Instruction Document

Instruction Document Japan:

Bridging Requirements for meeting Japanese sustainability, legality and GHG saving requirements

Sustainable Biomass Program

sbp-cert.org

Version 1.1

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In the case of inconsistency between translations, the official English language version shall always take precedence.

SBP welcomes comments and suggestions for changes, revisions and / or clarifications on all of its Standards documentation. Please contact: **info@sbp-cert.org**

Contents

A Introduction

The Sustainable Biomass Program (SBP) is a *certification scheme* designed for *biomass*, mostly in the form of wood pellets and chips.

The SBP *certification scheme* provides *assurance* to stakeholders that *biomass* is sourced both legally and sustainably, and it provides a means to collect and communicate reliable and verified data throughout the supply chain, including energy data, allowing companies in the *biomass* sector to demonstrate their responsible sourcing achievement and *compliance* with regulatory requirements, and to calculate their Greenhouse Gas (GHG) footprint.

There are six SBP Standards, which collectively represent the SBP *certification scheme*, against which *Organisations* can be assessed (as applicable) for *certification* by independent third-party accredited *Certification Bodies (CBs)*. The Standards were developed and revised following a rigorous process aligned with ISEAL Standard-setting Code of Good Practice, considering and building on existing regulatory requirements, peer voluntary certification standards and *stakeholders*' input.

An Organisation that satisfactorily demonstrates conformance with the SBP Standards receives a *certificate* and may be entitled to make use of the SBP *Data Transfer System (DTS)* and *SBP claims* in relation to the *biomass* it produces, sells, buys and / or uses.

B Purpose

The SBP *certification scheme* provides *assurance* to End-users that the *biomass* is sourced from legal and sustainable *feedstock* as defined in SBP Standard 1. SBP certification relies on a third-party, independent certification process carried out by accredited *CBs*.

SBP Instruction Document Japan specifies additional requirements that *Organisations* must comply with to deliver biomass to the Japanese market. The Instruction Document incorporates: the Japanese regulation as issued by the Ministry of Economy, Trade and Industry of Japan (METI) as part of the Feed in Tariff (FIT) programme, initially established in July 2012 under the Act on Special Measures Concerning Procurement of Renewable Energy Electricity by Electric Utilities (Act No. 108 of 2011); and the Feed in Program (FIP), established by the Partial Revision of the Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electricity Utilities, as established by Article 3 of the Act on Special Measures for the Promotion of the Use of Electricity from Renewable Energy Sources. The SBP certification scheme was approved by the Ministry of Economy, Trade and Industry (METI) as compliant with the aforementioned Japanese legislative requirements.

The FIT / FIP is a system supported by a levy borne by electricity users. Certified renewable energy power producers are required to comply with the standards set forth in Article 9, Paragraph 4 of the Act on Special Measures Concerning Renewable Energy and in Articles 5 and 5-2 of the Ordinance for Enforcement of the Act on Special Measures Concerning Promotion of Use of Electricity from Renewable Energy Sources (Ordinance of the Ministry of Economy, Trade and Industry No. 46 of 2012).

This Instruction Document also includes specific requirements set in the Guidelines on Legality and Sustainability of Wood and Wood Product set by the Government of Japan and promoting verified products as appropriate items for procurement of ministries and agencies, independent administrative institutions, special legal entities and so forth, by means of amending the Basic Policy on Promoting Green Purchasing of the Law Concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Law No.100 of 2000).

C Scope

SBP Instruction Document Japan shall be used by Biomass Producers wishing to meet the Legality and Sustainability Guidelines and FIT / FIP requirements for Life Cylce GHG emission calculation for biomass delivered to the Japanese market. Note that requirements in this Instrcution Document are additional and shall be applied on top of the SBP normative framework as described by the six SBP Standards (see A Introduction).

The following describes the scope of this Instruction Document, which is in compliance with the Legality and Sustainability Guidelines and FIT requirements for Life Cylce GHG emission calculation:

The scope of the SBP certification scheme in compliance with the Legality and Sustainability Guidelines and FIT requirements for Life Cylce GHG emission calculation is the following:

- Type of feedstock(s):
  - Primary Feedstock: Ligno-cellulosic material derived from forest and non-forest land
  - Processing residues: Feedstock derived from the processing of material from forest and non-forest
  - Post-consumer feedstocks
- Type of fuel(s): Biomass fuels (pellets and wood chips) produced from forest and non-forest ligno-cellulosic material and forest and agriculture related industry processing residues for heat and electricity production

  NOTE: "Bioliquids", "biofuels", "biogas", "renewable liquid and gaseous transport fuels of non-biological origin" and "recycled carbon fuels" are outside of the scope of the SBP certification scheme.
- Geographic coverage: Global
- Chain of custody coverage: Full biomass supply chain

D How to use this document

Feedstock sourced in compliance with the SBP requirements and the requirements in this Instruction Document, is deemed compliant with the Guideline for Verification on Legality and Sustainability of Wood and Wood Products and the FIT / FIP requirements for the calculation of lifecycle GHG emissions as described in Section 2. Feedstock sourced in accordance with this Instruction Document is demonstrated as compliant with the Legality and Sustainability Guidelines and FIT requirements, in particular the requirements to minimise waste and air pollution in the forest areas and in compliance with legal requirements applicable to air emissions and in compliance with GHG saving requirements.

Where there is a difference between requirements in this Instruction Document and the SBP Standards, the requirements in this document shall prevail.

Bridging requirements for GHG emission savings criteria and methodology for GHG emission calculation by End-users are included in a separate document, SBP Instruction Document 6D: Methodology for the calculation of GHG savings. The condition for using default values are specified within Instruction Document 6D.

DISCLAIMER: *Organisations* certified against this document shall implement all applicable requirements. Where there is a conflict between the requirements in this document and FIT requirements, FIT requirements shall have precedence.

The following terms are used by SBP in its normative documents to indicate requirements, recommendations, permissions, and possibilities or capabilities:

"shall" indicates a requirement,
"should" indicates a recommendation, "may" indicates a permission, and
"can" indicates a possibility or a capability.

E Normative references

SBP Appeals Procedure

SBP Complaints Procedure

SBP Glossary of Terms and Definitions

SBP Standard 1: Feedstock Compliance

SBP Instruction Document 1A: SBP Requirements for Primary Feedstock from Trees Outside Forests (TOF)

SBP Standard 2: Feedstock Verification

SBP Standard 3: Requirements for Certification Bodies

SBP Standard 4: Chain of Custody

SBP Standard 5 Collection and Communication of Data

SBP Instruction Document 5E: Collection and Communication of Energy and Carbon Data

SBP Standard 6 Energy and Carbon Balance Calculation

SBP Instruction Document 6D: Methodology for the calculation of GHG savings

SBP Instruction Document REDII: Meeting REDII

Normative Interpretations

SBP Audit Portal User Guide

Data Transfer System 2.0 User Guide

F Glossary of terms and definitions

The table below links the relevant definitions of the FIT programme, EU REDII and SBP certification scheme. Where there are inconsistencies the FIT definition shall prevail.

Table 1. FIT, EU REDII and SBP definitions

FIT definition	EU REDII definition	SBP definition
Biomass means reusable organic resources derived from living organisms, excluding fossil resources. Under feed-in tariffs, biomass is classified as follows: Methane fermentation gas, unused woody biomass generated by the cutting or thinning of standing bamboo in forests (excluding imported biomass), biomass solid fuel generated by the harvesting of general woody biomass and agricultural products (Lumber residue, imported wood, crop residue, etc), biomass liquid fuel generated by the harvesting of agricultural products, construction material waste, and power generation using biomass other than general waste and woody biomass as fuel.	**Biomass** means the biodegradable fraction of products, waste and residues from biological origin from agriculture, including vegetal and animal substances, from forestry and related industries, including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin.	**Biomass:** end product from a Biomass Producer Wood pellets Wood chips Lignin pellets (black pellets) **Primary biomass** means biomass produced from forestry.
CoC (Chain of Custody) Certification System is a System in which third party institution assesses and certificates the company about its way of custody to separate wood and wood products which originated in forest with certification properly from those not.		**Chain of Custody (CoC):** Process by which inputs and outputs and associated information are transferred, monitored and controlled as they move through each step in the relevant supply chain.
Forest Certification System is a system in which third party institution assesses and certificates the forest management level based on the standard settled by the independent forest certification institution.	**Certification Scheme:** Organisation that certifies the compliance of economic operators with criteria and rules including, but not limited to, the sustainability and greenhouse gas saving criteria set out in Directive (EU) 2018 / 2001 and in Delegated Regulation (EU) 2019 / 807; (Source: Commission implementing regulation).	**Voluntary Scheme:** Sustainability certification scheme with a similar scope as SBP.

F Glossary of terms and definitions continued

FIT definition	EU REDII definition	SBP definition
Forest residues: Low-quality wood generated from felling for the main purpose of producing wood for material use (including offcuts and branches), thinned wood, etc In addition, trees damaged by pests and diseases or natural disasters, pruned branches, driftwood of dams, etc generated by felling for purposes other than energy use (excluding waste). **Other harvested trees** Woody biomass generated from felling for the main purpose of energy use.		**Forest residues:** Feedstock comprising branch wood, diseased wood and storm salvage, end of life timber plantations, thinnings or tree tops.
	An **installation** shall be considered to be in operation once the physical production of fuel, heat or cooling, or electricity has started (i.e. once the production of fuels including biofuels, biogas or bioliquids, or production of heat, cooling or electricity from biomass fuels has started).	An **installation** shall be considered to be in operation once the physical production of fuel, heat or cooling, or electricity has started (i.e. once the production of fuels including biofuels, biogas or bioliquids, or production of heat, cooling or electricity from biomass fuels has started).
Legality means The timber to be procured should be harvested in legal manner consistent with procedures in the forest laws of timber producing countries and areas.		
		Pollution: air emission and waste disposal.
Processing residues: Offcuts, sawdust, bark and other residues generated during wood processing.	**Residue** means a substance that is not the end product(s) that a production process directly seeks to produce; it is not a primary aim of the production process and the process has not been deliberately modified to produce it.	**Processing residues** is unintentionally produced by-product reclaimed from a process of primary or secondary manufacture or other industry further downstream. It comes in a shape of wood chips, sawdust, shavings, offcuts.

F Glossary of terms and definitions continued

FIT definition	EU REDII definition	SBP definition
Processing residues: Offcuts, sawdust, bark and other residues generated during wood processing.		**Processing residues** / Wood industry or **sawmill residues:** Feedstock such as bark, sawdust, slab wood or residues arising from a primary or secondary wood processor; any wood rejected by a sawmill. Sawdust, shavings reduced during the processing of wood at the sawmill / wood industry. Chips, offcuts produced during the processing of wood at the sawmill / wood industry, that may include small offcuts or also bark that has been stripped from the wood.
Separative Custody Management is the way of custody to manage wood and wood products verified with legality and sustainability separated from those not.		
Sustainability means that the timber to be procured should be harvested from the forest under sustainable management.		**Sustainability characteristics:** Characteristics that describe attributes of feedstock or biomass which are related to definitions of sustainability.

