Alliance for Industry Decarbonization

Renewable technologies Supply chain traceability guidelines

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About AFID

The mission of the Alliance for Industry Decarbonization (AFID) is to foster action for decarbonisation of industrial value chains, and to promote understanding of renewables-based solutions and their adoption by industry with a view to contributing to country specific net-zero goals. Joining AFID as a member or ecosystem knowledge partner is open to any legal entity engaged in decarbonising industry with renewable energy solutions. This includes, but is not limited to, public and private sector industrial firms, industry associations, the financial community and intergovernmental organisations.

The International Renewable Energy Agency (IRENA) co-ordinates and facilitates the activities of AFID.

IRENA
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About this report

This paper was prepared jointly by members of the AFID Working Group: Renewables. It builds on the analysis of various stakeholders, as well as on the exchanges and discussions that took place among the working group members during a series of meetings held to realise joint initiatives. This paper is informed by the experience of AFID members and ecosystem knowledge partners from different regions around the world.

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Abbreviations

AFID	Alliance for Industry Decarbonization
ASI	Aluminium Stewardship Initiative
COC	chain of custody
ESG	environmental, social and governance
ID	identity
IRMA	Initiative for Responsible Mining Assurance
ISO	International Organization for Standardization
IRENA	International Renewable Energy Agency
NTRM	not traced raw material
OECD	Organisation for Economic Co-operation and Development
OEM	original equipment manufacturer
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals (European Union)
RMI	Responsible Minerals Initiative
SDG	Sustainable Development Goal
SEIA	Solar Energy Industries Association
SVHC	substances of very high concern
TRM	traced raw material

Glossary

Chain of custody (COC)

A COC is a documented sequence of physical and legal possession of material as it moves through a supply chain.

COC model

An approach taken to control inputs and outputs and associated information in a particular COC system [ISO 22095:2020]

COC system

A set of measures established to implement a COC, including the documentation of those measures (ISO, 2020).

COC transfer record

The record that follows the material as it is transferred along the supply chain and among outsourced entities. This record includes all the information required by the COC standard in use (The Copper Mark, 2022).

Mass balance model

A COC model in which materials or products possessing a specific set of characteristics are blended with materials or products lacking those characteristics, following established criteria (ISO, 2020).

Not traced raw material (NTRM)

Material not managed through the COC system.

Segregated model

A COC model in which the specified characteristics of a material or product are preserved, from the initial input to the final output (ISO, 2020).

Site

A location within geographical boundaries where an organisation conducts defined activities under its control.

Traceability

The capability to track the origin, usage, location or source(s) of a material or product across the entire supply chain (ISO, 2020).

Traceability system

A manual or electronic system that enables access to any or all information relating to the material or product under consideration throughout their life cycle, through documented information (ISO, 2020).

Traced raw material (TRM)

Material managed through the COC system and the related material accounting system.

1. Introduction

It is becoming increasingly important today to ensure that the highest social and environmental sustainability standards are met by all the actors along a renewable energy technology's value chain. Indeed, it is essential to ensure the visibility of that entire supply chain, if this goal is to be achieved, whilst at the same time facilitating the identification of potential environmental and social risks and impacts. This requirement includes ensuring the visibility of risks in the environmental, social and governance (ESG) sphere, as well as in the origin, processing and transport associated with a technology's raw materials.

With the goal of increasing transparency, this document sets out traceability guidelines that address the above requirement. In doing so, it sets the minimum recommended standards for guaranteeing the full traceability of the raw materials used in the renewable electrical energy technology supply chain. The guidelines provide the basic rules for the traceability management system, along with the evidence required to document the sequence of individuals and companies that maintain custody of materials as they move along the supply chain. They align with international frameworks and best practices. Those include:

- **The United Nations (UN) Sustainable Development Goals (SDGs) 8 and 12**, which promote decent work, responsible consumption and sustainable production (UN, 2015).
- **The Solar Energy Industries Association (SEIA) Traceability Protocol v2.1**, which provides industry-specific guidance for renewable supply chains (SEIA, 2024).
- **The principles of the circular economy**, as described in the Ellen MacArthur Foundation's *Completing the Picture* report (Ellen Macarthur Foundation, 2021).
- **The Organisation for Economic Co-operation and Development (OECD) Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas**, which ensures ethical and responsible sourcing practices (OECD, 2016).

The ability to trace the origin of components throughout the supply chain, from input materials to the finished product, provides openness and transparency. These are both necessary to uphold the principles of sustainability, while they also guarantee quality assurance and environmental performance (SEIA, 2021). In addition to these objectives, by promoting responsible sourcing practices and reducing environmental impacts, the use of eligible materials also supports broader sustainability goals.

2. Objectives

The objective of the guidelines presented in this report is to support responsible production and sourcing in the renewable technologies value chain. This increases transparency in that chain via the traceability of its materials and products. The active contribution of all the actors in the value chain is therefore essential in order to be able to achieve this goal of full traceability.

In addition, the more transparent supply chain that would result from their implementation brings concrete added value to companies. This could take a variety of forms, including the securing of additional competitive advantages, the strengthening of supply chain resilience, heightened customer satisfaction, and/or continuous quality improvement.

