained by the UNFCCC secretariat should be part of CARP. CARP is “for transparency related to a cooperative approach and to support the review provided in the provisions of Chapter 5” and provides that it “issues information submitted by participating countries”. In other words, the international registry is placed in the frameworks for disclosing information about the cooperative approach of Article 6.2.

However, the specific content was not decided in the Article 6.2 guidance adopted at CMA3, but it was decided that the Subsidiary Body for Scientific and Technological Advice (SBSTA) would conduct study work and based on the results, the specific content was expected to be decided at CMA4 to be held in 2022.

② Outline of provisions for Article 6 database

Article 6 database is the infrastructure set up for “recording and compiling information submitted by participating countries” regarding the implementation of Article 6. The Article 6.2 guidance requires each country to report activities under Article 6, and specific contents are provided in Chapter 4 Reporting (provisions on 2/CMA.3 Annex para 18 to 24).

The Article 6.2 guidance requires a variety of reports, including initial report, annual and periodic information, through which qualitative and quantitative information is reported by each country. The function of the Article 6 database is to record quantitative information (transfer, utilization, etc., of ITMOs, such as the “first transfer” amount of ITMOs, utilization volume of ITMOs, etc.) and qualitative information (details of the cooperative approach of each country, actions for environmental integrity, etc.) reported by these countries.

The recorded information is used in the review by the experts specified in Chapter 5 Review (provisions on 2/CMA.3 Annex para 25 to 28) in Article 6.2 guidance. As stated in the registry above, the Article 6 database is specified to be implemented as part of CARP.

As such, the main purpose and function of the database is to “record” the various types of information reported under Article 6.2, but the specific form of this was not decided at COP26, and was expected tobe decided in the subsequent technical technical work.

③ Outline of provisions of CARP

As mentioned above, the CARP is established to serve as an infrastructure that includes the registry and the Article 6 database. The Article 6.2 guidance stipulates that the CARP should "publish information submitted by participating countries" in order to ensure transparency[3]. It is required to disclose information regarding Article 6 provided by each country through the CARP, although certain restrictions are set where it is disclosed to the extent of non-breach of confidentiality. In doing so, it is specifically required to submit annual reports to the CMA on the usage status of ITMOs

④ Each role of the three infrastructures

The three infrastructures of the registry, database and CARP are specified in the Article 6.2 guidance and each has a different function. It stipulates that the registry is to "track" the transfer and use of ITMOs and that the database is to "record" contents each country reports under Article 6. Based on this, the Article 6.2 guidance stipulates that activities regarding Article 6 reported by each country should be "disclosed" to the extent that they do not violate confidentiality obligations in order to ensure transparency through the CARP.

⑤ Features and issues of the Article 6.2 registry

Under the UNFCCC, registries to implement market mechanisms has already been in place and operating under the Kyoto Protocol. However, it should be noted that the purpose (for tracking) and function (for publication of records and information) of the registry in Article 6.2 guidance and the purpose and function of the registry which countries were required to maintain under the Kyoto Protocol are different.

Registry under the Kyoto Protocol is required to be established and maintained "to ensure accurate accounting"[4]. Therefore, the registry under the Kyoto Protocol had the same "tracking" function as the registry under Article 6.2 guidance, but it is clearly stipulated that an account be opened within the registry, while, Article 6.2 guidance states that it is not necessarily mandatory to open an account, but may open it if necessary. Because the opening of an account is not always necessary for the recording or tracking of transfers of ITOMs required by Article 6.2 guidance to the registry.

On the other hand, the fact that accounts are allowed to be opened in this way makes an opportunity that allows parties choose to open accounts in the registry stipulated under the Article 6.2 guidance for the function of "accurate accounting" in addition to "tracking." However, it should also be noted that there is no clear definition of the functions of the accounts opened in the Article 6.2 registry. Depending on the function the account performs, the function of the registry may also change. On the other hand, the registry of CORSIA, actions on reducing CO_2 emissions from international civil aviation sector implemented by the International Civil Aviation Organization (ICAO), requires each country to open an account for reporting compliance with regulations, which may not necessarily have the same function as the Kyoto Protocol but may be a different one[5].

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[3] Provisions on 2/CMA.3 Annex para 35 to 36

[4] Provisions of Decision 13/CMP.1 and Decision 3/CMP.1

[5] Presentation materials for 2019 ICAO CORSIA Regional Workshops (Date: 21 March 2019 -12 April 2019) https://www.icao.int/Meetings/RS2019/Documents/Presentations/5_1%20CORSIA%20Central%20Registry.pdf

3. Technical works on the Article 6.2 registry of the Paris Agreement

(1). Decisions at CMA3 concerning the various registries on Article 6.2 of each country with regard to the registry

With regard to the registry provided for in Article 6.2, the Article 6.2 guidance of CMA3 (Decision 2/CMA.3) required the SBSTA to make "recommendations for guidance on registry, international registry, Article 6 database, central accounting and reporting platform" to the CMA, and accordingly, it was decided to adopt the guidance at CMA4 scheduled to be held in 2022[6].

In light of this, technical work was conducted under the SBSTA in 2022 to determine exactly what the registry should look like. The decision document of CMA3 called for countries to submit their submissions, and a number of submissions were submitted by countries in response. In addition, online workshops held in May 2022,the 56th Subsidiary Body meeting was held in person in Bonn, Germany, in June. Through these submissions and meetings, various views have been expressed from each country. As a result of consultations at the meeting, it was decided that the secretariat would prepare technical papers for expected technical works before COP27.

This section summarizes the views expressed by each country through submissions and meetings both online and in parson , as well as the technical points raised in a technical paper prepared by the secretariat, their respective issues, and possible solutions proposed by the secretariat.

(2). Various views of each country about the registry

① Each country's view and informal reports presented at technical workshops at SBSTA

Through discussions at online workshops in May, it became clear that there were diverse views and significant differences among countries on the basic idea about the registry as an infrastructure. The SBSTA Chair prepared an informal report (hereafter the informal report) summarizing the views expressed by each country at the online workshops in May[7].

In the informal report, the ideas about the registry presented by each country are summarized. It presents the views held by countries on the various points about the registry, and at the same time the elements and points on the premise for discussion are clarified, the various views expressed by countries are classified and presented as a model.

The informal report points to clarifying technical specifications for the registry as a elements and points on the premise for discussion.

Specifically, it includes the form of the registry (standardized electronic database, Excel), identifiers, types of accounts, authorization under Article 6.3, no need for the registry to record in real time changes in issuance and the status of ITMOs, procedures for completing transfers and transactions (common minimum standards of information exchange between registries for direct links between registries, or identifiers and appropriate

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[6] Decision 2/CMA.3 para 10

[7] "Article 6.2 technical workshop Options for implementing the infrastructure requirements as per Chapter IV (Reporting and tracking) of the annex to decision 2/CMA.3 Virtual event held on 18 and 19 May 2022 Informal report by the Chair of the Subsidiary Body for Scientific and Technical Advice"
https://unfccc.int/sites/default/files/resource/Informal_Report_Art.6.2%20workshop_Infrastructure.pdf

verification procedures for transactions by cancellation of registries to be transferred and issuance in registries to be acquired), publicly accessible information and security. It is also pointed out that it is not necessary to clarify all these points, but necessary to clarify them according to their necessity and relevance.

Furthermore, although the Article 6 database of the Article 6.2 guidance stipulates that identifiers wouldbe provided for ITMOs, the informal report points out that identifiers also play an important role in tracking ITMOs. On that basis, it is pointed out that there are two ways of thinking about identifiers of ITMOs. The first is that ITMOs is considered an aggregated amount reported for tracking NDC achievement, and the second is that ITMOs is considered units issued and blocks transferred.

The Article 6.2 guidance also does not provide a clear definition of ITMOs and states that there may be various units, but it has become clear that countries have diverse views on how to set identifiers required for tracking.

On the basis that elements and points that form the premise for discussing the registry are pointed out in this way, the informal report categorizes the various ideas presented by countries regarding the register into three main models.

② Three models for the registry

There are three main registries: registry which issues and tracks ITMOs designated by the country as units (model 1), registry which tracks the quantity (total) of ITMOs designated by the country (model 2), and centralized registry which consists of an international registry integrated with the Article 6.4 registry, which issues and tracks ITMOs as units (model 3).

In these models, tracking is commonly shown as the main function, but the three models differ in terms of what additional functions are provided, and whether the management and operation are decentralized or centralized.

While Article 6.2 guidance requires the registry to track the transfer of ITMOs, it does not deny the establishment of other functions, leaving it to each country's discretion. Therefore, for registries maintained by each country, it is possible to add functions other than tracking at the discretion of each country. On the other hand, since the international registry is managed and operated by the UNFCCC secretariat, its functions needed to be based on the decisions of the CMA, and countries needed to agree on what specific methods of tracking should be and what functions other than tracking should be added.

Table 6. Views on the registry expressed by countries (three models)

Type and model	Contents
Registry that issues and tracks ITMOs designated by the country as units (model 1)	• While this model consists of a few components and simple transfer management, it requires provisions for ownership and security measures, as well as handling of systemic risks and legislative competence. Not all countries have the necessary capacity. • The country acquiring the units has full regulatory authority over those units. • The registry designated by each country can be connected, but it is necessary to clarify the possibility of a connection between the international registry and the mechanism registry, as well as a fully integrated electronic database.
Registry that tracks the quantity (total) of ITMOs designated by the country (model 2)	• In this model, the registry does not issue ITMOs and ITMOs are not held. It tracks the (total) quantity of ITMOs (it indicates assets and units tracked by ton in a separate program or mechanism registry (Article 6.4 registry, registry of EU-ETS)). • It is necessary to agree on a procedure for verification among the registries. This is to ensure that no single unit exists more than one registry, and could be secured through verification of the Article 6 database. • Each country is not responsible for the management of individual assets and units but are responsible for reporting them. • It involves the risk of double counting and duplication. This is because the information is tracked in two registries. Therefore, provisions will be required to ensure that such duplication will not be considered double counting. • It is necessary to indicate as a label whether ITMOs are at the national level or from the underlying registry.
Centralized registry which consists of an international registry integrated with the Article 6.4 registry, which issues and tracks ITMOs as units (model 3)	All countries use the international registry. The mechanism registry is included in the international registry. Integrating the two into CARP and the Article 6 database would make a fully integrated system and reduce costs.

(Source) Prepared by the Institute of Energy Economics, Japan based on informal reports

③ Differences in three models

As mentioned above, there are various models of registries, and although there is a common understanding that tracking is a major function, different countries have different views on specific methods for tracking, other additional functions, and how to establish and operate registries. These different views are summarized in the table below.

Table 7. Differences in three models

Methods for tracking and recording ITMOs:	Views to track and record ITMOs as units (model 1 and model 3) and as quantities (model 2)
Issuance of ITMOs:	Whether to issue ITMOs as units (model 1 and model 3) or not (model 2).
Establishment of the registry and its operating body:	Decentralized as designated by each country (models 1 and model 2) or centralized under the UNFCCC (model 3)
Handling of transaction of units in the market:	While it is possible to provide a platform for the transaction in all model units (or quantity), it is not always necessary to provide the platform in model 2, and only tracking is required to the registry. In the case of model 2, a separate registry is required to manage the transactions of credits or units on which the ITMOs are based. And information from this registry (registries such as VCS, GS, etc.) needs to be reflected in the registry[8].
Connection between registries:	For model 1, connections between registries are possible, but it is not necessary to involve to transferring units between connected registries in case of model 2. Therefore, reconciliation is required between the registry transferred and registry acquired with the transfer of ITMOs.