FIT definition	EU REDII definition	SBP definition
	Waste means waste as defined in point (1) of Article 3 of Directive 2008 / 98 / EC, excluding substances that have been intentionally modified or contaminated in order to meet this definition; => **waste** means any substance or object which the holder discards or intends or is required to discard.	**SBP-compliant post-consumer tertiary feedstock:** This feedstock originates from a post-consumer source and sourced using SBP Standard 4 Instruction Note 4A: SBP tertiary feedstock requirements. **NOTE:** REDII specific requirements are included in section 7 below. Please note that post-consumer tertiary feedstock either supplied with an SBP-approved recycled claim, or sourced within the scope of the BP's own SBP-approved Chain of Custody (CoC) System certification, for example, non-certified reclaimed feedstock sourced in compliance with FSC-STD-40-007: FSC Standard for Sourcing Reclaimed Material for Use in FSC does not qualify to be used for production of REDII-compliant biomass because FSC, PEFC and SFI schemes are not recognised by EC for REDII compliance. Tertiary feedstock is exempt of sustainability criteria and is required to fulfil only the greenhouse gas emissions saving criteria of REDII.

1 https: / / www.enecho.meti.go.jp / category / saving_and_new / saiene / kaitori / fit_change_other.html
2 https: / / www.enecho.meti.go.jp / category / saving_and_new / saiene / kaitori / fit_change_other.html

1 Implementation timeline and eligibility

1.1 Implementation timeline

1.1.1 Biomass Producers, Traders and End-users (biomass power plants) must demonstrate compliance with the GHG reduction requirements included in the document according to the following schedule:

Table 2. Implementation timelines (if applying SBP)

Date power plants become approved by FIT	Date by which all *Organisations* up to Trader must be demonstrated against SBP requirements	Date by which power plants must be demonstrated against SBP requirements
Before 31 March 2022	Immediately, excluding LCGHG criteria. (All *Organisations* up to Traders supplying fuel to power plants which plan to submit "Fuel source change plan application"[1] must demonstrate compliance against all SBP requirements including LCGHG criteria).	Not applicable. (Power plants which plan to submit "Fuel source change plan application"[2] must demonstrate compliance against all SBP requirements including LCGHG criteria).
From 1 April 2022	Immediately, excluding LCGHG criteria; and All criteria need to be met either by the start of power plant operations or by 31 March 2026, whichever comes earlier.	Immediately, excluding LCGHG criteria; and All criteria need to be met either by the start of power plant operations or by 31 March 2026, whichever comes earlier.
From 1 April 2026	Immediately, all criteria.	Immediately, all criteria.

1.1.2 For biomass power plants with a capacity of 1MW or more certified for FIT before 1 April 2022, *Organisations* must demonstrate compliance with SBP requirements and this Instruction Document if their plan to change fuel source is granted after 1 April 2022.

1.1.3 For biomass power plants with a capacity of 1MW or more certified for FIT after 1 April 2022 and before 31 March 2026, power plants must demonstrate compliance with SBP requirements and this Instruction Document from start of operations. The grace period is granted for demonstration of compliance with LCGHG requirement up to the start of power plant operations or by 31 March 2026, whichever comes earlier.

1.1.4 For biomass power plants with a capacity of 1MW or more certified for FIT after 1 April 2026, power plants must demonstrate compliance with SBP requirements and this Instruction Document from start of operations.

1.1.5 The Certification Body shall clearly indicates in its certificate scope whether LCGHG criteria have been included in the assessment or not (SBP Standard 3, 12.3).

1.1.6 At the surveillance audit immediately before the end of the grace period (31 March 2026) or when the power plant starts operations, whichever comes earlier, the Organisation shall demonstrates compliance with the GHG reduction requirements in addition to demonstrating continued compliance with sustainability criteria.

[3] Minimise: meet or exceed legal requirements.

1.2 Eligibility of feedstock and biomass

1.2.1 The Organisation shall demonstrate compliance with the applicable SBP Standards and other scheme requirements to demonstrate compliance with the Guideline for Verification on Legality and Sustainability of Wood and Wood Products and the FIT requirements, including but not limited to the requirements set out in this Instruction Document and the GHG saving requirements applicable to power generators.

2 SBP requirements for Biomass Producers and Traders

2.1 Feedstock sourcing

2.1.1 The Organisation shall maintain up to date records about all suppliers who are supplying materials used for SBP product groups, including names, materials supplied, and certificate code where relevant. (SBP Standard 4, 2.1).

2.1.1.1 In particular, the Organisation shall develop and maintain a Risk Management Plan (RMP) which includes Risk Management Measures (RMMs) related to air pollution and waste disposal within its Supply Base Evaluation where specified risks have been identified (SBP Standard 2, 7.1).

2.1.2 Feedstock inputs for production of biomass in compliance with the Guideline for Verification on Legality and Sustainability of Wood and Wood Products and the FIT requirements shall be as follows:

2.1.2.1 SBP-compliant: feedstock sourced in conformance with SBP Standard 2, meaning that identified specific risks against indicators of Standard 1 have been effectively mitigated. In addition, it shall be in conformance with SBP Instruction Document REDII, or

2.1.2.2 SBP-controlled: feedstock is sourced under an SBP-recognised controlled claim (SBP Standard 4, 2.2). In addition, it shall be in conformance with SBP Instruction Document REDII.

2.1.3 Biomass input for the trade of biomass in compliance with the Guideline for Verification on Legality and Sustainability of Wood and Wood Products and the FIT requirements shall be as follows:

2.1.3.1 SBP-compliant biomass sourced in conformance with SBP Standard 4. In addition, it shall be in conformance with SBP Instruction Document REDII, or

2.1.3.2 SBP-controlled biomass sourced in conformance with SBP Standard 4 (SBP Standard 4, 2.2). In addition, it shall be in conformance with SBP Instruction Document REDII.

2.2 Material handling

2.2.1 The Organisation shall determine and implement effective measures to comply with all applicable laws, rules and regulations in countries where it conducts business activities (SBP Standard 4, 1.21), including, as required, develop and implement a plan to minimise[3] GHG emissions and pollution.

[4] Instruction Document 5E accompanies SBP Standard 5: Collection and Communication of Data and sets out the requirements and options for collecting the energy and carbon data that accompany SBP-certified biomass through the supply chain – https://sbpcert.wpenginepowered.com/wp-content/uploads/2023/12/SBP_Instruction-Document-5E_v2.1_final.pdf

Table 3. Feedstock characteristics for grouping feedstocks in SAR

2.2.2 In cases where there is a risk of mixing feedstock compliant with SBP requirements with non-eligible input, the Organisation shall segregate the SBP-certified feedstock physically and / or temporally from non-eligible input. (SBP Standard 4, 3.2).

NOTE: Temporally refers to situations where the *organisations* operate for example a single line of production. In such case and to ensure segregation, *organisations* shall process feedstock at different time, one after the other one, for example certified first and then non-certified material (for a comparative image, in the food industry, organic products are processed first, then machine are cleared and non-organic material is then processed).

2.2.3 Biomass compliant with SBP requirements shall not be mixed with non-compliant woody biomass at any point after the biomass production (e.g., by Traders at the wood pellet storage facilities). Mixing of compliant biomass with woody biomass that is not compliant shall result in losing compliance claim for the whole mix. (SBP Standard 4, 3.3).

2.3 Traceability requirements

2.3.1 The Organisation shall ensure that all transactions of material included in its SBP product Group schedule can be traced at least one step upstream and one step downstream from itself, and that all material is accounted for whilst under its legal ownership. (SBP Standard 4, 4.1).

2.3.2 When receiving biomass compliant with SBP requirements, the Organisation shall ensure that documentation exchanged between itself and the seller, in particular reference sales and delivery documentation, includes a number which enables the delivery to be linked to the corresponding transaction in the DTS. (SBP Standard 4, 4.4).

2.3.3 The Organisation shall register each transaction of biomass compliant with SBP requirements in the DTS. (SBP Standard 4, 4.20).

2.3.4 The supplying site of the Organisation shall ensure that sales and delivery documentation exchanged between itself and its customer includes a unique identification number which enables the delivery to be linked to the corresponding DTS transaction. (SBP Standard 4, 4.21).

2.4 Data reporting requirements and GHG calculation

2.4.1 Organisations handling feedstock and / or biomass compliant with SBP requirements shall collect data according to SBP Standard 5 and related Instruction Document 5E and report them in the SAR.

2.4.2 The Organisation shall confirm the Woody Biomass Categories in Japan FIT using the SAR as follows (SBP Instruction Document 5E, 3.3.3)[4].

Table 3. Feedstock characteristics for grouping feedstocks in SAR continued

Origin	Feedstock types	Physical description	SBP definition	FIT definitions
Specify one of the following options: – **Final harvest from (semi-) natural forests** – **Final harvest from plantations** Biomass feedstock produced when trees are felled in forests in a continuously regenerated forest.	High grade stemwood	Roundwood or chips	Wood from the stem of a tree (i.e. excludes branches, stumps and roots) that is merchantable as sawtimber in local markets. This also excludes salvage trees, end-of-life trees and trees removed for nature conservation.	N / A
Specify one of the following options: – **Thinning from (semi-) natural forests** – **Thinning from plantation forest** Biomass feedstock produced when trees are felled in forests or plantations to reduce stand density and enhance diameter growth and volume of the residual stand, as long as this practice does not change the land use status of the area.	High grade stemwood			N / A
Specify one of the following options: – **Final harvest from (semi-) natural forests** – **Final harvest from plantation forest** – **Thinning from (semi-) natural forests** – **Thinning from plantation forest** – **Landscape** (small wooded areas, wind and shelterbelts, trees along lakes and streams). – **Urban, domestic and infrastructure** (gardens and parks, roadside trees, trees along infrastructure (road, rail, power, etc), trees from new construction sites). – **Woody residues from agricultural land** (orchards, vineyards, nuts and other woody crops, agro-forestry).	Low grade stemwood		Wood from the stem of a tree (i.e. excludes branches, stumps and roots) that is not merchantable as sawtimber in local markets. This also excludes salvage trees, end of life trees and trees removed for nature conservation.	Forest residues
	Forest or landscape residues with stumps		Tops, limbs, branches, leaves, bark including stumps.	
	End-of-life trees		Wood for end-of-life trees including commercial end-of-life, like pruning and whole trees from crop rotation of fruit trees.	
	Salvage trees		Whole trees, resulting from fires, storms, illness, etc	
	Trees removed for nature conservation		Whole trees removed for environmental reasons.	

Origin	Feedstock types	Physical description	SBP definition	FIT definitions
Woody energy crops (i.e. woody biomass), Short Rotation Coppice	Product and co-products	Roundwood or chips	Trees originating from plantations on agricultural land with short harvest rotations less than eight (8) years. Wood for energy is the main product, such as willow, Poplar, Eucalyptus in SRC.	Other harvested trees
Processing residues	Sawmill and wood Industry residues	Sawdust, shavings	Produced during the processing of wood at the sawmill / wood industry.	Processing residues
	Industry residues	Chips, offcuts	Produced during the processing of wood at the sawmill / wood industry, that may include small offcuts or also bark that has been stripped from the wood.	
Post-consumer	Recycled wood	Clean chips or dust	Originating from material that is recycled at end of life after having been used as a product.	N / A
		Treated chips or dust	Originating from material that is recycled at end-of-life after having been used as a product and may contain non-wooden materials such as paint, non-natural heavy metals, metal or plastic.	N / A

2.5 GHG emissions saving

2.5.1 *Organisations*, except End-users, shall record the Energy and Carbon Data as required by SBP Standard 5 – Collection and Communication of Data and instructed by Instruction Document 5E – Collection and Communication of Energy and Carbon Data.

