J-Blue Credit® Certification Application Guidelines

- Climate Change Mitigation Utilizing Blue Carbon –

Ver. 2.5

March 2025

Japan Blue Economy Association (JBE)

Table of Contents

Chapter 1 - Introduction

1.1 How to use this guide

This guide outlines the application procedures and methodological considerations for obtaining certification under the J-Blue Credit® program, operated by the Japan Blue Economy Association (JBE). It summarizes key points to consider during the application process as well as the evaluation criteria emphasized during the review and certification stages. We encourage you to use this guide when planning surveys and preparing your application.

1.2 What is the J-Blue Credit®?

The Japanese government has declared its goal to achieve carbon neutrality by 2050, aiming for net-zero emissions of carbon dioxide (CO_2) and other greenhouse gases. To meet this goal, municipalities, businesses, and citizens are to make every effort to reduce CO_2 emissions. However, for the portion of emissions that cannot be entirely eliminated, it is possible to offset them through the purchase of CO_2 reduction or removal credits from others, a mechanism known as carbon offsetting.

Recent research has shown that carbon absorbed and stored by marine ecosystems (blue carbon) is just as important as the carbon in terrestrial ecosystems (green carbon). Given Japan's rich marine ecosystems, there are high expectations for the use of blue carbon as an effective measure toward achieving carbon neutrality.

J-Blue Credit® is a system that quantifies blue carbon and turns it into tradable credits. By utilizing J-Blue Credit, credit applicants can raise operational funds through credit sales and increase recognition of their activities, which can help stimulate further engagement. Credit purchasers can use the credits to reduce their reported CO_2 emissions and publicly demonstrate their efforts towards climate action. The system is designed to create a triple-win cycle between environmental, social, and economic activity.

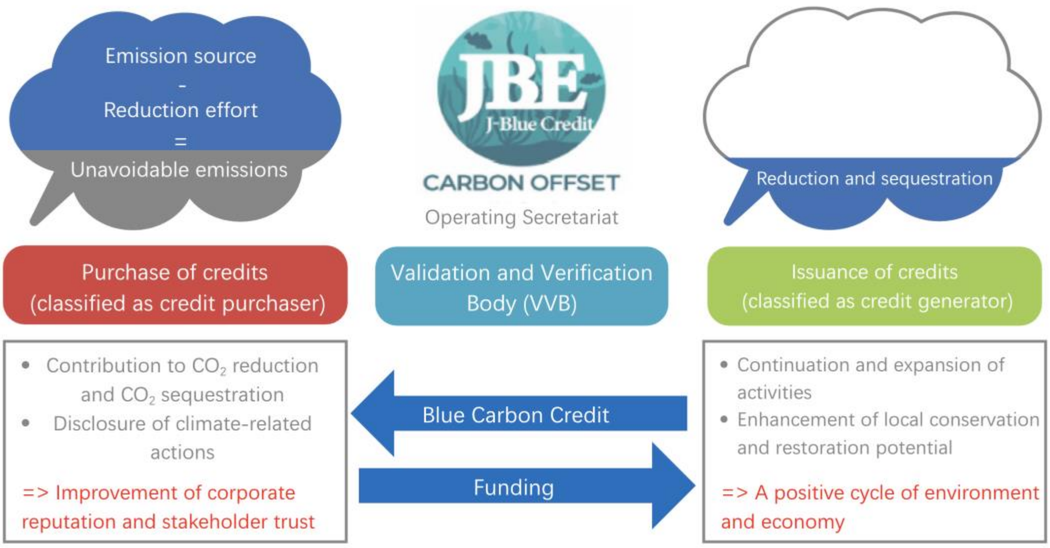


Figure 1-1 Overview of the J-Blue Credit System

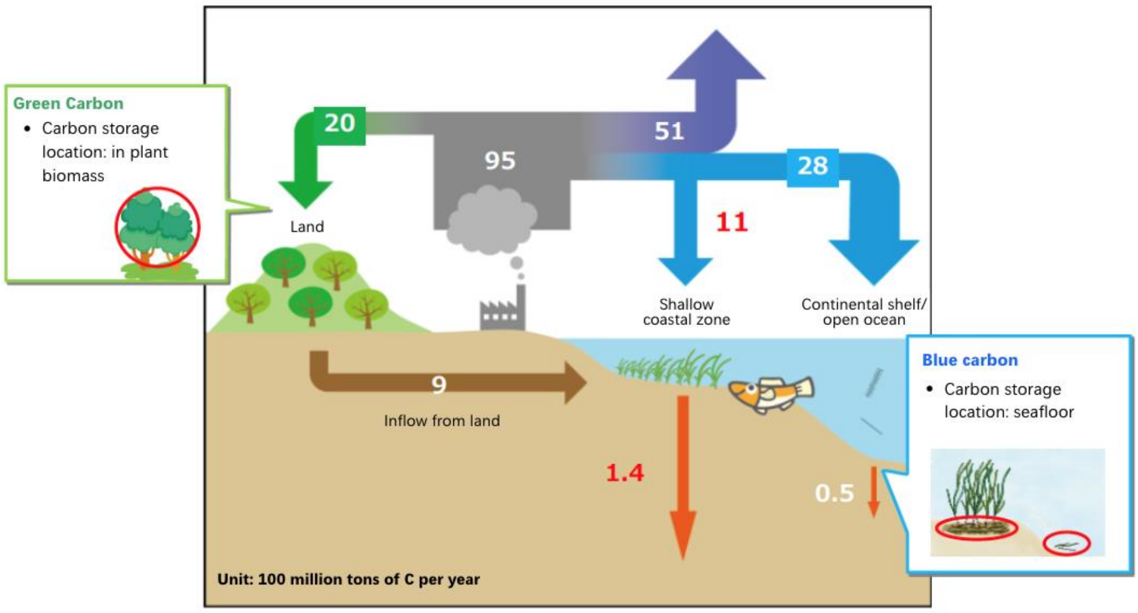
[Technical note] About Blue Carbon and Green Carbon

Blue carbon refers to CO_2 that is absorbed from the atmosphere by marine organisms and subsequently sequestered (i.e. stored long-term) within marine ecosystems such as seagrass beds, mangroves, and salt marshes. The term was introduced in 2009 by the United Nations Environment Programme (UNEP) as a counterpart to green carbon, which refers to CO_2 absorbed and sequestered in terrestrial ecosystems such as forests.

According to information from the Intergovernmental Panel on Climate Change (IPCC), the global carbon flux is illustrated in the figure below. It shows that the ocean absorbs approximately 2.5 billion tons of CO_2 per year, which exceeds the uptake by terrestrial areas (approximately 1.9 billion tons of CO_2 per year).

Furthermore, recent global estimates suggest that coastal shallow-water ecosystems, including seagrass beds, tidal flats, coral reefs, and inner bays, take up about 1.1 billions of CO_2 per year. Despite significant variability and uncertainty due to limitations in data and scientific understanding, this uptake amounts to nearly half of that of terrestrial ecosystems.

Japan, which has the sixth-longest coastline in the world, is considered to have high potential as a major CO_2 sink. As a result, there is growing interest in blue carbon from the national government, local governments, and private companies in recent years.



Source: Created based on Kuwae and Crooks (2021)

Figure 1-2: Carbon cycle diagram of green carbon and blue carbon

The mechanisms of CO_2 uptake and sequestration are outlined below, with each pathway involving different storage locations. While green carbon is primarily stored within the plant body (plant biomass), blue carbon is stored outside the plant, such as in seafloor sediments, which contributes to its relatively high persistence as a carbon sink.

Green Carbon: CO_2 absorbed through photosynthesis by terrestrial plants is stored in

(1) the plant biomass (e.g. trunks, branches, leaves, roots) and
(2) the soil as fallen leaves, dead roots, and decaying wood.

Blue Carbon: CO_2 absorbed through photosynthesis by seagrasses, seaweeds, and similar organisms is stored in

(1) seafloor sediments and the deep ocean as organic matter derived from the plant body, and
(2) seawater as recalcitrant dissolved organic matter (rDOM) released from the plant body.

Due to these differences in sequestration pathways and the lifespan of the organisms involved (e.g. trees: more than 50 years; seagrasses and seaweeds: approximately 1 to several years), the characteristics of the carbon credits issued also differ by category, as shown in the table below.

Table 1-1: Characteristics of Issued Credits

Item	Green carbon		Blue carbon*
Applicable scheme	J-Credit Scheme		J-Blue Credit Scheme
Carbon storage location (where CO_2 absorbed from the atmosphere is stored)	Biomass of the trees within the project area (trunks, branches, leaves, roots, etc.)		Mainly in soil or seawater as recalcitrant substances, or exported to areas outside the project site such as the deep ocean
Carbon Storage Persistence (how long atmospheric CO_2 remains in the carbon pool)	Several decades		Hundreds – thousands of years
	Up to clear-cutting (~80 years), accounted as emissions upon harvest		In soil, seawater, or deep ocean, on multi-century to millennial timescales
CO_2 Reversal Risk (risk that stored carbon is released back as CO_2 before the expected timeframe)	High		Low
	Due to wildfire, landslides, land-use change, or improper harvesting		If soil disturbance occurs, actual atmospheric CO_2 return is minimal
Measures against CO_2 reversal risk • Buffer management in the credit registry • Permanence safeguard measures	Non-anthropogenic reversals	3% credit buffer reserved (for natural events like wildfires)	Basically not required (one-year performance-based system, high permanence, and low reversal risk)
	Anthropogenic reversals	• 10-year commitment to avoid harvesting or land-use change • Required compensation for shortfall in CO_2 uptake	
Maximum credit issuance period at site	• Unlimited as long as trees continue to grow • However, subject to the above measures during the first 10 years of activity		• Unlimited if the ecosystem persists • If seagrass area or CO_2 uptake decreases the following year, it is not counted as an emission

*In principle, excludes the aboveground potions of mangroves

1.3 Concept behind J-Blue Credit Certification

J-Blue Credit certification follows the Core Carbon Principles proposed by the Integrity Council for the Voluntary Carbon Market (ICVCM), which serve as a global benchmark for high-quality credits in the voluntary carbon market (see p.5).

J-Blue Credit targets the amount of CO_2 that is absorbed and removed through project activities. Only CO_2 that is removed for over 100 years is considered eligible. Biomass carbon stored in plant bodies is excluded. The quantity of CO_2 proposed for certification is reviewed by the J-Blue Credit Validation and Verification Body (hereafter referred to as VVB) and is certified by JBE.

Certification is based on the net amount of CO_2 removed over a one-year period, calculated by subtracting the baseline level of removal (i.e. what would occur without the project) from the actual removal achieved through ecosystem creation, restoration, or maintenance. Applications must be calculated annually.

To ensure reliability of historical data, retroactive certification is limited to a maximum of five years, depending on the availability and clarity of records or memory of past activities.

The minimum certifiable amount per application is 0.1 t-CO_2.

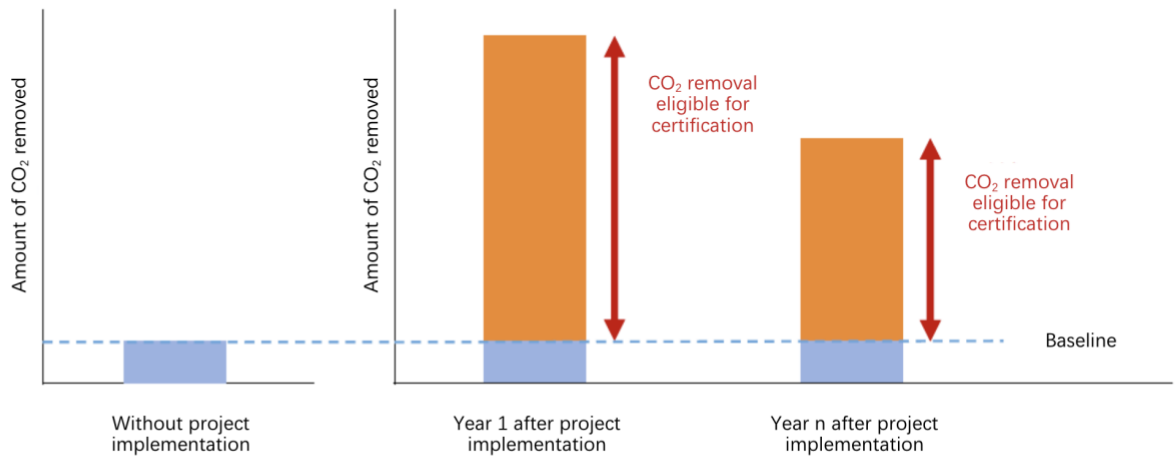


Figure 1-3: CO_2 removal eligible for certification

As noted above, this scheme is based on the Core Carbon Principles. Therefore, the content of each application must satisfy the criteria listed in the table below.

When submitting an application, please provide the necessary information so that the eligibility of each item can be properly assessed during the credit review process.

Table 1-2 Core carbon principles and evaluation criteria

Required item (based on Core Carbon Principles)	Evaluation criteria	Notes
Additionality	Does the issuance of credits lead to emission reductions or removals that would not have occurred otherwise?	See p.8 (1)
Transparency	Are the details of the credit activity disclosed comprehensively and transparently?	See p.8
No double counting	Are there any duplicate applications, issuances, or sales?	See p.9 (3)
Permanence	Are the emission reductions or removals long-lasting?	
Governance	Is there a governance structure in place that ensures transparency, accountability, and credit quality?	
Measurement of removals	Are the removals measured conservatively and scientifically?	See p.9 (2)
Sustainable development	Does the project contribute positively to social and environmental sustainability?	
Alignment with Net Zero	Does the activity avoid promoting fossil fuel use or contradicting net-zero goals, and does it support ongoing greenhouse gas reductions?	
Credit registry	Is there a registry system in place to identify, record, and track the credits and activities?	This is a system requirement, not applicable to participants
Third-party validation and verification	Are the credit activities reviewed and reviewed by an independent third party?	

Note: The contents of the online "CO_2 Removal Quantification Form" and any attached documents will be reviewed by a third-party validation and verification body. These materials will also be registered and published to ensure that credit activities, as well as credits themselves, can be clearly identified, recorded, and tracked.

1.4 Application Process

The overall process - from applying for J-Blue Credit, to credit certification and transfer - is outlined below. As part of this process, applicants are required to use the J-Blue Credit Management System (hereafter referred to as the "online system") available at https://credit.blueeconomy.jp/ to conduct preliminary consultations, confirm the project's eligibility, identify and coordinate with stakeholders, carry out surveys, submit applications through the system, undergo on-site hearings and verification of application details, and publish an activity report (follow-up information). Please note that if the activity report is not submitted, certification for the following year will not be granted. Make sure to submit the report before the next year's application. The certified project's application details and activity reports can be accessed on the JBE website: https://www.blueeconomy.jp/credit/follow-up/

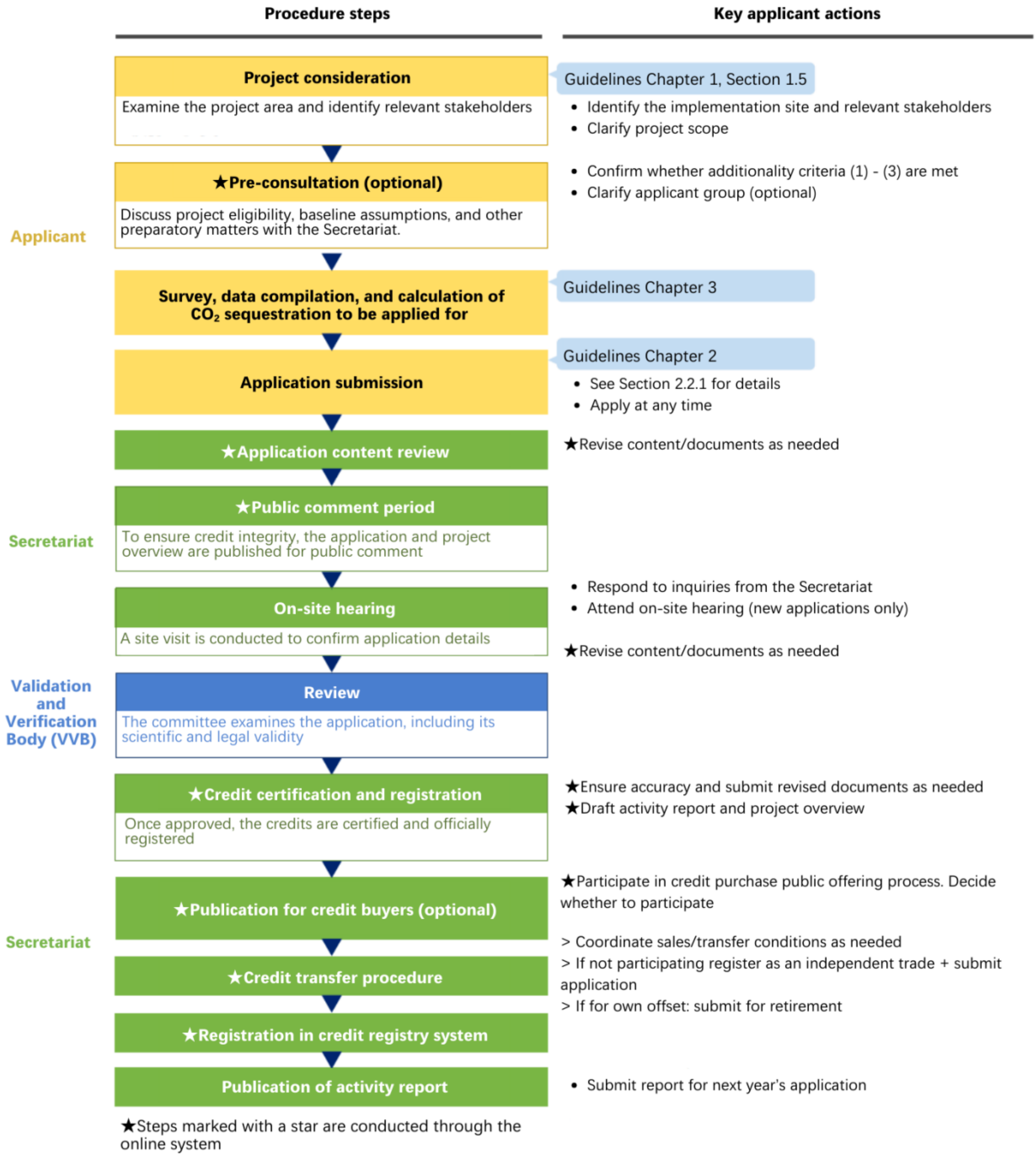


Figure 1-4: Overview of procedures

The review and quantification steps are outlined below.

Preliminary review (e.g., project details)

- ☐ Review of project content (→ See Chapter 1, p.10 onward)
  - ・Projects based on both natural or artificial infrastructures (including aquaculture) are eligible
  - ・Assess whether activities conducted during application period fall within the scope of an eligible project
- ☐ Review of the baseline (→ See Chapter 1, p.9)
  - ・Assess the baseline CO_2 removal prior to project implementation
- ☐ Review of the application scope （→ See Chapter 1 p.10）
  - ・Define the area in which the target ecosystems is created, conserved or maintained through the project

Reference for indicative minimum project area (when calculated based on production volume)

Target ecosystem	Seagrass beds	Seaweed beds	Mangroves	Tidal Flats
Area threshold	0.04ha	0.07ha	0.04ha	0.07ha

These are the estimated areas needed to reliably achieve the minimum certifiable removal amount of 0.1 tonne CO_2. This assumes a certainty factor of 80% for area and 70% for the removal coefficient in the application.