(Source) Prepared by the Institute of Energy Economics, Japan based on informal reports, etc.

As previously mentioned, while there is a common understanding that tracking is a required function of the registry, there are many areas where countries differ in their views.

In particular, there are two major different views: one that requires only the tracking of the transfer of ITMOs as a fundamental function of the registry, and the other that requires the registry to manage not only the tracking of the transfer of ITMOs but also the issuance, transaction of ITMOs and use for NDC, etc.

In the former case, the data exchange between registries can be for tracking the transfer of ITMOs, but in the latter case, since ITMOs are traded and transferred between registries as assets, there is a need for an accurate exchange of not only data for tracking the transfer but also information relating to the transaction, requiring more complex functions.

These differences also make a difference in the technology, budget and personnel required for the registry. Therefore, the informal report points out the need for capacity development, as well as options on how to procure operating funds.

④ Concerning the international registry

The informal report also summarizes views of each country on the international registry. As provided in

[8] Singapore's presentation at an online technology workshop held by the UNFCCC secretariat on May 18, 2022. https://unfccc.int/sites/default/files/resource/03_Singapore_UNFCCC%20Article%206.2%20technical%20workshop%20on%20registries.pdf

Article 6.2 guidance, there is a common understanding among countries that the tracking of ITMOs required in the registry will also be a major function in the international registry.

However, as noted above, each country has different perception about the other functions in the same way as the registry. In other words, there are two views: one that requires only tracking, and the other that requires to manage the issuance, transaction and use of ITMOs along with tracking.

It is also noted that the international registry could have the function to indicate best practice for registries of each country and also track contributions to OMGE and adaptation funds.

Regarding the connection with the Article 6.4 registry, while acknowledging the need for such a connection, there are differing views on the specific method of connection. There are two main views: the view that credits can be transferred from the Article 6.4 registry to the international registry, and the view that transfers of credit in Article 6.4 are recorded in the international registry as accounting information.

Various views were also expressed on the management and governance of the international registry, including how the CMA should conduct governance, how it should be managed simply as a ledger for accounting, and how each country should designate a manager under the support of the secretariat. At the same time, sources of funding were suggested, such as a method of collecting fees, a method of a certain amount of donations by all international transfers, a method of utilizing a portion of the CDM fund, a method of contribution from developed countries, and a method of providing supplementary funding through the CMA decision.

Two ideas were then presented as a function of the international registry: either to establish only accounts for each country or to allow accounts for private companies under supervision of each country along with accounts for each country.

⑤ Discussion at the 56th subsidiary body meeting and preparation of technical paper

Following the technology workshop, discussions on the registry continued at the 56th subsidiary body meeting (hereafter SB 56) held in person in Bonn, Germany, from June 6, 2022 to 16. The views expressed by each country were compiled as an informal note as a cooperative facilitator[9]. The contents of the informal note reflect the various views expressed by each country as it stands, although not all countries agreed on them.

In the informal note, two sections of the registry, the registry and the international registry, are set, which organize the views expressed by each country. Specifically, the differences in thinking pointed out at the technical workshop have been pointed out once again, and the registry indicates the elements required for the guidance on the registry to be adopted at CMA4 (identification of basic functions (accounts, units, vintages, etc.), clarification of specific methods of operation, specific methods of cooperation with the international registry, methods of considering existing registries (created by each country or by private sectors), etc.) and the need to grant serial numbers to ITMOs (including information on authorization).

It is then pointed out that the registry may have the function of holding credits as assets, but may only have the function of tracking and recording them, or may have both. At the same time, various views have been

[9] https://unfccc.int/event/sbsta-56?item=12

reported on information sharing and connections with other infrastructures (such as CARP and the international registry), and views that connections between registries are possible but not necessarily mandatory.

While each country shared the view that the international registry should have the same function as the registry, there were reports that there was a need to clarify the specific method of connecting the international registry with the registry under the Article 6.4 mechanism and that it had not been clarified whether private entities would be allowed to open accounts.

In light of these differences, each country agreed to conduct further technical work, and the concluding document of SB56 set forth specific procedures of work thereafter. Specifically, it was decided that the secretariat would prepare technical paper on individual points at issue, and that based on the paper, workshops would be held to deepen discussions.

With regard to technical paper, in relation to Article 6.2, it was decided to be prepared on points at issue such as how to conduct review procedures, tables and outlines of reports, infrastructure of the registry, and the relevance of the Article 6.4 registry. For Article 6.4, technical paper was decided to be prepared, including procedures for CDM transition, submission of reports required by Article 6.4, Article 6.4 registry, how to apply SOP, and how to apply OMGE.

(3). Technical issues related to registry

Based on the agreement among the countries in SB56, the secretariat prepared technical paper, which were published sequentially from September. The registry is shown in the technical paper on infrastructure in Article 6.2 (hereafter, the technical paper) issued on September 13. In the technical paper, further specialized and technical detailed studies of the technical issues were discussed based on the discussions up to June, and solutions based on the results were presented.

The technical paper presents a variety of methods for tracking, defined in the registry as a primary function, and their respective strengths and weaknesses. At the same time, the importance of ensuring consistency in the registry has been pointed out, and various methods for ensuring consistency have been considered. In addition, based on the model of the three registries presented in the informal report, the specific functions required of the registries and the expected operating methods and procedures are examined.

Furthermore, the technical paper indicates what methods there are as interoperability between registries, concerning connections between registries, or connections and linkage between registries and international registry, about which each country expressed various views. In light of the discussions presented in the informal report, we introduce what studies were conducted in the technical paper, concerning specific methods of tracking, issues of ensuring consistency, interoperability and the international registry, which have been further analyzed.

① Specific methods of tracking

As indicated in the informal report prepared after the technical workshop in May, countries presented two views on ITMOs: tracking and recording them as a unit and tracking and recording them as a quantity, but the technical paper analyzes the method of tracking in more detail. As a result, four methods are presented:

units with serial number, uniquely identifiable accounting amount (UIAA), balance-only accounting amount (BOAA), and balance high-tier account (BHTA)[10].

Table 8. Specific methods of tracking indicated by the technical paper

Defined specific methods	Contents
Unit with serial number	Unit calculated as the minimum independent mitigation outcomes recorded in the database. Unit is numbered serially.
Uniquely identifiable accounting amount (UIAA)	Record of mitigation outcomes in the database as quantity (block). UIAA has a unique identifier and the entire UIAA transfers between countries participating in a cooperative approach. It is necessary to set up a separate procedure for the partial transfer of the UIAA.
Balance-only accounting amount (BOAA)	Mitigation outcomes are recorded in the database as quantity, but it does not have a unique identifier. It transfers between countries participating in a cooperative approach. It does not have a unique identifier, so there is a problem to ensure consistency.
Balance high-tier account (BHTA)	The records held on the database account are integrated and indicated specifically. The status of the unit, UIAA or BOAA are indicated in another account in the same registry or in another form in another registry (such as the total quantity).

(Source) Prepared by the Institute of Energy Economics, Japan based on the technical paper

The technical paper provides specific methods of tracking with each method, points out issues, and suggests possible solutions to those issues. As the solutions indicated in the technical paper, it is pointed out that the methods other than BOAA are consistency risk of an acceptable level and it is strongly recommended that BOAA would be applied to simple domestic tracking. At the same time, countries participating in one cooperative approach are urged to adopt the same tracking method, and the need for uniform criteria and terminology on the attributes of ITMOs has been pointed out. And regarding terminology, the need for centralized decisions has been pointed out.

② The importance of ensuring consistency and issues

The technical paper stresses that ensuring consistency of data on transfers is necessary to gain credibility in activities under Article 6, in parallel with multiple and diverse cooperation in a single country. Specifically, it is required to ensure consistency of data at all times and correct inconsistency if it occurs. It analyzes what possible responses can be made to ensure data consistency in the possible diverse cooperation under Article 6[11].

The first is how to manage data under one centralized database. In this case, the cooperation of all countries would be recorded in one centralized registry, thus ensuring the consistency of the data of the

[10] See para 375 to para 399 of the technical paper for a detailed explanation.

[11] The technical paper explains that the basic design of the database should be based on the CAP theorem. The CAP theorem states that only two of consistency, availability, and partition tolerance can be satisfied in a distributed system. See para 365 in p.54 of the technical paper.

cooperation of all countries. The technical paper also points out the utilization of transaction logs in centralized registries. The transaction log confirms consistency in data exchange and disallows exchange if there is inconsistency.

On the other hand, there are restrictions on the introduction of such a centralized database, and the data may be exchanged among several distributed databases. The technical paper points out that regarding the exchange of data involving the transfer of ITMOs between multiple databases in the context of such distributed databases, it would be necessary to temporarily refuse the exchange to ensure consistency. In addition to the temporary refusal of data exchange, the paper suggests that a "shadow registry" or "metadata registry" could be set up separately from the registry where the units or credits are actually issued and transferred, and data exchange could take place here.

Furthermore, the technical paper analyzed the method to ensure consistency by using blockchain technology to track data transfers. It states that when blockchain is used, it is difficult to allow participating the network unconditionally and there is a need to allow participation under certain conditions, and pointed out that it is not possible to respond all emphatic approaches on Article 6.2 under one common blockchain. While acknowledging the potential for future technological advances, it is clear that there are many issues in using blockchain technology to ensure consistency.

Based on this analysis of a series of methods, the technical paper indicates the adoption of a tracking infrastructure to ensure maximum consistency to the extent possible in a cooperative approach as a possible solution, as well as the works of the secretariat to consider blockchain technology based on its technical strengths and weaknesses.

③ Interoperability

The technical paper positions interoperability as a capability of information exchange in the registry system to progress the analysis[12]. Although the connection between Article 6.4 registry and Article 6.2 international registry has been determined in the RMP, Article 6.2 guidance does not require the information exchange between registries. However, the technical paper states that interoperability between registries is commonly conducted, and that actually it was conducted under the Kyoto Protocol.

Therefore, interoperability between registries depends on the decision of each country, and while a new CMA decision is necessary for it. If developing countries do not have their own registries and use the international registry, it is also reasonable to provide assistance to the cooperative approach in interoperability with the registry of the other country. The paper then analyzes three issues related to interoperability.

The first issue is a problem of processing time for information exchange, and there are two approaches: real time interoperability and non-real time interoperability.

And two elements are needed to encourage the information exchange. One is communication standards (such as standards for data to be exchanged) and the other is institutional arrangements (such as procedures for data exchange).

Specific clarifications required in the communication standards include the manner of data to be exchanged

[12] See the technical paper p88 - p91 for details.

and how it will be exchanged, the criteria of data which can be allowed to be exchanged, the clarification of various types of processes and exchanges, the security of communication between registries, how to synchronize participation and how to respond to multiple languages.

On the other hand, institutional arrangements require elements such as clarification of contacts, corrective procedures of communication standards, procedures for dealing with security, how to test interoperability between registries, how to collate recorded data between registries, and how to correct records of transfers.

Next is the need to prevent double use. Article 6 of the Paris Agreement requires to avoid double counting when using market mechanism, and it is therefore necessary to prevent ITMOs from being used to achieve multiple objectives. However, when interoperating between distributed databases, issues including software errors and malicious attacks such as harming the security of the registry will be raised.