2.5.1.1 In the case that the BP reports data on recorded upstream use of energy (including mobile chipping) and / or chemicals (fertilisers, pesticides etc) for Feedstock Groups Short Rotation Coppice (as per 4.4.2), data and justification shall be reported in Table 2.2 of the SAR (SBP Instruction Document 5E, 3.4.1).

2.5.2 End-users using biomass compliant with FIT requirements shall demonstrate compliance with the GHG emissions reduction compared to the thermal baseline as shown below using Standard 6 – Energy and Carbon Balance Calculation, Instruction Document 6D: Methodology for the Calculation and Certification of GHG Emissions Savings for REDII and Annex C of this document.

Table 4. GHG reduction requirements ratio

Date of FIT approval for biomass power plant or date when plan to change fuel source is granted, whichever is later	Fuels procured from 1 April 2023 and before 1 April 2030	Fuels produced on or after 1 April 2030
Before 1 April 2021	Voluntary reporting	Voluntary reporting
On or After 1 April 2021 and before 1 April 2030	-50%	-70%
On or After 1 April 2030	N / A	-70%

2.5.3 For the calculation of GHG saving in compliance with this Instruction Document, the thermal baseline emissions is defined at 180g CO_2 / MJ.

2.5.4 End-users shall use SBP Standard 6 to perform their Lifecycle Assessment (LCA) calculation according to SBP Instruction Document ID 6D and Annex C of this document. When duly justified by the respective SAR attached to their inbound transactions, end users can use the default values presented in Annex A of this document in lieu of performing a LCA calculation.

2.5.4.1 The use of default value is not possible for biomass from Feedstock Group Short Rotation Coppice. The End User shall perform their Lifecycle Assessment (LCA) calculation according to SBP Instruction Document 6D and Annex C of this document.

2.5.5 End-users shall identify the Product Group ID and the appropriate DTR to ensure the biomass purchased and consumed comply with the criteria to choose default values as presented in Annex A of this document:

2.5.5.1 Inbound voyage distance for woodchips: 6,500km, 11,600km, 18,000km,

2.5.5.2 Inbound voyage distance for pellets: 6,500km, 9,000km, 18,000km,

2.5.5.3 Size of ships: Handy Size, Supramax,

2.5.5.4 Heat Source for drying process in wood pellets production: fossil fuel, biomass fuel.

3 SBP requirements for Certification Body: additional accreditation requirements for audits according to FIT requirements

NOTE: SBP-accredited Certification Bodies need to follow requirements of SBP Standard 3.

3.1 Management system

3.1.1 The Certification Body (CB) shall hold SBP accreditation in accordance with ISO 17065. (SBP Standard 3, 1.1.1).

3.1.2 The CB evaluating conformance against Standard 6 and against FIT GHG requirements shall be accredited against ISO14065 (SBP EU RED briding document 7.3.4).

3.1.3 Records shall be retained for a minimum of five (5) years and comply with legal and regulatory requirements.

3.2 Competence management

3.2.1 The CB shall ensure that auditors have successfully passed the initial auditor training courses approved by SBP (SBP Standards 3, 4.6).

3.2.2 The auditor shall have the appropriate specific skills necessary for conducting the audit related to the scheme's criteria (SBP Instruction Document REDII, 7.3.4).

3.2.2.1 Sustainability and legality criteria (Supply Base Evaluation).

3.2.2.2 GHG criteria (GHG emission calculation at the End-user level): A minimum of two years' experience in biofuels lifecycle assessment, and specific experience in auditing GHG emission calculations following the RED / REDII calculation methodology.

NOTE: Relevant experience is depending on the type of audits to be conducted by the individual auditor.

3.2.2.3 Chain of Custody criteria (all certificate holders): Experience in mass balance systems, supply chain logistics, book-keeping, traceability, data handling or similar.

3.3 Confirmation of woody biomass categories in FIT requirements

3.3.1 The SAR shall be verified by the CB by evaluating compliance against the requirements set out in the SBP Instruction Document 5E. The CB shall insert comments confirming the data recorded by the BP as indicated in the SAR. The CB shall also assure that a minimal set of pictures taken during the Reporting Period is included in the SAR to describe the biomass production process and equipment. The SAR shall be validated by the responsible CB auditor and shall include the contact details as indicated in the SAR. (SBP Instruction Document 5E, 3.1.1).

3 SBP requirements for Certification Body: additional accreditation requirements for audits according to FIT requirements continued

3.4 Requirements for certified Organisation certificates

3.4.1 The CB shall provide the certified Organisation with formal certification documentation (SBP Standard 3, 12.2).

3.4.2 The formal certification documentation shall clearly convey whether LCGHG criteria have been included in the assessment (SBP Standard 3, 12.3).

3.4.3 Where applicable, the Certification Body shall perform a scope change audit to include verification of compliance against LCGHG criteria at the planned surveillance audit occurring before the start of the power plant operations or the end of the grace period (31 March 2026) whichever comes earlier. Depending on the outcome of the evaluation, the Certification Body shall update the Organisation's certificate and clearly indicates that LCGHG criteria have been included in the assessment.

Annex A: Lifecycle GHG default values for imported woody biomass

Default values for imported woody biomass is determined for each fuel of woody chips and wood pellets with categories of following three feedstock types.

- Forest residue.
- Other harvested trees.
- Sawmill residues.

For the maritime transport, the transportation distance is set on the assumption of the representing countries producing woody biomass imported into Japan. Specifically, there are three categories of maritime transport distance for wood chips (6,500km, 11,600km, and 18,000km) and three categories for wood pellets (6,500km, 9,000km, and 18,000km). Two categories are set for size of ships (Handysize and Supramax).

In addition, there are two categories for wood pellets default values for heat sources in the drying process, fossil fuel and biomass fuel.

The calculation results of the default lifecycle GHG values for each fuel are as follows:

Table 1. Lifecycle GHG default values (g-CO_2 / MJ-fuel) for imported wood chips (forest residues)

Process	Handy Size 6,500km transport	Supramax 6,500km transport
Transportation process (collection of forest residues)	1.24	
Processing process	0.40	
Transportation process (domestic transport of wood chips in producing countries)	1.75	
Transportation process (maritime transport of wood chips)	14.13	8.98
Transportation process (domestic transport of wood chips in Japan)	0.44	
Power generation	0.41	
Total	**18.37**	**13.22**

Annex A Lifecycle GHG default values for imported woody biomass continued

Process	Handy Size 11,600km transport	Supramax 11,600km transport
Transportation process (maritime transport of wood chips)	25.21	16.02
(The rest of the process is omitted because it is the same as 6,500km transport)		
Total	**29.45**	**20.26**

Process	Handy Size 18,000km transport	Supramax 18,000km transport
Transportation process (maritime transport of wood chips)	39.13	24.86
(The rest of the process is omitted because it is the same as 6,500km transport)		
Total	**43.37**	**29.10**

Table 2. Lifecycle GHG default values for imported wood chips (other harvested trees) (g-CO_2 / MJ-fuel)

<table>
<tr><th>Process</th><th>Handy Size
6,500km transport</th><th>Supramax
6,500km transport</th></tr>
<tr><td>Cultivation process</td><td colspan="2">1.11</td></tr>
<tr><td>Processing process</td><td colspan="2">0.40</td></tr>
<tr><td>Transportation process (domestic transport of wood chips in producing countries)</td><td colspan="2">1.75</td></tr>
<tr><td>Transportation process (maritime transport of wood chips)</td><td>14.13</td><td>8.98</td></tr>
<tr><td>Transportation process (domestic transport of wood chips in Japan)</td><td colspan="2">0.44</td></tr>
<tr><td>Power generation</td><td colspan="2">0.41</td></tr>
<tr><td>Total</td><td>18.24</td><td>13.09</td></tr>
</table>

Annex A Lifecycle GHG default values for imported woody biomass continued

Process	Handy Size 11,600km transport	Supramax 11,600km transport
Transportation process (maritime transport of wood chips)	25.21	16.02
(The rest of the process is omitted because it is the same as 6,500km transport)		
Total	**29.32**	**20.13**

Process	Handy Size 18,000km transport	Supramax 18,000km transport
Transportation process (maritime transport of wood chips)	39.13	24.86
(The rest of the process is omitted because it is the same as 6,500km transport)		
Total	**43.24**	**28.97**

Table 3. Lifecycle GHG default values for imported wood chips (sawmill residues) (g-CO_2 / MJ-chip)

Process	Handy Size 6,500km transport	Supramax 6,500km transport
Processing	0.00	
Transportation process (domestic transport of wood chips in producing countries)	1.75	
Transportation process (maritime transport of wood chips)	14.13	8.98
Transportation process (domestic transport of wood chips in Japan)	0.44	
Power generation	0.41	
Total	**16.73**	**11.58**

Process	Handy Size 11,600km transport	Supramax 11,600km transport
Transportation process (domestic transport of wood chips in producing countries)	25.21	16.02
(The rest of the process is omitted because it is the same as 6,500km transport)		
Total	**27.81**	**18.62**

Process	Handy Size 18,000km transport	Supramax 18,000km transport
Transportation process (maritime transport of wood chips)	39.13	24.86
(The rest of the process is omitted because it is the same as 6,500km transport)		
Total	**41.73**	**27.46**

Table 4. Lifecycle GHG default values (g-CO_2 / MJ-pellet) for imported wood pellets (forest residues)

	Drying: Fossil fuel use (Pelletising: Grid power use)		Drying: Biomass use (Pelletising: Grid power use)	
Process	Handy Size 6,500km transport	Supramax 6,500km transport	Handy Size 6,500km transport	Supramax 6,500km transport
Transportation process (collection of forest residues)	1.18		1.51	
Transportation process (transportation of feedstocks)	0.85		1.08	
Processing	25.78		9.66	
Transportation process (domestic transport of pellets in producing countries)	1.36			
Transportation process (maritime transport of pellets)	3.11	2.01	3.11	2.01
Transportation process (domestic transport of pellets in Japan)	0.34			
Power generation	0.25			
Total	**32.87**	**31.77**	**17.31**	**16.21**

Annex A Lifecycle GHG default values for imported woody biomass continued

Process	Drying: Fossil fuel use (Pelletising: Grid power use)		Drying: Biomass use (Pelletising: Grid power use)	
	Handy Size 9,000km transport	Supramax 9,000km transport	Handy Size 9,000km transport	Supramax 9,000km transport
Transport process (maritime transport of pellets)	4.30	2.78	4.30	2.78
(The rest of the process is omitted because it is the same as the 6,500km transport)				
Total	**34.06**	**32.54**	**18.50**	**16.98**

Process	Drying: Fossil fuel use (Pelletising: Grid power use)		Drying: Biomass use (Pelletising: Grid power use)	
	Handy Size 18,000km transport	Supramax 18,000km transport	Handy Size 18,000km transport	Supramax 18,000km transport
Transport process (maritime transport of pellets)	8.60	5.56	8.60	5.56
(The rest of the process is omitted because it is the same as the 6,500km transport)				
Total	**38.36**	**35.32**	**22.80**	**19.76**