- ☐ Understanding regional conditions
  - ・Identify whether the survey area overlaps with fishing rights zones, protected area designations, or other regulatory classifications; and identify conditions such as water depth

  Reference databases:

  Marine Condition Display System：https://www.msil.go.jp/msil/htm/main.html?Lang=0

  EADAS（Environmental Assessment Database）：https://www2.env.go.jp/eiadb/webgis/index.html
- ☐ Identification of Stakeholders （→ Chapter 2 p.9）
  - ・To avoid double counting, identify all stakeholders related to the project and site, and carry out any necessary coordination or notification required for surveys and applications

Optional preliminary consultation with the Secretariat regarding application content, survey methods, and quantification approach

Note: Please confirm in advance that the three conditions (① to ③) listed under "(1) Additionality" on p.8 are satisfied, and identify the expected applicant group. Use this information when conducting the preliminary consultation.

Preliminary review (survey and quantification plan)

- ☐ Selection of quantification method
  - ・Select an appropriate quantification method based on the project's characteristics and key considerations for carbon accounting(→ See Chapter 3, p.17 onward)
- ☐ Design of survey method
  - ・Determine the survey timing, locations, and techniques in accordance with the type, scale, and environmental conditions of the target ecosystem

Survey, data compilation, and calculation of claimed removal

- ☐ Conducting the survey
  - ・Record evidence such as photos supporting ecosystem type classification and spatial distribution
  - ・If vessels are used during the survey, record usage time and related information
- ☐ Setting the removal coefficient
  - ・Define the removal coefficient to be used in calculations (→ See Section 3.3)
- ☐ Calculation of claimed CO_2 removal
  - ・From the measured CO_2 removal, subtract baseline CO_2 removal and CO_2 emissions from vessels or other sources (→ See Section 3.6, p.46)

> Formula for claimed CO_2 removal = (distribution area of the target ecosystem x area reliability) x (removal coefficient x coefficient reliability) – baseline CO_2 removal – CO_2 emissions from vessels or similar sources

Application Procedure (→ See Chapter 2)

Figure 1-5: Survey and Quantification Procedure

1.5 Eligible project operators and projects requirements

1.5.1 Eligibility criteria for Project Operators

Entities eligible to apply for J-Blue Credit must meet both of the following conditions:

(1) They must be a non-state actor (i.e. any entity other than the national government)
(2) They must be either directly involved in the project activities (e.g. municipalities, local organizations, fisheries cooperatives, private companies, and other entities), or have made an indirect contribution to the project (e.g. providers of subsidies or grants, land managers, etc.)

1.5.2 Project eligibility requirements

Projects eligible for J-Blue Credit may involve either natural or artificial infrastructures (including aquaculture). However, they must meet the conditions of additionality and baseline setting, as outlined below.

(1) Additionality

The goal of the J-Blue Credit system is to support the continuation and development of voluntary activities that contribute to climate change mitigation or adaptation. Based on this objective, the concept of additionality in this system is defined as follows:

"*The acquisition of credits should contribute to the continuation or expansion of the activity.*"

Whether a given application satisfies the additionality requirement is evaluated by the VVB, based on criteria below, along with other relevant factors, particularly whether the activity qualifies as voluntary[1]. The VVB will make this determination in conjunction with other certification requirements and may apply these assessments appropriately and flexibly in response to evolving national and international discussions[2]. Please include the following three points in the "Project Overview" section of the online application system.

① The activity was voluntarily implemented with the aim of increasing or maintaining carbon removal
② A clear rationale for why credit acquisition is necessary
③ A plan or outlook showing how credit acquisition will support the continuation or scaling of climate mitigation actions (including the project itself)

[1] As a general rule, a project may be considered voluntary if all or a substantial part of its activities are not mandated by laws, government policies, or regulations, and if it was not implemented as a commercial transaction, such as a contract, commission, or other profit-driven service arrangement.

[2] The necessity and interpretation of additionality for credits based on carbon removal remain under discussion. The VVB will assess compliance with additionality requirements in a timely and context-sensitive manner, informed by ongoing domestic and international developments.

(2) Baseline

As noted earlier, the baseline refers to the scenario in which the project is not implemented. The baseline in this credit system is defined as follows:

"An increase in carbon removal as a result of voluntary activities must be demonstrated through both a before-and-after comparison (pre- and post-project implementation), and a control-impact comparison (between project and non-project sites – i.e. control sites)."

Ideally, the amount of CO_2 removed under the baseline should be calculated using the same method as that used for post-project CO_2 quantification. However, if no surveys were conducted prior to implementation, applicants should gather and document as much relevant information as possible for the project site.

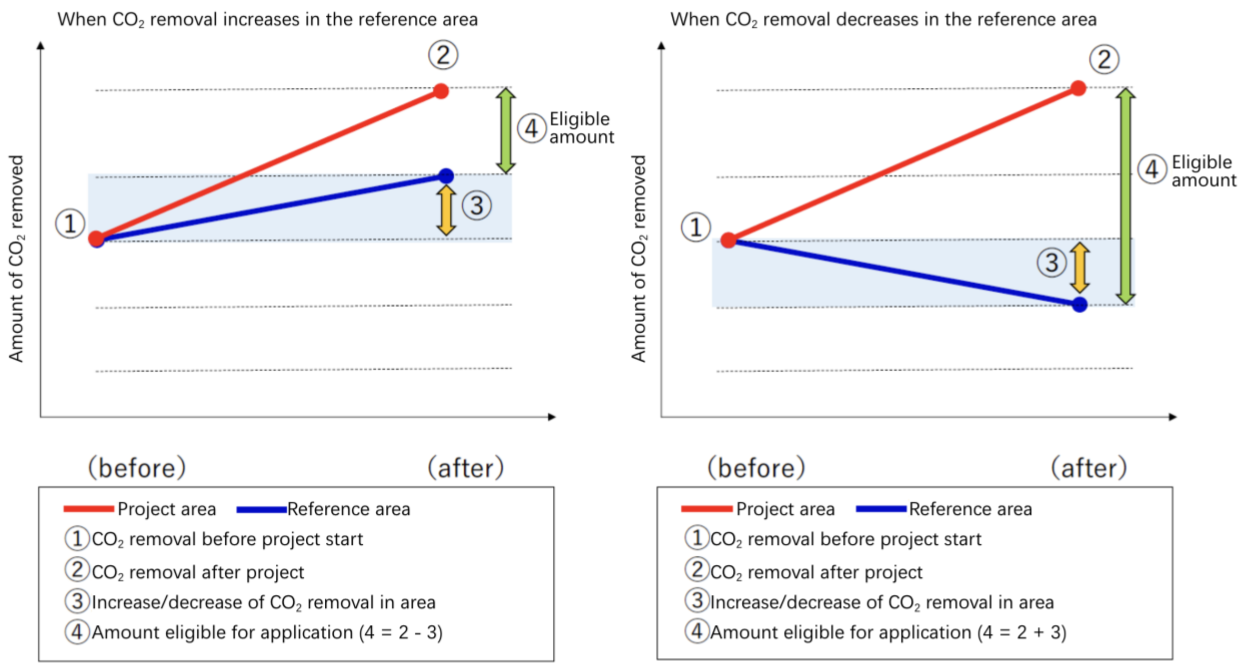


Figure 1-6: Concept of baseline

(3) Avoidance of double counting

To prevent double counting, coordination with relevant stakeholders must be conducted in advance. In addition, publicly disclosed application records shall be reviewed to confirm that the proposed marine area does not overlap with existing applications. Examples of relevant stakeholders include:

- Fishers (including those holding fishing rights)
- Port authorities
- Local governments (administrative bodies)
- Universities (e.g. when conducting research in the area)
- Other organizations active in the same marine area

To verify the absence of double counting, the project summary will be published online for approximately 2 to 3 weeks, during which a public comment period will be held. The applicant's name and project summary will be disclosed during this period.

1.5.3 Eligible projects

As outlined in Section 1.5.2 (Project Eligibility Requirements), projects must satisfy all three of the following conditions:

- The project must have climate change mitigation as one of its objectives.
  For example, there should be verifiable evidence of decarbonization efforts in addition to fisheries-related objectives, such as activities specifically targeting carbon removal or the formation of collaborative frameworks with other entities for that purpose.
- The increase in carbon removal must be the result of project activities, not natural variation. This must be demonstrated through comparisons before and after the intervention, and between the project site and non-project areas (see “Baseline”).
- The acquisition of credits must contribute to the maintenance or enhancement of removal (see “Additionality”).

The project activity must also fulfill at least one of the criteria listed in Table 1-3. Projects must be implemented within Japan and must not have significant adverse impacts on surrounding ecosystems. The defined project area shall be set based on the ability to demonstrate spatial and temporal changes in target ecosystems resulting from the activities. This includes evidence that ecosystems have expanded following direct intervention, and that the area of ecosystem distribution has increased outward from the intervention site over time.[3]

Table 1-2 Eligible projects

Eligible project criteria		
1 Natural infra-structure	Activities in natural coastal and marine areas, including seagrass and seaweed beds, mangroves, salt marshes (tidal flats), and other inner bays	1.1 Creation of ecosystems
		Creating new ecosystems through activities such as placing rocks or blocks as substrate, sand capping, adjusting water depth, modifying external forces (waves, currents), improving sediment conditions, transplanting or seeding vegetation, and removing herbivorous predators.
		1.2 Restoration, Maintenance, or Degradation Suppression of Ecosystems
		In areas where ecosystems had deteriorated or disappeared before the project began, carrying out similar interventions (as listed above) to restore, maintain, or prevent further degradation.
2 Artificial Infra-structure	Activities involving artificial structures (e.g. engineered substrates, aquaculture facilities)	2.1 Restoration, Maintenance, Expansion, or Degradation Suppression of Ecosystems
		Applies when climate change mitigation (e.g. CO_2 removal) is a stated objective in addition to the original infrastructure purpose. For aquaculture, if the project meets eligibility criteria, existing cultivation areas may also be included in the application.

Table 1-4 Specific examples of eligible projects

[3] See “Chapter 5: Glossary” (p.58)

Type	Example
① Installation of substrate for attachment (e.g. seaweed beds or artificial reefs)	Use of natural stones, concrete blocks, aquaculture structures, etc.
② Sand capping	Application of marine sand, dredged sediment, terrestrial soil, modified soil (marine-derived and industrial by-products), etc.
③ Adjustment of water depth	Gently sloping surfaces of seawalls and breakwaters to increase sunlight exposure, creating step zones on sloped revetments, raising seabed height using stone placement (also includes ② sand capping)
④ Adjustment of external forces (waves and currents)	Creating channels by seabed excavation, installation of physical structures
⑤ Improvement of seabed conditions	Application of soil conditioners, fertilization, tilling, etc. (also includes ② sand capping)
⑥ Transplanting and seeding	Transplantation of eelgrass seeds, provision of seed-bearing seaweed, rope seeding for cultivation, etc.
⑦ Removal of herbivorous species	Removal of sea urchins, herbivorous fish, etc.
⑧ Substrate and vegetation management	Cleaning rocky areas, thinning, removal of residual biomass
⑨ Regulation of activities in the area	Measures to prevent illegal harvesting, reduction of vegetation loss due to fishing activities
⑩ Change in operational framework	Establishment of coordination bodies for climate change mitigation objectives, etc.

Points to note when applying for credits from Isoyake Countermeasure projects or seaweed cultivation

When applying for J-Blue Credit based on isoyake (barren ground) countermeasure projects or seaweed cultivation, the following data shall be prepared. Reference project applications from similar certified cases are available on the JBE website and may be used as guidance.

- ◆ Isoyake Countermeasure Projects (e.g. projects under the "Measures to promote the multifunctional role of fisheries" by the Fisheries Agency Japan")
  Data from before and after project implementation within the project area, and data from before and after implementation in surrounding areas of the site

- ◆ Seaweed Cultivation
  Data that clearly identifies the cultivation area and quantity (e.g. rope length) through aerial imagery of the aquaculture zone, or
  Documentation such as insurance certificates for aquaculture facilities that can objectively verify the cultivation scale through a third party (i.e. not the applicant)
  ※ Harvest or shipment data held by fisheries cooperatives, or aquaculture implementation plans, are not accepted as objective evidence of activity.

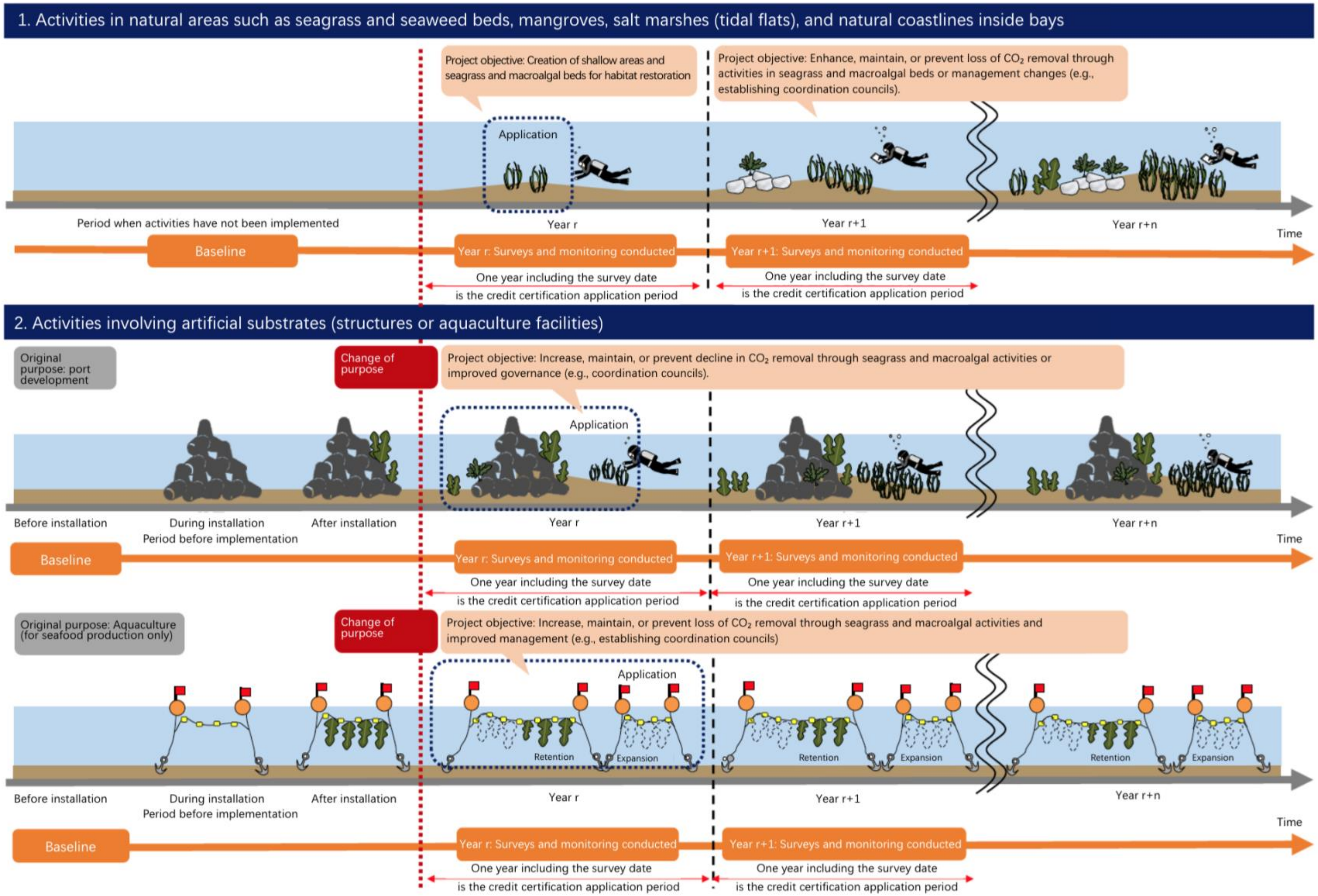


Figure 1-7: Visualization of target projects

Chapter 2 – Application Procedures

2.1 Application period

The applicable period for J-Blue Credit is one year. Applications must be submitted on a yearly basis. Regarding retroactive applications, due to the potential lack of clarity in past records or memory, the allowable retroactive period is limited to a maximum of five years.

2.2 Application via the J-Blue Credit Management System

Important points to consider when preparing your application and detailed input instructions are provided on the following pages. The required information for credit review is organized by input field, so please refer to these when completing your submission.

Transition to the J-Blue Credit Management System As of August 17th, 2023, all procedures for pre-consultation and applications (both new and continued) must be conducted through the J-Blue Credit Management System. For detailed instructions on how to register and input information, please refer to the J-Blue Credit Management System website (https://www.blueeconomy.jp/credit). When preparing your registration and input, please also consult the "2.2.1 Notes on Application and Input Details" section of the guidelines. Please note: While applications can now be submitted at any time due to the introduction of the J-Blue Credit Management System, review, certification, and issuance are not conducted on a rolling basis. Please check the J-Blue Credit website (https://www.blueeconomy.jp/credit) for the schedule of reviews, certification, and issuance.

2.2.1 Points to note when submitting an application/entry details

[User registration]

Application field	Notes and entry instructions
Applicant	The project operator must register as a user in the online system. Both individuals and organizations are eligible. For joint applications involving multiple parties, the representative must register first. After saving the project application as a draft, additional joint applicants can be added by selecting "Edit representative and joint applicants."
Applicant information	For individual applicants, enter your full name, address, phone number, email address, and password. For organization applicants, enter the organization name along with the address, phone number, email address, and password. When adding joint applicants, provide the address and full name. If the joint applicant is an organization, also include the organization name, the applicant's title and name, address, and corporate registration number.

[Project application]

Application field	Notes and entry instructions
Project Name	Enter the name of the project (e.g. project or initiative title). If continuing a previously submitted project, select the corresponding project from "Project Transfer." If there has been a change in the project operator or activity content, please indicate this during the preliminary consultation
Project category	Check the applicable project category (multiple selections allowed). Refer to Table 1-3 "Eligible Projects" (p.10).
Project information (up to 8,000 characters)	Include the following: • Status before project initiation • Rationale for launching the project • Description of activities implemented after initiation • Explanation of how the project aims to restore or expand CO_2 sinks Attach any relevant documents that help explain the project via "Add Attachment."
Reason for obtaining credits (up to 1,000 characters)	State the reason for seeking credit issuance.
Plans and outlook after credit issuance (*Up to 2,000 characters*)	Describe how obtaining credits will contribute to the continuation or scaling of climate mitigation activities (including the project itself)
Overview of activities implemented during the application period	Based on the project overview, describe the activities implemented during the applicable crediting period. Activities outside this period should be described under Project Information.
Project start date	Enter the project's implementation start date.
Project location	• Specify the project location using the map function. • For instructions for creating the location data, please refer to the *User Manual for General System Users.*

Selection of Target Marine Vegetation

Application field	Notes and Entry Instructions
Selection of target marine vegetation	・[Ecosystem] [Bed Type] [Component Species]: Specify the type of habitat (e.g. seagrass bed, seaweed bed, tidal flat, seaweed aquaculture). For seaweed beds, also select the bed type (see p.20). ・[Calculation Formula Used]: Select the formula used in quantification (see p.17). ・[Cultivation Type]: Indicate whether aquaculture is involved. ※ If the certified period, habitat type, or coefficients used in biomass (wet weight) calculation differ, the input must be split by those distinctions.