There are two possible measures to real-time interoperability: the use of reliable online system or the use of blockchain technology. Both are equally capable of confirming and tracking transfers, but vary widely in technology maturity, security, and cost. However, in the case of non-real-time interoperability, at present, no concrete measures have been found to prevent double use, which is a future issue.

Last issue includes electronic authentication and electronic signatures. In a registry system, electronic authentication and electronic signatures are likely to be required because of the wide range of applications, diverse technologies, and wide variety of places used. Therefore, the technical paper lists specific uses such as establishing a secure tunnel for data exchange, ensuring the security on the Internet, ensuring the security of mail and message exchanges between registries, ensuring non-repudiation, and signing important documents. At the same time, the technical paper points out that there is already experience with such electronic authentication and electronic signatures under the Kyoto Protocol.

In light of these analyses, the technical paper points out that, as a possible solution, if the international registry and the Article 6.4 registry are connected with other tracking systems, the secretariat can also clarify interoperability, in consultation with persons in charge of registry of cooperative approach in each country, and countries may use the electronic authentication currently used under the secretariat.

④ International registry

The technical paper points out the need to consider additional issues for the international registry in addition to the issues considered in the registry, based on the different views of countries expressed in the informal report[13].

The first point raised is the need to address the diverse needs of each country. Since multiple countries will implement multiple cooperative approaches, multiple ITMOs should be identified and tracked, and there may be multiple units for each cooperative approach, so the international registry needs to respond to the needs of these diverse countries.

At the same time, it is also required to ensure consistency in the international registry as each country implements diverse cooperative approaches. The technical paper points out that a centralized method allows for simpler responses, while a decentralized method is more technically complex and expensive. At the same

[13] See p75 to p79 of the technical paper for a detailed explanation.

time, however, the technical paper points out that it is necessary to keep in mind that some countries do not prefer a centralized method and that there is also a need to accommodate the demands of such countries.

The technical paper points out that there is a need for communication between the international registry and the registry, and between the international registry and the Article 6.4 registry. Therefore, Data Exchange Standard (DES) is required, while the technical paper also analyzes that existing DES under the Kyoto Protocol cannot be utilized under the Paris Agreement because it covers only serially numbered units, has limited users, and the communication protocol used by DES under the Kyoto Protocol is outdated. In light of this, the technical paper points out the need to develop a protocol for data exchange with the participation of many stakeholders while maintaining limited functions under the idea of Graceful Degradation[14].

After analyzing such technical issues related to the international registry, the technical paper further analyzes specific development and operational issues such as management of the international registry, operating procedures, agreements at the operating level, models of funding sources, and development approaches.

Analysis of the technical paper suggests that the international registry will need three types of administrators: those for the entire registries, those for countries using the international registry, and those for each cooperative approach.

It then points out the need to clarify the type of account, the process of maintenance, the flow of transfers, the representation of the account and its approval process, the role of the administrator, operational agreements, how to respond to communications with other registries, the management of records, confidentiality and actual submission methods of reports, fees and procedures for changes.

Furthermore, it points out that there is a need for concluding the Operational Level Agreement (OLA) of the international registry between the administrator of the international registry as a whole and administrators of each country, which sets out the division of roles, the work contents, the reliability and expected response time, and the services to be provided in relation to the operation of the international registry.

As for funding sources, the need for a stable and reliable funding model has been pointed out in order to guarantee the level of services required by the international registry. It is pointed out that this requires an initial investment, especially in software development.

As for the development approach, the technical paper presents three approaches: one by the secretariat, one under the cooperation of each country, and one with open source. However, it is pointed out that the more stakeholders involved, the more the complexity increases and ensuring the security is required.

In light of these, possible solutions indicated include addressing all tracking methods, taking steps to ensure consistency, clarifying the functions, management approaches and funding sources of the international registry, and requiring the secretariat to develop operating procedures.

(4). Outline of guidance on the Article 6.2 registry in CMA4

In the decision document of CMA4, guidance was adopted with respect to the infrastructure, the registry,

[14] See para 503 to 506 of the technical paper for a detailed explanation.

CARP in Article 6.2 and the Article 6 database, respectively. The adopted guidance set out the basic functions, forms, etc. required for individual infrastructure. At the same time, specific work for 2023 were determined for the full-scale operation of each infrastructure.

The registry has been adopted as the guidance on registry in Paragraph 29 of Annex 2/CMA.3 (hereafter, guidance on the registry), which provides two main contents: the guidance on registry provided in Paragraph 29 of Annex 2/CMA.3 (registry that each country holds or has access to) and the guidance on the international registry provided in Paragraph 30 (registry for countries that do not hold or have access to).

For the registry, guidance is provided on "form, function and process" and "interoperability," and for the international registry, guidance is provided on "accounts and activities," "processes" and "interoperability."

Table 9. Outline of guidance on the registry

Item	Contents
(1) Form, function, and process	**(i) Basic functions:** Set up an account if necessary to record activities related to ITMOs (authorization, first transfer, transfer, acquisition, use towards NDCs, authorization for use towards other international mitigation purposes, voluntary cancellation, etc.). **(ii) Tracking methods:** Ensure a uniform recording and tracking method during the NDC, and for ITMOs, individually identify the mitigation outcomes on which they are based to make them traceable. **(iii) Contents of identifiers:** the identifier of the cooperative approach, the identifier of the registry of originating countries (ITMOs), the identifier of the "first transfer" country, the serial number (indicating the year of occurrence of the mitigation outcomes on which the ITMOs are based) is indicated by identifier.
(2) Interoperability	**(i) Mitigation of the risk of data consistency:** Implement appropriate standards and procedures to mitigate uncertainty of data consistency when interoperating among registries of each country. **(ii) Response to information security:** Transfers between registries cannot be refused ex post facto.

(Source) Prepared by the Institute of Energy Economics, Japan, based on the CMA4 decision document

Table 10. Outline of guidance on the international registry

Item	Contents
The role and function of the international registry	**(i) Basic functions:** Similar to the registry (functions of (1) and (2) indicated in the Table Outline of guidance on the registry). **(ii) Structure of the international registry:** The international registry consists of a specific section of the country of use and a section of the administrator of the international registry. **(iii) Ensuring data consistency:** Each section operates separately, but data consistency is ensured.
(1) Accounts and activities	**(i) Measures for tracking (e.g. electronic databases):** The international registry consists of electronic databases and other technical and administrative measures for recording and tracking ITMOs. **(ii) Account for tracking:** An account that allows information about activities related to ITMOs to be recorded and tracked.
(2) Process	**(i) Role of the administrator:** The secretariat assumes the role of the administrator of the international registry, dealing with the software of the international registry, revision of administrative procedures, tasks such as agreeing implementation levels and ensuring uniformity of terminology with CARP, revision of ITMOs calculations and corrective procedures to ensure consistency, and standards and procedures for interoperability between registries. **(ii) Responsibility of each country:** Countries using the international registry are responsible for tracking mitigation activities and mitigation outcomes on which the ITMOs are based and for avoiding double counting. **(iii) Least developed countries and small island states:** The secretariat provides assistance for the use of the international registry. **(iv) Recording methods and information disclosure:** Make automatic entries possible for recording in the international registry, and prepare and publish reports on the holdings of ITMOs and related activities recorded in the registries of the countries of use. Publish non-confidential information through CAPR.
(3) Interoperability	**(i) Connection with the Article 6.4 registry:** The international registry and the Article 6.4 registry shall be connected in accordance with paragraph 69 of Annex 3/CMA.3. This connection is intended to enable, at a minimum, the functions required for interoperability provided in the guidance on the registry (functions in (2) of Table Outline of guidance on the registry). **(ii) Connection with registries of each country:** Registries of each country and the international registry can be connected. The connection method between registries of each country and the international registry must also apply to all measures for interoperability between registries of each country (function in (2) of Outline of guidance on the registry).

(Source) Prepared by the Institute of Energy Economics, Japan, based on the CMA4 decision document

Chapter 2. Other Trends that Affect International Market Mechanisms

1. Trends in Voluntary Credit (Corporate trend)

(1). Trends in voluntary credit concerning carbon removal technology

① Trading contract for voluntary credit using carbon removal technology is signed

CarbonCure, a Canadian venture company with carbon removal technology, announced that the company had signed credit transaction agreements with Invert and Ripple in April 2022. Contract amount is $30 million USD, which is the largest credit transaction agreement based on carbon removal technology to date according to CarbonCure. CarbonCure's technology, which sequesters and fixes CO_2 into concrete, is the only carbon mineralization methodology approved by VCS.

Invert, the concerned party of the contract, develops business of supporting companies responding to global warming and Ripple expands business related to crypto assets, which suggests a wide range of companies are showing a keen interest in voluntary credits for carbon removal technology.

② Advance Market Commitment (AMC), a new initiative to promote carbon removal technology

A new initiative has been made to promote carbon removal technology. It's called the Advance Market Commitment (AMC). AMC was an initiative to promote the pneumococcal vaccine in developing countries by clearly indicating that a certain quantity of the vaccine would be purchased at a certain price, and by guaranteeing future demand. The initiative promoted the development of the vaccine by pharmaceutical companies and encourages the spread of the vaccine in developing countries.

Efforts are being made to apply AMC to carbon removal technology to promote its use. The initiative comes under the umbrella of Frontier, a group founded by Google, Meta (former Facebook), etc. with an intention of promoting carbon removal technology.

Frontier applies the AMC concept, raise money, and use the fund to promote an initiative to provide the fund for the amount of carbon per ton that is removed by the carbon removal technology. On April 12, 2022, major e-commerce company shopify announced a new fund contributing to Frontier. As for the amount of carbon removal by Frontier, there are several points that are not clear such as whether or not credits will be issued in the first place, what kind of credits will be issued, and what methodology will be used, etc. It's also not clear at this point what technologies will be used.

However, shopify points out the importance of the initiative through AMC in the press release, which is, the company can contribute to the innovation and the spread of technology by identifying the presence of demand at a certain scale through the fund to Frontier.

Carbon removal technology requires high cost, which has been a barrier to widespread adoption, but how AMC will work as a means to overcome the high costs could receive more attention in the future. In addition, while voluntary credits have been used in the past to encourage the implementation of cost-effective emission reduction measures, this could significantly change how voluntary credits are used.

③ Aircraft makers and airline companies such as Airbus and Air France sign contracts to buy DACCS-derived credits.

On July 18, 2022, seven aircraft makers and airline companies such as Airbus, Air France, Lufthansa and Air Canada announced the joint purchase of DACCS-derived credits. DACCS, which stands for Direct Air Carbon Capture and Storage, is an initiative to directly capture and store CO_2 in the atmosphere, and is gaining attention as an initiative to remove CO_2. They plan to purchase a credit of 1POINTFIVE, which is a subsidiary company of Occidental, a major U.S. oil company. The purchase period is 4 years from 2025 to 2028, and the quantity purchased is 400,000 tCO_2e. It is planned to remove and store CO_2 from the atmosphere at the DACCS plant in Permian Basin in Texas which will start to be constructed in late 2022.

However, there is no description about a standard that issue credits. Therefore, it is not certain what type of credit will be obtained. However, both the Airbus and 1POINTFIVE websites state that removal credits will be traded, and it is likely that credits issued by a standard will be delivered.