In consideration of the above rationale, the core objectives of the guidelines are the following:

- To provide common guidelines for the implementation of chain-of-custody (COC) systems in the renewable technologies value chain. A COC system is the traceability mechanism that records how material moves between actors.
- To serve as an open-source document, enabling raw materials users and other actors along the value chain to establish and improve their own COC initiatives.
- To contribute to an increase in the use of recycled material and to support efforts to move to a circular economy.
- To increase the transparency and sustainability of the electrical energy technology value chain. This chain runs not only from raw material extraction to the final product, but also includes end-of-life management for downstream tiers. Increased transparency and sustainability gives end-customers and stakeholders clear visibility over a project's raw material supply chains and enhances supply chain transparency through the use of eligible materials. In turn, this helps ensure compliance with international standards for responsible sourcing.

In consideration of these core elements, the COC management system in this report has the following characteristics:

- Applicable all along the value chain.
- Facilitates responsible production, as sites involved in a specific value chain can be audited on their ESG standards in order to verify their sustainability performance.
- Allows separation and mass balance systems, as users can choose between applying a separation system or a mass balance system at the site level (The Copper Mark, 2022).
- Facilitates the utilisation of responsibly-sourced secondary raw materials. Users are able to track claims for secondary raw material usage (*e.g.* from waste and scrap) in their supply chain.
- Independently verifiable by third party auditors.

3. Scope

The guidelines that are the subject of this report are of global scope, yet they are implemented and assessed at site-level. Indeed, they apply to any site involved in the raw materials supply chain that directly extracts, purchases, processes, stores, handles or ships raw materials. Such sites include mines, smelters, refineries, semi-product producers, equipment manufacturers and recyclers. In addition, although the information needs to be available per site, mapping, tracing, auditing and assessment/reassessment can be executed at the group and/or company and corporate level.

The scope of these guidelines also includes ensuring that all eligible materials are sourced from suppliers who adhere to environmental and social responsibility standards. These guidelines apply to all raw materials purchased through such traders – potentially encompassing all the materials used in renewable energy technologies, from mining and extraction to end-of-life. Additionally, these guidelines support ethical sourcing practices and alignment with national and international regulatory frameworks.

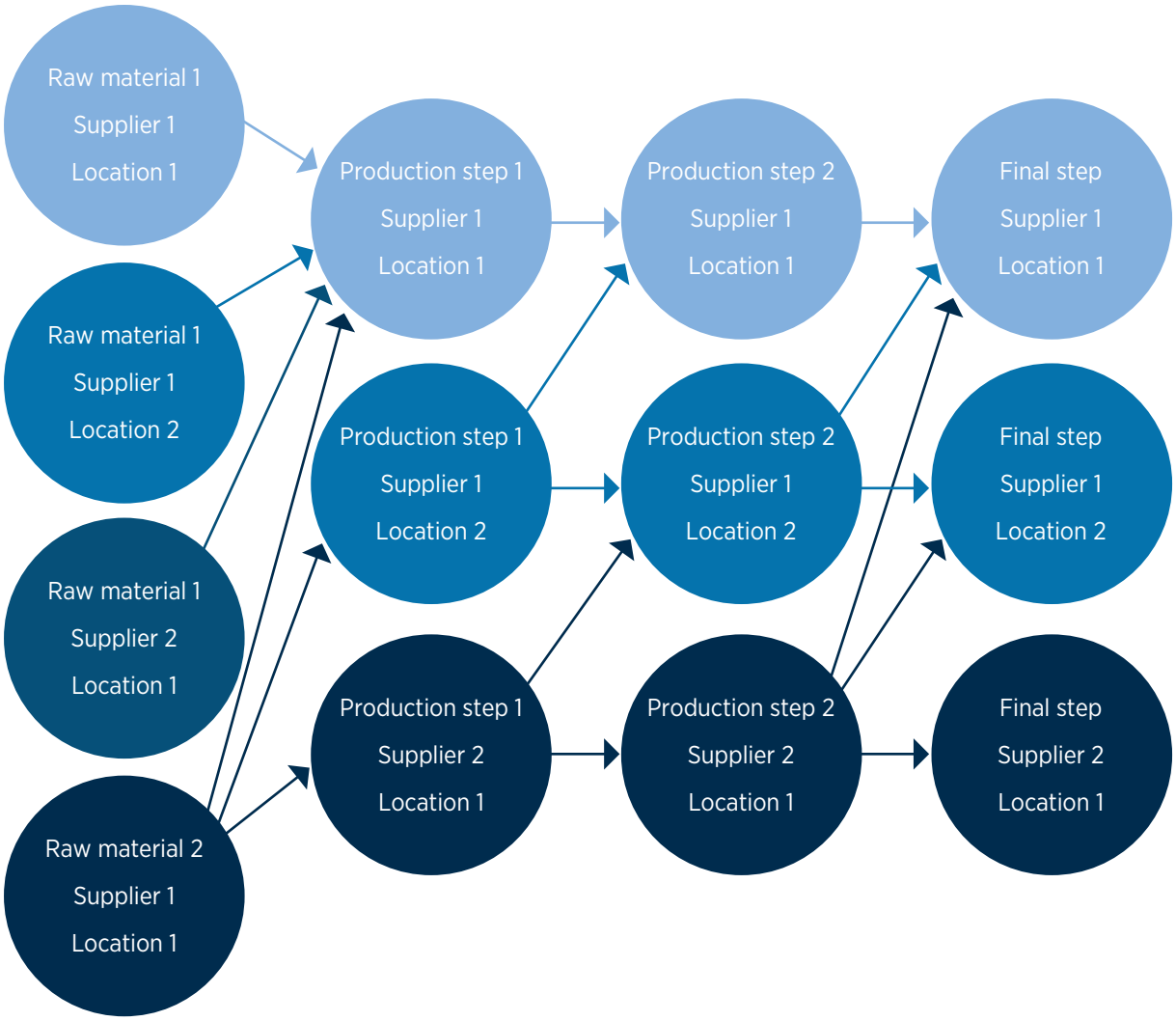
It should be noted, however, that other materials that may be present alongside traced raw material (TRM) at one or more stages of the value chain are outside the scope of this document (ASI, 2017).