[CO_2 removal calculation form]

Application field	Notes and entry instructions
Target Period for Credit Certification	Enter the period for which you are applying for J-Blue Credit certification in the format "from (start date) to (end date)." The certification period must be set in one-year units, although multiple years can be submitted in one application. Since J-Blue Credit is issued based on the annual CO_2 removal estimated from measured standing stock, the selected period must include the survey date. Retroactive certification is permitted for up to 5 years, provided the following two conditions are met: ・ Records of activities and surveys are retained for each applicable year ・ Implementation results for each year can be explained during interview
Target area (ha)	Enter the area (in hectares) for each ecosystem type included in your application.
Basis for Area Calculation	Describe the spatial and temporal justification for defining the project boundary, including supporting documentation (any format is acceptable). Please include the following: ➢ Survey date ➢ Maps or figures showing the survey method and results used to determine area and coverage ➢ Method for identifying ecosystem type (e.g. seagrass bed type) and assessing coverage class ➢ Reasoning behind the activity boundary (e.g. evidence of ecosystem expansion beyond direct intervention areas) ● Include photos as evidence for deeper or difficult-to-verify zones. ● Bathymetry and seafloor maps may also be used. Note: Certainty depends on the survey and identification methods used.
CO_2 removal per unit area	Enter the removal rate (t-CO_2/ha/year) used for calculation
Basis for removal per unit area	Specify the method used to determine the removal factor (e.g. literature-based or field-measured). ※ Attach any supporting documentation if available. ※ Certainty varies depending on data source
Credibility evaluation	To be completed upon resubmission after review by the VVB

[Vessel use during survey]

Application field	Notes and entry instructions
Vessels used during survey	・Provide details about vessels used, including vessel types, number of vessels, operating hours, engine output (kW), and fuel type. ・See p.45 for the method to calculate CO_2 emissions associated with project implementation. ※ If multiple vessels with different specifications were used, enter them separately. For additional vessels, set "Marine plant selection" to "0" and enter only the vessel data.

[New use of nets, ropes, and buoys]

Application field	Notes and entry instructions
New use of nets, ropes and buoys	・If new nets, ropes, or buoys are used during project implementation, you must deduct the associated CO_2 emissions from material production from the first year's removal amount. Enter the type and weight of the materials used. ・Refer to p.45 for the emission calculation method.

[Baseline setting, validity, and quantity]

Application field	Notes and entry instructions
Baseline CO_2 removal amount	・Enter the estimated amount of CO_2 removal that would occur in the absence of the project (i.e. the baseline).
Basis for baseline estimation	・Explain the environmental conditions of the project area without project implementation, and describe the basis for how the baseline CO_2 removal amount was determined. ・Refer to p.9 of the Guidelines for the baseline concept. ※ If you have reference documents to support the baseline calculation, attach them using the "Add Attachment" option. ※ The value calculated in the "CO_2 Removal Estimation Form" will automatically subtract the baseline removal amount and CO_2 emissions from vessel use (see p.46).

[Lead applicant and co-applicant entry form (Non-public information)]

Application field	Notes and entry instructions
Initial holder of the J-Blue Credit upon Issuance	The issued J-Blue Credits will initially belong to the entity designated by the applicant. Enter the name of each entity with their initial ownership percentage in parentheses after the name (ensuring the total adds up to 100%). Also include a note on each party's contribution level. For guidance on determining contribution, refer to p.16 of the Guidelines. Note: The initial ownership ratio does not need to match the contribution level. Please coordinate among all involved parties to determine both. ※ Examples of relevant parties: fishers (with or without fishing rights); port authorities; local governments (administration); universities (e.g. involved in field research); other organizations active in the same marine area

2.2.2 Concept of contribution

When determining the ownership of credits, all relevant parties should discuss and agree upon their respective levels of contribution, based on the actual implementation and roles in the project. Below is an example of how to consider the contribution levels of different parties in a project focused on ecosystem base creation:

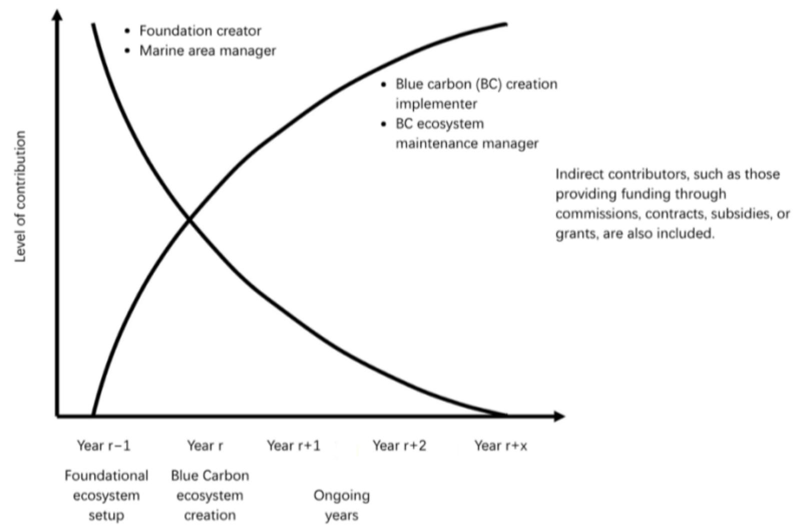


Figure 2-1: Example of how to consider project implementers' contributions (in the case of foundation creation projects)

Chapter 3 – Survey and Calculation

3.1 Planning for quantifying CO_2 removals

3.1.1 Selection of CO_2 removal quantification method

Coastal ecosystems such as seagrass and seaweed beds, mangroves, and tidal flats absorb atmospheric CO_2 through photosynthesis. A portion of the atmospheric CO_2-derived organic matter is stored in sediments, seawater, or the deep ocean, where it can remain for hundreds of years. These ecosystems serve as net sinks of atmospheric CO_2, and the J-Blue Credit scheme quantifies and credits this net removal, referred to as blue carbon.

The amount of CO_2 removed is calculated by multiplying the distribution area of the target ecosystem (as influenced by project implementation) by the annual CO_2 removal amount per unit area, which is defined as "removal coefficient (RC)". This RC is derived from net primary production (NPP) and the percentage remaining in the carbon pools, defined as the "residual fraction (RF).

There are two main quantification approaches:

- Equation 1 is applicable to all eligible ecosystem types.
- Equation 2 is used for seagrass and seaweed ecosystems specifically.

For seaweed aquaculture projects:

If the cultivation structure (e.g. raft, net) has a measurable surface area, CO_2 removals may be estimated using that area. If the cultivated area is difficult to measure (e.g. rope-based systems), removals may instead be calculated based on the total rope length, using Equation 2-2. This involves multiplying the wet biomass per unit rope length by the RF.

The following parameters should generally be obtained through field measurements: distribution area of the target ecosystem or aquaculture facility, wet biomass per unit area or per unit rope length. In contrast, the RC and RF are typically drawn from literature values.

Refer to Figure 3-2 for an overview of the available quantification methods. Select the method that aligns with your project design, and plan the necessary field surveys accordingly. Details on survey methods are provided in Section 3.2, and information on removal coefficients is outlined in Section 3.3.

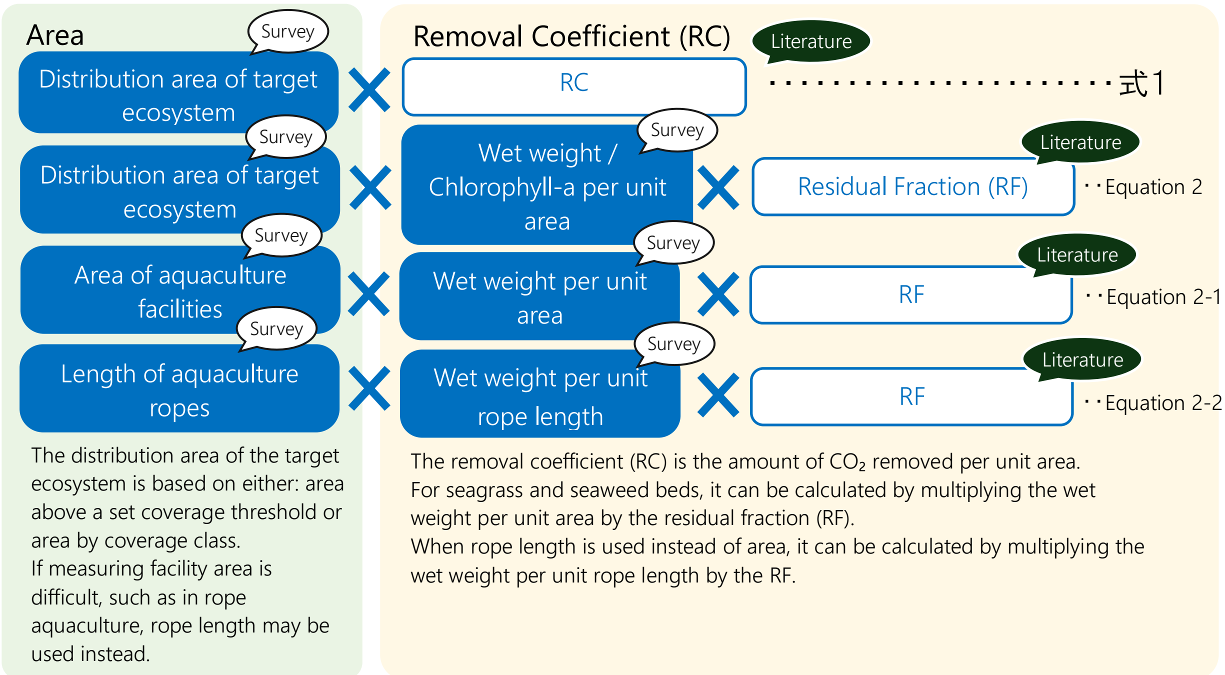


Figure 3-1: Method for calculating CO_2 removal from production volume

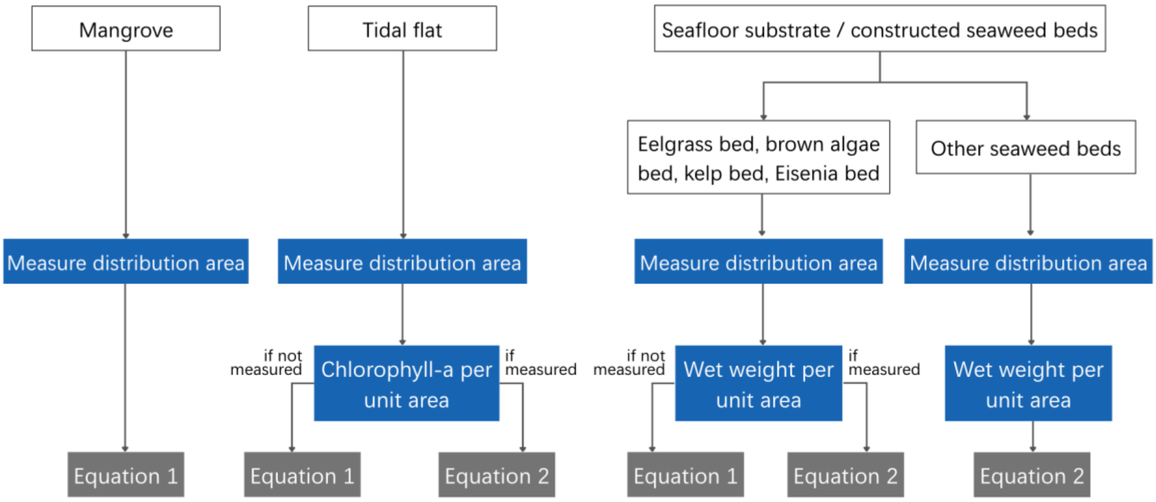


Figure 3-2 (1): Formula selection flow (excluding cultivated seaweed beds)

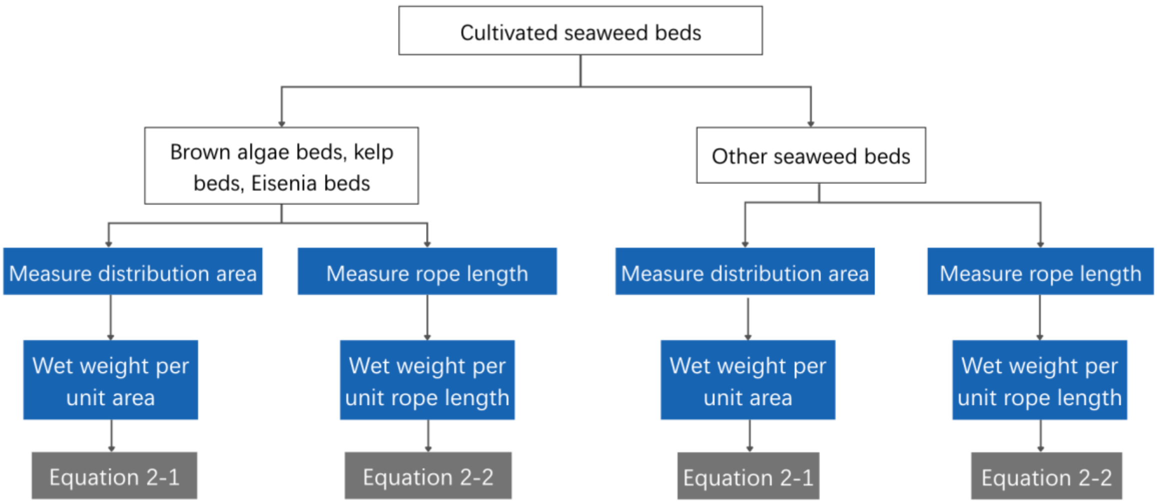


Figure 3-2 (2): Formula selection flow (cultivated seaweed beds)

3.1.2 Key considerations for quantifying CO_2 removals

The certainty of each parameter required to calculate CO_2 removals varies depending on the method used to measure or estimate it. Under the J-Blue Credit system, the credibility of each parameter used in the calculation is reflected in the final volume of credits issued.

To enhance the overall confidence in the estimated CO_2 removals, project developers should ensure that all parameters, such as survey data and removal coefficients, are established using robust and transparent methods. The greater the reliability of each element, the higher the certainty of the resulting CO_2 removal value.

Table 3-1 Key considerations for calculation

<table>
<tr><th>Elements required for calculation</th><th colspan="2">Key considerations</th><th>Reference</th></tr>
<tr><td>Appropriate area of the target ecosystem</td><td>Certainty of the distribution area of the target ecosystem
• Determination of ecosystem boundaries
• Consideration of vegetation cover (e.g., density or percent cover)</td><td>Certainty of the ecosystem type</td><td>3.6 (p.41)</td></tr>
<tr><td>Removal coefficient by ecosystem type</td><td colspan="2">Reliability of the removal coefficient
• Use of site-specific or literature-based values
• Consideration of the local ecosystem type and density</td><td>3.6 (p.43)</td></tr>
</table>

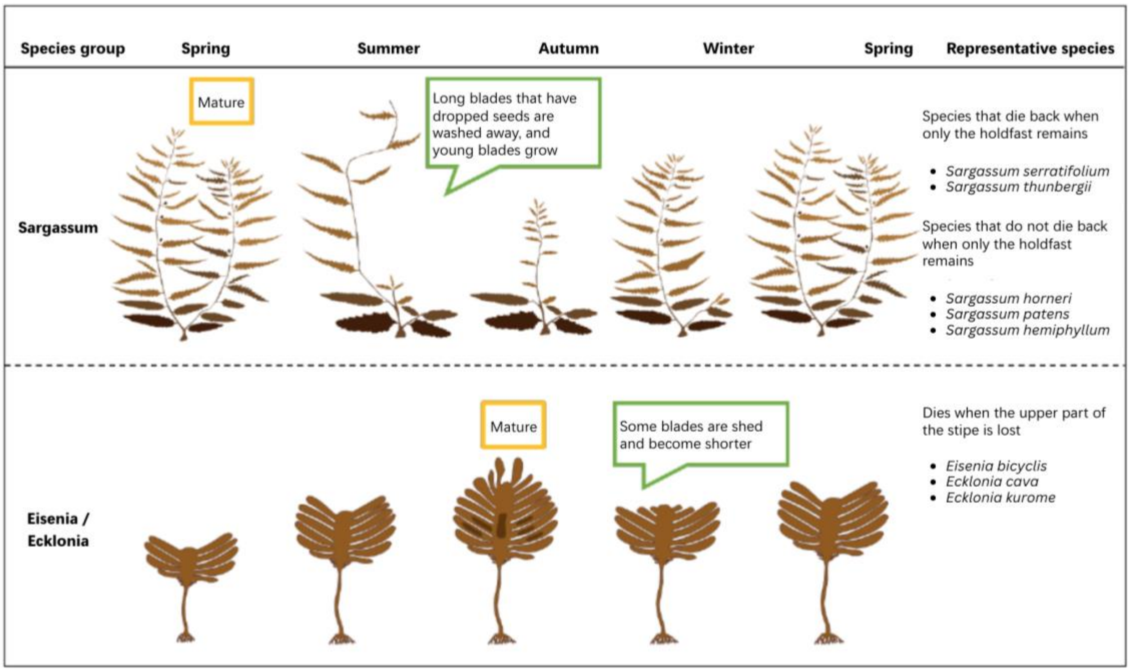
As noted in Chapter 1, whether the proposed project qualifies for credit certification, and whether the project boundaries and baseline are appropriately defined, will be subject to review. Therefore, these aspects should be carefully verified before proceeding with any surveys or calculations.

Reference materials for selecting survey methods and setting removal coefficients are provided in Sections 3.2 and 3.3. However, since the most suitable approaches may vary depending on the characteristics of the target ecosystem, local conditions, or available budget, it is strongly recommended to consult with technical experts or the secretariat in advance when planning your monitoring and calculation approach.

3.2 Selecting Survey Methods

3.2.1 Timing of surveys

Among the ecosystems covered by this program: seagrass beds, seaweed beds, mangroves, and tidal flats, the distribution and biomass of seagrass and seaweed ecosystems vary seasonally. Therefore, it is recommended to conduct field surveys during the peak growing season, when the target seagrass or seaweed species are most developed and their distribution and composition are easiest to assess. For tidal flat ecosystems, surveys should ideally be conducted between April and June, during daytime spring low tides, when conditions allow for optimal observation.