There have been other moves related to DACCS. Climatework, the Swiss company that built the DACCS plant in Iceland and has been operating since 2021, announced a 10 year off-take agreement with Microsoft. Although it is not explicitly stated as a credit transaction, it is expected that Microsoft will provide Climatework with long-term financing, which will help Climatework expand its business. At the same time, Climatework is raising funds to build a large DACCS plant, and it is likely that DACCS CO_2 removal will be carried out on a larger scale under Climatework. It is not certain at the moment whether the credit will be issued.

④ Issuance of credit certificates from carbon removal projects

Although projects related to CO_2 removal, such as REDD+, have been implemented in the past, the credits issued have not been specifically identified as projects related to CO_2 removal. Among them, in April of this year, the American Carbon Register (ACR), one of standards on voluntary credit in the United States announced that it would make it clear in issuing credits that they were derived from projects that had undergone CO_2 removal. Based on this announcement, on May 5, Blue Source Corporation of the United States announced that it had obtained credits for CO_2 removal labels that clearly indicated that the project originated from CO_2 removal by utilizing this new method of credit presentation. Among the credits derived from forest conservation projects in the United States, 106,300 tCO_2e out of the total 677,000 tCO_2e credit issued were labeled for CO_2 removal. Credits with this CO_2 removal label have also been well received in the market, reportedly trading at $24 USD per ton, higher than the trading price of credits derived from normal forest conservation projects.

Climeworks, a Swiss venture specializing in direct atmospheric CO_2 capture and storage (DACCS), has issued a certificate for CO_2 removed from the atmosphere by its Orca project in Iceland since September 2021.

Unlike normal offset credits, they were issued as certificates based on a methodology developed by Climeworks in collaboration with a consultant, with monitoring and confirmation by DNV as a third party. Certificates issued for a total removal of just over 6,700 tCO_2e were provided to investors Microsoft, Shopify

and Stripe.

Climeworks' Orca project is the world's first full-scale DACCS project which uses adjacent geothermal power to run the facility and does not emit CO_2 in capturing and storing CO_2. The Orca project has an annual recovery and storage capacity of 4,000 tCO_2e, but last year Climeworks announced plans to build Plant 3 in Iceland (36,000 tCO_2e/year) and Plant 4 in Louisiana (1 million tCO_2e/year). Many have pointed out that CO_2 removal technology is essential to achieve carbon neutrality and how much achievement such DACCS project will gain in the future will catch an attention.

(2). New initiatives to reduce emissions and increase sequestration

① Spread of activities related to regenerative agriculture

In May, it was marked by the participation of companies in an initiative called "regenerative agriculture" to promote CO_2 sequestration through agriculture. For example, Cargill, a major grain manufacturer in the United States, has implemented non-till farming and CO_2 sequestration on soil through cover crop cultivation in fallow and started a system to pay a certain amount equivalent to CO_2 sequestration in 2021. Cargill also announced that the company will carry out this initiative in 15 states including Illinois. They are looking for farmers to participate. This year, they plan to increase the payment per ton from $20 USD last year to $25 USD. Regrow is supposed to measure the sequestration in applicable farmland.

It is not clear whether it will issue credits, but it is possible that it has. With the financing of the credit in mind or not specified, European housewares manufacturer Unilever, together with insurance companies, Axa and asset management firm Tikehau Capital, announced that they have launched a fund to support projects and companies working on the transition to regenerative agriculture, with each contributing 10 billion euros.

In addition, a US startup company, Perennia, which is developing a low-cost method for measuring soil CO_2 sequestration by regenerative agriculture, has received $18 million USD in funding from Microsoft's Climate Innovation Fund and other investors, suggesting a growing interest in regenerative agriculture from companies and investors.

This may be because many companies and investors believe that activities to sequester CO_2 in soil will become even more important in the future, as CO_2 sequestration is expected to play an important role in achieving the net-zero target in the future. As credit may be used in some cases, there may have some impact on the credit trading market in the future.

② Blue carbon credits is traded at $27.8 USD per ton at auction.

An auction of blue carbon credits, which derive from a mangrove conservation project in Pakistan, was held at CIX, a Singapore-based voluntary credit trading market, and it was announced that 250,000 tons of 2021 vintage credits were traded at $27.8 USD per ton. According to the CIX press release, it is the largest blue carbon project in the world, and it was also announced that the auction showed a price of up to $35 USD, compared to the lowest price of $27.5 USD per ton. It could also be said that companies have a lot of interest in blue carbon credit.

In addition to these overseas movements, this month, blue carbon initiatives in Japan and abroad have been

expanding, which includes the announcement of a blue carbon initiative to increase the amount of algae sequestration by utilizing steel slag in Japan.

③ Successive announcements of blue carbon credit initiatives in Japan

This month, a series of initiatives related to blue carbon credits in Japan were announced. In connection with the initiative to issue credits for the amount of CO_2 sequestered and removed through the creation of seaweed called J Blue Credit, it was announced that 3,105 tCO_2e credits have been issued through the creation and conservation of seaweed beds in Hirono-cho, Iwate Prefecture. Although J blue credit has been active since 2020, it is the largest amount of credits issued so far.

As other initiatives related to J Blue Credit, initiatives at Kansai Airport is also announced. Likewise the case of Hirono-cho, the initiative at Kansai Airport aims to sequester and remove CO_2 by creating seagrass beds.

For J blue credit, it is not known whether they can be used to adjust emissions in emissions factor on reporting under the Act on Promotion of Global Warming Countermeasures, and not necessarily in large amounts. However, according to the Japan Blue Economy Association website, which manages J Blue Carbon Credit, the number of applications for issuing credits has increased significantly from 4 in 2021 to 22 in 2022. Although still fewer in number and smaller in size compared to J-Credit, the figures suggest a growing interest from companies.

(3). World Bank report "State and Trends of Carbon Pricing" reports rapid growth of voluntary credit trading market

The World Bank, which annually publishes the results of its State and Trends of Carbon Pricing report, released its latest report for 2022 on May 24. According to the report, prices on the emissions trading market reported record growth in the second half of 2021 as more countries around the world adopted carbon pricing.

Issuance of credits increased significantly by 48% in 2021 compared with last year to 478 million tons. In terms of standards, non governmental standards such as VCS and Gold Standard accounted for 74% of the total, at 352 million tons, which increased by 88% compared with last year. Only 15% of all credits were issued by national and local government-run credit schemes such as the Australian credit scheme and the offset mechanism implemented by the State of California, and 11% were issued by schemes run by international organizations such as the CDM.

As more companies set decarbonation goals, the voluntary credit market was worth $1.4 billion at the time of publication. In 2021, the average price was $3.82 per ton, which increased from $2.49 of the previous year, and the volume of trade increased by 92% to over 362 million tons, which leads to a significant increase in both price and volume and also it leads to an increase in market size.

(4). Trends in reliability of voluntary credit

① Voluntary credit rating agency BeZero evaluates two REDD + projects as reliable

On September 21, 2022, Verra, the operator of VCS, the voluntary credit standard, announced that two projects registered with VCS had reportedly received AAA- ratings by BeZero.

BeZero evaluates projects from a variety of perspectives such as the additionality of projects that issue voluntary credits and the risk of over-crediting, and provides a rating on the likelihood that the credits are actually issued based on the emissions reductions.

The projects that are most likely to reduce emissions are rated AAA, followed by AA for projects that are somewhat likely to reduce emissions, and A for projects that are unlikely to reduce emissions.

The two REDD + projects receiving AAA- ratings from BeZero are the Katingan Peatland Restoration & Conservation Project and the Sumatra Merang Peatland Project in Indonesia.

From the viewpoint of BeZero, there is a good reason for additionality in the Katingan project, and the possibility of excessive credit issuance has been minimized by conducting sampling survey. The Merang project also has strong additionality and the company points out that it avoids over-crediting by setting a lower baseline emissions level to calculate emissions reductions. In addition, it has been pointed out that two projects are successful even though policy environment in host country is not supportive.

As for AAA- rating, the agency downgraded the Katingan project because forest protection in the project area could lead to deforestation in other areas, as well as the possibility of forest fires. The Merang project raises the possibility of deforestation in other areas similar to the Katingan project and the low level of awareness of compliance among stakeholders in the project area.

Although the projects are not 100%, BeZero indicates that there is high possibility of these two REDD+ projects actually reducing the emissions.

As for REDD+ project, there are persistent doubts about its reliability but there is such reputation as BeZero. It can be said that careful consideration is needed when evaluating REDD+ projects.

② Sylvera responds to reports questioning REDD+ project's reliability

On January 18, 2023, The Guardian, a British newspaper, published an article that introduced research of excessive crediting of REDD+ projects and questioned the reliability of REDD+ projects. According to the research paper presented in the article, 94% of REDD+ projects are attributed to projects that do not contribute to actual emissions reductions.

On contrary, Verra, the orgnization that operating VCS which registers many REDD+ projects and issues credits for the criticized REDD+ projects, was quick to issue a rebuttal statement, but others, including credit generating project developers and project reliability rating firms, issued a string of rebuttals to the article.

Above all, credit rating agency Sylvera has questioned the validity of approach that found REDD+ projects were over-creditings. In particular, Sylvera points out that the method called synthetic baselines, in which an analysis is conducted with proxies similar to the project site and physical conditions (such as distance from roads, rivers, settlements, slopes, etc.), does not take into account the actual state of deforestation at the project site.

Silvera has already evaluated a number of projects for rating and says that as a result of evaluation, around 31% of current REDD+ projects are high quality projects, and credits are issued from those projects after the credits actually achieve emission reductions. On the other hand, 25% of projects are evaluated as "junk" and it acknowledges that not all projects are reliable.

In this way, while some have questioned the reliability of REDD+ projects, it is not possible to categorically conclude that all REDD+ projects are not reliable. However, doubts about the reliability of REDD+ projects are starting to affect the trading of credits. There have also been reports that the operators involved in one REDD+ project have stopped selling credits after a Dutch journalist published an investigation into excessive credit issuance.

Expectations for REDD+ projects are high because large-scale emissions are expected to be reduced and it may contribute to remove CO_2. On the other hand, it is also necessary to carefully assess whether credit purchases are fully reliable.

③ BeZero cooperates with Xpansive CBL (trading market)

On June 9, 2022, XPansiv CBL, a trading market that includes voluntary credit as one of its trading products announced that it has partnered with BeZero, a rating agency for projects that generate voluntary credits, to provide project rating information along with market pricing.

BeZero establishes evaluation criteria such as additionality, over-crediting, leakage and persistence to evaluate and rank the projects. The results of evaluation are classified into three categories: AAA (Emissions are likely to be reduced or removed for 1 ton of credit issued), AA (Emissions may be reduced or removed for 1 ton of credit issued), and A (Emissions are unlikely to be reduced or removed for 1 ton of credit issued). BeZero also provides information to other exchanges of credit such as AirCarbon Exchange.

XPansiv already started to offer similar credit rating information from Silvera in March 2022. XPansiv said BeZero's information enables service users to get deeper credit information.

(5). Various initiatives to expand business transactions by companies, etc.

① Trends in tokenizing voluntary credit

On August 17, 2022, the International Finance Corporation (IFC), a member of the World Bank Group, announced that it has established a new fund to purchase voluntary credits. IFC purchases credits derived from projects that remove CO_2 through conservation of natural ecosystems. For purchasing, credits are purchased with the support from project developer Cultivo and card payment provider Aspiration.