Under the guidelines, companies can present a supply chain map that takes into consideration all the entities involved in creating their product or material.

That supply chain map (*e.g.* Figure 1) outlines each step in the process. This includes the provision of information about the item being produced, a description of the overall manufacturing steps, the name of the producer and the production location, and any other relevant information.

In the case of multiple suppliers or production locations for the same item, the map must reflect all the various entities involved (SEIA, 2021).

FIGURE 1 Supply chain map



Source: (Solar Now, 2021).

3.1 Eligible materials

The starting point of a COC is the raw material extracted from a mine. This material is then processed at a refinery and/or smelter as it travels up the value chain – a chain which also includes any storage steps. Eventually, the chain either reaches the final product built by an original equipment manufacturer (OEM), or is used in construction. In addition, these guidelines recommend that the COC be extended to end-of-life management of the product or material. This includes its collection as waste and the use of that waste in recycling or landfill.

This document also covers recycled materials, meaning that materials produced by a re-melting or refining facility can also be mapped through this COC model. This procedure would also take into consideration the production of such recycled materials and their re-insertion into the value chain. In addition, this COC model also applies to raw materials acquired from traders.

For downstream companies, or companies managing a large number of materials, mapping all the material supply chain inputs can be a difficult process to implement, as a great quantity of information must be gathered from all the actors involved. To assist in this task and ensure that the proper material to be tracked is selected, downstream companies should identify which raw materials or commodities carry the highest risk of having an adverse impact. This should be done after considering each material's ESG characteristics, their supply chain risks, the quantity of the material managed and other key factors. A proposed methodology for this assessment procedure can be found in Annex 1 of this report.

4. Management system responsibilities

When defining the scope of the management system, organisations should consider product traceability as an internal and external issue, ensuring alignment with both current and future market and regulatory demands (SEIA, 2021).

It is also advisable to structure this management system according to international standards, such as International Organization for Standardization (ISO) 9001:2015, or equivalent. That standard covers operational and supporting processes, and governance or management processes (ISO, 2020).

4.1 Management system

The section below sets out the general characteristics of the management system that each entity or site needs to have in order to guarantee the effectiveness of traceability. Those characteristics include:

- A COC management system that is implemented via a digital, integrated tool throughout the entire supply chain. Such a system should be suited to the size and complexity of the site's operations and address all the applicable requirements described in this document.
- The COC management system should also consider the recyclability of materials, ensuring that end-of-life products can be efficiently reused or recycled, thereby supporting the principles of the circular economy.
- Digital traceability tools, such as blockchain platforms and systems integrated into enterprise resource planning, can enhance transparency and auditability across the supply chain (OECD, 2019; World Economic Forum, 2023).
- The COC management system may be embedded within existing management systems, such as sourcing, sales, legal and internal controls.

When incorporating supply chain traceability into management system planning, the organisation must also evaluate the following (SEIA, 2021):

- How to ensure supply chain transparency.
- Ways to assess the effectiveness of the traceability process.
- Appropriate actions when stakeholders are unable or unwilling to comply with requests.
- How to allow an audit trail by third parties, such as permitting authorities. Preferably, this should be done by using specific internal control tools.

The entity's management system must also incorporate a material accounting system in order to ensure the integrity of any TRMs (ASI, 2022).

4.2 Responsibility and accountability

An appropriate COC management system must also consider organisational roles, responsibilities and accountabilities.

The site must designate responsibility and accountability to at least one senior management representative with the overall responsibility and authority to implement, oversee, maintain and update the management system. The site should also regularly review the management system's effectiveness and performance so as to take any action necessary to evaluate and close gaps and deficiencies, and improve that performance.

In addition, the site management must:

- Ensure that the COC management system is correctly integrated into all business processes.
- Ensure that the site/company has the correct resources – in terms of economics, dedicated staff, competences, *etc.* – to undertake the above-mentioned activities.
- Establish and implement communications/training measures for the relevant staff so they can become competent in their responsibilities.