Annex A Lifecycle GHG default values for imported woody biomass continued

Table 5. Lifecycle GHG default values for imported wood pellets (other harvested wood) (g-CO_2/ MJ-pellets)

Process	Drying: Fossil fuel use (Pelletising: Grid power use)		Drying: Biomass use (Pelletising: Grid power use)	
	Handy Size 6,500km transport	Supramax 6,500km transport	Handy Size 6,500km transport	Supramax 6,500km transport
Cultivation	1.06		1.36	
Transportation (transportation of feedstocks)	0.85		1.08	
Processing	25.78		9.66	
Transportation process (domestic transport of pellets in producing countries)	1.36			
Transportation process (maritime transport of pellets)	3.11	2.01	3.11	2.01
Transportation process (domestic transport of pellets in Japan)	0.34			
Power generation	0.25			
Total	**32.75**	**31.65**	**17.16**	**16.06**

Process	Drying: Fossil fuel use (Pelletising: Grid power use)		Drying: Biomass use (Pelletising: Grid power use)	
	Handy Size 9,000km transport	Supramax 9,000km transport	Handy Size 9,000km transport	Supramax 9,000km transport
Transport process (maritime transport of pellets)	4.30	2.78	4.30	2.78
(The rest of the process is omitted because it is the same as the 6,500km transport)				
Total	**33.94**	**32.42**	**18.35**	**16.83**

Annex A Lifecycle GHG default values for imported woody biomass continued

Process	Drying: Fossil fuel use (Pelletising: Grid power use)		Drying: Biomass use (Pelletising: Grid power use)	
	Handy Size 18,000km transport	Supramax 18,000km transport	Handy Size 18,000km transport	Supramax 18,000km transport
Transport process (maritime transport of pellets)	8.60	5.56	8.60	5.56
(The rest of the process is omitted because it is the same as the 6,500km transport)				
Total	**38.24**	**35.20**	**22.65**	**19.61**

Table 6. Lifecycle GHG default values for imported wood pellets (sawmill residues) (g-CO_2/ MJ-pellets)

Process	Drying: Fossil fuel use (Pelletising: Grid power use)		Drying: Biomass use (Pelletising: Grid power use)	
	Handy Size 6,500km transport	Supramax 6,500km transport	Handy Size 6,500km transport	Supramax 6,500km transport
Processing	14.92		5.18	
Transportation process (domestic transport of pellets in producing countries)	1.36			
Transportation process (maritime transport of pellets)	3.11	2.01	3.11	2.01
Transportation process (domestic transport of pellets in Japan)	0.34			
Power generation	0.25			
Total	**19.98**	**18.88**	**10.24**	**9.14**

Annex A Lifecycle GHG default values for imported woody biomass continued

Process	Drying: Fossil fuel use (Pelletising: Grid power use)		Drying: Biomass use (Pelletising: Grid power use)	
	Handy Size 9,000km transport	Supramax 9,000km transport	Handy Size 9,000km transport	Supramax 9,000km transport
Transport process (maritime transport of pellets)	4.30	2.78	4.30	2.78
(The rest of the process is omitted because it is the same as the 6,500km transport)				
Total	**21.17**	**19.65**	**11.43**	**9.91**

Process	Drying: Fossil fuel use (Pelletising: Grid power use)		Drying: Biomass use (Pelletising: Grid power use)	
	Handy Size 18,000km transport	Supramax 18,000km transport	Handy Size 18,000km transport	Supramax 18,000km transport
Transport process (maritime transport of pellets)	8.60	5.56	8.60	5.56
(The rest of the process is omitted because it is the same as the 6,500km transport)				
Total	**25.47**	**22.43**	**15.73**	**12.69**

Annex B: Detailed calculation for setting the default values

A Lifecycle of wood chips GHG default value calculation process

Wood chips derived from forest residues, etc

Target processes

Covered processes are shown in the blue box below.

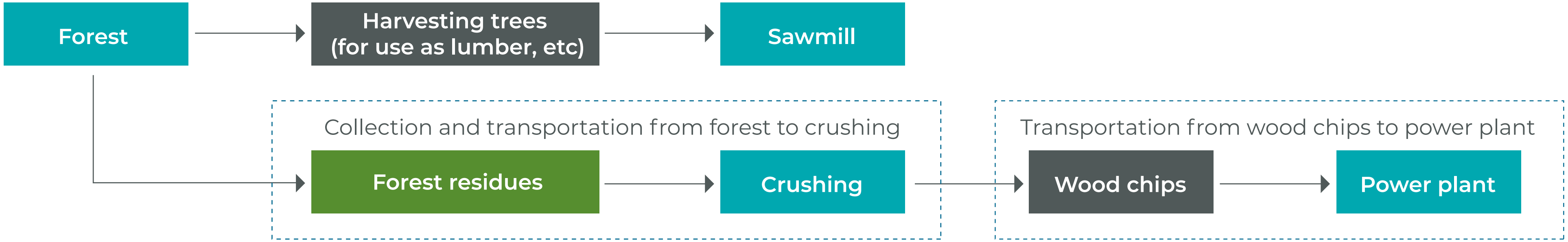

Figure 1: Lifecycle of wood chips derived from forest residues, etc: covered processes for GHG

With regard to maritime transport, the 9th session of the Biomass Sustainability WG recognised that specific voyage pattern is taken (dedicated vessels are used) in maritime transport of wood chips. Therefore, the distance of empty cargo transport is set as the same as that of wood chips transportation, unlike pellets for which the value of the ratio of empty cargo transport is set at 30% of the total voyage distance.

Calculating emissions by process

The calculation results of emissions from the transportation process (collection of forest residue) are as follows.

Annex B Detailed calculation for setting the default value continued

Table 7: Calculation of emissions from the transportation process (collection of forest residue)

	Dimensions	Values	Units	Source
1	Diesel oil input in collection of forest residues.	0.0120	MJ-diesel oil / MJ-feedstock	JRC(2017b)
2	Diesel oil emission factor of CO_2	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
3	CH_4 emissions intensity (when agricultural machinery is used)	0.00000257	g-CH_4 / MJ-feedstock	JRC(2017b)
4	N_2O emissions intensity (when agricultural machinery is used)	0.00001075	g-N_2O / MJ-feedstock	JRC(2017b)
5	CH_4 emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.00006	g-CO_2eq / MJ-feedstock	=(3)×25
6	N_2O emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.00320	g-CO_2eq / MJ-feedstock	=(4)×298
7	GHG emissions intensity of forest residue collection process per MJ of forest residue	1.14447	g-CO_2eq / MJ-feedstock	=(1)×(2)+(5)+(6)
8	Forest residue equivalent required for chip manufacturing	1.079	MJ- feedstock / MJ-fuel	JRC(2017b)
9	GHG emissions of the process	1.24	g-CO_2eq / MJ-fuel	=(7)×(8)

The calculation results of emissions from the processing (crushing) are as follows.

Table 8: Calculation of emissions from the processing of wood chips (crushing)

	Dimensions	Values	Units	Source
1	Diesel oil input during crushing	0.003357	MJ-diesel oil / MJ-fuel	JRC(2017b)
2	Diesel oil emission factor (including methane and N_2O)	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
3	CH_4 emissions intensity (when using crushing machinery)	0.0000092	g-CH_4 / MJ-fuel	JRC(2017b)
4	N_2O emission intensity (when using crushing machinery)	0.0000385	g-N_2O / MJ-fuel	JRC(2017b)
5	CH_4 emissions intensity (when using crushing machinery) CO_2 equivalent	0.00023	g-CO_2eq / MJ-fuel	=(3)×25
6	N_2O emission intensity (when using crushing machinery) CO_2 equivalent	0.01147	g-CO_2eq / MJ-fuel	=(4)×298
7	GHG emissions of the process	0.33	g-CO_2eq / MJ-fuel	=(1)×(2)+(5)+(6)
8	GHG emissions from the process (increase (7) by 20% to ensure conservativeness)	0.40	g-CO_2eq / MJ-fuel	=(7)×1.2

Annex B Detailed calculation for setting the default value continued

The following are the results of calculations of emissions from the transport of wood chips from wood chips factories.

Table 9: Calculations of emissions from the wood chips transportation (transportation in the production country)

	Specifications	Values	Units	Source
1	Distance (in production)	300	km	Set based on plant locations of woody biomass suppliers
2	Round-trip fuel economy	0.811	MJ-diesel oil / tkm	JRC(2017b)
3	Diesel oil emission factor (including methane and N_2O)	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
4	Emission intensity from diesel oil (not including methane and N_2O from combustion)	77.1	g-CO_2eq / tkm	=(2)×(3)
5	CH_4 emissions intensity (when trucks are used)	0.0034	g-CH_4 / tkm	JRC(2017a)
6	N_2O emissions intensity (when trucks are used)	0.0015	g-N_2O / tkm	JRC(2017a)
7	CH_4 emissions intensity (when trucks are used) CO_2 equivalent	0.085	g-CO_2eq / tkm	=(5)×25
8	N_2O emissions intensity (when trucks are used) CO_2 equivalent	0.447	g-CO_2eq / tkm	=(6)×298
9	GHG emissions intensity of land transport	77.7	g-CO_2eq / tkm	=(4)+(7)+(8)
10	Wood chip Heat value	13,300	MJ-fuel / t-fuel	JRC(2017b) (assuming 30% moisture content for a dry heating value of 19,000 MJ / t)
11	GHG emissions from the process	1.75	g-CO_2eq / MJ-fuel	=(1)×(9) / (10)

For maritime transport emissions intensity, the value is originally calculated referring to values used in developing EU REDII default values. Specifically the value assuming the ratio of empty cargo transport as 30% of total voyage distance and the bulk density as 0.22 t / m^3 used in EUREDII is converted to the values assuming the distance of empty cargo transport as the same as wood chips transportation.