The report says IFC plans to purchase 250,000 to 300,000 tCO_2e of credits by the end of the year with $10 million USD as seed money and will purchase 1 million tCO_2e of credits within a few months. It is not clear under what criteria the credits will be purchased. However, Aspiration representative reportedly comments that "less than 10% of projects meet the purchasing criteria," which suggests that the company intends to apply strict criteria when purchasing credits.

The fund is characterized by the tokenization of purchased credits and the use of blockchain for transparency. The World Bank has already launched an initiative called Climate Warehouse, which uses blockchain to ensure transparency in credit issuance, transfer and other matters in the registries of various standards. According to the press release, the company plans to have transparency while taking advantage of this initiative. However, details of how blockchain technology could be used, how it could be tokenized, or other relevant matters was not clarified in press releases or reports.

The current situation of large amounts of credit being tokenized and traded is regarded as a problem by voluntary credit issuance organization and VCS, which basically indicate a policy not to allow voluntary credit to be tokenized. The report says that VCS officials are discussing what role IFC will play in Climate Warehouse. Although it is not certain how the role will be played, it could be a precursor to blockchain initiatives.

② Risk-sensitive insurance for voluntary credit continues to unveil

While the initiative to reduce or remove CO_2 through the protection and restoration of natural ecosystems such as forests and the demand for voluntary credits derived from Nature Based Solution (NBS) projects increase, on September 22, 2022, Aon, a global insurance company, announced that it will offer coverage for risks associated with credits derived from NBS projects.

According to the presentation material by Aon, while credits derived from NBS projects are currently traded in the market as voluntary credits, the voluntary credit trading market is not under official regulation, and contracts are signed in a variety of ways, exposing companies participating in the trade to a wide variety of risks. Aon classifies those risks into four categories. Aon's insurance will reduce the risk of physical loss of assets due to forest fires, the risk of liability for environmental losses (e.g., environmental losses caused by the use of exotic species to restore natural ecosystems), the risk of project implementation being hampered by policy changes in the host country, and the risk that the technology introduced will not work as expected and the amount of credits scheduled under the contract will not be provided on time.

In addition to Aon, Howden, an insurance brokerage, announced that it would offer insurance to address the reputation risk of voluntary credit. What Howden will provide is insurance to cover any negligence or fraud that may have been committed in the validation review and verification leading up to the issue of the voluntary credit. Howden describes such insurance as the first of its kind in the world.

While interest in voluntary credit trading is on the rise, it is also true that there are a wide variety of risks that are preventing previously inexperienced companies from entering the market. In particular, many have questioned the reliability of voluntary credit. Ensuring its reliability has become an issue for the future growth of the voluntary credit trading market. It can be said that the insurance provided by Howden represents a new effort to ensure the reliability of voluntary credit.

③ Various Japanese companies embark on using credit

The move to sell carbon-neutral LNG has been growing in Japan this year, but there have been other moves to use the credit. Airline companies, venture companies and professional basketball teams have announced various ways to use the credits to combat global warming.

In particular, attention has been focused on J-Credit, among companies. Companies offering matching services for J-Credit sellers and buyers are emerging, which could be seen as a sign of growing interest in credit in Japan. As for J-Credit, proposals for new methodologies utilizing biochar and registration of new types of projects of increasing CO2 stock in soil , which suggests that there is potential interest from Japanese companies.

This growing interest in J-Credit from Japanese companies may be partly due to trends such as GX ETS,

as well as calls to question the reliability of voluntary credits derived from overseas projects. In fact, there are reports this month that BeZero, the company that evaluates and rates the reliability of voluntary credits, has downgraded some projects that generate them.

Although it is likely that there is a judgment that projects in Japan are reliable to some extent, on the other hand, the amount of supply is small compared to VCS and Gold Standard, and it remains to be seen how far they can meet the demand from Japan.

2. Trends in Voluntary Credit (trends in credit issuance organization, etc.)

(1). New initiatives for issuing credit

① Allow credit to be issued before CAR emissions reductions occur to encourage investment

Carbon offset standards such as the Carbon Action Registry (CAR), where most projects in the United States are registered, and the Verified Carbon Standard (VCS), where the largest number of credits currently are issued among standards, are moving to allow credits to be issued before actual emission reductions occur as an incentive to develop and implement projects.

On April 29, 2022, CAR announced that it would approve the issuance of credit to reforestation project before actual emission reductions (sequestration) are achieved. The credits to be issued are in quantities discounted by a percentage of the emissions reductions expected to be achieved in the future after the actual planting takes place.

The special circumstances of the reforestation project have influenced the introduction of such system. Reforestation projects often need a long period of time from 15 to 30 years after trees are planted until sequestration actually occurs. This would delay the issuance of credits and, as a result, delay in the payment of profits from the sale of credits, which could hamper project implementation. For that reason, CAR has expressed the idea that it will incentivize project implementation by allowing some credits to be issued before sequestration actually occurs.

On May 3, 2022, Verra, the company that runs VCS, announced proposed changes to its procedures for issuing Projected Carbon Units (PCU), credits before actual emissions reductions (removals) occur. Verra explains the reason of proposing the introduction of such system as follows. For operators developing projects related to carbon removal such as reforestation project and Carbon dioxide Capture, Utilization and Storage (CCUS) projects, the introduction of PCUs is beneficial because it requires a large initial investment and takes a long time to implement, while it reduces the risk of credit delivery for investors and credit buyers at the time of contract, increases transparency and helps to ensure reliability with investors. The system change is still a draft amendment, which was supposed to be released in the fall of 2022 after public comments are received (comments will be accepted until June 1), but has not yet been finalized.

Although the methods of explanation is different, both credit issuance organizations try to promote project development by giving a certain amount of revenue to project developers by allowing them to issue credits in advance. However, there are various risks involved in the development and implementation of projects leading up to the issuance of credits, and emissions reductions and removals may not be achieved as it is estimated. Although this is an interesting revision of procedures from the perspective of promoting project development, there may be various issues in the future in terms of actual operation.

② Movement to add a label to indicate characteristics of project to credit

Verra, which is a voluntary credit issuing organization and operates VCS, has begun a review process to establish a new label for VCS-issued credits, VCU. Two types of labels are considered to be newly established.

One label is to indicate characteristics of project created to the credit. Following characteristics of projects

are considered to be indicated in the label from Verra.

i. Reduction of emission or removal of emissions
ii. Activity related to nature or activity related to technology and industry
iii. Types of authorization for Article 6 of the Paris Agreement (NDC achievement, CORSIA and use for voluntary corporate initiatives)
iv. Contribution to the SDGs

As for adding these new labels to VCU, Verra started to accept public comments on June 30, 2022. Accepting comments is closed on July 31, 2022. Based on the comments received, a final version will be prepared within 2022, with an intention of putting the system into full operation by June 2023.

In addition to these initiatives, Verra began to accept comments from the public on July 7, 2022 about further new labels. Specifically, the new ABACUS label will be established to projects that apply the new methodology, new forestation, reforestation and revegetation methodology, which is currently being developed in the VCS.

ABACUS is intended to be a label for credits derived primarily from activities related to removals, particularly reforestation, but credits derived from removals are also of great interest to the market. Some standards have already indicated that they will specify credits from removals. By labeling such credits to distinguish more easily from other types of credits, it could be aimed at broadening the trade of credits derived from removal and promoting project development. With a similar intention, Verra seems to create a new label for credits. However, if this move spreads to other credit issuance organizations, it may have an impact on the trading of credits derived from removals.

This was described as pre-consultation and based on the comments, Verra is set to decide whether to begin work on a new label, ABACUS in January 2023, but it has not been officially announced yet.

(2). Response to crypto-assets

Since 2021, there has been a movement toward the use of voluntary credit in some crypto asset transactions. VCS credits are refunded and then tokenized into crypto-assets to trade as crypto-assets.

However, on May 25, 2022, in response to such a move, the VCS governing body, Verra, announced that it would prohibit the use of credit to trade crypto assets. Verr explained the reasoning behind the decision, saying that credits should be used by companies and others to contribute to climate action, and that using credits to trade crypto assets confuses market participants.

It was also explained that exactly how to prohibit the use of credit for crypto asset transactions would be a topic for discussion, and the public was invited to comment.

(3). There is a delay in the issuance of credit

There have been reports of delays in the process of issuing credits in Verra. An article in Carbon pulse on December 7, 2022 reported that Verra intends to provide an analysis of the list and validation of a significant number of projects that have a backlog of credit processing this year, and to provide further documentation

to interested parties. According to the article, based on estimates of year-to-date data through November, Verra pipeline project list is up 226% compared to 2021. Despite this, Verra will continue to conduct the necessary reviews to ensure credit integrity.

Although Verra has already made actions to strengthen the capacity of third-party verification bodies and increase the number of personnel at Verra in order to speed up the processing of procedures, it seems that the number of applications has not kept pace with the increase.

There have been reports that project developers have complained about the delay and some have even tried to obtain credits under schemes other than Verra.

While certain severity is required to review project registrations and credit applications to ensure reliability, the delay can also lead to another delay in the process of the issuance and delivery of credits. If the issuance of credits is later than it was expected, it may also be impossible to meet the delivery time in the contract for the sale of credits.

While there is no information on delays in processing at other private credit issuance organizations, delays in processing at Verra that operates VCS, which has the largest amount of credit issuance in voluntary credit, may have an impact on the future supply of credit and may also have some impact on project development trends.

(4). IETA releases standards for carbon geological storage

IETA has published a set of standards (High-Level Criteria for Carbon Geostorage Activities) to manage the trade in CO_2 reduction and removal by enhancing technology-based carbon sinks. IETA prospects that it is necessary to collect and store up to 16 billion tons of CO_2 in order to achieve global net-zero emission in 2050 and emphasizes its importance.

IETA has spent nearly a year exchanging opinions with various stakeholders before being developed. IETA says this is expected to encourage investment in technologies that could make a significant contribution to mitigating climate change.

The standards developed by IETA consist of 6 methodological elements and 10 regulatory safeguards, which are based on the results of various discussions, methodologies and standards held by credit issuance organizations such as CDM, GCC and ACR, and standards bodies such as ISO.

To be more specific, the methodological elements include the additionality, baseline emissions and monitoring generally required in the baseline credit mechanism, as well as elements to ensure the storage of carbon removed from the atmosphere, such as project boundaries and leakage, and non-persistency and responsibility. Regulatory safeguards require the development of a legal system for safe storage, a legal basis for injection, political and social acceptance, and include items such as liability in the event of a leak.

(5). Trends related to IC-VCM

① IC-VCM announces draft evaluation framework with CCP

On July 27, 2022, the Integrity Council Voluntary Carbon Market (IC-VCM), which was established to ensure the reliability of voluntary credits, released its draft Core Carbon Principles (CCP), a set of principles

to ensure the quality of voluntary credits, and its draft Assessment Framework and Assessment Procedures (AF), a framework and procedures for assessing the suitability of voluntary credits with CCPs. As well as the announcement of these two proposals, a schedule for further work was also announced, according to which public comments will be received until the end of September 27 (UK time), after which a final version will be published this year in the fourth quarter of 2022 based on the comments received.

The IC-VCM operation plan released in March 2022 was set to work in the third quarter of this year to fully implement the CCP and AF. However, the full implementation of the plan is expected to be pushed further back, as the final version of the plan will be published .