The management system must also maintain up-to-date records, in line with the requirement set in this document for a minimum of five years' record keeping, or in accordance with other stated retention policies.

4.3 Improvement process

The site must establish a process to determine, examine and address complaints, discrepancies and errors associated with the production, transfer, receipt or management of TRMs. This process should cover issues originating from the site itself and those reported by customers or suppliers (The Copper Mark, 2022).

This process provides guidelines for the site to:

- Examine complaints or concerns about identified or reported gaps, errors or discrepancies and determine the underlying cause.
- Create an improvement plan to prevent future gaps, mistakes, or discrepancies caused by the site. Customers or suppliers should also be supported in creating their own improvement plans when the gaps, mistakes or discrepancies were caused by the customer or supplier.
- Identify and apply suitable corrective actions to address any mistakes or discrepancies.
- Promptly inform the respective customer or supplier of any corrective measures in order to facilitate an assessment of their effectiveness.
- Evaluate the possibility of substituting the non-certified material for another certified raw material.

5. COC models

Sites may use one of the two models described below and should define in their management system which model they are using.

5.1 Separation model

In this, TRM is physically separated from non-traced raw material (NTRM) at each stage of the supply chain.

5.2 Mass balance model

TRM is physically separated from NTRM until a set processing stage at which TRM is allowed to be mixed with NTRM.

In this instance, proportions of TRM and NTRM at the overall site level are documented and verified within the material accounting period (The Copper Mark, 2022).

The mass balance system mandates that every entity managing TRM must be COC-certified in order to create an unbroken COC. This allows TRM to be combined with NTRM over a specified period at any point in the value chain.

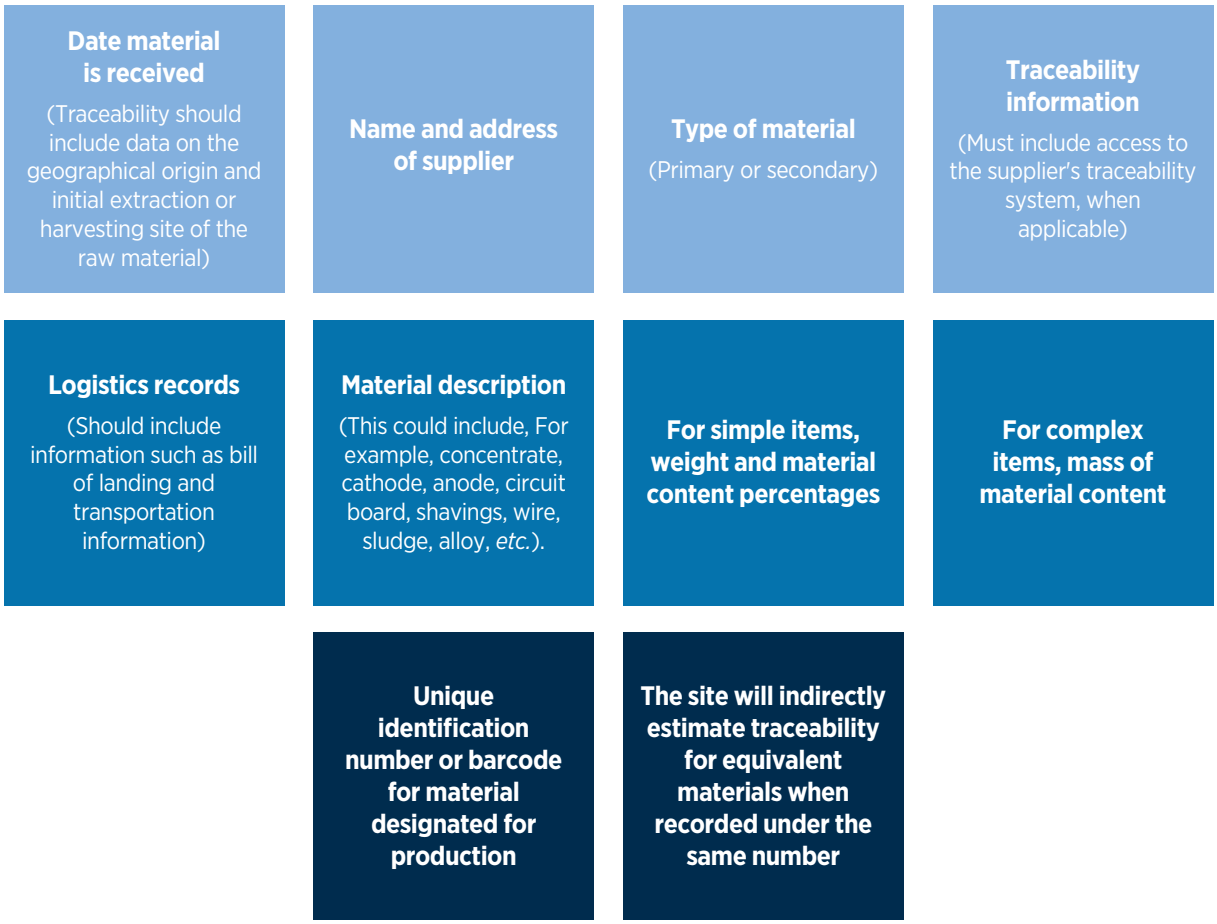
The entity's material accounting system ensures that the output of TRM from an entity does not proportionally exceed the input under its certification scope (ASI, 2022).