Annex B Detailed calculation for setting the default value continued

Table 10: Calculations of emissions from maritime transport of wood chips (Handy Size 6,500km transport)

	Specifications	Values	Units	Source
1	Maritime transport distance	6,500	km	Estimated distance between Vietnam's representative port and Japan
2	Marine transport emissions intensity (bulk density of 0.22 t / m^3 or more, Handy Size)	28.91	g-CO_2eq / tkm	Calculated from JRC(2017b)
3	Wood chip heating value	13,300	MJ-fuel / t-fuel	JRC(2017b) (assuming 30% moisture content for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	14.13	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Table 11: Calculation of emissions from maritime transport of wood chips (Handy Size: 11,600km transport)

	Specifications	Values	Units	Source
1	Maritime transport distance	11,600	km	Approximate route between Australian representative port and Japan
2	Marine transport emissions intensity (bulk density of 0.22 t / m^3 or more, Handy Size)	28.91	g-CO_2eq / tkm	Calculated from JRC(2017b)
3	Wood chip heating value	13,300	MJ-fuel / t-fuel	Same as above (assuming 30% moisture content for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	25.21	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Annex B Detailed calculation for setting the default value continued

Table 12: Calculation of emissions from maritime transport of wood chips (Handy Size: 18,000km transport)

	Specifications	Values	Units	Source
1	Maritime transport distance	18,000	km	Ascertaining the distance between U.S. East Coast representative ports and Japan
2	Marine transport emissions intensity (bulk density of 0.22 t / m^3 or more, Handy Size)	28.91	g-CO_2eq / tkm	Calculated from JRC(2017b)
3	Wood chip heating value	13,300	MJ-fuel / t-fuel	JRC(2017b) (assuming 30% moisture content for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	39.13	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Table 13: Calculation of emissions from maritime transport of wood chips (Supramax : 6,500km transport)

	Specifications	Values	Units	Source
1	Maritime transport distance	6,500	km	Estimate between Vietnam's representative port and Japan
2	Marine transport emissions intensity (bulk density 0.22 t / m^3 or higher, Supramax)	18.37	g-CO_2eq / tkm	Calculated from JRC(2017b)
3	Wood chip heating value	13,300	MJ-fuel / t-fuel	JRC(2017b) (assuming 30% moisture content for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	8.98	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Annex B Detailed calculation for setting the default value continued

Table 14: Calculation of emissions from maritime transport of wood chips (Supramax 11,600km transport)

	Specifications	Values	Units	Source
1	Maritime transport distance	11,600	km	Estimated distance between Australian representative ports and Japan
2	Marine transport emissions intensity (bulk density 0.22 t / m^3 or higher, Supramax)	18.37	g-CO_2eq / tkm	Calculated from JRC(2017b)
3	Wood chip heating value	13,300	MJ-fuel / t-fuel	JRC(2017b) (assuming 30% moisture content for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	16.02	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Table 15: Calculation of emissions from maritime transport of wood chips (Supramax : 18,000km transport)

	Specifications	Values	Units	Source
1	Maritime transport distance	18,000	km	Guided service between U.S. East Coast Representative Port and Japan
2	Marine transport emissions intensity (bulk density 0.22 t / m^3 or higher, Supramax)	18.37	g-CO_2eq / tkm	Calculated from JRC(2017b)
3	Wood chip heating value	13,300	MJ-fuel / t-fuel	JRC(2017b) (assuming 30% moisture content for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	24.86	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Annex B Detailed calculation for setting the default value continued

Table 16: Calculating emissions from the transport of wood chips (domestic transport in Japan)

	Specifications	Values	Units	Source
1	Distance	20	km	Document 2 of the 12th WG
2	Round-trip fuel economy 10 t truck	3.06	MJ-diesel oil / tkm	Table.179
3	Diesel oil emission factor (including methane and N_2O)	95.1	g-CO_2eq / MJ- diesel oil	JRC(2017b)
4	Emission intensity from diesel oil (not including methane and N_2O from combustion)	291.0	g-CO_2eq / tkm	=(2)×(3)
5	CH_4 emissions intensity (when trucks are used)	0.0034	g-CH_4 / tkm	JRC(2017a)
6	N_2O emissions intensity (when trucks are used)	0.0015	g-N_2O / tkm	JRC(2017a)
7	CH_4 emissions intensity (when trucks are used) CO_2 equivalent	0.085	g-CO_2eq / tkm	=(5)×25
8	N_2O emissions intensity (when trucks are used) CO_2 equivalent	0.447	g-CO_2eq / tkm	=(6)×298
9	GHG emissions intensity of land transport	291.5	g-CO_2eq / tkm	=(4)+(7)+(8)
10	Wood chip heat value	13,300	MJ-fuel / t-fuel	JRC(2017b) (assuming 30% moisture content for a dry heating value of 19,000 MJ / t)
11	GHG emissions from the process	0.44	g-CO_2eq / MJ-fuel	=(1)×(9) / (10)

Calculation results of emissions from power generation with wood pellets are as follows.

Table 17: Calculation of generation process emissions

	Specifications	Values	Units	Source
1	CH_4 emissions (wood chips)	0.00489	g-CH_4 / MJ-chips	JRC(2017b)
2	N_2O emissions (wood chips)	0.00098	g-N_2O / MJ-chips	JRC(2017b)
3	Emissions from the power generation	0.41	g-CO_2eq / MJ-fuel	1 x 25+(2) x 298

Annex B Detailed calculation for setting the default value continued

Wood chips from other harvested trees

Target process

Covered processes are shown in the blue box below.

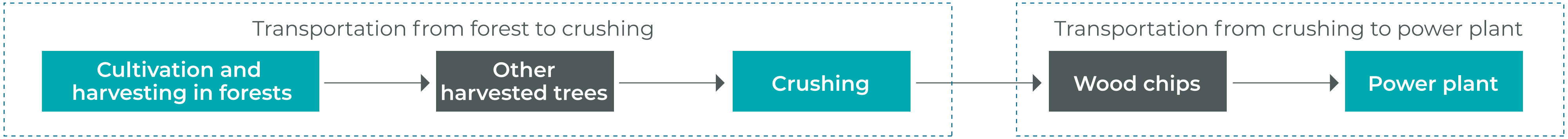

Figure 2: Boundary for Lifecycle GHG emissions of wood chips derived from other harvested trees

Emissions from maritime transport are the same as wood chips derived from forest residues.

Calculating emissions by process

The calculated emissions from the cultivation process are as follows:

Table 18: Calculation of emissions from the cultivation process

	Dimensions	Values	Units	Source
1	Diesel oil inputs in cultivation and logging	0.01066	MJ-diesel oil / MJ-feedstock	JRC(2017b)
2	Diesel oil emission factor CO_2	95.1	gCO_2 / MJ-diesel oil	Ibid
3	CH_4 emissions intensity (when agricultural machinery is used)	0.00000816	g-CH_4 / MJ-feedstock	JRC(2017b)
4	N_2O emissions intensity (when agricultural machinery is used)	0.00003413	g-N2O / MJ-feedstock	JRC(2017b)
5	CH_4 emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.00020	g-CO_2eq / MJ-feedstock	=(3)×25
6	N_2O emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.01017	g-CO_2eq / MJ-feedstock	=(4)×298
7	GHG emissions intensity of cultivation process	1.02414	g-CO_2eq / MJ-feedstock	=(1)×(2)+(5)+(6)
8	Amount of other harvested trees required to make chips	1.079	MJ-feedstock / MJ-fuel	JRC(2017b)
9	GHG emissions of the process	1.11	g-CO_2eq / MJ-fuel	=(7)×(8)

Emissions from processing (crushing) are the same as wood chips derived from forest residues.
Emissions from transport (chip transport) are the same as wood chips derived from forest residues.
Emissions from power generation emissions are the same as wood chips derived from forest residues.

Wood chips derived from sawmill residues

Covered processes, etc

Covered processes are shown in the blue box below.

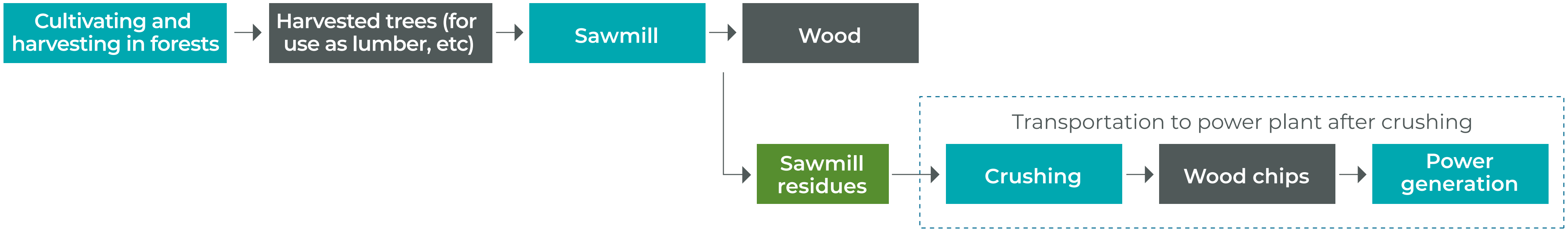

Figure 3: Boundary for Lifecycle GHG emissions of wood chips (sawmill residues)

Emissions from maritime transport are the same as wood chips derived from forest residues.

Calculating emissions by process

The emissions from processing (crushing) are assumed to be zero because there is no processing for wood chips derived from sawmill residues.

Emissions from wood chip transport are the same as wood chips derived from forest residues.

Emissions from power generation are the same as wood chips derived from forest residues.

B Calculation process of Lifecycle GHG default values for Wood Pellets

Pellets derived from forest residues

Covered processes, etc

Covered processes are shown in the blue box below.

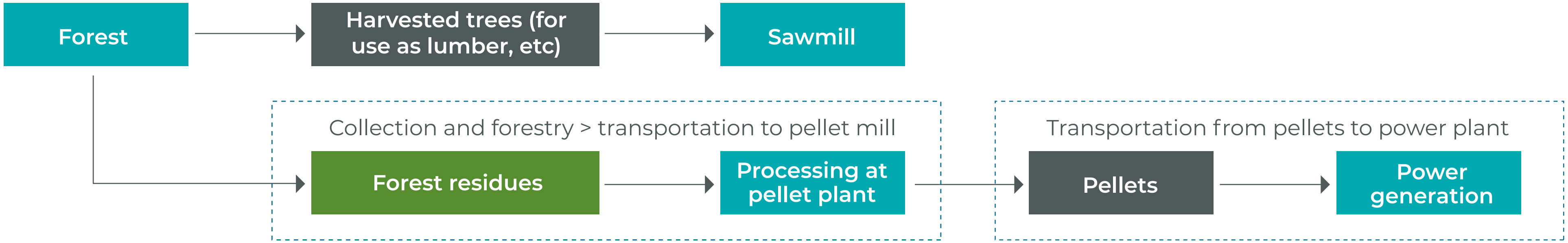

Figure 4: Boundary for lifecycle GHG emissions of wood pellets derived from forest residues

With regard to maritime transport, the 9th session of the Biomass Sustainability WG recognised that no specific voyage pattern is taken in transporting Wood pellets. Therefore, the value of the ratio of empty cargo transport is set at 30% of the total voyage distance for Wood pellets.

Calculating emissions by process

The calculation results of the collection process of forest residue, are as follows.

Table 19: Calculation of emissions from the collection process of forest residue (when fossil fuels are used as dry heat sources)

	Specifications	Values	Units	Source
1	Diesel oil input in collection of forest residues	0.0120	MJ-diesel oil / MJ-forest residues, etc. (before seasoning)	JRC(2017b)
2	Diesel oil emission factor CO_2	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
3	CH_4 emissions intensity (when agricultural machinery is used)	0.00000257	g-CH_4 / MJ-feedstock	JRC(2017b)
4	N_2O emissions intensity (when agricultural machinery is used)	0.00001075	g-N_2O / MJ-feedstock	JRC(2017b)
5	CH_4 emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.00006	g-CO_2eq / MJ-feedstock	=(3)×25
6	N_2O emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.00320	g-CO_2eq / MJ-feedstock	=(4)×298
7	GHG emissions intensity of forest residue collection process per MJ of forest residue	1.14447	g-CO_2eq / MJ-feedstock	=(1)×(2)+(5)+(6)
8	Equivalent amount of forest residue required for pellet production (before seasoning)	1.035	MJ-feedstock / MJ-fuel	JRC(2017b)
9	GHG emissions of the process	1.18	g-CO_2eq / MJ-fuel	=(7)×(8)

Table 20: Calculation of emissions from the forest residue collection (when biomass is used as a dry heat source)

	Specifications	Values	Units	Source
1	Diesel oil input in collection of forest residues	0.012	MJ-diesel oil / MJ-feedstock	JRC(2017b)
2	Diesel oil emission factor CO_2	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
3	CH_4 emissions intensity (when agricultural machinery is used)	0.00000257	g-CH_4 / MJ-feedstock	JRC(2017b)
4	N_2O emissions intensity (when agricultural machinery is used)	0.00001075	g-N_2O / MJ-feedstock	JRC(2017b)
5	CH_4 emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.00006	g-CO_2eq / MJ-feedstock	=(3)×25
6	N_2O emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.00320	g-CO_2eq / MJ-feedstock	=(4)×298
7	GHG emissions intensity of forest residue collection process per MJ of forest residue	1.14447	g-CO_2eq / MJ-feedstock	=(1)×(2)+(5)+(6)
8	Equivalent amount of forest residue required for pellet production (before seasoning)	1.323	MJ-feedstock / MJ-fuel	JRC(2017b)
9	GHG emissions of the process	1.51	g-CO_2eq / MJ-fuel	=(7)×(8)

Annex B Detailed calculation for setting the default value continued

The calculation results of the transportation (pre-processing transportation) are as follows.