(3rd edition, Guidelines for Countermeasures against Isoyake, Fisheries Agency, March 2021)

Figure 3-3: Seasonal changes in perennial seaweeds

Table 3-2 Main ecosystems eligible for J-Blue Credit and recommended survey timing

Ecosystem type	Seabed type	Key Species	Survey timing (recomm.)
Seagrass beds	Eelgrass beds	*Zostera marina, Zostera japonica, Phyllospadix iwatensis, Halophila spp.*	Early summer
Seaweed beds	Sargassum beds	*Sargassum horneri, Sargassum siliquastrum, Sargassum muticum, Sargassum* spp.	Spring
	Kelp beds	*Saccharina japonica, Saccharina angustata, Agarum clathratum, Alaria crassifolia, Costaria costata*	Summer
	Arame beds	*Eisenia bicyclis, Ecklonia cava, Ecklonia stolonifera, Ecklonia kurome, Ecklonia tsuruarum*	Autumn
	Wakame beds	*Undaria pinnatifida, Hizikia fusiforme*	Spring to early summer
	Tengusa beds	*Gelidium, Gracilaria, Ahnfeltia spp.*	Spring to summer
	Other	*Porphyra, Corallina, green algae, small brown algae*	-
Mangroves	-	Mangrove species	All year
Tidal flats	-	-	During low tide

※ The recommended timing may vary depending on the local marine environment. Confirm the peak growth season and appropriate timing for surveys in the target region.

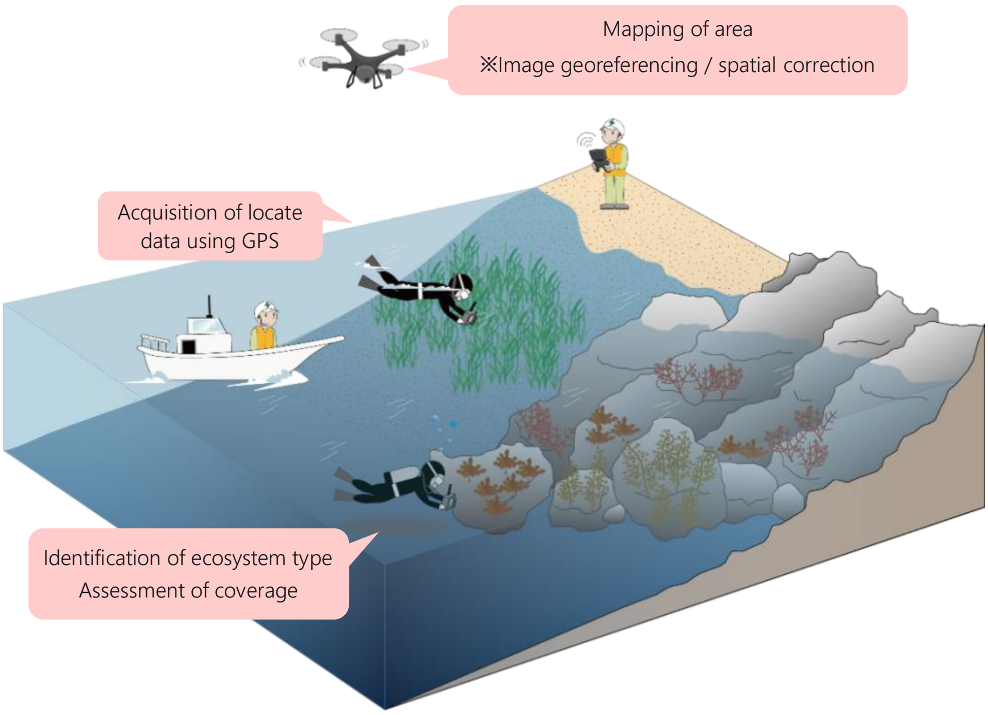
3.2.2 Method for determining distribution area

This section outlines standard survey methods for determining the distribution area of the target ecosystems

As previously noted, accurately estimating CO_2 removal requires identifying both the spatial extent and the type of the ecosystem. There are several approaches for determining distribution, including the use of aerial or satellite imagery to assess broader coverage, and on-site visual surveys for direct observation. Where the ecosystem is clearly visible, aerial or drone imagery are an efficient way to capture large-scale distribution patterns. Where visual confirmation is difficult or the ecosystem type cannot be distinguished from imagery, methods such as underwater visual surveys may be necessary. The same applies to aquaculture facilities: drone images or equivalent sources should be used to define the area of cultivation.

High-accuracy geolocation is essential for estimating area, so images should be georeferenced or corrected for positional accuracy. For field surveys, using GPS to record coordinates significantly increases the reliability of the area estimate. Since seagrass and seaweed ecosystems often vary in density (or "coverage"), estimating area by coverage class within the distribution range can improve accuracy.

Combining multiple survey methods, based on their respective strengths, can further improve data reliability. Even when using the same method, the type of ecosystem and local environmental conditions may influence what information can be collected. Therefore, survey planning should be tailored to the local context and the information needed.



Key points for surveying

(1) Defining the boundaries of the target ecosystem
- Select methods that allow for accurate delineation of the spatial extent and boundaries
- Record positional data using corrected imagery or GPS-based geolocation

(2) Accounting for coverage density (for example: determine area above a defined coverage threshold, or calculate area by coverage class)

(3) Use methods that allow identification of ecosystem type: choose approaches suitable for distinguishing between ecosystem types present in the area

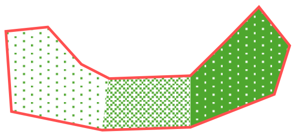
[Method for Estimating Area with Coverage Consideration]

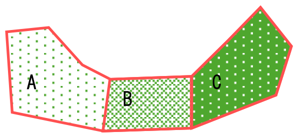
Seagrass and seaweed beds exhibit varying biomass density depending on habitat conditions. Therefore, when estimating CO_2 removal, it is more accurate to calculate distribution area based on actual coverage-adjusted area rather than using the outer boundaries of the bed alone.

Certainty of distribution area estimations

Area estimation based on outer edge of ecosystem < Effective area estimation based on the area of each coverage class

Effective area＝area×coverage





Zone	Area	Coverage	Area
A	14ha	25%	3.5ha
B	10ha	50%	5.5ha
C	18ha	75%	13.5ha
Total	42ha	―	22.5ha

Figure 3-5: Example of Area Estimation Incorporating Coverage

■ Method for Assessing Coverage

To assess the coverage of a seagrass or seaweed bed, place a quadrat (square frame) on the seabed and record the percentage of the area covered by the vegetation as seen from above. This is referred to as visual coverage. Since visual estimates can be prone to error, a classification using approximately five levels (e.g., coverage ranges) is considered sufficient. If possible, capture photographs or other visual records to support your observations and attach them to the online system as supporting evidence.

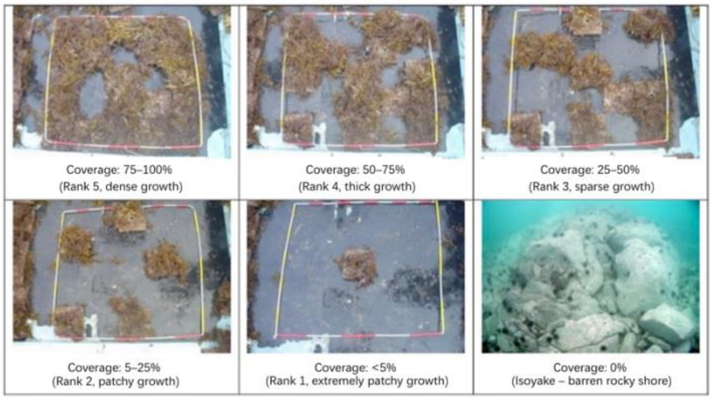
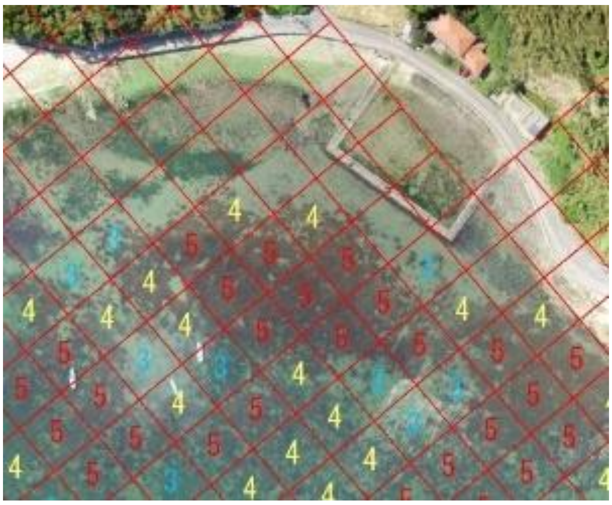


Figure 3-6: Example of coverage classes

Source:
3rd Edition, *Isoyake Countermeasure Guidelines*, Fisheries Agency of Japan, March 2021 (partially modified).



If the condition of the seagrass and seaweed bed is clearly visible, it is also effective to divide aerial drone images into grids (mesh), interpret the coverage class for each grid, and then calculate the actual coverage area by summing the area for each coverage class.

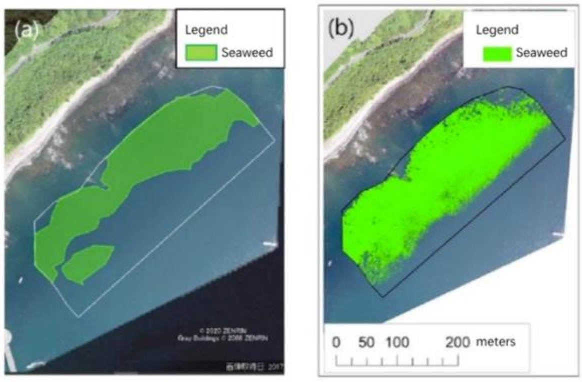
Figure 3-7: Example of coverage classes using drone imagery

Source: Sugimura K., Kobayashi T., Mito Y., Yoshihara S., Okada T., Kuwae T. (2021). *Establishment of a Blue Carbon Offset System in Hakata Port and Future Prospects*. Journal of Japan Society of Civil Engineers, Series G (Environmental Research), Vol. 77, No. 2, pp. 31–48.

[Method for Determining Distribution Area]

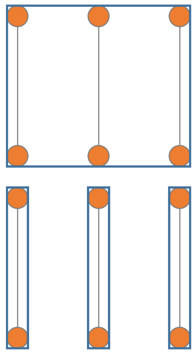
■ Interpreting Imagery

There are two main ways to identify seaweed beds from drone or aerial images: visual interpretation and image analysis. Both methods are said to achieve an accuracy of approximately 70 to 90 percent. When submitting an application through the online system, it is important to clearly indicate the basis for identifying the seagrass or seaweed bed and the method used for analysis.



Source: *Guidelines for Large-Scale Seaweed Bed Monitoring*, Fisheries Agency of Japan, March 2021.

[Method for Determining the Area or Rope Length of Aquaculture Facilities]



It is important to accurately determine both the area or rope length of the aquaculture facilities or zones subject to the application, and the amount of seaweed cultivated within those measured areas. To determine the area of aquaculture facilities or plots, you may use aerial photographs taken by drones, or satellite images from tools such as Google Earth or QGIS to confirm the facility's location and calculate the area.※

Please note that harvest (shipment) data held by fisheries cooperatives is not accepted as objective evidence. Instead, clear documentation is required to verify the location and amount of cultivated seaweed - such as aerial drone imagery showing the cultivation zones and rope length, or third-party verification materials like insurance certificates for the aquaculture facilities.

※ For details on how to calculate area using drone or satellite images, refer to the Guidelines for Large-Scale Seaweed Bed Monitoring, Fisheries Agency of Japan, March 2021.

Table 3-3: Characteristics of Survey Methods (Seagrass and Seaweed Beds)

Perspective	Survey Method	Considerations	On-site survey	Seagrass/seaweed: Boundary determination	Seagrass/seaweed: Coverage density	Type (seagrass/ seaweed)
Aerial	Satellite imagery	Image correction required (geometric correction, orthorectification)		○		
	Aerial photography			○		
	Aerial drone		○	○		
On water	Shoreline/Stand-up Paddle (SUP) Survey	GPS-based position data can be obtained	○	○		
Surface	Surface observation (viewing box, surface drone, etc)		○	○	○	○
	Acoustic surveying		○	○		
Underwater	Underwater camera	Requires techniques to obtain accurate location data	○		○	○
	Underwater drone		○	○	○	○
	Direct diver observation		○	○	○	○
Other	Existing survey reports (survey drawings, etc.)	Position data confirmation only	–	※	–	–

Notes: "O" indicates that the method generally provides reliable data for the corresponding item. Results may vary depending on the type of ecosystem, local environmental conditions, and the equipment used.

※ Existing diagrams or survey results (e.g. blueprints) may be used as reference materials for area estimation.

Table 3-4 Characteristics of survey methods (mangrove and tidal flat ecosystems)

Perspective	Survey method	Considerations	On-site survey	Ecosystem area: Boundary determ.	Ecosystem type identification
Aerial	Satellite imagery	Requires image position correction (geometric correction, orthorectification)		○	○
	Aerial photography			○	○
	Aerial drone survey		○	○	○
On water	Surface survey (e.g. SUP)	Possible to obtain GPS-based location data	○	○	○
Other	Existing survey reports (e.g. survey results)	Location information confirmation	–	※	–

Notes: "O" indicates that the method generally provides reliable data for the corresponding item. Results may vary depending on the type of ecosystem, local environmental conditions, and the equipment used.

※ Existing diagrams or survey results (e.g. blueprints) may be used as reference materials for area estimation.

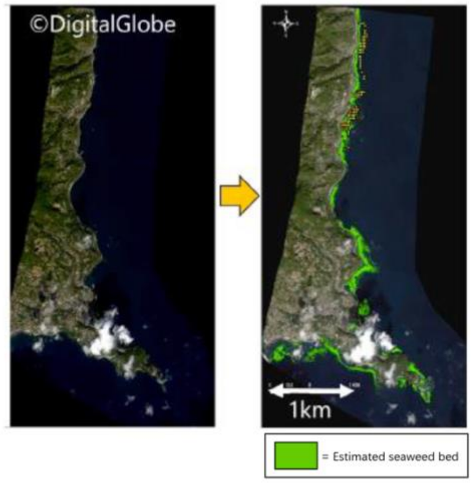
■ Reference Materials for Surveys

- Guidelines for Wide-Area Seagrass Bed Monitoring, Fisheries Agency, March 2021
- 3rd Edition: Guidelines for Countermeasures Against Isoyake (Seaweed Bed Degradation), Fisheries Agency, March 2021
- Monitoring Site 1000 Coastal Survey Manual (Rocky Shores, Tidal Flats, Seagrass Beds, Seaweed Beds), Ministry of the Environment

Satellite imagery

■Survey overview

・Target ecosystems are identified through visual interpretation or automated classification of satellite images



Source: Guide to Broad-Scale *Seaweed and Seagrass Beds* monitoring, Ministry of Agriculture, Forestry and Fisheries

■Certainty of area estimation

- Enables broad-scale spatial assessment (municipal, prefectural, regional).
- Suitable for depths of approximately 0–10 meters; deeper areas are difficult to assess.
- Vertical distribution (e.g. growth along vertical seawalls) is hard to assess.
- Accuracy for distinguishing presence or absence of seagrass/seaweed beds is approximately 60–85%. ※1
- High-precision positional data can be obtained.
- Coverage density (canopy density) is often difficult to evaluate.

■Certainty of ecosystem type identification

- Mangroves and tidal flats can be identified
- Presence or absence of algal beds can be observed, but identification of specific algal bed types is often difficult.

■Advantages & Considerations

- Calculation is possible by utilizing open-source data or purchasing satellite images.
- Photos may not always be available for optimal timing or season, potentially resulting in underestimation of seagrass or tidal flat areas.
- New satellite imaging can be commissioned, but it is often expensive.
- In algal bed ecosystems, it is often difficult to assess coverage or type, so combining this with other survey methods is recommended if such information is needed.

※1: *Guide to Broad-Scale Seaweed and Seagrass Beds Monitoring*, Fisheries Agency of Japan, March 2021

Aerial Photography

■Survey overview

・Target ecosystems are identified through visual inspection or automated interpretation of aerial photographs.

■Certainty of Area Estimation

- Enables large-scale spatial assessment (e.g. municipal, prefectural level).
- Suitable for depths of approximately 0–10 meters; deeper areas are difficult to assess.
- Vertical distribution (e.g. growth along vertical seawalls) is hard to assess.
- Accuracy of seagrass and seaweed bed detection is approximately 65–85%※1.
- High-precision geolocation is possible (orthorectification is required).
- Often difficult to assess vegetation density (percent cover).

■Certainty of Ecosystem Type

- Mangroves and tidal flats can be identified.
- Presence of seagrass or seaweed beds can be detected, but distinguishing specific bed types is often difficult.

■Advantages and Considerations

- Surveys can be conducted using purchased aerial photographs.
- Photos may not always reflect the optimal season or timing for surveys, potentially leading to underestimation of bed or flat areas.
- New photography is possible but often costly.
- In seagrass and seaweed ecosystems, identifying percent cover and ecosystem type may be difficult. Combining this method with others is recommended for more reliable data.

※1: *Guide to Broad-Scale Seaweed and Seagrass Beds Monitoring*, Fisheries Agency of Japan, March 2021

Drone Imagery

■Survey overview

- Target ecosystems are identified through visual inspection or automated interpretation of low-altitude images captured by drones or similar tools.

Figure Source: *Guide to Broad-Scale Seaweed and Seagrass Beds Monitoring*, Fisheries Agency of Japan, March 2021.

■Certainty of Area Estimation

- Enables broad spatial assessment (e.g. local coastal areas).
- Effective for depths of approximately 0–10 meters; deeper areas are difficult to assess.
- Vertical distribution (e.g. growth along vertical seawalls) is hard to assess.
- Accuracy of detecting seaweed/seagrass beds is estimated at 70–90%※1.
- High-precision geolocation is possible (orthorectification is required).
- If the imagery clearly shows seaweed or related features, it may be possible to estimate percent cover (density).

■Certainty of Ecosystem Type

- Mangroves and tidal flats can be identified.
- In some cases, specific types of seagrass or seaweed beds may also be identified.

■Advantages and Considerations

- Surveys can be conducted during optimal seasons.
- If it is difficult to assess percent cover or identify bed types, it is recommended to combine this method with other techniques.

Wading/on-foot survey / Stand-Up Paddleboard (SUP)

■Survey overview

- The target ecosystem is assessed visually while moving it over it via wading or stand-up paddleboard (SUP)

■Certainty of Area Estimation

- Since this method follows linear transects, the comprehensiveness of area coverage is lower compared to aerial photography.
- Effective for depths of approximately 0–10 meters; deeper areas are difficult to assess.
- Vertical distribution (e.g., vegetation on vertical seawalls) is hard to assess.
- When carrying a GPS device, accurate geolocation data can be obtained.
- In some cases, vegetation cover density within seagrass and seaweed beds can be visually assessed.

■Certainty of Ecosystem Type

- Mangrove and tidal flat ecosystems can be identified.
- Seagrass and seaweed bed types may be identifiable depending on visibility.

■Advantages and Considerations

- Surveys can be timed to coincide with the optimal season.
- Suitable for shallow waters where boats cannot enter.
- Not suitable for covering large areas due to reliance on manual labor.
- If vegetation cover or seagrass/seaweed bed type identification is difficult, it is recommended to combine with other methods.

Surface observation (viewing box, surface drones, snorkeling, etc.)