6. Material accounting system

Under the guidelines, all sites must implement a material accounting system designed to control the TRM from the moment it enters the site to the final product's departure. The entity operating the site documents receipt controls, ensuring that the process is carried out by qualified employees (SEIA, 2021).

For all incoming material, the material accounting system must contain and document the elements shown in Figure 2 (SEIA, 2021; The Copper Mark, 2022).

FIGURE 2 The elements of a material accounting system



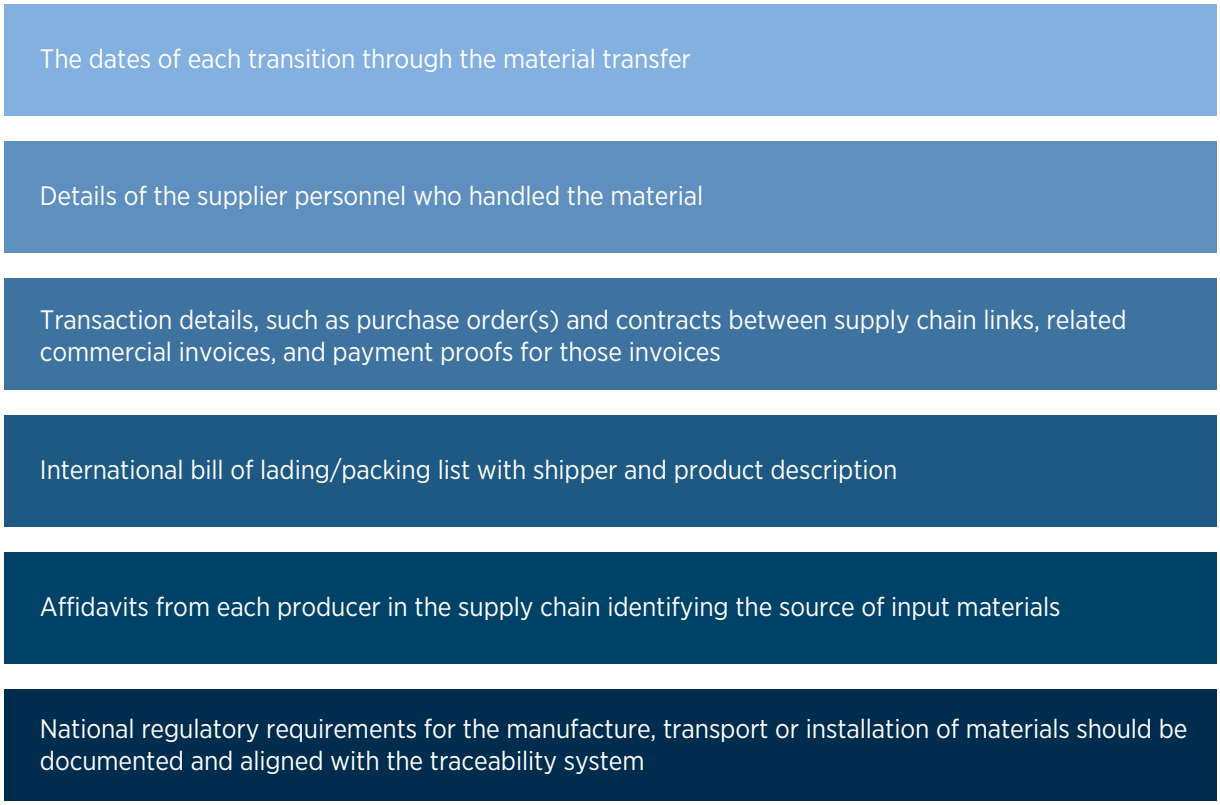
Source: (SEIA, 2021; The Copper Mark, 2022).

When equivalent materials from different suppliers are recorded under the same batch number, the site will indirectly calculate traceability based on procurement information from various suppliers. This information may be sourced from the current year's procurement forecast, or the previous year's overall consumption records.[1]

It is recommended that the information in Figure 3 is also included in the material accounting system.

1 This is a non-optimal method, to be applied only if strictly necessary and for a transitional period. As an alternative, it is possible, for example, to evaluate the use of a unique identity (ID) that also takes into account the specific supplier. This can be done in order to split the tracking of materials for each source.

FIGURE 3 Additional requirements of the material accounting system



Source: (SEIA, 2021).

Where the TRM is received, the site must record the following additional data points (The Copper Mark, 2022):

- The weight of the TRM received.
- The COC model used for TRM production (either separation or mass balance).
- The COC transfer record reference number issued by the supplier. For TRM processed under the separation model, this number must remain unchanged throughout the supply chain.

In the separation model, TRM is kept physically separate from NTRM throughout storage and at all stages of production.

When handling previously processed materials, such as during melting, smelting or refining, the site may mix only 100% TRM with material that is also 100% TRM.

A site is not permitted to use the separation model after receiving TRM produced using a mass balance model.