Table 21: Calculation of emissions from the transport of wood chips (pre-processing transport) (when fossil fuels are used as dry heat sources)

	Specifications	Values	Units	Source
1	Distance	100	km	JRC(2017b)
2	Round-trip fuel economy	0.811	MJ-diesel oil / tkm	JRC(2017b)
3	Diesel oil emission factor (including CH_4 and N_2O)	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
4	Emission intensity from diesel oil (not including methane and N_2O from combustion)	77.1	g-CO_2eq / tkm	=(2)×(3)
5	CH_4 emissions intensity (when trucks are used)	0.0034	g-CH_4 / tkm	JRC(2017a)
6	N_2O emissions intensity (when trucks are used)	0.0015	g-N_2O / tkm	JRC(2017a)
7	CH_4 emissions intensity (when trucks are used) CO_2 equivalent	0.085	g-CO_2eq / tkm	=(5)×25
8	N_2O emissions intensity (when trucks are used) CO_2 equivalent	0.447	g-CO_2eq / tkm	=(6)×298
9	Heat value of forest residue	9,500	MJ-feedstock / t-feedstock	Ibid (assuming a moisture content of 50% for a dry heating value of 19,000 MJ / t)
10	GHG emission intensity for land transport	0.817	g-CO_2eq / MJ-feedstock	=(1)×(4)+(7)+(8) / (9)
11	Equivalent amount of forest residue required for pellet production (before natural drying)	1.035	MJ- feedstock / MJ-fuel	JRC(2017b)
12	GHG emissions of the process	0.85	g-CO_2eq / MJ-fuel	=(10)×(11)

Table 22: Calculation of emissions from the transport of wood chips (pre-processing transport) (when biomass is used as a dry heat source)

	Specifications	Values	Units	Source
1	Distance	100	km	JRC(2017b)
2	Round-trip fuel economy	0.811	MJ-diesel oil / tkm	JRC(2017b)
3	Diesel oil emission factor (including CH_4 and N_2O)	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
4	Emission intensity from diesel oil (not including methane and N_2O from combustion)	77.1	g-CO_2eq / tkm	=(2)×(3)
5	CH_4 emissions intensity (when trucks are used)	0.0034	g-CH_4 / tkm	JRC(2017b)
6	N_2O emissions intensity (when trucks are used)	0.0015	g-N_2O / tkm	JRC(2017b)
7	CH_4 emissions intensity (when trucks are used) CO_2 equivalent	0.085	g-CO_2eq / tkm	=(5)×25
8	N_2O emissions intensity (when trucks are used) CO_2 equivalent	0.447	g-CO_2eq / tkm	=(6)×298
9	Heat value of forest residue	9,500	MJ-feedstock / t-feedstock	JRC(2017b) (Assuming a moisture content of 50% for a dry heating value of 19,000 MJ / t)
10	GHG emission intensity for land transport	0.817	g-CO_2eq / MJ-feedstock	=(1)×(4)+(7)+(8) / (9)
11	Equivalent amount of forest residue required for pellet production (before natural drying)	1.323	MJ- feedstock / MJ-fuel	JRC(2017b)
12	GHG emissions of the process	1.08	g-CO_2eq / MJ-fuel	=(10)×(11)

The following are the calculated emissions from the processing process when fossil fuel is used as dry heat source for pelletising.

Annex B Detailed calculation for setting the default value continued

Table 23: Calculation of emissions from crushing process of wood pellets (fossil fuel is used as dry heat source)

	Specifications	Values	Units	Source
1	Diesel fuel input in crushing process	0.003357	MJ-diesel oil oil / MJfeedstock	JRC(2017b)
2	Diesel oil emission factor (including CH_4 and N_2O)	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
3	CH_4 emissions intensity (when using crushing machinery)	0.0000092	g-CH_4 / MJ-feedstock	JRC(2017b)
4	N_2O emission intensity (when using crushing machinery)	0.0000385	g-N_2O / MJ-feedstock	JRC(2017b)
5	CH_4 emissions intensity (when using crushing machinery) CO_2 equivalent	0.00023	g-CO_2eq / MJ-feedstock	=(3)×25
6	N_2O emission intensity (when using crushing machinery) CO_2 equivalent	0.01147	g-CO_2eq / MJ-feedstock	=(4)×298
7	CO_2 equivalent emissions from crushing process per MJ after crushing	0.33	g-CO_2eq / MJ-feedstock	=(1)×(2)+(5)+(6)
8	Equivalent amount of forest residue, required for pellet production (after seasoning)	1.010	MJ-feedstock / MJ-fuel	Derived from JRC(2017b) calculated data
9	GHG emissions of the process	0.33	MJ / MJ-fuel	=(7)×(8)
10	GHG emissions from the process (increase (9) by 20% to ensure conservativeness)	0.40	g-CO_2eq / MJ-fuel	=(9)×1.2

Table 24: Calculation of emissions from pelletising process of wood pellets (using fossil fuels as a dry heat source)

	Specifications	Values	Units	Source
1	Natural gas input for boilers	0.185	MJ-steam / MJ-fuel	JRC(2017b)
2	Natural gas boiler efficiency	0.9	MJ-steam / MJ-natural gas	JRC(2017b)
3	Natural gas emission factor (not including methane and N_2O during combustion)	66	g-CO_2eq / MJ-natural gas	JRC(2017b)
4	Natural gas boiler emissions intensity (not including methane and N_2O during combustion)	73.3	g-CO_2eq / MJ-steam	=(3) / (2)
5	CH_4 emissions intensity from natural gas boiler combustion	0.00280	g-CH_4 / MJ-steam	JRC(2017b)
6	N_2O emission intensity from combustion of natural gas boiler	0.00112	g-N_2O / MJ-steam	JRC(2017b)
7	Natural gas boiler CH_4 emissions intensity (CO_2 equivalent)	0.070	g-CO_2eq / MJ-steam	=(5)×25
8	Natural gas boiler, N_2O emission intensity (CO_2 equivalent)	0.33376	g-CO_2eq / MJ-steam	=(6)×298
9	GHG emissions of the process	13.64	g-CO_2eq / MJ-fuel	=(1)×(4)+(7)+(8)
10	GHG emissions from the process (increased by 20% from (9) to ensure conservativeness)	16.37	g-CO_2eq / MJ-fuel	=(9)×1.2

[5] https://www.nedo.go.jp/content/100932088.pdf (2022 viewed November 10)

Annex B Detailed calculation for setting the default value continued

Table 25: Calculation of emissions from pelletising process of wood pellets (using fossil fuels as a dry heat source)

	Specifications	Values	Units	Source
1	Input power	0.050	MJ-power / MJ-fuel	JRC(2017b)
2	Electric power emission factor (grid power)	148.1	g-CO_2eq / MJ-power	GHG Emissions Intensity for U.S. Florida Grid power in GREET2022
3	Electricity-derived emissions intensity	7.32	g-CO_2eq / MJ-fuel	=(1)×(2)
4	Diesel oil input	0.0020	MJ-diesel oil / MJ-fuel	JRC(2017b)
5	Emission factor of diesel oil (not including methane and N_2O from combustion)	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
6	Emission intensity from diesel oil (excluding methane and N_2O from combustion)	0.19	g-CO_2eq / MJ-diesel oil	=(4)×(5)
7	CH_4 emissions intensity (entire pelletising process)	0.00000153	g-CH_4 / MJ-fuel	JRC(2017b)
8	N_2O emissions intensity (entire pelletising process)	0.00000640	g-N_2O / MJ-fuel	JRC(2017b)
9	CH_4 emissions intensity (entire pelletising process) CO_2 equivalent	0.00004	g-CO_2eq / MJ-fuel	=(7)×25
10	N_2O emissions intensity (entire pelletising process) CO_2 equivalent	0.00191	g-CO_2eq / MJ-fuel	=(8)×298
11	GHG emissions from the Process	7.51	g-CO_2eq / MJ-fuel	=(3) + (6)+(9)+(10)
12	GHG emissions from the process (increase (11) by 20% to ensure conservativeness)	9.01	g-CO_2eq / MJ-fuel	=(11)×1.2

The calculation results of the emissions from the processing process when biomass is used as drying heat source for pelletising are as follows: The emissions from the pelletisation process are the same as when fossil fuels are used as drying heat source.

Table 26: Calculation of emissions from crushing process of wood pellets (using biomass as drying heat source)

	Specifications	Values	Units	Source
1	Diesel oil input for the crushing process	0.003357	MJ-diesel oil / MJ-feedstock	JRC(2017b)
2	Diesel oil emission factor (including CH_4 and N_2O)	95.1	g-CO_2eq / MJ- Diesel oil	JRC(2017b)
3	CH_4 emissions intensity (when using crushing machinery)	0.0000092	g-CH_4 / MJ-feedstock	JRC(2017b)
4	N_2O emission intensity (when using crushing machinery)	0.0000385	g-N_2O / MJ-feedstock	JRC(2017b)
5	CH_4 emissions intensity (when using crushing machinery) CO_2 equivalent	0.00023	g-CO_2eq / MJ-feedstock	=(3)×25
6	N_2O emission intensity (when using crushing machinery) CO_2 equivalent	0.01147	g-CO_2eq / MJ-feedstock	=(4)×298
7	CO_2 equivalent emissions from crushing process per MJ after crushing	0.33	g-CO_2eq / MJ-feedstock	=(1)×(2)+(5)+(6)
8	Equivalent amount of forest residue required for pellet production (after seasoning)	1.291	MJ-feedstock / MJ-fuel	JRC(2017b)
9	GHG emissions of the process	0.43	MJ-feedstock / MJ-fuel	=(7)×(8)
10	GHG emissions from the process (increase (9) by 20% to ensure conservativeness)	0.51	g-CO_2eq / MJ-fuel	=(9)×1.2

Table 27: Calculating emissions from drying process of wood pellets (using biomass as a drying heat source)

	Specifications	Values	Units	Source
1	Biomass input for boilers	0.239	MJ-heat / MJ-fuel	JRC(2017b)
2	Woodchip boiler / CO_2 emissions intensity	0	g-CO_2eq / MJ-steam	Biomass-derived emissions are not accounted for
3	Woodchip boiler / CH_4 emissions intensity	0.005751	g-CH_4 / MJ-steam	JRC(2017b)
4	Woodchip boiler / N_2O emissions intensity	0.001150	g-N_2O / MJ-steam	JRC(2017b)
5	Woodchip boiler / CH_4 emissions intensity (CO_2 equivalent)	0.144	g-CO_2eq / MJ-steam	=(3)×25
6	Woodchip boiler / N_2O emission intensity (CO_2 equivalent)	0.343	g-CO_2eq / MJ-steam	=(4)×298
7	GHG emissions of the process	0.12	g-CO_2eq / MJ-fuel	=(1)×(2)+(5)+(6)
8	GHG emissions from the process (increase (7) by 20% to ensure conservativeness)	0.14	g-CO_2eq / MJ-fuel	=(7)×1.2

Annex B Detailed calculation for setting the default value continued

The calculated emissions from transportation (pellet transportation) are as follows.