■Survey overview
- Visual observation from the water surface is used to assess seagrass and seaweed bed ecosystems.

Source: Wide-area Seagrass and Seaweed Bed Monitoring Guidelines, Fisheries Agency.

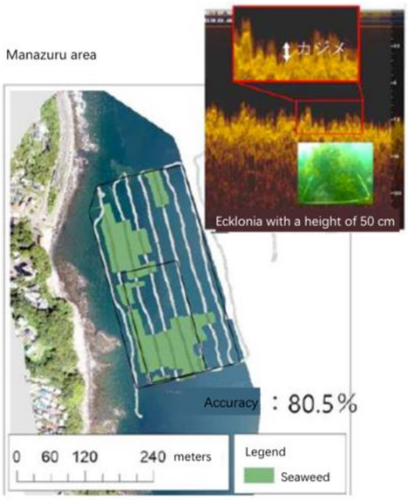
■Certainty of Area Estimation
- Since this method follows linear transects, the comprehensiveness of area coverage is lower compared to aerial photography.
- Effective for depths of approximately 0–10 meters; deeper areas are difficult to assess.
- Vertical distribution (e.g., growth on vertical seawalls) can be observed within the field of view, but depth estimation accuracy is limited with visual observation alone.
- Accurate location data can be obtained using GPS-enabled devices or carrying a GPS unit.
- Can distinguish between sparse and dense coverage (percent cover) of vegetation within the visual range.

■Certainty of Ecosystem Type
- Seagrass or seaweed bed type can be identified within the visible range.

■Advantages and Considerations
- Surveys can be conducted during the optimal season.
- Surface drones and snorkeling are effective even in shallow areas where boats cannot access.
- While snorkeling alone is not suitable for large-scale surveys, broad spatial coverage is possible using the manta tow method (a diver towed by a boat).
- If assessing percent cover or bed type proves difficult, combining this with other methods is recommended.

Acoustic surveying

■Survey overview
- The seagrass or seaweed bed ecosystem is identified using sonar, based on differences in acoustic reflection between vegetation and the seabed.



Source: Wide-area Seagrass and Seaweed Bed Monitoring Guidelines, Fisheries Agency.

■Certainty of Area Estimation
- Since this method follows linear transects, the comprehensiveness of area coverage is lower compared to aerial photography.
- Capable of surveying depths of approximately 3 to 100 meters, making it suitable for deeper areas.
- Vertical distribution (e.g., along vertical seawalls) can be assessed below the surface layer.
- Accuracy in detecting the presence or absence of seagrass or seaweed beds is approximately 74–92%[※1].
- High-precision location data can be obtained using GPS on the survey vessel.
- It is generally difficult to assess seagrass or seaweed bed density (coverage).

■Certainty of Ecosystem Type
- The presence or absence of a bed can be determined, but it is generally difficult to identify the specific bed type.

■Advantages and Considerations
- Surveys can be conducted during appropriate seasonal windows.
- Effective even in turbid water or when seagrass and seaweed beds are not visible from the surface.
- If detailed information on density or ecosystem type is needed, combining this method with other approaches is recommended.

※1: Wide-area Seagrass and Seaweed Bed Monitoring Guidelines, Fisheries Agency, March 2021.

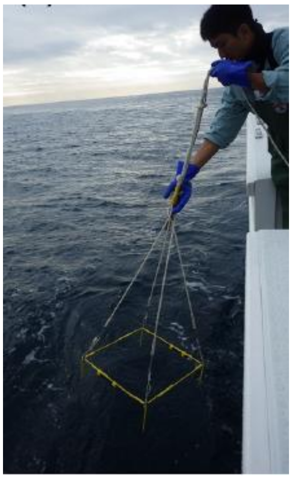
Underwater camera

■Survey overview

- The underwater ecosystem is identified by visually interpreting video footage captured by an underwater camera.

■Certainty of Area Estimation

- As a point-based survey, spatial coverage is limited compared to aerial imagery. Survey range depends on cable length, typically covering depths of approximately 3–40 meters.
- If camera angle is adjusted appropriately, vertical distribution (e.g., growth along vertical seawalls) can be observed.
- Presence or absence of seagrass or seaweed beds can be determined.
- Although GPS can be used on the vessel, current drift may cause discrepancies in pinpointing survey locations.
- Density or patchiness of seagrass or seaweed coverage can be assessed



Source: Guidelines for Broad-Scale Seaweed and Seagrass Beds Monitoring, Fisheries

■Certainty of Ecosystem Type

- Ecosystem (e.g., seagrass or seaweed bed) type can be identified.

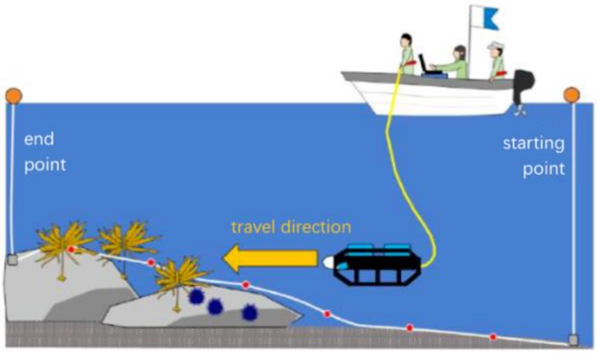
■Advantages and Considerations

- Surveys can be conducted during optimal seasonal windows.
- Camera deployment may be difficult under rough wave or strong current conditions.
- In turbid waters, it may be challenging to identify bed type or assess coverage.
- Area estimation may require combining this method with other approaches.

Underwater drone

■Survey overview

- Identifies seagrass and seaweed bed ecosystems by visually interpreting underwater video footage captured using an underwater drone.



Source: Guidelines for Broad-Scale Seaweed and Seagrass Beds Monitoring, Fisheries Agency, March 2021

■Certainty of Area Estimation

- As a line-based survey, its spatial coverage is lower than aerial photography.
- Survey range depends on cable length, typically covering 3–150 meters.
- Vertical distribution (e.g., growth on vertical seawalls) can be captured.
- Presence or absence of seagrass and seaweed beds can be determined.
- GPS can be used on the vessel to record dive start points, but precise underwater positioning of the drone is difficult, lowering location accuracy.
- Positioning accuracy can be improved by laying out transects (lines) with GPS-measured start and end points and observing along those lines.
- High-accuracy location data is possible when equipped with a transponder (underwater acoustic receiver).
- Density of seagrass or seaweed cover can be assessed.

■Certainty of Ecosystem Type

- Ecosystem (e.g., seagrass or seaweed bed) type can be identified.

■Advantages and Considerations

- Can be conducted during appropriate seasonal timing.
- Surveying may be difficult in strong waves or currents if the drone drifts.
- If precise location data is hard to obtain, it is advisable to combine with other survey methods.

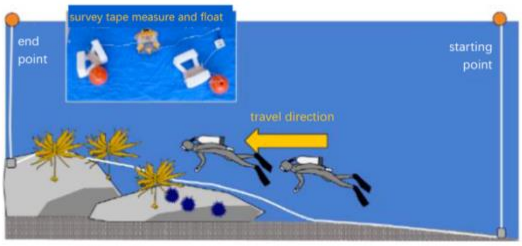
SCUBA Visual Survey

■Survey overview

- Seagrass and seaweed bed ecosystems are identified through visual assessment by a diver.

■Certainty of Area Estimation

- As a line-based survey, its spatial coverage is lower than aerial photography.
- The typical surveyable depth range is 0–30 meters.
- Vertical distribution (e.g., vegetation on vertical seawalls) can be assessed.
- Presence or absence of seagrass or seaweed beds can be determined.
- While GPS can be used on the vessel to log dive start points, it is difficult to accurately track a diver's underwater position, resulting in reduced location precision.
- Accuracy can be improved by setting transects using GPS at the start and end points and conducting observations along the transect line.
- If equipped with a transponder (underwater acoustic receiver), high-accuracy positioning is possible.
- Seagrass and seaweed cover density can be measured with high accuracy using quadrats.



Source: Guidelines for Broad-Scale Seaweed and Seagrass Beds Monitoring, Fisheries Agency, March 2021

■Certainty of Ecosystem Type

- Ecosystem (e.g., seagrass or seaweed bed) type can be identified.

■Advantages and Considerations

- Surveys can be conducted during optimal seasonal windows.
- Less affected by currents or turbidity compared to other methods.

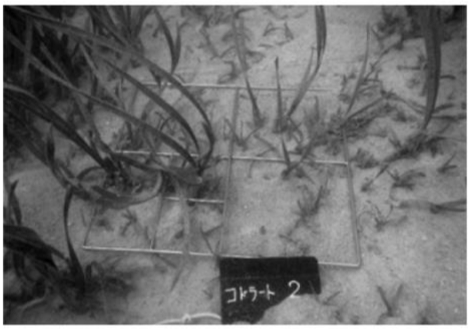
3.2.3 Method for Determining Wet Weight per Unit Area

There are two approaches to determine the wet weight per unit area: on-site measurement and use of literature values.

(1) On-site measurement

1) Natural habitats and artificial structures

To determine the wet weight per unit area, a quadrat (sampling frame) is placed at representative locations within the target seaweed or seagrass bed, selected with consideration to coverage density. Seaweed or seagrass within the quadrat is harvested, and the wet weight is measured. The total weight is then divided by the area of the quadrat to calculate the wet weight per square meter. Because biomass can vary between locations, collecting samples from multiple representative sites improves the reliability of the result.



Source: Guidelines for Measuring Blue Carbon (CO_2 Uptake and Carbon Removal) in Ports, Port and Airport Research Institute Report, No.1309, 2015.
Figure 3-8: Example of Quadrat Setup

2) Aquaculture Facilities

For projects involving aquaculture operations, it may not be feasible to measure the total harvest and residual biomass. In such cases, wet weight per unit area (or per unit rope length) can be estimated by harvesting at representative sites, measuring the biomass, and dividing by the harvested area or rope length. Accuracy is improved by conducting harvests at multiple representative points. It is also recommended to capture visual evidence of biomass conditions—such as photographs or video taken using underwater drones or cameras. For further details on how to calculate CO_2 removal for farmed seaweed, see Section 3.3: Approach to Setting Removal Coefficients.

Note that harvest volume data held by fisheries cooperatives (e.g., shipping records or cultivation plans) are not accepted as objective evidence of actual activity. Instead, documentation that allows for independent verification (e.g. aerial imagery pinpointing cultivation areas and rope lengths, or insurance certificates for aquaculture facilities) is required. The VVB evaluates the reliability of reported harvest and residual volumes based on aquaculture area and reported wet weight per unit area.

■ Reference Materials on Field Observation

- Monitoring Site 1000 Coastal Survey Manual (Rocky Shores, Tidal Flats, Seagrass Beds, and Seaweed Beds), Ministry of the Environment, Japan
- Guidelines for Measuring Blue Carbon (CO_2 Uptake and Carbon Removal) in Ports, Port and Airport Research Institute Report, No.1309, 2015
- Third Edition of the Guidelines for Countermeasures Against Isoyake (Seaweed Bed Degradation), Fisheries Agency, March 2021

When conducting on-site observations, the following points must be considered. Since there is a trade-off between survey efficiency and representativeness of the sampling locations, it is important to develop a feasible survey plan based on the specific conditions of the target area.

Table 3-5 Considerations for On-Site Observation

Key considerations	Details to keep in mind
Survey Timing by Seaweed Bed Type	The optimal timing for surveys varies depending on the type of seaweed bed. To capture higher CO_2 uptake, it is preferable to conduct surveys during the peak growth period whenever possible.
Representativeness of Survey Sites	It is important to select survey sites that are representative of the seaweed bed type and its growth conditions. The more survey sites are selected, the less variation in the data - improving the accuracy of annual CO_2 uptake estimates. As supporting evidence of the representativeness of survey sites, it is helpful to record coverage and take photos of the quadrat area prior to biomass collection
Permit Requirements	Depending on the species or location, you may need permission from local authorities. Before collection, confirm with the prefectural fisheries department whether a special harvest permit is required. Also check with environmental departments regarding permits under laws like the Natural Parks Act or Natural Environment Conservation Act, or relevant local ordinances.

(2) Use of Literature Values

It is also possible to estimate the wet biomass per unit area using the relationship between coverage and wet weight, based on observed coverage from on-site surveys. Table 3-6 and Figure 3-9 present the results of this relationship by seaweed bed type, showing coverage class and corresponding wet biomass (kgWW/m²). However, please note that these values can vary significantly depending on the timing and location of the survey, so they should be used as reference examples only.

Table 3-6: Relationship Between Coverage Class and Wet Biomass

Seaweed bed type	Regression Formula (contains R2: coefficient of determination, and n: sample size)	Data Source notes ※²	
Garamo bed	Wet biomass (kgWW/m²) = 0.0279 × e^(1.2032 × coverage class※1) (R^2 = 0.684, n = 42)	Spring data of Garamo beds, Sargassum patens, and Sargassaceae species.	1) 2) 3)
Kombu Bed	Wet biomass (kgWW/m²) = 0.9762 × e^(0.3855 × coverage class) (R^2 = 0.4339, n = 28)	Early summer and summer data for Mitsuishi kombu and Sujime.	1)
Arame bed	Wet biomass (kgWW/m²) = 0.0311 × e^(0.9658 × coverage class) (R^2 = 0.4291, n = 26)	Early summer and summer data for Kurome, Arame, and Tsuruarame.	1) 2)
Wakame bed	Wet biomass (kgWW/m²) = 0.0673 × e^(0.7658 × coverage class) (R^2 = 0.2758, n = 20)	Spring data for Wakame and Chigaiso	1) 3)

※1 The coverage classes used in the regression formulas are based on the classification shown in Figure 3-6 on p22.
※2 The data used to compile the regressions are as follows:

1. Unpublished data from the Port and Airport Research Institute
2. Unpublished data from Electric Power Development Co., Ltd. (J-Power)
3. Survey results on the effects of constructing gently sloping revetments as part of the Island City Development Project (Seaweed Bed Survey), August 2020, Fukuoka City Port and Airport Bureau

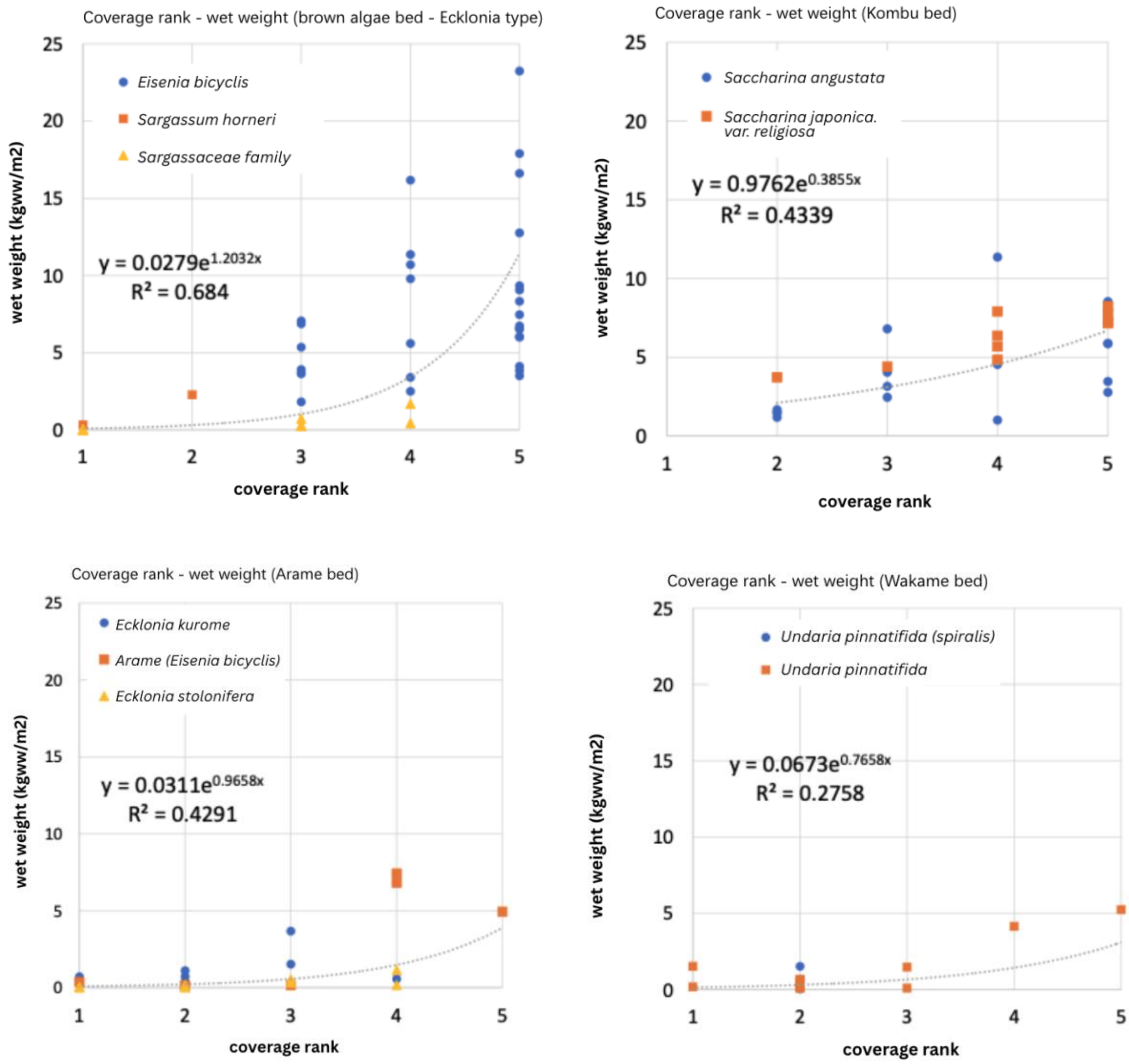


Figure 3-9: Relationship between coverage rank and wet weight by seaweed bed type

3.3 Considerations for setting removal coefficients

As shown previously in Figure 3-1, CO_2 removal is calculated by multiplying the "distribution area of the target ecosystem" or the "wet biomass of the target ecosystem" by various removal coefficients (RC), such as the "CO_2 removal per unit area for each ecosystem type" and "residual fraction (RF)". This section outlines the approach and methods for determining these RCs.

RC can be determined through two methods: on-site observations and use of literature values. In practice, you may either rely solely on already established literature values or set coefficients based on both local measurements and collected literature data.

When setting RCs, it is important to consider the characteristics of the target ecosystem. In particular, for seaweed and seagrass ecosystems, using region-specific coefficients improves the reliability of the estimates.

For example, using national average coefficients listed in this guideline for seaweed ecosystems (i.e., using literature values) is straightforward but lacks regional specificity. As a result, such estimates may not align well with the actual ecosystem and could lead to over- or underestimation, lowering the confidence in the RC. In contrast, if the coefficient is derived from on-site measurements and local studies or research on the constituent species of the ecosystem, the value is more consistent with the local ecosystem and yields greater reliability.