The site must also be able to verify effective separation throughout the entire production process (The Copper Mark, 2022).

6.1 Mass balance only

In the mass balance model, the site determines the percentage of product that qualifies as TRM. This is based on the site's total input percentage of TRM over the assessment period (The Copper Mark, 2022). This can be calculated via the following formula:

(Input of TRM in mass) / [(Input of TRM in mass) + (Input of NTRM in mass)]

6.2 Contents of the COC transfer record

At a minimum, the COC transfer record must contain the information set out in Figure 4 (The Copper Mark, 2022).

FIGURE 4 Minimum information required in a COC transfer record

Source: (The Copper Mark, 2022).

6.3 Communicating the COC transfer record

Each COC transfer record must be physically or digitally linked to the raw materials contained in the product.

Each time there is a change of custody of the certified material, the facility that currently has custody of the certified material must provide an updated transfer record.

A template for this process is provided in Annex II of this report. Sites may, however, choose to integrate the required information into their own format (The Copper Mark, 2022).

6.4 Release of products

The equipment or product manufacturer must incorporate traceability requirements into their product release process. At a minimum, this process must include the requirements set out in Figure 5.

FIGURE 5 Minimum traceability requirements for product release

Source: (SEIA, 2021).

Qualified personnel must conduct the release process, while the equipment or product manufacturer should establish documented procedures to prevent the shipment of products that have not successfully completed that process.

7. Audit

Under these guidelines, the organisation must guarantee the possibility of auditing by a recognised third-party auditor. To this end, the entity should establish and implement specific systems, processes and procedures.

These measures will have to guarantee, for example, the possibility of checking the relevant documents. This information could include sales documents, traceability information, invoices and the documentation in place regarding the physical segregation of the material/products being examined.

In particular, the audit (RINA, 2021) aims to verify the following:

- The compliance of the entity's COC process and model with the requirements outlined in the COC reference standard. In this report, the COC reference standard refers to internationally recognised frameworks such as ISO 22095 or The Copper Mark.
- The alignment of the client organisation's management and material accounting systems with the requirements of the COC reference standard and its effective implementation.
- Implementation of effective procedures to ensure traceability of material origin. These must be based on: the defined model for calculating TRM; the definition of the roles and responsibilities relating to the COC; the training of the personnel involved in maintaining the system; a system of internal audits; a complaint management process; and an improvement process.

8. Claims

If an error is identified after the shipment or receipt of COC material, the entity and the receiving party must document the issue and include in that documentation any corrective steps agreed upon. They must also implement measures to avoid a recurrence of the error.

Where the entity makes claims and/or representations about TRM, the entity must have systems in place to provide verifiable evidence supporting those claims (ASI, 2017).

If a supplier fails to meet traceability programme requirements, the buyer must:

- Immediately set aside the material to avoid any mixing with other inputs.
- Determine the material's origin before its release.
- Decline the material as non-conforming, if the origin cannot be verified.

If the provenance of the non-conforming material is concluded, the buyer and supplier should collaborate to establish corrective actions to prevent the recurrence of the non-conformance. If the non-conformance remains unresolved, the buyer should reassess the non-conforming supplier's "qualified" status in line with the supplier selection process (SEIA, 2021).

9. Outsourcing contractors and service companies

Sometimes, a company physically holding TRM that is outside the site's control is contracted, outsourced or tolled to undertake activities such as processing, treating, manufacturing or otherwise manipulating raw materials. In such circumstances, there is a risk that a link in the physical COC may have been broken.

If the site uses an outsourced contractor, it must retain ownership of all the materials. If ownership is not retained, any raw materials returned by the outsourced contractor will no longer qualify as TRM.

The outsourcing of TRM is allowed by this document, however, under the following conditions:

- The site's contract with the outsourced contractor mandates the continued application of separation or mass balance models, as required in order to maintain the site's COC model. The contract must ensure that all the necessary information for material traceability is available and displayed in accordance with the guidelines set out in this document.
- The site has prohibited outsourced contractors from sub-contracting any TRM matters to other companies.
- Site verification (sent or third party) has been undertaken. This is necessary in order to check compliance with the terms of the contract as well as the COC reference standard. The contractor must ensure the auditors have access to all the relevant information.

Any errors or discrepancies that arise in this procedure must result in corrective actions and/or termination of the site's relationship with the outsourced contractor.

The site must keep a detailed record of all outsourced contractors and maintain due diligence documentation for review during all COC reference standard assessments (The Copper Mark, 2022).