This delay was probably due to the fact that it was difficult to find a director to represent original inhabitants and the sudden passing of Hugh Sealy, who was initially a co-chairperson of IC-VCM, but there was also information that internal disagreements occurred over the operating policy of IC-VCM, and internal struggle over the operating policy may have caused this delay.

The proposal announced this time stipulates that the CCP will be used as a guiding principle for the assessment of “carbon-crediting programs and different types of carbon credits.” On this basis, principles such as “additionality”, “information on mitigation activities”, “no double counting”, “persistent”, “governance of credit issuance organization”, “registry”, “robust validation and verification by independent third-party”, “robust quantification of emissions reductions and sequestration”, “sustainable development impacts and safeguards” and “a shift towards net-zero emissions” are indicated.

Some companies that purchase voluntary credits also focus on the characteristics of the credits (such as their contribution to sustainable development), so suggestions have been made on how to provide information on the characteristics of individual credits. These include “types of mitigation activities”, “authorization for Article 6”, “quantified impacts on the SDGs” and “secondary benefits on adaptation.”

In the draft AF to evaluate these principles, detailed draft criteria are provided, and IC-VCM has indicated its basic view that these criteria will be applied in response to voluntary applications from each credit issuance organization. However, it has not ruled out the possibility of conducting an independent assessment based on published information. This issue will be discussed based on the public comments and the specific application of AF may be a point of discussion in the future.

There remains some uncertainty as to whether future review work will proceed according to the work plan announced this time, and how the CCP and AF that have been formulated will actually be implemented. However, with the announcement of this draft, it is certain that IC-VCM has finally taken the first step toward implementing concrete initiatives to ensure the trust of voluntary credit.

② Reactions from VCS and GS

The two leading private credit issuance organizations, Verra and Gold Standard, offered their views on the proposed Core Carbon Principle that was announced at the end of July 2022 by IC-VCM, which makes actions to ensure the reliability of the voluntary credit trading market, but their evaluations were completely contrasting.

On September 21, 2022, Verra issued a statement on IC-VCM’s draft CCPs and AF, noting that the

published draft was uniform approach that did not consider regionality and that the requirements for CCPs were also too prescriptive and impracticable. And then, IC-VCM criticized the content of these drafts as hindering the expansion of the market for voluntary credit, saying they needed to be rectified.

Gold Standard, on the other hand, stated an announcement on September 27, 2022 that it welcomed IC-VCM's draft CCPs and AF as important to ensure high standards. The reaction contrasted with Verra that criticized this guideline. Although Gold Standard gave positive feedback, it stated that the draft needed flexibility not to exclude existing good projects from the IC-VCM label because there were still areas that needed improvement. Also, based on the regulations under Article 6 of the Paris Agreement, IC-VCM should cancel some amount credits on the timing of issuance as same with Article 6.2.

While there are contrary viewpoints, it remains to be seen how the draft CCP will be finalized.

(6). Trends in using voluntary credit

① VCMi and others announce the guidelines of using voluntary credit

On June 7, 2022, Voluntary Credit Market Integrity (VCMi) issued interim practice guidelines on the use of voluntary credit. In this report, it is shown how to use voluntary credits for companies' voluntary actions to combat global warming, and how to present and explain (claim) the use of such credits when publicizing their use externally.

Specifically, in order to use voluntary credits, first, subject to the range of corporate emissions (Scope 1, Scope 2 and Scope 3), companies commit to achieving science-based, long-term net-zero emissions (science-aligned long-term net zero emissions), and then set intermediate targets to achieve those targets. Credits can be used at any time. To do this, it is necessary to put the next interim goal in the state of being achieved. For emissions that could not be reduced (Unabated emissions) after meeting these conditions and achieving the target, credits are allowed to be used for all or part of the emissions that could not be reduced in Scope 1, 2 and 3. In addition, as for Scope 3, it is also allowed to use credits to achieve some of the goals that fail to be achieved. Depending on the extent to which such credits are used, the following statuses are given.

Gold: After goal is achieved, credit is used for all Unabated emissions.

Silver: After goal is achieved, credit is used for more than 20% of Unabated emissions.

Copper: After goals are achieved in Scope 1 and Scope 2, credits are used for more than 20% of Unabated emissions and credits are used up to 50% of emissions that did not meet targets for Scope 3 emissions.

This time, based on the comments received on the published documents, further review will be undertaken and a final version is expected to be published in early 2023.

Interestingly, in addition to VCMi, regarding the use of voluntary credit, draft guidance is announced by WRI, a prominent think tank on environmental issues and Draft Code of Best Practice is announced by Nordic Dialogue on Voluntary compensation that is implemented under the support of Nordic Council that is a framework for regional cooperation among Nordic countries.

In addition to actions to ensure the quality of credits supplied, such as IC-VCM, various initiatives have begun to use credits for voluntary measures to combat global warming by companies, and these developments may have various impacts on the use of voluntary credits in the future.

② Finnish government creates guidelines for use of voluntary credit

The Finnish government has developed new guidelines on the use of voluntary credit. As interest in voluntary credit has grown in recent years, many projects using the voluntary credits have also been implemented in Finland. Private companies are undertaking various initiatives using voluntary credits, and projects in the land use sector are positioned as a major measure against global warming in Finland.

On the other hand, there is no uniform standard or definition for how to use the credit, leaving it up to the companies that use it to decide. At the same time, many issues remain in evaluating the quality and reliability of voluntary credit.

Under such circumstances, the Finnish government announced in 2022 that it would start an operation around the summer to provide guidance on specific ways for businesses to use voluntary credits and to develop guidelines to enable consumers to track their emissions along the value chain when making purchases.

The guidelines to be developed will clarify two matters.

- Definition of carbon neutrality or net zero, and a method of achievement
- Specific criteria required when companies, etc. use voluntary credit

Guidelines were announced in January 2023 through a process of consultation with stakeholders.

(7). Trends of the government of host country

① Indonesian government imposes new rules on domestic credit issuance

On April 8, 2022, it was reported that the Indonesian government had temporarily suspended the issuance of voluntary credits for emission reductions since 2021. The report states that the process of issuing the credits has now been suspended while, Verra the operates the VCS, voluntary credit standard reviewed details of Indonesian government regulations. And project developers who were set to begin the process of issuing voluntary credits have also reportedly confirmed that the process is temporarily on hold.

These measures by the Indonesian government were implemented based on Presidential Regulation No. 98 of 2021 issued in 2021. The Presidential Regulation states that the government will establish a National Registry System for Climate Change Control (SRN PPI) to manage activities to reduce GHG emissions, such as a baseline credit mechanism, in order to use Indonesia's national carbon tax, emissions trading system and baseline credit mechanism to achieve the NDC. Projects that generate voluntary credits are also subject to this regulation, allowing voluntary credits generated from projects implemented in Indonesia to be used for domestic regulation or as part of measures to reduce emissions in corporate supply chains.

However, it is not clear whether an initiative involving the transfer of international emissions reductions will be possible with the approval of the Indonesian government, although legal experts interpret this as possible.

In addition, SRN PPI to manage emission reduction project in Indonesia is not established. Furthermore, experts in Indonesia have expressed the view that further development of ministerial ordinances in individual ministries is necessary for the implementation of the Presidential Regulation and it remains uncertain how the Regulation will be implemented in the future.

Some companies have suggested that it may not affect the process of issuing voluntary credit for existing registered projects. In addition, at COP26, the process of avoiding double counts on voluntary credits was left to the discretion of the host country, and countries such as Colombia, Costa Rica, and Peru have already clearly stated that they would apply corresponding adjustment to transfers of voluntary credits to overseas. The report said that there is an opinion in Indonesian government to apply corresponding adjustment to international transfer of voluntary credit likewise other countries.

Indonesia which is one of the major sources of voluntary credit may have a significant impact on the voluntary credit trading market in the future, and may further influence trends in other host countries.

② Governments of developing countries start to move toward the use of voluntary credit.

Various initiatives were announced to coincide with UNFCCC COP27 including several initiatives for voluntary credit in developing country governments.

First pointed out initiative is the African Carbon Market Initiative (ACMI). Currently, Africa generates only about 2% of the largest annual carbon credits but has ambitious plans to generate 300 million annual offsets by 2030 and 1.5 to 2.5 billion annual offsets by 2050. The VCM boom is expected to create 30 million by 2030 and more than 100 million employments by 2050. But it is also acknowledged that expanding the African market poses many challenges.

Similar activities has been shown at side events at COP27 that Laos is also looking to raise funds for forest protection through initiatives under Article 6 of the Paris Agreement and voluntary credits, and Saudi Arabia investing public funds in companies involved in the regional voluntary carbon market.

It can also be said that there is a growing view that voluntary credits can be a source of new global warming financing for developing countries. On the other hand, it remains to be seen how much these activities can achieve in the future.

③ Ghana, Zambia, Tanzania and other African countries set up procedures for credit transfers overseas

At the end of 2022, several African countries such as Ghana, Zambia and Tanzania announced a series of regulations on the procedure for transferring credits overseas. In Africa, South Africa, Gabon and other countries have already provided similar procedures, followed by Ghana's announcement of a framework for financing climate change through Article 6 of the Paris Agreement.

The Framework announced specifies that Ghana's NDC will use ITMOs to achieve at least 24 million CO_2e of the emissions reductions called for in the conditional target of 39.4 million tCO_2e in the target year, 2030, and provides specific procedures for authorization, registration, issuance and transfer of ITMOs. Specifically, the timing of application for authorization (such as timing of registering mitigation activity, issuance of mitigation achievement, "first transfer" of mitigation achievement and timing of using ITMOs),

issuance of pre authorization and specific form of authorization (Letter of Authorization, issued as LoA) are provided. In addition, authorization is to retain 1% of credits issued to avoid excessive credit issuance, which are to be stored in a buffer account set up by the government of Ghana.

There is also a procedure for avoiding double counts, a provision for the application of corresponding adjustment, including the collection of fees when applying corresponding adjustment ($3/ton or $5/ton fees depending on the size of the project) and the use of the fees collected (10% for the operation of carbon market offices and the remaining 90% for the achievement of conditional NDC).

No other developing country so far has defined international procedures for ITMOs under Article 6 of the Paris Agreement as its domestic legal system in such comprehensive and detailed manner. Characteristic of this procedure is the imposition of various restrictions (such as setting of the total amount of mitigation outcomes transferred out of the country, partial retention at the time of credit issuance) on the transfer of mitigation to abroad. Other host countries are now developing such procedures to implement Article 6. The procedures set out by Ghana may have implications for procedures of other countries.

Among other things, setting limits on the amount of credits transferred internationally, withholding some credits at the time of issuance, and charging fees in the process of making corresponding adjustment could spread to other host countries, and could result in new costs for future project development and credit acquisition. On the other hand, by having a procedure of host country under such regulation, it is expected to mitigate the risk of occurring double counting, so there are some points that are not necessarily negative for the companies that obtain credits.

(8). Action to use for implementing measures for global warming in one's country

① Verra cooperates with Thai government to implement T-VER

It was revealed that Verra, which operates VCS, a voluntary credit issuance organization, will carry out various initiatives with developing country governments. First pointed out initiative is activities by Verra. On August 25, 2022, it was announced that Verra had signed a memorandum of understanding with Thailand Greenhouse Gas Management Organization (TGO) and would cooperate to support the implementation of T-VER, the TGO's own baseline credit mechanism. It was decided that they would cooperate to implement T-VER based on international best practices by sharing the standards and requirements required in VCS and providing information on the operation of the registry and carbon markets.