(1) On-site measurement + literature review	(region-specific)	Higher certainty of removal coefficient (RC)	Lower certainty of removal coefficient (RC)
(2) Use of literature values	(region-specific)		
(3) Use of literature values	(not region-specific)		

Figure 3-10 Removal Coefficient (RC) Categories and Their Certainty

CO_2 removal can be calculated using the following formulas:

■ When calculating for natural seagrass or seaweed bed ecosystems:

[Formula 1]

CO_2 removal = A × B

A: Distribution area of the target ecosystem (ha) ⇒ p.21 for details
B: CO_2 removal per unit area (RC, tons CO_2/ha/year) ⇒ section 3.3.1 (1) p.36 for details

[Formula 2]

CO_2 removal = $A \times W_s \times (1 - P_{(w)}) \times P_{(C)} \times R_x \times 44/12 \times (P_1 + P_2) \times C_{(r)}$

A: Distribution area (ha) ⇒ p.21 for details
W_s: Wet weight per unit area (t/ha). ⇒ p.30 for details
$P_{(w)}$: Water content ratio. ⇒ p.37 for details
$P_{(C)}$: Carbon content ratio ⇒ p.37 for details
R_x: Production/biomass ratio (P/B ratio) ⇒ p.37 for details
P_1: Residual fraction (RF) (1) in seafloor sediment ⇒ p.38 for details
P_2: Residual fraction (RF) (2) in the water column as DOC or rDOC ⇒ p.38 for details
$C_{(r)}$: Conversion factor for the entire ecosystem ⇒ p.38 for details

■ When calculating for cultivated seaweed beds

※ Only cultivated areas under the eligible project types outlined on p.10 are subject to this method.

[Formula 2-1] When calculating based on cultivation facility area:

CO_2 removal = $A_f \times (((W_y + W_r) / A_f) \times (1 - P_w) \times P_c \times R_b \times 44/12 \times (P_{r1} + P_{r2}) - (W_y / A_f) \times (1-P_w) \times P_c \times 44/12 \times P_{r1}) \times C_e$

A_f: Cultivation area (ha)
W_y: Harvested wet biomass (tons)
W_r: Unharvested wet biomass (tons)
Pw: Water content ratio ⇒ p.37 for details
P_C: Carbon content ratio ⇒ p.37 for details
Rb: Production/biomass ratio (P/B ratio) ⇒ p.37 for details
P_{r1}: Residual fraction (RF) (1) in seafloor sediment ⇒ p.38 for details
P_{r2}: Residual fraction (RF) (2) in the water column as DOC or rDOC ⇒ p.38 for details
C_e: Conversion factor for the entire ecosystem ⇒ See p.38

[Formula 2-2] When calculated based on rope length at rope-type aquaculture facilities

CO_2 removal = $L_f \times ((W_s + W_l) / L) \times (1 - P_{(w)}) \times P_{(C)} \times R_x \times 44/12 \times (P_1 + P_2) - (W_s / L) \times (1 - P_{(w)}) \times P_{(C)} \times 44/12 \times P_{(L)} \times C_{(r)}$

L_f: Total rope length (m)
W_y: Harvested wet biomass (tons)
W_r: Unharvested (residual) wet biomass (tons)
Pw: Water content ratio. ⇒ p.37 for details
P_C: Carbon content ratio ⇒ p.37 for details
Rb: Production/biomass ratio (P/B ratio) ⇒ p.37 for details
P_{r1}: Residual fraction (RF) (1) in seafloor sediment ⇒ p.38 for details
P_{r2}: Residual fraction (RF) (2) in the water column as DOC or RDOC ⇒ p.38 for details
C_e: Conversion factor for the entire ecosystem ⇒ p.38 for details

■ For Mangrove Ecosystems

[Formula 1]

CO_2 removal = A × B

A: Distribution area of the target ecosystem (ha) ⇒ p.21 for details
B: CO_2 uptake per unit area (RC) ⇒ section 3.3.1 (1) p.36 for details

■ For Tidal Flat Ecosystems

[Formula 1]

CO_2 removal = A × B

A: Distribution area of the target ecosystem (ha) ⇒ p.21 for details
B: CO_2 uptake per unit area (RC) ⇒ section 3.3.1 (1), p.36 for details

[Formula 2]

CO_2 removal = A × C x D

A: Distribution area of the target ecosystem (ha) ⇒ p.21 for details
C: Chlorophyll-a concentration ($mg/m^2/day$) ⇒ p.30 for details
D: Conversion factor from chlorophyll-a to RC ⇒ p.40 for details

■ Example Calculation (CO_2 removal in a Garamo bed (Sargassum-type), 10 ha

[Formula 1] Target ecosystem area: 10 ha (Garamo bed), equivalent to coverage class 3
CO_2 removal = Area of target ecosystem × Removal Coefficient
= 10 ha × 2.7
= 27 t-CO_2/year

[Formula 2] Target ecosystem area: 10 ha (Garamo bed), Wet biomass per unit area: 10 t/ha (equivalent to coverage class 3)
CO_2 removal
= Area × Wet biomass per unit area × RF
= Area × Wet biomass × (1 − Water content ratio) × P/B ratio × Carbon content ratio × 44/12 × (Residual Fraction (1)+ Residual Fraction (2)) × Conversion factor for the entire ecosystem
= 10 ha × 10 t/ha※ × {1 − (0.7–0.9)} × (1.0–1.7) × (0.3–0.35) × 44/12 × (0.0472 + 0.0499) × 1.50
= 1.60 – 9.53 t-CO_2/year

※ Estimated using the conversion formula from 3.2.3 (2) Use of Literature Values (p.31)
Values for each removal coefficient represent minimum and maximum across multiple sources (see p.36–)
Since regional variation can be significant, please consider the reliability criteria when using literature values to determine coefficients.

3.3.1 Setting Removal Coefficients

To establish accurate removal coefficients, it is necessary to define values for each of the contributing elements, including wet biomass per unit area, moisture content (water content ratio), P/B ratio[§] (production to biomass ratio), and carbon content ratio. These coefficients can be derived from direct field measurements, literature reviews, or published reference values. However, when actual measurements are used, the certainty of the removal coefficient increases.

(1) In the case of Formula 1

1) Removal (CO_2 uptake) per Unit Area

The average removal values per unit area are shown below:

Table 3-7: Average CO_2 removal per Unit Area for Blue Carbon Ecosystems (Japan National Average)

Formula	Ecosystem / Habitat type		Removal Coefficient ($t\text{-}CO_2/ha/yr$)	Source
Formula 1	Seagrass bed	Zostera bed	4.9	1
	Seaweed bed	Garamo bed	2.7	1
		Kelp bed	10.3	1
		Arame bed	4.2	1
	Mangrove※		4.76	2
	Tidal flat		2.6	1

※ Recommended for use with beds classified as Coverage Class 3 or higher (see Figure 3.6, p.22)

※ For mangroves, the value reflects soil-based removal only, excluding plant biomass.

Source 1: Table 3-8 No.2
Source 2: Table 3-8 No.1

Table 3-8: References for CO_2 uptake per Unit Area

No	Reference title		Category
1	Edited by: Hiraishi, T., Krug, T., Tanabe, K., Srivastava, N., Baasansuren, J., Fukuda, M., and Troxler, T.G. (IPCC, Switzerland, 2014)	Hiraishi, T., Krug, T., Tanabe, K., Srivastava, N., Baasansuren, J., Fukuda, M. and Troxler, T.G. (eds). IPCC, Switzerland, 2014.	Global average
2	Nationwide estimate of the annual uptake of atmospheric carbon dioxide by shallow coastal ecosystems in Japan	Kuwae, A., Yoshida, G., Hori, M., Watanabe, K., Tanaya, T., Okada, T., Umezawa, A., Sasaki, J. (2023) Journal of JSCE, 11, 23-00139.	Domestic average

(2) In the case of Formula 2

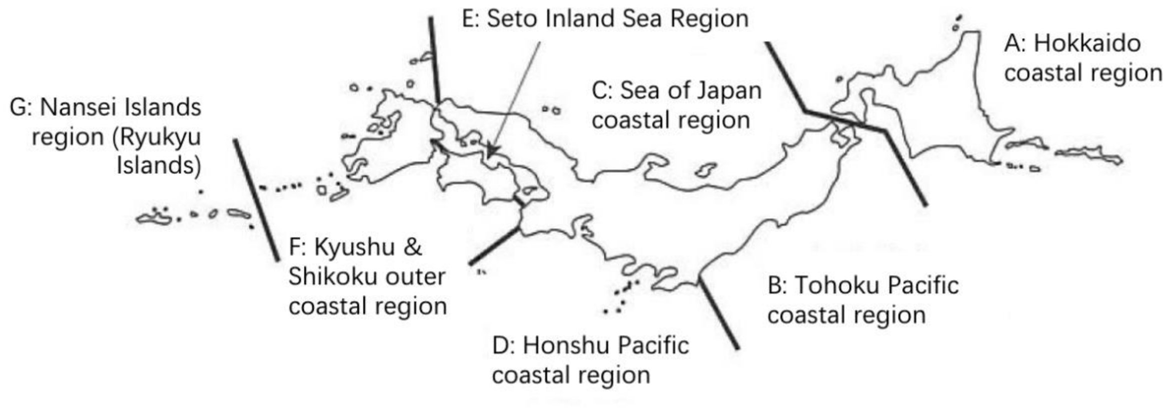
1) Wet Weight per Unit Area
"Wet weight per unit area" can be determined either through on-site measurement or by using literature values.
Refer to section 3.2.3 (1) "Method for Determining Wet Weight per Unit Area" (p.30) for guidance on field-based data collection, and section 3.2.3 (2) (p.31) for guidance on using literature values.
Conversion formulas linking coverage data to wet weight per unit area are also provided.

2) Water Content Ratio, P/B Ratio, and Carbon Content Ratio
The water content ratio, P/B ratio§, and carbon content ratio can be defined through either direct measurement or literature sources (e.g. the Guidelines for Isoyake Countermeasures, 3rd Edition). When using literature sources, it is important to select and set values based on the considerations outlined below.

Table 3-9: Key Considerations When Using Literature Values

Consideration	Details
Are literature sources regionally appropriate?	It is recommended to collect sources that reflect the regional characteristics of the relevant coastal area or regional marine zone.
Do the sources correspond to the main or similar species within the target ecosystem?	Because removal coefficients can vary between species, it is recommended to use values corresponding to the dominant or ecologically similar species in the target ecosystem.
Are multiple literature sources used?	A single source may lack representativeness. Therefore, it is recommended to reference and aggregate data from multiple publications when setting the removal coefficient.

Note: It is advisable to consult with the Secretariat or technical experts in advance to ensure the validity of the collected literature values and methods.



Source: Masakazu Hori, Tomohiro Kuwae, *Blue Carbon: CO_2 Uptake and Storage in Shallow Coastal Ecosystems and Their Utilization*, Chijin Shokan, 2017

Figure 3-11: Example of Marine Regional Classifications

3) Residual fraction

Blue carbon refers to the portion of carbon absorbed by seaweed and seagrass ecosystems that is either deposited as biomass within the ecosystem or in the deep sea, or stored in the ocean as refractory (slowly degradable) dissolved organic carbon (RDOC).

Residual coefficient (1) represents the proportion of annually produced biomass that is deposited within or beyond the ecosystem as carbon.

Residual coefficient (2) represents the proportion of refractory dissolved organic carbon (RDOC) that is stored in the ocean over the course of one year.

These residual coefficients can be determined using literature values from scientific studies. In the application system, default values for residual coefficients are automatically populated based on the target ecosystem and habitat type.

Table 3-10: Removal Coefficient (1) (Carbon Deposition) from Research Studies

Formula	Ecosystem	Removal Coefficient (1)	Source
Formula 2	Seagrass beds	0.1620	1
	Seaweed beds	0.0493	2
	Cultivated beds	0.0472	3

※ For formulas, see p.37. Sources:

1: National estimate of annual CO_2 removal in shallow marine ecosystems (Table 3.8 No.2)

2: Filbee-Dexter et al. (2024), *Carbon export from seaweed forests to deep ocean sinks*

3 Krause-Jensen & Duarte (2016), *Substantial role of macroalgae in marine carbon removal*, Nature Geoscience

Table 3-11: Removal Coefficient (2) (RDOC Retention) from Research Studies

Formula	Ecosystem	Habitat type	Retention Coefficient ②
Formula 2	Seagrass beds	Zostera (Zostera-type)	0.0181
	Seaweed beds	Garamo (Sargassum-type)	0.0499
		Kelp (Laminaria-type)	0.0285
		Arame (Ecklonia-type)	0.0528
		Wakame (Undaria-type)	0.0279
		Tengusa (Red algae-type)	0.0484
		Coralline algae-type	0.0484
		Green algae-type	0.0699
	Cultivated beds	Kelp	0.0285
		Wakame / Mozuku	0.0279
		Susabi-nori	0.0206
		Hitoegusa	0.0699
		Garamo (Sargassum-type)	0.0499

※ For formulas, see p.37.

Source: Watanabe et al., under review

4) Conversion Factor for the Entire Ecosystem

This factor is used to convert the removal rate by the target species into the removal rate for the entire ecosystem (i.e., taking into account removal by other microalgae and organisms).

Table 3-12: Ecosystem-Wide Conversion Coefficients from Research Studies

Formula	Ecosystem	Conversion Coefficient
Formula 2	Seagrass beds	2.12
	Seaweed beds	1.50
Formulas 2-1/2-2	Cultivated beds	1.00

Source: Table 3.8 No.2

※ For cultivated beds, the coefficient is set to 1 due to lack of supporting scientific evidence.

5) Relationship Between Wet/Dry Biomass and CO_2 removal per Unit Area

The graphs below show the relationship between biomass (wet and dry weight) and CO_2 removal per unit area when using Formula 2. In Formula 2, wet weight is converted to dry weight by multiplying by (1 − water content ratio), and CO_2 removal is calculated based on that value. It is also acceptable to use directly measured dry weight values, if available. Alternatively, wet weight can be estimated from observed coverage using the conversion formulas shown in Table 3-6: Relationship Between Coverage Class and Wet Biomass (p.31). However, since the relationship between coverage class and wet weight varies significantly depending on the region and time of survey, the accuracy of removal estimates depends on the calculation method used, in the following order:

Table 3-13: Ranking of Biomass Calculation Methods by Certainty

Order of Certainty	Calculation method
(1) Dry weight	Calculated using directly measured dry weight
(2) Wet weight	Calculated using wet weight (measured) and converting to dry weight using literature values for moisture content
(3) Coverage	Calculated using wet weight estimated from observed coverage

Note: P/B ratios and carbon content ratios are based on literature values specific to each habitat type.

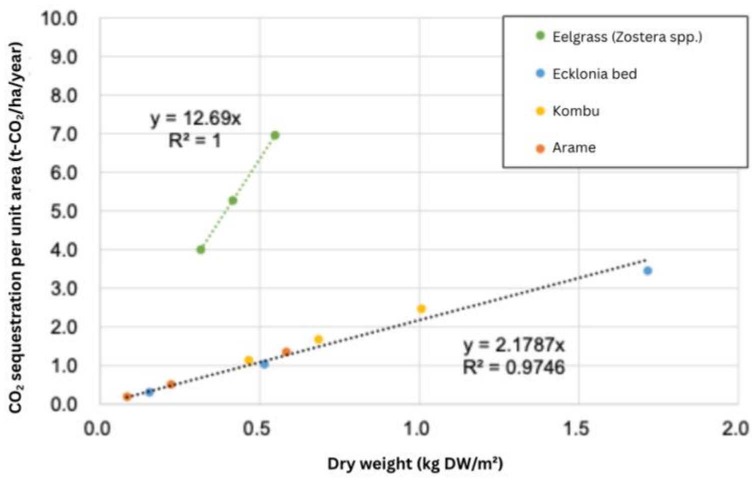


Figure 3-12: Relationship Between Dry Weight and CO_2 Removal per Unit Area

Dry weight used directly (measured). P/B ratio and carbon content ratio: literature values by habitat type.

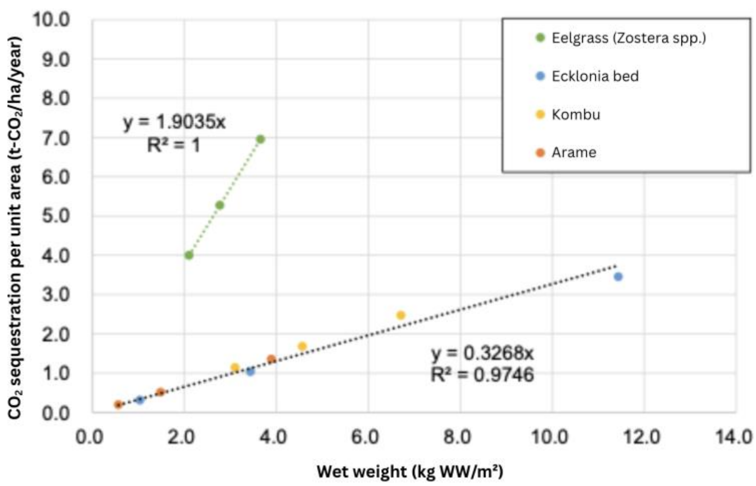


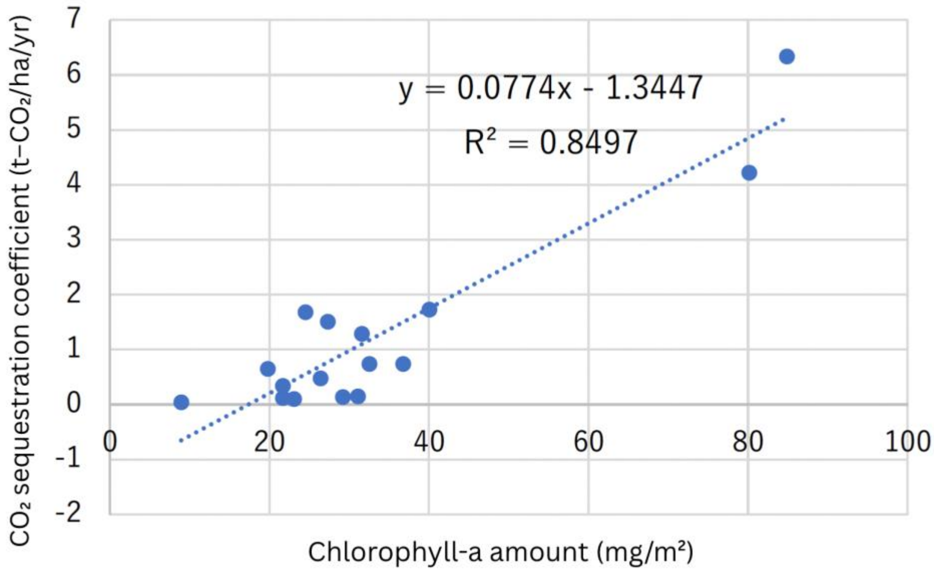
Figure 3-13: Relationship Between Wet Weight and CO_2 removal per Unit Area

Assumed water content ratio = 0.85. P/B ratio and carbon content ratio: literature values by habitat type.

6) Relationship Between Chlorophyll-a Content and CO_2 Removal per Unit Area

In tidal flat ecosystems, the relationship between chlorophyll-a content and CO_2 removal per unit area using Equation 2 is shown in the figure below.

With Equation 2, it is also possible to calculate the removal amount using measured chlorophyll-a content and a corresponding conversion equation.