References

ASI (2017), *ASI Chain of Custody (CoC) Standard*, Aluminium Stewardship Initiative, Balwyn East, Victoria, https://aluminium-stewardship.org/wp-content/uploads/2017/12/ASI-Chain-of-Custody-Standard-V1-Dec2017.pdf

ASI (2022), *ASI Chain of Custody (CoC) Standard – Guidance*, Aluminium Stewardship Initiative, Balwyn East, Victoria, https://aluminium-stewardship.org/wp-content/uploads/2022/05/ASI-Chain-of-Custody-Standard-Guidance-V2-May2022-1.pdf

Ellen Macarthur Foundation (2021), *Completing the picture: How the circular economy tackles climate change*, Ellen Macarthur Foundation, Cowes, https://circulareconomy.europa.eu/platform/sites/default/files/emf_completing_the_picture.pdf

ISO (2020), "ISO 22095:2020 Chain Of Custody - General Terminology And Models", International Organization for Standardization, Geneva, www.iso.org/standard/72532.html

OECD (2016), *OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*, Organisation for Economic Co-operation and Development, Paris, www.oecd.org/en/publications/2016/04/oecd-due-diligence-guidance-for-responsible-supply-chains-of-minerals-from-conflict-affected-and-high-risk-areas_g1g65996.html

OECD (2019), *Is there a role for blockchain in responsible supply chains?*, Organisation for Economic Co-operation and Development, Paris, www.oecd.org/en/publications/is-there-a-role-for-blockchain-in-responsible-supply-chains_bfa93287-en.html

RINA (2021), *Rules for the concession and maintenance of chain of custody certification of forest based products (PEFC – chain of custody)*, RINA, Genoa, https://scresources.rina.org/resources/Documents/REGOLAMENTO%20PEFC_COC_ITA_rev1.pdf

SEIA (2021), *Solar supply chain traceability protocol 1.0*, Solar Energy Industries Association, Washington D.C., https://seia.org/wp-content/uploads/2021/04/SEIA-Supply-Chain-Traceability-Protocol-v1.0-April2021.pdf

SEIA (2024), "SEIA Releases National Standard to Enhance Solar Supply Chain Transparency", Solar Energy Industries Association, Washington D.C., https://seia.org/news/seia-releases-national-standard-to-enhance-solar-supply-chain-transparency/ (accessed 29 March 2026).

Solar Now (2021), "Solar supply chain traceability protocol 1.0: industry guidance", https://now.solar/2021/05/10/solar-supply-chain-traceability-protocol-1-0-industry-guidance/ (accessed 29 March 2026).

The Copper Mark (2022), *The Copper Mark Chain of Custody Standard*, The Copper Mark, Cheltenham, https://coppermark.org/wp-content/uploads/2022/06/The-Copper-Mark_Chain-of-Custody-Standard_FINAL_1Jul2022.pdf

UN (2015), "UN Sustainable Development Goals", United Nations Department of Economic and Social Affairs, New York and Vienna, https://sdgs.un.org/goals (accessed 29 March 2026).

World Economic Forum (2023), *Blockchain for Scaling Climate Action*, WEF, Cologny, https://www3.weforum.org/docs/WEF_Blockchain_for_Scaling_Climate_Action_2023.pdf

Annex 1

The matrix below is a proposal developed by Enel Green Power to guide companies in prioritising and identifying which raw materials should be traced, based on the level of associated risk.

The matrix is designed to help users conduct a structured and comparative risk assessment, especially in complex or diversified supply chains.

The core of this approach is a **decision matrix** (see Table A1). This guides traceability decisions based on the risk level of both the raw material and its supply chain. Table A1 presents the traceability decision logic by cross-referencing raw material risk (left-hand side) with supply chain risk (right-hand side). Based on the intersection of these two dimensions, the table indicates whether a material should be traced or not.

The inputs to this matrix are derived from two separate assessments:

- **Table A2** defines the criteria for assessing the risk level of the raw material itself. These criteria include: the material's presence in the environment, its environmental impact, associated social and human rights risks, geopolitical and supply chain disruption risks, and the presence or absence of hazardous substances in the raw material's supply chain.
- **Table A3** outlines the criteria for evaluating supply chain risk, based on supplier certifications, audit records, sustainability credentials and any history of unresolved non-conformities.

Raw materials and their associated supply chains are scored separately and then cross-referenced in the decision matrix to determine whether traceability is recommended. This approach enables companies to focus traceability efforts where the risks – or stakeholder expectations – are greatest.

Each company can also modify the questions and the matrix as required in order to do a risk assessment that takes into account the company's particular experience with suppliers and raw materials.

TABLE A1 Matrices to guide companies on prioritising and identifying raw materials for tracing

Matrix of decisions to trace raw materials	Supply chain		
	Low risk (>3 points)	Medium risk (1 or 2 points)	High risk (0 points)
Raw material			
Low risk (0 points)	Do not trace	Do not trace	Do not trace
Medium risk (up to 3 points)	Do not trace	Do not trace	Trace
High risk (>3 points)	Do not trace	Trace	Trace

TABLE A2 Criteria for assessing raw material risk levels

What could be considered a high risk raw material? Assignment of points		
Low quantity in the environment	Yes (1 point)	No (0 point)
High environmental impact in mining and refining process	Yes (1 point)	No (0 point)
High social and human rights risk in mining and refining process	Yes (1 point)	No (0 point)
Geopolitical, supply chain disruption and commodity risk	Yes (1 point)	No (0 point)
Dangerous substances present among its components (*i.e.* >0.1% of the REACH SVHC list)	Yes (1 point)	No (0 point)

Notes: This table does not specify quantitatively how to calculate the different criteria, leaving companies free to define their own approach. REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals regulation, European Union; SVHC = substances of very high concern; tbd = to be determined.