② Singapore to allow companies subject to carbon tax regulation to use VCS and gold standard credits

On August 30, 2022, it was announced that companies regulated by carbon tax in Singapore would be allowed to use voluntary credits issued by VCS or Gold Standard to implement the carbon tax.

Carbon tax of Singapore allows international credits to account for up to 5% of taxable emissions, and the memorandum allows regulated companies to use some VCS or gold-standard credits instead of paying the carbon tax.

Press release indicated that there are certain conditions for using the credit of both Verra and Gold Standard. To authorize its use, National Environment Agency (NEA) of Singapore has signed a memorandum of understanding with Gold Standard and Verra for further details to be released by the NEA. However, press release for both Verra and Gold Standard states that the credits must have applied corresponding adjustment required under Article 6.2 of the Paris Agreement to avoid double counting.

The initiative of Singapore allows voluntary credits obtained by domestic and overseas projects to be used for official regulation. This effort made by Singapore may also have an impact on other countries that will implement the same initiatives in the future.

Chapter 3. Overseas Market Mechanism Trend

In recent years, the introduction of market mechanisms has been seen not only in developed countries in Europe and the United States but also in emerging countries such as China and South Korea. EUETS in Europe had a significant influence on the international credit trading market as the largest source of demand for credits until 2012. In recent years, the introduction of emission trading systems in China, South Korea and other countries has advanced, and in South Korea, CDM credits have been allowed to be used, which has been affecting international market mechanism. Here, the results of the research on overseas trends in market mechanisms (US, EU, China, South Korea, etc.) are reported.

1. Trend on Market Mechanisms in the United States

In a complete turnaround from the previous administration, the Biden administration has promoted the strengthening of climate change policies in various fields. In the United States, there is no emissions trading at the federal level. Two of the Supreme Court rulings on GHG emission control authority may be mentioned.

1. Introducing carbon pricing for methane emissions from the oil and natural gas industry

The first federal carbon pricing in the United States has been introduced for methane emissions from the oil and gas industry.

The newly introduced system is based on the Inflation Reduction Act (IRA) enacted on August 16, 2022. The Inflation Control Act calls for $396 billion in spending on climate change and energy security, centered on clean tax credits for renewable energy generation and EVs, as well as charges for methane emissions from the oil and gas industry. It included what to do.

Carbon pricing for methane emissions from the oil and natural gas industry is levied on methane emissions exceeding standard values from large-scale facilities that emit more than 25,000t-CO2. Penalties for exceeding the standard will be raised in stages from $900/t in 2024 to $1,200/t in 2025 and $1,500/t from 2026. Converting this surcharge into CO2, it is expected to be 36$/t-CO2 to 60$/t-CO2.

The United States has historically had carbon pricing at the local and state levels, but not at the federal level. Although the target industries and GHG are limited, the introduction of carbon pricing at the federal level is considered a major change in the United States.

2. Supreme Court Decision on Environmental Protection Agency's Authority to Control GHG Emissions

As mentioned above, while the United States introduced carbon pricing at the federal level for the first time, the Supreme Court ruled against the Environmental Protection Agency's authority to regulate GHG emissions.

The issue in this lawsuit was the scope of the Clean Power Plan, which regulates GHG emissions from existing thermal power plants formulated by the Obama administration. In the clean power plan, we expected to switch energy sources to renewable energy from coal, which is an effort outside the power plant. In response, the Supreme Court ruled that under the current Clean Air Act, the Environmental Protection Agency does not have the power to regulate comprehensive GHG emissions outside power plants.

The Clean Power Plan called for the formulation of GHG emission reduction plans for each state, and allowed the use of emissions trading schemes as a means to achieve this. The ruling made it difficult to introduce an emissions trading system for power plants at the federal level, which was envisioned in the Clean Power Plan, without legislative changes.

On the other hand, since the ruling does not limit the EPA's ability to regulate GHG emissions, it will not prevent the establishment of GHG emission regulations for existing thermal power plants in the future. Currently, the Biden administration is considering GHG emission regulation proposals for existing thermal power plants. Although there may be a delay in the publication of the draft regulations due to the revision of the regulations following the judgment, it is believed that the examination and formulation of the regulations will proceed.

(3). Launch of new initiatives related to the international carbon market

The United States also announced the launch of a new carbon market initiative, the Energy Transition Accelerator (ETA), on November 9 by Climate Envoy Kelly at the US Pavilion in the COP27 conference hall. Amazon's founder Bezos Earth Fund and the Rockefeller Foundation will also participate in this effort, and the public and private sectors will work together.

The U.S. State Department announced that the initiative aims to help fund the transition to clean energy in developing countries. It says that it will verify the amount of reduction and provide options for using credit.

Proceeds from the implementation of the ETA will then act as incentives for investment from governments, financial donors, international development aid agencies and private financial institutions, as well as pre-fixing the price of verified emission reductions. By doing so, it points out that it is possible to increase the predictability of funding.

Furthermore, safeguards are to be put in place to protect the interests of local communities (e.g. job creation) towards a just transition.

In this way, although the presentation indicated the basic direction and direction of a framework for assisting developing countries using credits, the specific system was not clarified.

After that, in January 2023, the guiding principles for future ETA efforts, guiding principles, inclusiveness, comprehensiveness, high integration, etc. will be announced. Along with the principles, the members of the high level consulting group that will be involved in this initiative were also announced.

These include representatives of SBTi and Professor Stern of the University of London, as well as groups and experts who have expressed critical or passive views on the use of credits. It can be seen that the government is trying to implement measures while incorporating such opposing opinions.

2. Trend on Market Mechanisms in the EU

The amendments of the EU Emission Trading System which were proposed in July 2021 as part of the Fit for 55, were agreed to by the European Parliament and the European Council in June 2022. The Trilogue has been held by the European Commission, the European Parliament and the European Council since July and it was settled at midnight on December 18 of the same year. Despite advance reports that disagreements over the final draft had not been settled, two days of intense debate led to a political Provisional Agreement.

The table shows the major amendments from the amendments proposed by the European Commission.

Table11. Major amendments to the proposed amendments to the Directive proposed by the Commission

	European Commission	Tentative agreement (December 18)
Annual reduction rate (Liner Reduction Factor)	61% compared with 2005 4.2%/year	62% compared with 2005 2024 to 2027: 4.3%/year 2028 to 2030: 4.4%/year In addition, a reduction of 90 million t-CO_2 in 2024 and 27 million t-CO_2 in 2026
Allotment without contribution	A condition for making a gratis allotment (25%) is the presence or absence of measures based on the energy audit results.	Bonus-malus system is adopted. Implementation of decarbonization plan an energy audit is mandatory for the bottom 20% of emission unit. If both are not implemented, 50% to 100% of allotment without contribution will be reduced. Up to 20% of allotment without contribution to top 20% of emissions intensity
Percentage of reduction in allotment without contribution due to application of CBAM	Decrease by 10% annually from 2026 to 2035	Decrease by 2.5% in 2026 Decrease by 48.5% in 2030 Suspension of allotment without contribution in 2034
Percentage of benchmark improvement	2021 to 2025: 0.2 to 1.6% 2026 to 2030: 0.2 to 2.5%	(Unknown as official documents are not released.)
Measures against price rise		Article 29a of Directive that has not been applied is exercised and emission right is supplied to the market. (Agreement seems to be made to strengthen measures that emission right is automatically released from MSR when price fluctuate.)
Expansion to consumer and transportation sectors ETS (ETS2)	Implementation from 2026 emissions/2027 submissions	Scheduled to start in 2027. However, it can be postponed to 2028 if energy price rises.

(Source) Prepared by the Institute of Energy and Economics, Japan based on various materials

In addition, the following amendments were agreed upon:

- Agreement was concluded to strengthen measures that emission right is automatically released from MSR when EUA prices fluctuate
- Additional waste incineration plants will be assessed by the European Commission by 2026, with a decision in 2028, but a decision in 2031 on whether to opt out
- Marine transportation is subject to the emissions in 2024 and 100% auctions from 2026.

Owing to this amendment, the allotment without contribution for the process of producing CBAM products will be gradually reduced for the sectors that have been eligible for allotment without contribution. Carbon pricing coverage in Europe is expected to be about 80% or more, with the introduction of ETS2 subject to marine transportation, public welfare and transportation sectors.

3. Trend on Market Mechanisms in China

As domestic economic conditions have worsened since 2022 due to COVID-19 outbreak, China began to step up economic measures, including boosting new coal capacity and providing economic support to electric power companies. At the 20th National Congress of the Communist Party of China in October, the representative said that "Aggressively and steadily promote carbon neutrality (CN), firmly establish new ones first and then abolish old ones based on the amount of available energy and resources, and implement and plan carbon peak activities in stages" as a policy direction on energy and climate change, and warned against leaning forward on environmental policy. Furthermore, in December, 2022, as the impact of COVID-19 worsened and the macroeconomy faced difficult times due to the decline of consumption and confusion in supply, the cautious stance on environmental policy became even more pronounced. Especially at the Central Economic Work Conference held in December,2022, no reference was made at all regarding renewable energy or climate change policy unlike previous years. In this way, 2022 was a year when Chinese environmental policy was carefully revised.

Given the circumstances, in June,2022, the Ministry of Ecology and Environment took mitigating measures for corporate reporting of greenhouse gas emissions, such as conditional substitution of missing values and reduction of default values in case of missing values for reporting 2021 and 2022 CO_2 emissions, in order to alleviate difficulties that companies are facing due to COVID-19. Furthermore, in November, the Ministry of Ecology and Environment released a draft of the benchmark standards for CO_2 emissions to be distributed in the national ETS system for target years 2021 and 2022, which are mitigated more than the previously proposed 8% reduction. The draft estimates 0.82 tCO_2/MWh (2021) and 0.8159 tCO_2/MWh (2022) for coal fired power plants with capacity greater than 300 MW. This is equivalent to reductions of 6.5% and 6.97% from standard in 2019 and 2020. Incidentally, in July the State Council again included a national ETS ordinance in its 2022 legislative work plan. However, likewise in 2021, nothing happened.

Meanwhile, activity related to climate change became active in industrial sector. First, in August, the Steel Industry Low Carbon Promotion Committee of Chinese steelmakers released its "Roadmap for Carbon Neutrality (CN) and Low Carbon Technology in the Steel Industry," setting forth its policy of tackling the following as its priority issues: supply-side structural reform, upgrading the manufacturing process, developing low-carbon technology, building low-carbon supply chains, and international cooperation in low-carbon industries. China National Offshore Oil Corporation (CNOOC) made a statement that they would aim at carbon peak-out (CP) by 2028 and CN by 2050. The Ministry of Industry and Information Technology, the Ministry of Finance, etc. jointly announced the "Action Plan to Accelerate the Development of Green, Low Carbon, and Innovation in Power Facilities," which set out 6 priority items, including the greening of power facilities, and set numerical targets to refurbish more than 200 GW of coal power facilities, continuously increase renewable energy power facilities, expand wind and solar power to more than 1,200 GW, and nuclear power to more than 70 GW. Subsequently, in September, the China Building Materials Federation announced its commitment to help cement production achieve CP by 2023. It was also stated that the building materials industry as a whole is expected to achieve CP by 2025. The Civil Aviation Administration of China (CAAC)

issued an action plan to promote green development in this area, although it did not mention China's participation to the CORSIA implemented by ICAO, which covers international flights. According to CAAC, eight action plans have been submitted to the International Civil Aviation Organization to tackle climate change. According to the plan, CAAC has committed to reduce fuel consumption per ton kilometer and carbon emissions to 0.293 kg and 0.886 kg respectively in order to achieve CN in air transport by 2035 and has promised to reach cumulative sustainable aviation fuel consumption to 50,000 tons in the next five years. In November, the Ministry of Industry and Information Technology (MIIT) announced plans for the building materials sector to peak out emissions by 2030, with efficiency in cement production as a focus of action. The short-term goal is to reduce the electricity consumption used for cement clinker production by at least 3% by 2025. In November, MIIT also released a roadmap that the nonferrous metals sector peaks out the carbon emission by 2030 and indicated a countermeasure policy that includes a plan to adopt low-carbon technologies, improve the coal-dependent power configuration and increase the proportion of recycled metals to at least 24% by 2025. However, according to the high official of the National Federation of Industry, petrochemical sector is likely to join the national ETS in 2024, while a senior official at the Chinese Federation of Petrochemical Industries (CPCIF) said there was "little chance of the petrochemical industry joining the domestic carbon market in the next two years."