Source: FY2024, 3rd J-Blue Credit Certification and Issuance, "Cradle of the Sea in Onomichi" – Satoumi Creation through the Restoration of Tidal Flats and Seagrass Beds https://www.blueeconomy.jp/archives/2024-3-jbc-register/#38

Figure 3-14: Relationship Between Chlorophyll-a Content and CO_2 Removal per Unit Area

3.3.2 Evaluating Certainty

(1) Area Estimation

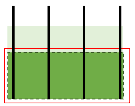
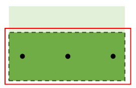
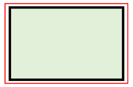
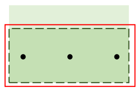
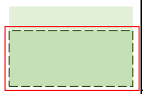
The evaluation criteria related to the certainty of the distribution area for the target ecosystem are summarized in Table 3.14, and example model cases are presented in Table 3.15. Based on these criteria, the VVB will determine the appropriateness of submitted applications. Applicants should ensure that the level of certainty in the data is reflected in the application itself. For reference, detailed examples of certified projects are available on the JBE website: https://www.blueeconomy.jp/credit/

Table 3.14: Evaluation Criteria for Area Estimation Certainty

Category	Certainty of the distribution area of the target ecosystem		Certainty of ecosystem type
	Boundary delineation	Consideration of coverage	
Evaluation criteria	Overall evaluation based on the following perspectives ■Spatial comprehensiveness ・Is the distribution range accurately captured? (e.g., image clarity, accounting for effort in line/point surveys, use of bathymetric data such as contour lines) ■ Accuracy in detecting the presence of the target ecosystem ・Has a survey been conducted that can accurately determine the boundaries of the target ecosystem? ■ Accuracy of location information ・Is the location information for the ecosystem boundary accurate? (e.g., acquisition using GPS, georectification of aerial images)	■Coverage assessment※ ・Has the coverage been assessed across the area (spatially)? ・Has the actual (effective) area been calculated by accounting for the level of coverage? ※ Tidal flats and mangroves are excluded	■Accuracy of ecosystem type ・Has information been obtained that allows for identification of the ecosystem type?
Remarks	To obtain the information described above, surveys should be conducted using one or more methods in combination, based on the conditions of the target survey area.		

■ Key Points for Applicants:

- Clearly describe the survey methods and results used to estimate area and coverage (including maps if available).
- Explain the basis for identifying the ecosystem type, and attach supporting evidence (e.g. photographs).
- Specify the methods used to collect geospatial data and to delineate ecosystem boundaries

Certainty evaluation		Model case		Evaluation criteria				
				Boundary determination				
				Spatial coverage	Accuracy of Boundary Delineation	Accuracy of location information	Coverage consideration	Ecosystem type
		Survey content	Survey illustration	Is the distribution range accurately understood?	Is a survey conducted to determine ecosystem boundaries?	Is the location info accurate?	Is the coverage understood spatially?	Information obtained to identify ecosystem type?
100～80%	High	① Clear image of marine vegetation bed ＋ ②Underwater visual observation (multiple lines) ① : Interpretation from aerial photographs (with georeferencing) Area calculated using advanced image analysis. ② : Shore-to-offshore transects recorded with GPS, with vegetation type and coverage recorded. ①＋② : coverage and ecosystem types are spatially mapped		・Seaweed and seagrass beds are accurately identified through high-resolution imagery and transect surveys. ◎	・Boundaries in deeper zones not visible in imagery are accurately determined through visual observation. ◎	・High-accuracy georeferenced imagery is used ◎	・Coverage is understood across the area ・The actual area, taking coverage into account, is identified ◎	・The ecosystem type is understood spatially ◎
90～70%		①Clear image of vegetation bed ＋ ②Underwater visual observation (multiple points) ① : Interpretation from aerial photographs (with georeferencing). Area calculated manually based on estimated boundaries ② : Vegetation type and coverage recorded		・Seaweed/seagrass bed accurately identified through high-res image interpretation ◎	・Boundaries judged within the range visible in the imagery ○	・High-accuracy georeferenced imagery is used ◎	・Coverage not spatially understood ・Actual area accuracy is low △	・The ecosystem type is not understood spatially △
80～60%		Underwater visual observation (outer boundary of vegetation bed only) ・Boundary recorded ・Type and coverage at boundary recorded with GPS		・Only the outer edges of the seaweed/seagrass beds are surveyed, resulting in low spatial coverage △	・Boundaries are accurately determined through visual observation ◎	・Location accuracy is moderate ○	・Coverage is not understood spatially ・The accuracy of actual area estimates is low △	・The ecosystem type is not understood spatially △
70 ～50%		①Unclear image of vegetation bed ＋ ②Underwater visual observation (multiple points) ① : Boundary estimated using sources like Google Earth ② : Vegetation type and coverage recorded		・The seaweed and seagrass beds are unclear, and image interpretation quality is low △	・Boundaries are poorly defined due to low image clarity △	・High-accuracy georeferenced imagery is used ◎	・Coverage is not understood spatially ・The accuracy of actual area estimates is low △	・The ecosystem type is not understood spatially △
60 ～20%	Lo w	Unclear image of seaweed bed ・Vegetation area estimated from Google Earth		・The seaweed and seagrass beds are unclear, and image interpretation accuracy is low. △	・Boundary accuracy is low due to poor image clarity. △	・High-accuracy georeferenced imagery is used. ◎	・Coverage is not captured. ・Actual area is not identified. ×	・No information is available to determine the ecosystem type. ×

: raw data : cleaned data : processed data : aggregated data : modeled data : observed data

Table 3-15. Model Cases and Certainty Levels for Area Estimation of Seagrass and Seaweed Bed

Note (※): Accuracy of identifying presence or absence of seaweed and seagrass beds: Drone imagery: approx. 70–90% Aerial photography: approx. 65–85%; Satellite imagery: approx. 60–85%; (Source: *Guidelines for Wide-Area Seaweed Bed Monitoring*, Fisheries Agency, March 2021

(2) CO_2 Removal Coefficient

Table 3-16 presents the evaluation criteria for the certainty of the removal coefficient (§), and Table 3-17 shows the model cases. Based on these criteria, the VVB will assess the validity of the submitted evaluation results.

Please reflect the certainty (§) of the review outcome in your application.

Details of application examples are available on the JBE website:
https://www.blueeconomy.jp/credit/

Table 3-16: Evaluation criteria for the certainty of the CO_2 removal coefficient

Category	Certainty of the CO_2 removal coefficient Consideration of regional specificity	
Evaluation criteria	■Literature collection ・Are literature-based values collected from areas near the target region? ■ Consideration of Seabed Vegetation Type and Coverage ・Is the removal coefficient set based on the local type of seaweed and seagrass beds and their coverage?	■Presence of on-site observations ・Are measured values such as wet weight or water content ratio used, based on on-site observations? ・Are survey sites selected by vegetation type and located in representative areas that reflect actual conditions? ※A larger number of survey sites leads to higher accuracy.
Remarks	To obtain the above information, removal coefficients must be collected and set based on either field surveys or literature values, considering the conditions of the target site.	

■Key points at the time of application

・For the CO_2 removal coefficient, indicate whether it is based on field survey data or literature values.

・If field surveys were conducted, provide specific details on the survey methods, the rationale for selecting survey sites, and the survey results.

・If using literature values (with consideration of regional specificity), provide a list of the collected references, the rationale for how the removal coefficient was set (e.g., maximum value, average), and the specific values used in the calculation.

Table 3-17: Model cases and certainty levels for setting CO_2 removal coefficients for seagrass and seaweed beds

Evaluation of certainty		Model case	Evaluation criteria: Reliability of the CO_2 removal coefficient — Area-Based (using Equation 1): Has the removal coefficient been set with consideration of regional specificity (i.e., local seaweed and seagrass bed types and their coverage)?	Evaluation criteria: Reliability of the CO_2 removal coefficient — Weight- or Rope-Length-Based (using Equation 2): Has the removal coefficient been set with consideration of regional specificity (i.e., local seaweed and seagrass bed types, the contributing elements, and their coverage), based on field observations or literature sources?
100 ~ 80 %	High	① Measurement of wet weight per unit area ＋ ② Literature-based setting of CO_2 removal coefficient Regional specificity considered	—	・Field observations are conducted in the target area. ・The removal coefficient is set based on literature collected with consideration of the local characteristics of the seaweed and seagrass bed types. ・A removal coefficient that accounts for coverage is used.
90 ~ 50 %		Use of literature values Regional specificity considered	・The removal coefficient is set based on literature collected with consideration of the local characteristics of the seaweed and seagrass bed types. ・A removal coefficient that accounts for coverage is used.	—
50 ~ 30 %	Low	Use of literature values Regional specificity not considered	・ National average literature values are used ・Coverage is not taken into account	—

(3) Baseline

Since the baseline is calculated using a methodology similar to that for blue carbon removal, the same level of certainty evaluation will be applied to both the assessment of the target ecosystem area and the CO_2 removal coefficient.

For details on the baseline, please refer to page 9.

3.4 Method for calculating CO_2 emissions from vessel use

The method for calculating CO_2 emissions from fuel consumption by vessels used in marine surveys, as well as the coefficients used for the calculation, are as follows.
Please use the fuel consumption rate corresponding to the engine output closest to that of the vessel used.

CO_2 emissions (t-CO_2) = Operating time (h) × Engine output (kW) × Fuel consumption rate (liters/kWh) × 1/1000 × Emission factor (t-CO_2/kiloliter)

Table 3-18: Coefficients used for calculating CO_2 emissions from vessel use

Coefficient				Remarks	Source
Fuel consump-tion rate	Outboard vessel	Approx. 11kW(15PS)	0.209 L/kWh	Value for outboard vessel	1
	Survey vessel	Approx. 51kW(70PS)	0.146 L/kWh	Value for passenger vessel (FRP, 3t)	1
		Approx. 132kW(180PS) or more	0.046 L/kWh	Value for safety monitoring vessel (FRP, 10t)	1
	Diver support vessel	Approx.206kW(280PS)	0.108 L/kWh	Value for diver vessel	1
	Guard vessel	Approx. 254kW(180PS)	0.046 L/kWh	Value for safety monitoring vessel (FRP, 10t)	1
		Approx. 423kW(180PS)	0.046 L/kWh		1
Emission factor	A-type heavy oil		2.75 t-CO_2/kL	—	2
	Gasoline		2.29 t-CO_2/kL	—	2
	Diesel		2.62 t-CO_2/kL	—	2

Source 1: Standard for Cost Estimation of Port Civil Engineering Works, FY2024 Revised Edition (Ministry of Land, Infrastructure, Transport and Tourism)
Source 2: List of Calculation Methods and Emission Factors under the GHG Calculation, Reporting and Publication System (Ministry of the Environment, updated December 12, 2023) https://ghg-santeikohyo.env.go.jp/calc

3.5 Method for calculating CO_2 emissions from the newly used nets, ropes, and buoys

In seaweed cultivation, CO_2 emissions from the production of newly used nets, ropes, and buoys are calculated using the method and emission factors shown below:

CO_2 emissions (t-CO_2) = Material weight (t) × Emission factor (t-CO_2/t)

Table 3-19: Emission Factors for calculating CO_2 emissions from the use of nets, ropes and buoys

Coefficient			Remarks	Source
Emission factor	Nets and ropes	4.40 t-CO_2/t	—	1・2
	Buoys	2.07 t-CO_2/t	—	1・2

Source 1: 2015 Input-Output Tables (Statistics Bureau, Ministry of Internal Affairs and Communications)
Source 2: Embodied Energy and Emission Intensity Data for Japan Based on Input-Output Tables (3EID) (Center for Global Environmental Research, 2015)

3.6 Calculation of the claimed amount

The amount of CO_2 removal eligible for certification as J-Blue Credit is calculated by subtracting the following from the total CO_2 removed and stored after project implementation:

- CO_2 removal under the baseline scenario
- CO_2 emissions from vessel fuel use associated with marine surveys
- CO_2 emissions from the use of nets, ropes, and buoys

Additionally, as noted earlier, the certainty of the area and removal coefficient used in the CO_2 calculation varies depending on the survey methods applied.

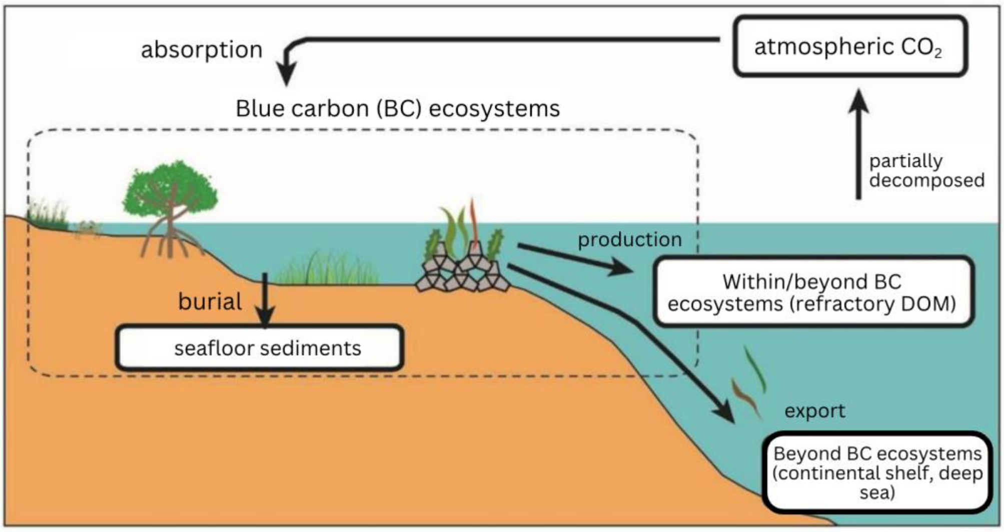
■ CO_2 removal to be claimed by the project

CO_2 removed (eligible for crediting)
= (Distribution area of the target ecosystem × Certainty rating) x (CO_2 removal x Certainty rating)
- CO_2 removal under the baseline scenario
- CO_2 emissions from vessel use and the newly used nets, ropes and buoys

[Box] Direct Measurement of Atmospheric CO_2 Removal

In this guidance document, the measurement of CO_2 removal is, in practice, based on the annual amount of carbon stored in the three "carbon storage pools" indicated by red boxes in Figure 3-15. In other words, it is assumed that the amount of carbon stored per year is equal to the net annual CO_2 removal from the atmosphere, and this value is used as an indirect estimate of CO_2 uptake. On the other hand, although technically more advanced, there is a method called the air-sea gas flux method, which allows for direct measurement of net annual CO_2 removal from the atmosphere. For further details, please refer to the references listed below.

■ Reference on the Air-Sea Gas Flux Method
Guidelines for Measuring Blue Carbon (CO_2 Removal and Carbon Storage) in Ports,
Port and Airport Research Institute Report, No. 1309, 2015.



Source: Table 3-8 No.2

Figure 3-15: Mechanism of Blue Carbon Removal and Storage

The air-sea gas flux method measures the partial pressure of CO_2 in water (pCO_{2water}) and in the atmosphere (pCO_{2_air}), and calculates the CO_2 gas exchange rate between water and air to determine the CO_2 removal coefficient for a given marine area.

① Timing and location requirements for field surveys

1. Survey timing

pCO_{2_water} fluctuates daily due to photosynthesis and respiration in seaweed and seagrass beds. In addition, standing biomass and primary productivity exhibit seasonal variation. Therefore, when applying the gas flux method, the timing of the survey must take these variations into account. It is recommended to conduct at least two seasonal surveys per year, covering both the peak and decline of vegetative growth, and at least two measurements per day (e.g., early morning and late afternoon) to capture diurnal variation
Increasing the frequency of observations leads to more reliable estimates.

2. Survey location

To distinguish the effect of vegetated areas (seaweed and seagrass beds) on CO_2 gas exchange rates, measurements must be taken both inside and outside the bed. Sampling locations within the bed should be selected to capture an average value (e.g. spaced evenly from one edge of the bed to the other). For sites outside the bed, choose locations with similar salinity, water temperature, etc., but which are minimally influenced by the vegetated area.

② Method for measuring underwater pCO_2

1. Direct measurement using a CO_2 analyzer

A common method for automated pCO_{2_water} measurement uses non-dispersive infrared (NDIR) sensors. NDIR works by directing infrared light through a gas sample and calculating pCO_2 based on removal. Because NDIR only measures gas, a gas with equivalent pCO_2 is extracted from the seawater using a gas-permeable membrane or seawater spray chamber.
These sensors can be deployed in the field for continuous measurements and are well suited to capturing diurnal cycles.

2. Estimation from chemical analysis of water samples

pCO_2_water can also be estimated through laboratory analysis of water samples by measuring any two of the following carbonate parameters: DIC (Dissolved Inorganic Carbon); TA (Total Alkalinity); pH. Using these, along with field-measured temperature and salinity, pCO_2_water is calculated by equilibrium chemistry.
Samples are collected in thick glass bottles using overflow to avoid air contamination, and preserved (e.g. with saturated $HgCl_2$ solution) before lab transport.
Measurements are conducted using specialized carbonate analysis instruments.
Equilibrium calculations are typically performed using software such as CO2SYS (Lewis and Wallace, 1998). As only one data point is obtained per sample, multiple samples per day are needed to capture daily variability. However, this method allows for relatively easy sampling at multiple locations.

③ Method for measuring atmospheric pCO_2

Atmospheric pCO_2 (pCO_2_air) is measured directly using a CO_2 analyzer equipped with an NDIR sensor, as described above.
If such equipment is unavailable, pCO_2_air data can also be obtained from existing databases, such as: National Institute for Environmental Studies (NIES):
http://db.cger.nies.go.jp/gem/ja/ground/; and Japan Meteorological Agency (JMA):
https://www.data.jma.go.jp/ghg/kanshi/obs/co2_monthave_ryo.html

④ Method for calculating CO_2 gas exchange rate

Using the daily average values of pCO_{2water}, pCO_{2air}, water temperature, and salinity measured as described above, the daily CO_2 gas exchange rate (FCO_2) between the atmosphere and seawater can be calculated using the bulk formula (§) shown below.
A negative value indicates net CO_2 uptake from the atmosphere into the water.

$$FCO_2 = k \times S \times (pCO_{2water} - pCO_{2air}) \quad \text{(Unit: } \times 10^{-8} \text{ mol/m}^2\text{/h)}$$
$$= (k \times S \times (pCO_{2water} - pCO_{2air})) \times 44 \times 10^{-4} \times 24 \quad \text{(Unit: gCO}_2\text{/ha/d)}$$

The solubility of CO_2 (*S: mol/m³/atm*) can be calculated from water temperature and salinity using an empirical function (Weiss, 1974[1)]). Here, *WT* represents water temperature (°C) and *SAL* represents salinity.

$$S = \mathrm{EXP}\,(-60.2409 + 93.4517 \times (100 / (WT + 273.15))$$
$$+ 23.3558 \times \mathrm{LN}\,((WT + 273.15) / 100)$$

$+ SAL \times (0.023517 - 0.023656 \times ((WT + 273.15) / 100)$
$+ 0.0047036 \times (((WT + 273.15) / 100)^2)))$
$\times (999.842594 + 6.793952 \times 10^{-2} \times WT$
$-9.09529 \times 10^{-3} \times WT^2 + 1.001685 \times 10^{-4} \times WT^3$
$-1.120083 \times 10^{-6} \times WT^4 + 6.536332 \times 10^{-9} \times WT^5$
$+ SAL \times (8.24493 \times 10^{-1} - 4.0899 \times 10^{-3} \times WT + 7.6438 \times 10^{-5} \times WT^2$
$-8.2467 \times 10^{-7} \times WT^3 + 5.3875 \times 10^{-9} \times WT^4)$
$+ SAL^{1.5} \times (-5.72466 \times 10^{-3} + 1.0227 \times 10^{-4} \times WT$
$-1.6546 \times 10^{-6} \times WT^2) + SAL^2 \times (4.8314 \times 10^{-4}))$

The gas transfer coefficient K (cm/h) can be calculated using the following equation.

$$K = 0.251 \times U_{10}^2 \times (660 / Sc)^{0.5}$$ （Wanninkhof, 2014[2)] ）

U_{10} (m/s) refers to the wind speed at 10 meters above the sea surface. If direct measurement is not possible, U_{10} can be estimated using wind speed data from a nearby Japan Meteorological Agency AMeDAS station, based on the relationship between wind speed, height, and surface roughness. The equation below can be used (Kondo, 2000[3])).