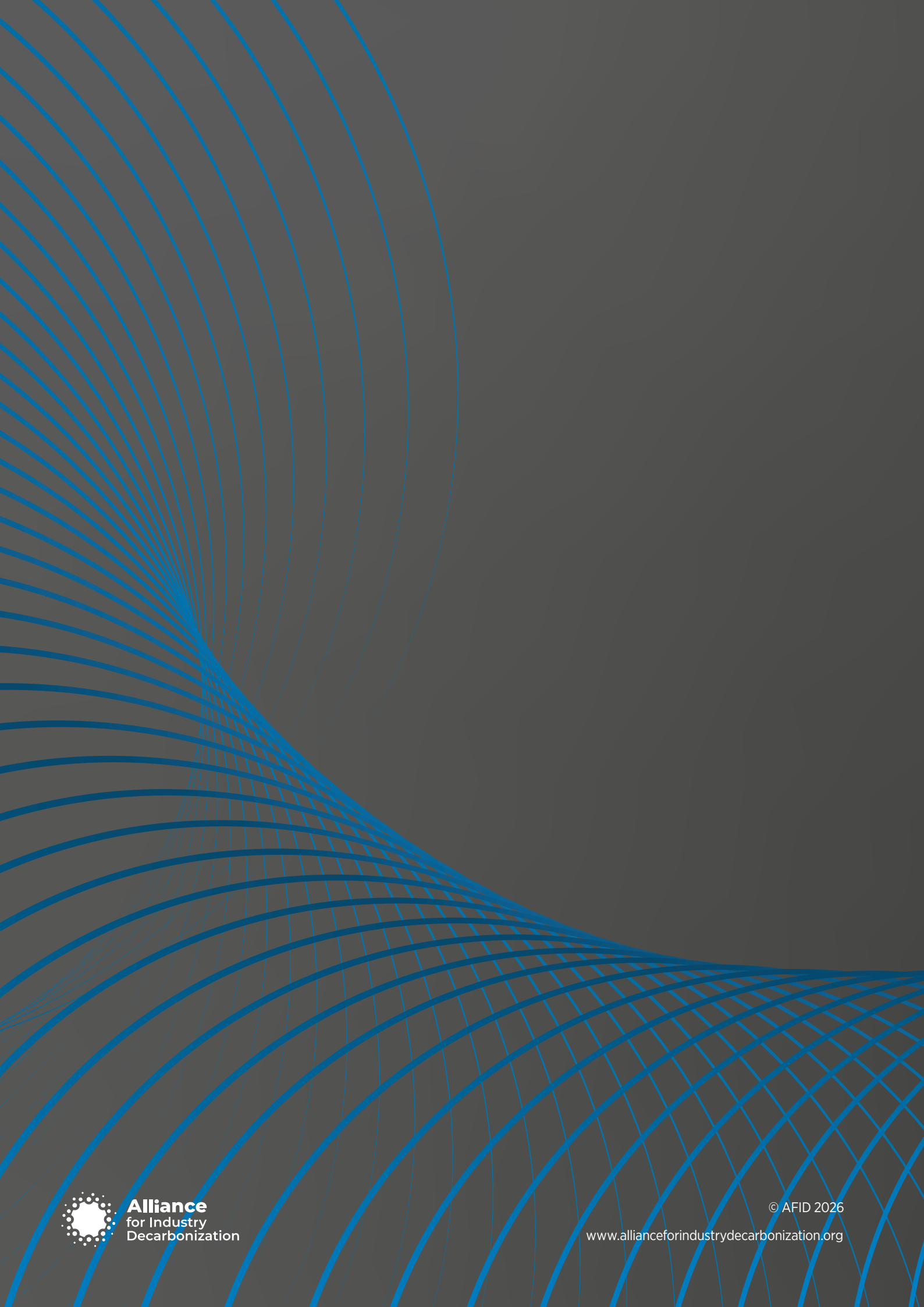
TABLE A3 Criteria for assessing supply chain risk levels

What could be considered a high risk supply chain? Assignment of points		
Does the supplier have external certificates (*e.g.* ISO 9001, ISO 14001, ISO 45001)?	Yes (1 point)	No (0 point)
Has the supplier been audited following an internationally recognised sustainability audit framework?	Yes (1 point)	No (0 point)
Do the raw materials have any sustainability certification (*e.g.* RMI, IRMA, ASI, Copper Mark)?	Yes (1 point)	No (0 point)
Does the supplier have any unresolved non-conformity from the previous audit, or been given any penalty?	Yes (0 point)	No (1 point)

Note: RMI = Responsible Minerals Initiative; IRMA = Initiative for Responsible Mining Assurance; ASI = Aluminium Stewardship Initiative.

Annex 2

Sample COC transfer record	
Date of issue:	COC transfer record reference number:
Supplier information	
Name:	Address:
Unique ID:	Name of responsible person:
Customer information	
Name:	Address:
Unique ID (if applicable):	
Material information	
Description:	Weight:
Separation/mass balance	**Separation only:** full chain of sites involved in the production using separation model.



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