On the other hand, prices of national ETS have remained generally stable since the start of trading in 2021. In 2021, the first implementation period, the daily closing price was in the range of 40 to 60 yuan per ton with an average share price of 42.85 yuan per ton. Incidentally, it closed at 56.00 yuan per ton on February 6, 2023 (1 yuan equals to approximately 20 yen.)

4. Trend on Market Mechanisms in South Korea

The South Korean government built a legal foundation to achieve its carbon neutrality goal in 2021. In October 2021, the government raised its 2030 national reduction target for greenhouse gases to "40% reduction from 2018 levels." In March 2022, the conservative opposition won the presidential election by a narrow margin of 0.7%, and announced policy changes that differed from those of the previous administration, such as a shift away from nuclear power and an emphasis on incentives for companies rather than regulations. The main developments regarding climate change policies and market mechanisms in FY2022 are as follows:

[Shift in Energy Mix Policy: From Abolishing Nuclear Power to Prioritizing Nuclear Power]

In presidential election on March 9, 2022, conservative opposition candidate Mr. Yoon won by a slight difference of 0.7% (the smallest margin in history), which was a change of government for the first time in five years. The Presidential Underwriting Committee immediately announced that they would amend the former Moon administration's carbon-neutral policy, particularly by reorganizing the existing solar-centric renewable energy market to include wind power.[15] In July, the Ministry of the Environment of Korea officially included nuclear power in its Korean-style green classification system, ensuring a shift in policy toward nuclear power. On climate change policy, the ministry stated the national GHG emissions reduction target, stipulated in the NDC, would not be changed, but sectoral reduction targets, such as increasing the weight of nuclear power, would be revised. The "First National Carbon Neutrality and Green Growth Master Plan" reflecting the redesign (draft) of these reduction targets will be formulated in March 2023.

[Strategy for the Promotion of International Greenhouse Gas Reduction Projects (released on August 19, 2022)][16]

When the South Korean government revised its NDC upward in 2021, the government proposed "international reduction of challenging targets" as one of the means to achieve the target.

<International reduction of challenging targets>

The plan is to reduce greenhouse gas emissions by 40% (291 million t-CO_2e) compared from 2018 by 2030 and of these, 33 million t-CO_2e will be secured through international reductions (initial target is 16.2 million t-CO_2e).

On August 19, 2022, the South Korean government announced the Strategy for the Promotion of International Greenhouse Gas Reduction Projects in a joint effort of related ministries and agencies, in which the government indicated that it would promote the achievement of NDC by activating overseas greenhouse

[15] enewstoday "Yoon administration announces new renewable energy reform... 'Sunlight sinks, wind rises'" 2022.4.19 http://www.enewstoday.co.kr/news/articleView.html?idxno=1564090

[16] Press Release of the Ministry of Planning and Finance entitled "230 Foreign Economic Ministers' Meeting and 143 Foreign Economic Cooperation Fund Steering Committee" held on August 19, 2022 https://www.moef.go.kr/nw/nes/detailNesDtaView.do?searchBbsId1=MOSFBBS_000000000028&searchNttId1=MOSF_000000000060709&menuNo=4010100

gas reduction projects. The government stated that the participation level would rise not only for the government but also public institutions and domestic private companies. In September, the government established a new platform under the International Reduction Council of the Prime Minister's Office to integrate and support international reduction projects and to check policy issues every month. Furthermore, according to the strategy, it will finalize relevant rules in September and develop an annual support plan. To promote international reduction projects, the government will also expand the signing of MOUs among countries and promote them in cooperation with ODA, especially among the 18 priority partner countries.

[Proposed Improvement of Emissions Trading System (released on November 24, 2022)][17]

A proposal to improve the Emissions Trading System was released at the 16th Emissions Trading System Committee on November 24, 2022. Strengthening incentives for reduction through the revitalization of the trading market and the improvement of the allocation method are the main point.

① Improvement plans to encourage companies to reduce

- When installing the best facilities that emit less greenhouse gases (top 10% in the same industry) or upgrading aging equipment to improve greenhouse gas emissions efficiency, companies are encouraged to invest in lower carbon by allocating more allowances.
- Certified for greenhouse gas reduction※1 when producing products with low-carbon materials such as bio-naphtha or using renewable electricity for "100% use of renewable energy (RE100)."

※1 Excluded from calculation of bio-raw materials and emissions from renewable electricity use

② Vitalization of transactions and mitigation of price fluctuations risk

With regard to trading markets, organization changes have been conducted to expand mobility. In March 2021, the upper limit on the use of overseas offset emissions credits (up to 50% of offset emissions credits) was abolished and in September 2021, third parties such as financial companies were allowed to participate in the market ("Notice on Emissions Trading Intermediary Companies in the Emissions Trading Market (2021.9)").

In the present amendment:

- In addition to companies participating in the trading system, the government will gradually increase the participation of financial institutions, such as market makers, and introduce brokerage commissions so that companies can trade their allowances more conveniently.
- After the determination of emissions in the previous fiscal year (May), the period until the submission of allowances will be extended to ensure a sufficient trading period※2, and market information

[17] The Ministry of the Environment Korea Press Release on "Reducing Greenhouse Gases Benefits ... Revealed Measures to Improve Emissions Trading System" (2022.11.24)
https://me.go.kr/home/web/board/read.do?pagerOffset=0&maxPageItems=10&maxIndexPages=10&searchKey=title&searchValue=%EB%B0%B0%EC%B6%9C%EA%B6%8C&menuId=10525&orgCd=&boardId=1562990&boardMasterId=1&boardCategoryId=&decorator=

disclosure for emissions credit price forecasting will be expanded to support smooth trading.

※2 (Initial) Apply to carry forward emission right (6.10), Submit emission right (6.30) > (Improvement) Apply to carry forward and submit emission right (8.10)

③ Rationally improve emissions offset business certification procedures and standards

- If overseas emissions reductions already certified by the United Nations are converted into domestically tradable emissions credits, the scope and period of consideration will be shortened.

[Korea's First Government Secured International Offset Credit (released on January 27, 2023)[18]

The Toshkent landfill gas power plant, which is scheduled to be completed in 2024, is the first private-public cooperation project in Central Asia for the generation of landfill gas, and the first case in which the Korean government invests in an overseas project to reduce greenhouse gas emissions, and the emisssions reduction achieved by the project is expected to account as Korean's greenhouse gas reduction. The project is projected to reduce greenhouse gas emissions by 720,000 tons per year and a total of 10.8 million tons over 15 years by producing electricity using the landfill gas (methane) generated from the landfill. The Ministry of the Environment Korea expects to secure 110,000 tons of carbon emission rights over 10 years by investing the equity equivalent to 2.7 billion won on this project including facility installation costs.

Finally, as for the trend in the price of emissions rights, it shifted around 30,000 won at the beginning of 2022 due to economic recovery, etc., but later declined due to a decline in trading volume and the supply of surplus emissions rights. It has been shifting around 12,000 to 6,000 won since the beginning of 2023. The price of emissions credits has fallen by almost half from the level at the end of 2021, likely due to companies selling off excess allowances held in anticipation of a recession in 2023. These surplus allowances are believed to be purchased by securities companies, and the analysis shows that the share of trading by emissions credit market participants consists of 24.4% in the energy conversion sector, 26.4% in the industrial sector, 34.0% in securities companies, and 8.8% in market makers.[19]

[18] The Ministry of the Environment Korea Press Release "Uzbekistan to Build Landfill Gas Power Plant to Secure Carbon Emissions Rights" 2023.1.27
https://me.go.kr/home/web/board/read.do?pagerOffset=0&maxPageItems=10&maxIndexPages=10&searchKey=title&searchValue=%EB%B0%B0%EC%B6%9C%EA%B6%8C&menuId=10525&orgCd=&boardId=1576310&boardMasterId=1&boardCategoryId=&decorator=

[19] Energy economy "Emissions prices fell by more than half last year ... Liquidity increased" 2023.1.10
https://www.ekn.kr/web/view.php?key=20230106010001512

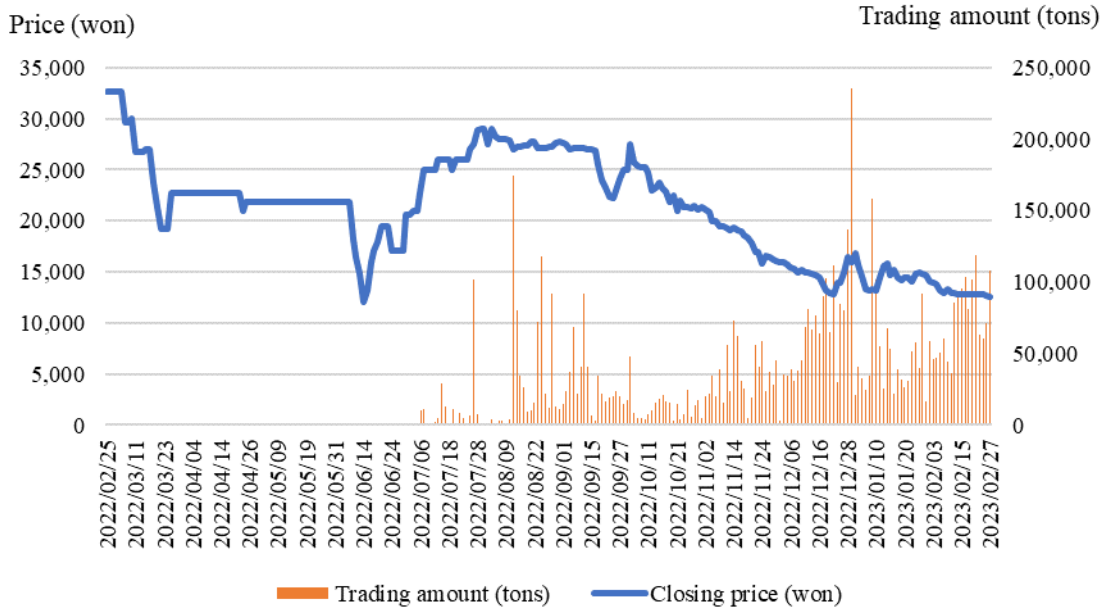

Figure 1. Trends in ETS emission rights prices in South Korea (2022 emission rights)

(Source) Created by the Institute Energy Economics, Japan from Korean Exchange Database