In this equation, *V* is the average wind speed (m/s); Z_a is the height at which the anemometer is installed (m); and Z_0 is the surface roughness (m) for each direction at the AMeDAS site. For information on surface roughness, refer to Kondo (2000)[3]) and related sources.

$$U_{10} = (0.4 \times V / \mathrm{LN}\,(Z_A / Z_0)) / 0.4 \times \mathrm{LN}\,(10 / Z_0)$$

The Schmidt number (*Sc*) is a dimensionless value representing the ratio of the kinematic viscosity (§) of surface water to the diffusion coefficient, and is determined from surface water temperature (WT) and salinity (SAL) (Jähne et al., 1987[4])).

$$Sc = (2073.1 - 125.62 \times WT + 3.6276 \times WT^2 - 0.043219 \times WT^3) \times (0.06 / 35 \times SAL + 0.94)$$

Using the FCO_2 value calculated as described above, the CO_2 gas exchange attributable to the vegetated area (e.g., seagrass/seaweed bed) can be calculated using the following equation:

CO_2 gas exchange attributable to the vegetated area = $FCO_{2inside.} - FCO_{2outside}$

This value is calculated for each season, and the annual average CO_2 gas exchange by the vegetated area is then estimated in t-CO_2/ha/year.

⑤ Calculation of CO_2 removal using the gas flux method
CO_2 removal using the gas flux method can be calculated using the following equation:

CO_2 removal (tCO_2/year)
=Vegetated area (ha)×Footprint coefficient×CO_2 gas exchange by the vegetated area (t-CO_2/ha/year)

Photosynthesis within the vegetated area reduces pCO_{2water} and promotes CO_2 uptake from the atmosphere at the water surface.

At the same time, water within the vegetated area is constantly exchanged with water outside, leading to dilution and dispersion of the water mass and its pCO_2 signal.

The footprint coefficient is a correction factor that accounts for these dilution and diffusion effects.

For example, in Lake Furen, Hokkaido, a study reported a CO_2 gas exchange rate of 0.285 t-CO_2/ha/year within the vegetated area (Tokoro et al., 2014[5]).

In contrast, the CO_2 removal calculated using Equation 2 and the maximum standing biomass (wet weight: approx. 2,300 g/m^2) was about 3.7 t-CO_2/ha/year.

Since the footprint is influenced by site-specific physical conditions such as advection, diffusion, and stratification, accurately determining the footprint coefficient requires multi-point pCO_2 monitoring and direct measurements of water flow.

References

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3) Kondo, J. (2000). *Science of the atmosphere near the surface: understanding and application*. University of Tokyo Press. (*In Japanese: 地表面に近い大気の科学—理解と応用，東京大学出版会*)
4) Jähne, B., Heinz, G., & Dietrich, W. (1987). *Measurement of the diffusion coefficients of sparingly soluble gases in water*. Journal of Geophysical Research: Oceans, 92, 10767–10776.
5) Tokoro, T., Hosokawa, S., Miyoshi, E., Tada, K., Watanabe, K., Montani, S., Kayanne, H., & Kuwae, T. (2014). *Net uptake of atmospheric CO_2 by coastal submerged aquatic vegetation*. Global Change Biology, 20, 1873–1884.

Chapter 4 Frequently Asked Questions (FAQ)

4.1 About Blue Carbon

Q1. What is Blue Carbon?

A1.

- Blue carbon refers to carbon that is stored in the ocean through the activity of marine organisms.
- In shallow coastal areas, plants absorb CO_2 through photosynthesis and store carbon in the seafloor.
- Carbon stored in the seafloor can remain there for hundreds of years. Globally, it is estimated that 190 to 240 million tons of carbon are stored each year.

Q2. What are the main ecosystems where blue carbon is stored, and how do they remove CO_2?

A2.

- The main ecosystems that store blue carbon include seagrass beds, seaweed beds, salt marshes and tidal flats, and mangrove forests.
- The mechanisms by which carbon is removed vary by ecosystem, as described below:

① Seagrass beds
Organic matter produced through photosynthesis by seagrasses is removed in seafloor sediments or transported to the deep sea as plants die or detach. In addition, refractory dissolved organic matter (DOM) released from seagrass tissues accumulates in the water column.

② Seaweed beds
Macroalgae such as *Sargassum*, *Undaria*, and *Saccharina* (including cultivated species) absorb CO_2 through photosynthesis and produce organic matter, which is stored in seafloor sediments or the deep sea as it dies or detaches. Refractory dissolved organic matter released from seaweed tissues also accumulates in seawater.

③ Salt marshes and tidal flats
Organic matter produced via photosynthesis by reeds and benthic microalgae on the sediment surface is removed in soils or the deep-sea following plant death or runoff.

④ Mangrove forests
Mangrove trees absorb CO_2 through photosynthesis and produce organic matter, which is stored in soils or the deep sea as it dies or is transported.

Q3. How much CO_2 is estimated to be removed through blue carbon in Japan?

A3.

- According to the latest research, it is estimated that approximately 0.34 million tons of CO_2 are removed annually in Japan, primarily by seaweed and seagrass beds.
- Future increases in CO_2 removal are anticipated through habitat restoration, the use of eco-engineered port structures, and the expansion of seaweed cultivation.

Q4. What is the difference between seagrass beds and seaweed beds?

A4.

■ Seagrass beds

- These are vegetated areas dominated by seagrasses, such as eelgrasses, which are seed plants (angiosperms).
- Seagrasses typically have rhizomes and fibrous roots that anchor them into the seafloor, which generally needs to be composed of sandy or muddy sediment.

■ Seaweed beds

- This is a general term for vegetated areas composed of seaweeds (spore-producing algae).
- Areas where branched seaweeds such as *Sargassum horneri* grow densely are known as garamo, while forests of large, upright macroalgae such as kombu and arame are called underwater kelp forests.
- These areas may also be referred to by the dominant species, such as kombu beds, arame beds, or kajime beds.

- Vegetated area
  - Seagrass beds — *Zostera* beds
  - Seaweed beds
    - Garamo beds — Sargassum communities
    - Kelp forest
      - Kombu beds — Kombu
      - Arame beds — Arame
      - Kajime beds — Kajime

Overview of vegetated habitat classification (seagrass and seaweed beds)

4.2 About J-Blue Credit

Q5. What is the overall concept of J-Blue Credit? What is its purpose, and what will it enable in the future?

A5.

- J-Blue Credit is a scheme that quantifies blue carbon and makes it tradable (crediting).
- J-Blue Credit is a unique credit certified and issued by JBE, after review by an independent third-party Validation and Verification Body separate from JBE.
- J-Blue Credit applies nationwide across Japan.

※ For information about JBE, see A11.

Q6. Is this the first crediting scheme in Japan that uses blue carbon?

A6.

- Precedents include independent credit certification and issuance schemes developed by Yokohama City and Fukuoka City.

Q7. What is the status of international certification and credit creation globally?

A7.

- For example, credits have been certified and registered under the Verified Carbon Standard (VCS), operated by Verra.

Q8. Who certifies the credits and how?

A8.

- Certification is carried out by JBE
- The VVB conducts reviews, and evaluates factors such as the distribution area of the target ecosystem and the CO_2 removal coefficient.

Q9. How does J-Blue Credit differ from the J-Credit scheme?

A9.

- Each crediting system has its own strengths and limitations. Applicants and buyers are encouraged to select the scheme that best fits their goals.
- At present, the J-Credit scheme does not include a blue carbon methodology.

4.3 About JBE

Q10. What is JBE? When was it established, and what are its purpose and members?

A10.	
■ Official name:	Japan Blue Economy Association (JBE)
■ Established:	July 2020
■ Members:	National Institute of Maritime, Port and Aviation Technology (a national R&D agency), Sasakawa Peace Foundation (public interest incorporated foundation), among others
■Purpose and activities:	Research and development of technologies (methodologies) necessary for promoting conservation, restoration, and sustainable use of marine and coastal areas, in order to advance blue economy initiatives.

※ The Japanese Ministry of Land, Infrastructure, Transport and Tourism approved the foundation of the JBE as a Collaborative Innovation Partnership (CIP). CIP is a legal entity established with ministerial approval under the Technology Research Association Act, allowing multiple companies and academic institutions to jointly conduct R&D.
Key features include:
① Equipment procured with member contributions is eligible for special tax treatment (depreciation),
② Patent fees may be reduced or waived if certain conditions are met,
③ Smooth organizational transition to corporations such as joint-stock companies is possible.

Q11. What kind of organization is JBE (Japan Blue Economy Association)?

A11.

- JBE was established in July 2020 as an organization responsible for the development of technologies, policy frameworks, and technical guidance to support the conservation, restoration, and sustainable use of the ocean, which are key elements of the blue economy.
- It currently oversees the certification, issuance, management, and transaction of J-Blue Credits, which are at the core of Japan's blue carbon crediting framework.
- JBE operates the J-Blue Credit scheme in collaboration with the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), based on the discussions with the MLIT-established Study Group on the Role of Blue Carbon in Climate Change Mitigation.

4.4 Domestic developments and other topics

Q12. Will blue carbon be included in Japan's national greenhouse gas inventory? If so, when and to what extent?

A12.
- As of April 2023, carbon stock changes in mangroves have been newly incorporated into the national inventory.
- Seagrass and seaweed beds were also officially included in the inventory as of April 2024.

Q13. It is said that blue carbon cannot currently be used in the calculation of adjusted GHG emissions under Japan's Act on Promotion of Global Warming Countermeasures. Will it be usable in the future?

A13.
- Discussions are ongoing with relevant ministries regarding the feasibility of inclusion.
- Notably, under the Japanese emissions trading system (GX-ETS), J-Blue Credit was officially registered as an eligible carbon credit in October 2024.
- A total of 54 certified projects and approximately 6,000 t-CO_2 have been publicly listed as "eligibility-certified."

Q14. Who can become a credit creator?

A14.
- Any organization other than national government agencies may apply.
- Applicants must be engaged in creation, restoration, or management of target ecosystems.
- For joint applications, credit allocation must be agreed upon at the time of submission.

※ Allocation is determined through consultation among parties, but entities without actual management or operational involvement are not eligible.

Q15. Can credits be generated again from the same site once it has already been certified?

A15.
- Yes, if a different period from the one previously certified result in verifiable blue carbon, the site may be re-certified for a new credit.
- Since J-Blue Credit operates on an annual application basis, an application can be submitted each year.

Q16. For example, if J-Blue Credit is issued for *Zostera* (eelgrass), is it necessary to harvest the plants to account for the removed carbon?

A16.
- Under this scheme, blue carbon from *Zostera* beds primarily refers to carbon removed in seafloor sediments or the deep sea through natural processes such as plant death and detachment, as well as refractory dissolved organic matter released from plant tissues. Therefore, harvesting is not required.
- However, if harvested *Zostera* is properly disposed of (e.g. landfilled or used as industrial feedstock) and this contributes to additional CO_2 reduction or removal, such activities may be eligible under other crediting schemes as distinct project types.

Q17. To what extent must a certified site be maintained and managed?

A17.
- Credit certification is based on the results of restoration or maintenance activities. Therefore,

maintenance after the certified project implementation period is not directly linked to previously issued credits.

- However, since the aim of the J-Blue Credit scheme is to support "voluntary activities for climate change mitigation and adaptation that are sustained or expanded over time," it is important to note that "credits should contribute to the continuation or development of activities."
- As noted in Q15, proper maintenance and management can also enable additional credit creation in subsequent years.

Q18. What constitutes proper maintenance and management? How should seagrass and seaweed beds be managed to remain eligible for J-Blue Credit?

A18.

- For both seagrass and seaweed beds, credits may be certified if ongoing activities such as transplantation, seeding, and herbivory control are carried out to maintain a minimum habitat size (currently assumed to be 0.1-0.2 ha or larger).
- That said, the scheme does not require activities beyond what is reasonable and sustainable, as imposing excessive burdens on credit creators would be counterproductive.
- Examples of eligible activities include additional transplantation of *Zostera* (eelgrass), establishing local marine use rules to conserve growing environments, monitoring seabed conditions and vegetation health, hosting environmental education sessions for local schools, community outreach and awareness-raising campaigns
- To verify the eligibility requirement of "additionality", i.e., the required link between credit acquisition and activity continuation, credit creators must submit regular activity reports, which will be made publicly available.

Q19. Is there a way to structure applications so that annual J-Blue Credit revenue can cover maintenance costs?

A19.

- J-Blue Credit does not guarantee future maintenance funding.
- However, if the activities allow for continuous credit creation, the revenue from credit transfers may be used to support maintenance costs.
- Since the same area of activity can be applied for each year, this could allow for planned budget allocation, provided that appropriate maintenance is carried out and properly documented.

Q20. What kind of organization is ideal as a credit creator (i.e., applicant)?

A20.

- From a buyer's perspective, projects that involve a diverse set of local stakeholders, such as NPOs, educational institutions, or local communities, may be more appealing and considered more credible or valuable than those managed solely by a single entity.
- This broader participation may increase public support and perceived value, potentially leading to higher transfer prices for the credits.

Q21. What types of companies are expected to purchase credits?

A21.

- Potential buyers include companies and organizations that have greenhouse gas (GHG) reduction targets and need to use offsets to meet them, as well as entities that value contributing to society by supporting project implementers.
- For credit purchase applicants, JBE requires that the buyer: is a domestic (Japan-based) legal

entity; understands the J-Blue Credit scheme and the scope of JBE's responsibilities; agrees to comply with the official procurement procedures

Q22. Can a company participating as a joint applicant purchase credits issued by its own project?

A22.
- Yes, purchase is permitted.

Q23. Is it possible to purchase J-Blue Credits on a regular annual basis?

A23.
- Yes, regular purchases are possible. However, the timing and volume of credit issuance and public offerings vary each year, so it is necessary to check the JBE website regularly for updates.

Q24. How are credits transacted?

A24.
- Transaction methods are determined by JBE on a case-by-case basis, taking into account the project's characteristics and the credit creator's preferences.

Q25. What are the application fees?

A25.
- For details on application fees, refer to the "List of Application Fees" on the JBE website: https://www.blueeconomy.jp/credit/

Q26. If multiple types of activities are carried out during the eligible project period, must they be submitted as separate projects?

A26.
- If the applicant is the same entity, they may apply as a single project, even if it includes different types of activities.

Q27. By when should an application be submitted if certification is desired within the same fiscal year?

A27.
- The deadline depends on the number of applications received in that year. Please check the JBE website (https://www.blueeconomy.jp/credit/) or confirm directly during the pre-application consultation process.

Chapter 5. Glossary

Term	Definition
Greenhouse gases	The following seven substances listed in Article 2, Paragraph 3 of the Act on Promotion of Global Warming Countermeasures (Act No. 117 of October 9, 1998, including subsequent amendments): ・Carbon dioxide (CO_2) ・Methane (CH_4) ・Nitrous oxide (N_2O) ・Hydrofluorocarbons (HFCs) specified by government ordinance ・Perfluorocarbons (PFCs) specified by government ordinance ・Sulfur hexafluoride (SF_6) ・Nitrogen trifluoride (NF_3)
Credit	A quantified and certified amount of CO_2 reduction or CO_2 removal, made tradable by following a predefined methodology.
J-Credit	One of Japan's government-managed credit systems. (Note: Blue carbon is not currently included in this scheme.)
J-Blue Credit	A voluntary credit certified by JBE for greenhouse gas removal achieved through blue carbon projects implemented within Japan. This is a type of voluntary credit not governed by the government, but led by non-government bodies.
UNEP: United Nations Environment Programme)	Established in 1972, UNEP plays a leading role in environmental protection and encourages partnerships so that governments and people can improve their quality of life without compromising that of future generations. As the UN's main environmental body, it identifies global environmental issues, supports policymakers, coordinates environmental efforts within the UN system, and advocates globally for environmental sustainability.
IPCC (Intergovernmental Panel on Climate Change)	An intergovernmental body established in 1988 by the World Meteorological Organization (WMO) and UNEP. Its role is to provide a scientific basis for climate policy by compiling regular assessment reports based on published scientific literature, reflecting the latest scientific understanding of climate change.
Voluntary carbon market	A marketplace for the trading of voluntary credits, which are expected to play a critical role for companies and organizations aiming to achieve carbon neutrality.
Climate change mitigation measures	Measures taken to reduce greenhouse gas emissions in response to climate change. In contrast, measures to prepare for or adapt to the adverse effects of warming are referred to as adaptation strategies.
Project implementer (Project Developer)	An entity responsible for implementing a project that increases greenhouse gas removal. This includes any party providing technical, financial, or operational support in joint project execution.
Validation and Verification Body (VVB)	An independent expert panel within the J-Blue Credit system responsible for evaluating and approving projects, as well as verifying and confirming actual CO_2 removal results.

Term	Definition
Certainty	The reliability or accuracy of figures such as the distribution area or CO_2 removal coefficient of blue carbon ecosystems.
Geometric correction / orthorectification	The process of correcting distortions or displacements in aerial photographs or similar imagery to produce data with accurate spatial information.
Trade-off	A situation in which two conditions cannot be simultaneously satisfied, representing a mutually exclusive relationship.
Blue carbon ecosystem	Ecosystems that act as CO_2 sinks, such as seagrass and seaweed beds, wetlands/tidal flats, and mangrove forests
Net primary production (NPP)	Total amount of organic matter produced by plants through photosynthesis, minus the amount of carbon released through respiration
P/B ratio	The ratio of net primary production (P) to standing biomass (B)
DOC (dissolved organic carbon)	Organic carbon (carbon contained in organic matter) dissolved in water
RDOC (refractory dissolved organic carbon)	A fraction of DOC that resists decomposition and remains stable for hundreds to thousands of years
Bulk formula	A theoretical model used to indirectly estimate gas flux
Kinematic viscosity	A measure of a fluid’s resistance to flow and the ease with which motion is transmitted through it.

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