Table 28: Calculations of emissions from transport of wood pellets (production domestic transport)

	Specifications	Values	Units	Source
1	Distance	300	km	Set with reference to plant locations of woody biomass suppliers
2	Round-trip fuel economy	0.811	MJ-diesel oil / tkm	JRC(2017b)
3	Diesel oil emission factor (including methane and N_2O)	95.1	g-CO_2eq / MJdiesel oil	JRC(2017b)
4	Emission intensity from diesel oil (not including methane and N_2O from combustion)	77.1	g-CO_2eq / tkm	=(2)×(3)
5	CH_4 emissions intensity (when trucks are used)	0.0034	g-CH_4 / tkm	JRC(2017a)
6	N_2O emissions intensity (when trucks are used)	0.0015	g-N_2O / tkm	JRC(2017a)
7	CH_4 emissions intensity (when trucks are used) CO_2 equivalent	0.085	g-CO_2eq / tkm	=(5)×25
8	N_2O emissions intensity (when trucks are used) CO_2 equivalent	0.447	g-CO_2eq / tkm	=(6)×298
9	GHG emission intensity for land transport	77.7	g-CO_2eq / tkm	=(4)+(7)+(8)
10	Biomass fuel heat value	17,100	MJ-fuel / t-fuel	JRC(2017b) (assuming 10% moisture content for a dry heat value of 19,000 MJ / t)
11	GHG emissions from the process	1.36	g-CO_2eq / MJ-fuel	=(1)×(9) / (10)

As GHG emission intensity of maritime transport, the emission intensity used in the EU REDII default value, which assumes that the ratio of empty cargo transportation is 30% of the total voyage distance, is quoted. As quality standards for wood pellets in Japan include a bulk density of 0.65-0.7 t / m^3, emission intensity of 0.65 t / m^3 is cited.[5]

5 https://www.nedo.go.jp/content/100932088.pdf (2022 viewed November 10).

Annex B Detailed calculation for setting the default value continued

Table 29: Calculation of emissions from maritime transport of wood pellets (Handy size 6,500km transportation)

	Specifications	Values	Units	Source
1	Distance	6,500	km	Estimate between Vietnam's representative port and Japan
2	Marine transport emissions intensity (Bulk density of 0.65 t / m^3 or more, Handy Size)	8.17	g-CO_2eq / tkm	JRC(2017b)
3	Wood pellet heating value	17,100	MJ-fuel / t-fuel	JRC(2017b) (assuming 10% moisture content for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	3.11	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Table 30: Calculation of emissions from maritime transport of wood pellets (Handy Size 9,000km)

	Specifications	Values	Units	Source
1	Distance	9,000	km	Approximate distance between Canada West Coast Representative Port and Japan
2	Marine transport emissions intensity (Bulk density of 0.65 t / m^3 or more, Handy Size)	8.17	g-CO_2eq / tkm	JRC(2017b)
3	Wood pellet heating value	17,100	MJ-fuel / t-fuel	Same as above (assuming 10% moisture content for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	4.30	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Table 31: Calculation of emissions from maritime transport of wood pellets (Handy Size 18,000km transport)

	Specifications	Values	Units	Source
1	Distance	18,000	km	Guided service between U.S. East Coast Representative Port and Japan
2	Marine transport emissions intensity (Bulk density of 0.65 t / m^3 or more, Handy Size)	8.17	g-CO_2eq / tkm	JRC(2017b)
3	Wood pellet heating value	17,100	MJ-fuel / t-fuel	Same as above (assuming a moisture content of 10% for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	8.60	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Table 32: Calculation of emissions from maritime transport of wood pellets (Supramax 6,500km transport)

	Specifications	Values	Units	Source
1	Distance	6,500	km	Estimated distance between Vietnam's representative port and Japan
2	Marine transport emissions intensity (Bulk density of 0.65 t / m^3 or higher, Supramax)	5.28	g-CO_2eq / tkm	JRC(2017b)
3	Wood pellet heating value	17,100	MJ-fuel / t-fuel	Ibid (assuming 10% moisture content for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	2.01	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Table 33: Calculation of emissions from maritime transport of wood pellets (Supramax 9,000km transport)

	Specifications	Values	Units	Source
1	Distance	9,000	km	Guided service between Canada West Coast Representative Port and Japan
2	Marine transport emissions intensity (Bulk density of 0.65 t / m^3 or higher, Supramax)	5.28	g-CO_2eq / tkm	JRC(2017b)
3	Wood pellet heating value	17,100	MJ-fuel / t-fuel	Same as above (assuming a moisture content of 10% for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	2.78	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Table 34: Calculation of emissions from maritime transport of wood pellets (Supramax 18,000km transport)

	Specifications	Values	Units	Source
1	Distance	18,000	km	Understanding the distance between the East Coast Representative Port of the United States and Japan
2	Marine transport emissions intensity (Bulk density of 0.65 t / m^3 or higher, Supramax)	5.28	g-CO_2eq / tkm	JRC(2017b)
3	Wood pellet heating value	17,100	MJ-fuel / t-fuel	JRC(2017b) (assuming 10% moisture content for a dry heating value of 19,000 MJ / t)
4	GHG emissions from the process	5.56	g-CO_2eq / MJ-fuel	=(1)×(2) / (3)

Table 35: Calculation of emissions from transport of wood pellets (domestic transport in Japan)

	Specifications	Values	Units	Source
1	Distance	20	km	Document 3 of the 12th WG
2	Round-trip fuel economy 10 t truck	3.06	MJ-diesel oil / tkm	Table.179
3	Diesel oil emission factor (including methane and N_2O)	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
4	Emission intensity from diesel oil (not including methane and N_2O from combustion)	291.0	g-CO_2eq / tkm	=(2)×(3)
5	CH_4 emissions intensity (when trucks are used)	0.0034	g-CH_4 / tkm	JRC(2017a)
6	N_2O emissions intensity (when trucks are used)	0.0015	g-N_2O / tkm	JRC(2017a)
7	CH_4 emissions intensity (when trucks are used) CO_2 equivalent	0.085	g-CO_2eq / tkm	=(5)×25
8	N_2O emissions intensity (when trucks are used) CO_2 equivalent	0.447	g-CO_2eq / tkm	=(6)×298
9	GHG emission intensity for land transport	291.5	g-CO_2eq / tkm	=(4)+(7)+(8)
10	Pellet Heat value	17,100	MJ-fuel / t-fuel	JRC(2017b) (assuming 10% moisture content for a dry heating value of 19,000 MJ / t)
11	GHG emissions from the process	0.34	g-CO_2eq / MJ-fuel	=(1)×(9) / (10)

Emissions from the power generation are calculated using the defaults for wood pellets used in the EU REDII defaults.

Table 36: Calculation of emissions from the power generation

	Specifications	Values	Units	Source
1	CH_4 emissions (pellets)	0.00297	g-CH_4 / MJ-pellet	JRC(2017b)
2	N_2O emissions (pellet)	0.00059	g-N_2O / MJ-pellet	JRC(2017b)
3	Emissions from the power generation	0.25	g-CO_2eq / MJ-fuel	1 x 25+(2) x 298

Annex B Detailed calculation for setting the default value continued

Pellets from other cut trees

Target process

Covered processes are shown in the blue box below.

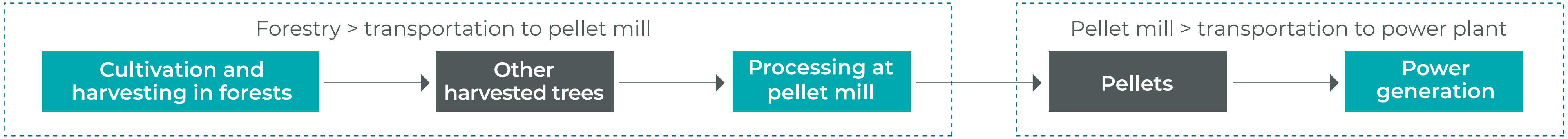

Figure 5: Boundary for lifecycle GHG emissions of wood pellets from other harvested trees

Emissions from maritime transport are the same as pellets derived from forest residues.

Calculating emissions by process

The calculation results of cultivation are as follows.

Table 37: Calculation of emissions from cultivation (when fossil fuels are used as dry heat sources)

	Specifications	Values	Units	Source
1	Input diesel oil for cultivation	0.01066	MJ- diesel oil / MJ-feedstock	JRC(2017b)
2	Diesel oil emission factor CO_2	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
3	CH_4 emissions intensity (when agricultural machinery is used)	0.00000816	g-CH_4 / MJ-feedstock	JRC(2017b)
4	N_2O emissions intensity (when agricultural machinery is used)	0.00003413	g-N_2O / MJ-feedstock	JRC(2017b)
5	CH_4 emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.00020	g-CO_2eq / MJ-feedstock	=(3)×25
6	N_2O emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.01017	g-CO_2eq / MJ-feedstock	=(4)×298
7	GHG emissions intensity of cultivation process per MJ of other harvested trees	1.02414	g-CO_2eq / MJ-feedstock	=(1)×(2)+(5)+(6)
8	Amount of other harvested trees required for pellet production (before seasoning)	1.035	MJ-feedstock / MJ-fuel	JRC(2017b)
9	GHG emissions of the process	1.06	g-CO_2eq / MJ-fuel	=(7)×(8)

Annex B Detailed calculation for setting the default value continued

Table 38: Calculation of emissions from cultivation (when using biomass as a drying heat source)

	Specifications	Values	Units	Source
1	Input diesel oil for cultivation	0.01066	MJ-diesel oil oil / MJ-feedstock	JRC(2017b)
2	Diesel oil emission factor CO_2	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
3	CH_4 emissions intensity (when agricultural machinery is used)	0.00000816	g-CH_4 / MJ-feedstock	JRC(2017b)
4	N_2O emissions intensity (when agricultural machinery is used)	0.00003413	g-N_2O / MJ-feedstock	JRC(2017b)
5	CH_4 emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.00020	g-CO_2eq / MJ-feedstock	=(3)×25
6	N_2O emissions intensity (when agricultural machinery is used) CO_2 equivalent	0.01017	g-CO_2eq / MJ-feedstock	=(4)×298
7	GHG emissions intensity of cultivation process per MJ of other harvested trees	1.02414	g-CO_2eq / MJ-feedstock	=(1)×(2)+(5)+(6)
8	Amount of other harvested trees required for pellet production (before seasoning)	1.323	MJ-feedstock / MJ-fuel	JRC(2017b)
9	GHG emissions of the process	1.36	g-CO_2eq / MJ-fuel	=(7)×(8)

Emissions from transport (pre-processing transport) are the same as pellets from forest residues.

Emissions from processing are the same as pellets from forest residues.

Emissions from transport (pellet transport) are the same as pellets from forest residues.

Emissions from power generation are the same as pellets from forest residues.

Pellets from sawmill residues

Target process

Covered processes are shown in the blue box below.

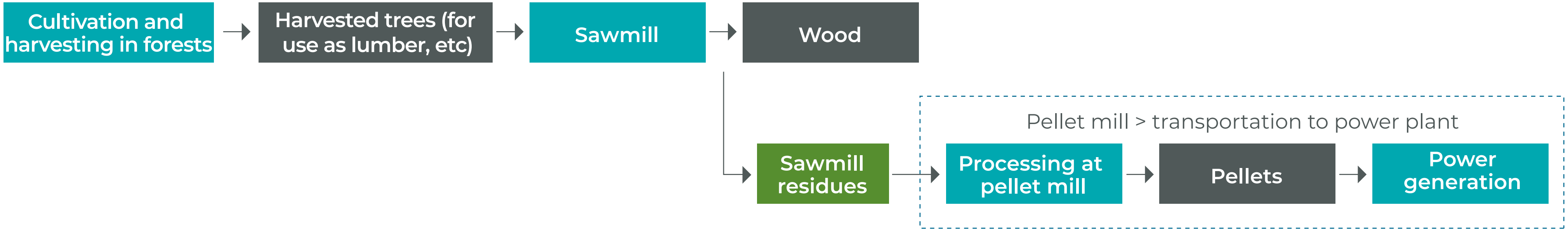

Figure 6: Boundary for lifecycle GHG emissions of wood pellets (derived from sawmill residue)

Emissions from maritime transport are the same as pellets derived from forest residues.

Calculating emissions by process

The following are the calculated emissions from processing when fossil fuel is used as dry heat source for pelletising. In line with the EU REDII default, the crushing process is not included.

Table 39: Calculation of emissions from processing of wood pellets (drying) (when fossil fuel is used as the drying heat source)

	Specifications	Values	Units	Source
1	Natural gas input for boilers	0.111	MJ-heat / MJ-fuel	JRC(2017b)
2	Natural gas boiler efficiency	0.9	MJ-steam / MJ-natural gas	JRC(2017b)
3	Natural gas emission factor (including CH_4 and N_2O)	66	g-CO_2eq / MJ-natural gas	JRC(2017b)
4	Natural gas boiler emissions intensity (not including methane and N_2O during combustion)	73.3	g-CO_2eq / MJ-steam	=(3) / (2)
5	CH_4 emissions intensity from natural gas boiler combustion	0.0028	g-CH4 / MJ-steam	JRC(2017b)
6	N_2O emission intensity from combustion of natural gas boiler	0.00112	g-N_2O / MJ-steam	JRC(2017b)
7	Natural gas boiler CH4 emissions intensity (CO_2 equivalent)	0.07	g-CO_2eq / MJ-steam	=(5)×25
8	Natural gas boiler, N_2O emission intensity (CO_2 equivalent)	0.33376	g-CO_2eq / MJ-steam	=(6)×298
9	Drying process GHG emissions	8.18	MJ / MJ-fuel	=(1)×(4)+(7)+(8)
10	GHG emissions from the process (increase (11) by 20% to ensure conservativeness)	9.82	g-CO_2eq / MJ-fuel	=(9)×1.2

Annex B Detailed calculation for setting the default value continued

Table 40: Calculation of emissions from processing of wood pellets (pelletising) (using fossil fuels as drying heat sources)

	Specifications	Values	Units	Source
1	Input power	0.028	MJ-power / MJ-pellet	JRC(2017b)
2	Electric power emission factor (grid power)	146.3	g-CO_2eq / MJ-power	GHG Emissions Intensity for U.S. Florida Grid power in GREET2022
3	Electricity-derived emissions intensity	4.10	g-CO_2eq / MJ-fuel	=(1)×(2)
4	Diesel oil input	0.0016	MJ-diesel oil / MJ-fuel	JRC(2017b)
5	Emission factor of diesel oil (not including methane and N_2O from combustion)	95.1	g-CO_2eq / MJ-diesel oil	JRC(2017b)
6	Emission intensity from diesel oil (excluding methane and N_2O from combustion)	0.19	g-CO_2eq / MJ-diesel oil	=(4)×(5)
7	CH_4 emission intensity (entire pelletising process)	0.00000153	g-CH_4 / MJ-fuel	JRC(2017b)
8	N_2O emission intensity (entire pelletising process)	0.00000640	g-N_2O / MJ-fuel	JRC(2017b)
9	CH_4 emissions intensity (entire pelletising process) CO_2 equivalent	0.00004	g-CO_2eq / MJ-fuel	=(7)×25
10	N_2O emissions intensity (entire pelletising process) CO_2 equivalent	0.00191	g-CO_2eq / MJ-fuel	=(8)×298
11	GHG emissions from pelletising process	4.25	g-CO_2eq / MJ-fuel	=(3)+(6)+(9)+(10)
12	GHG emissions from the process (increase (11) by 20% to ensure conservativeness)	5.10	g-CO_2eq / MJ-fuel	=(11)×1.2

The calculation results of the emissions from processing when biomass is used as a drying heat source for pelletising are as follows. The emissions from pelletising process are the same as when fossil fuels are used as a drying heat source.

Emissions from transport (pellet transport) are the same as pellets from forest residues.

Emissions from power generation are the same as pellets from forest residues.

Annex B Detailed calculation for setting the default value continued

Table 41: Calculation of emissions from processing of wood pellets (drying) (using biomass as a drying heat source)

	Specifications	Values	Units	Source
1	Biomass input for boilers	0.143	MJ-heatp / MJ-fuel	JRC(2017b)
2	Woodchip boiler / CO_2 emissions intensity	0	g-CO_2eq / MJ-steam	Biomass-derived emissions are not accounted for
3	Woodchip boiler / CH_4 emissions intensity	0.005751	g-CH_4 / MJ-steam	JRC(2017b)
4	Woodchip boiler / N_2O emissions intensity	0.001150	g-N_2O / MJ-steam	JRC(2017b)
5	Woodchip boiler / CH_4 emissions intensity (CO_2 equivalent)	0.144	g-CO_2eq / MJ-steam	=(3)×25
6	Woodchip boiler / N_2O emission intensity (CO_2 equivalent)	0.343	g-CO_2eq / MJ-steam	=(4)×298
7	Drying process GHG emissions	0.07	g-CO_2eq / MJ-fuel	=(1)×(2)+(5)+(6)
8	GHG emissions from the process (increase (7) by 20% to ensure conservativeness)	0.08	g-CO_2eq / MJ-fuel	=(7)×1.2

Annex C: Lifecycle GHG calculation formula in Japan FIT

A Target gas

The types of GHGs to be calculated CO_2, CH_4, and N_2O.

The GWPs shall be CH_4:25 and N_2O:298.

B Boundary and calculation

Carbon stock changes including land-use change, cultivation, processing, transportation, and power generation are included in the calculation.

Emissions from construction of facilities such as power plants and biomass fuel production plants are not considered.

GHG emissions from CO_2 capture and sequestration and CO_2 capture and alternative use (limited to CO_2 of biomass origin) can be considered as emission reductions if they can be avoided.

The “LCA Guidelines for Greenhouse Gas Reduction Effects of Renewable Energy” developed by the Ministry of Environment may be used as a reference for determining the amount of activity and setting emission factors.

$$E = e_{stock} + e_{cultivate} + e_{processing} + e_{transportation} + e_{generation} - e_{rccs} - e_{rccr}$$

Where

E = Total GHG emissions from fuel use before conversion due to generation efficiency

e_{stock} = Emissions and emission reductions associated with changes in carbon stocks, including land use change

$e_{cultivate}$ = Emissions from cultivation

$e_{processing}$ = Emissions from processing

$e_{transportation}$ = Emissions from transportation

$e_{generation}$ = Emissions from power generation

e_{rccs} = Emission reductions by CO_2 capture and sequestration

e_{rccr} = Emission reductions by CO_2 capture and alternative use (eligible only if biomass origin CO_2 is captured)

C Calculation method for each process

Carbon stock changes, including land use change

For carbon stock changes including land use changes, only direct land use changes are to be accounted for at this stage.

Cultivation (cultivation and collection of raw materials)

GHG emissions associated with consumption of fossil fuels, electricity, and heat for cultivation of raw materials, production,procurement, and use of fertilizer and chemical substances inputs, and fermentation and fertilization of organic matter must be included.

If CO_2 generated is captured and sequestered or alternatively used (eligible only if biomass origin CO_2 is captured), it maybe deducted from the emissions.

Processing (pre-processing and conversion)

For processing processes, GHG emissions associated with consumption of fossil fuels, electricity, and heat for processing,and manufacturing, procurement, and use of chemical substances must be included.

If CO_2 generated is captured and sequestered or alternatively used (eligible only if biomass origin CO_2 is captured), it maybe deducted from the emissions.

Transportation (raw material and fuel transportation)

GHG emissions associated with consumption of fossil fuels, electricity, and heat for transportation and storage of raw materials and consumption of fossil fuels, electricity, and heat for the transportation and storage of fuels must be included.

GHG emissions on return routes shall be taken into account. In particular, for marine transportation, the fuel consumption of the vessel shall be used,taking into account the biomass bulk density. For the time being, the voyage distance ratio of empty cargo transportation shall be set at 30% for cases where no specific voyage pattern is taken, and in the case of round-trip transportation (round-trip from the same port), the transportation of empty cargo shall be recorded as the transportation distance of biomass fuel, unless it can be confirmed that the return vessel is unloaded.

Power generation

CO_2 emissions from use of biomass fuels are regarded as zero.

Emissions of CH_4 and N_2O shall be included.

D Allocation

The target process / emission activity to be included and the target of allocation shall be specified by biomass type.

The allocation method shall be the heat quantity proration method.

E Power generation efficiency

Generation efficiency is based on the transmission end efficiency and the calorific value of fuel is based on the lower heating value standard.

In the case of a combined heat and power plant, the exergy proration of the biomass fuel lifecycle GHG before conversion by generation efficiency is performed on the electricity and heat produced to identify the emissions to be allocated to the electricity portion. Specifically, the following equation is followed.

$$E_{cogen\text{-}bio} = E_{bio} \times [\eta_{el} / \{\eta_{el} + \eta_h \times (T_h - 290) / T_h\}]$$

Where,

$E_{cogen\text{-}bio}$ = Total GHG emissions from biomass fuels before conversion based on generation efficiency (for power generation at combined heat and power plants)

E_{bio} = Total GHG emissions from biomass fuels before conversion based on power generation efficiency

η_{el} = Power generation efficiency in combined heat and power plants (annual power generation divided by annual heat input)

η_h = Thermal efficiency in combined heat and power plants (annual heat supply (excluding on-site consumption including biomass fuel processing, etc) divided by annual heat input)

T_h = Absolute temperature of the heat supplied in the combined heat and power plant (K)