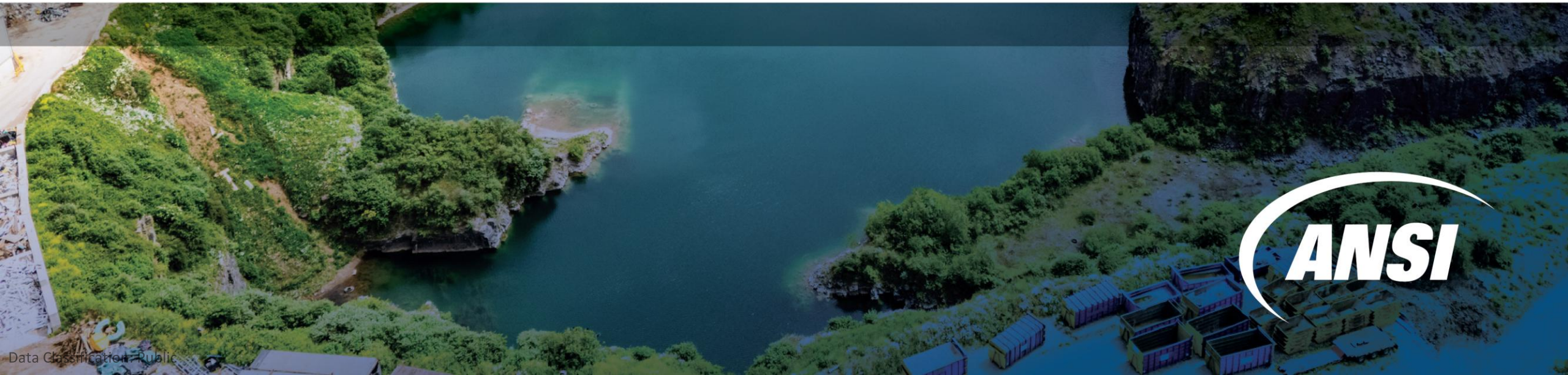




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They are not positions or recommendations from session moderators or formal and final statements.



Traceability Deep Dive

Moderated by
Frank Menchaca
Auzolan LLC





Traceability Deep-Dive Tasking: What is traceability?

“Traceability systems can enable the collection of data on **product origin, geographic path, the sequence of entities that held ownership or control** over the product and its physical evolution.”

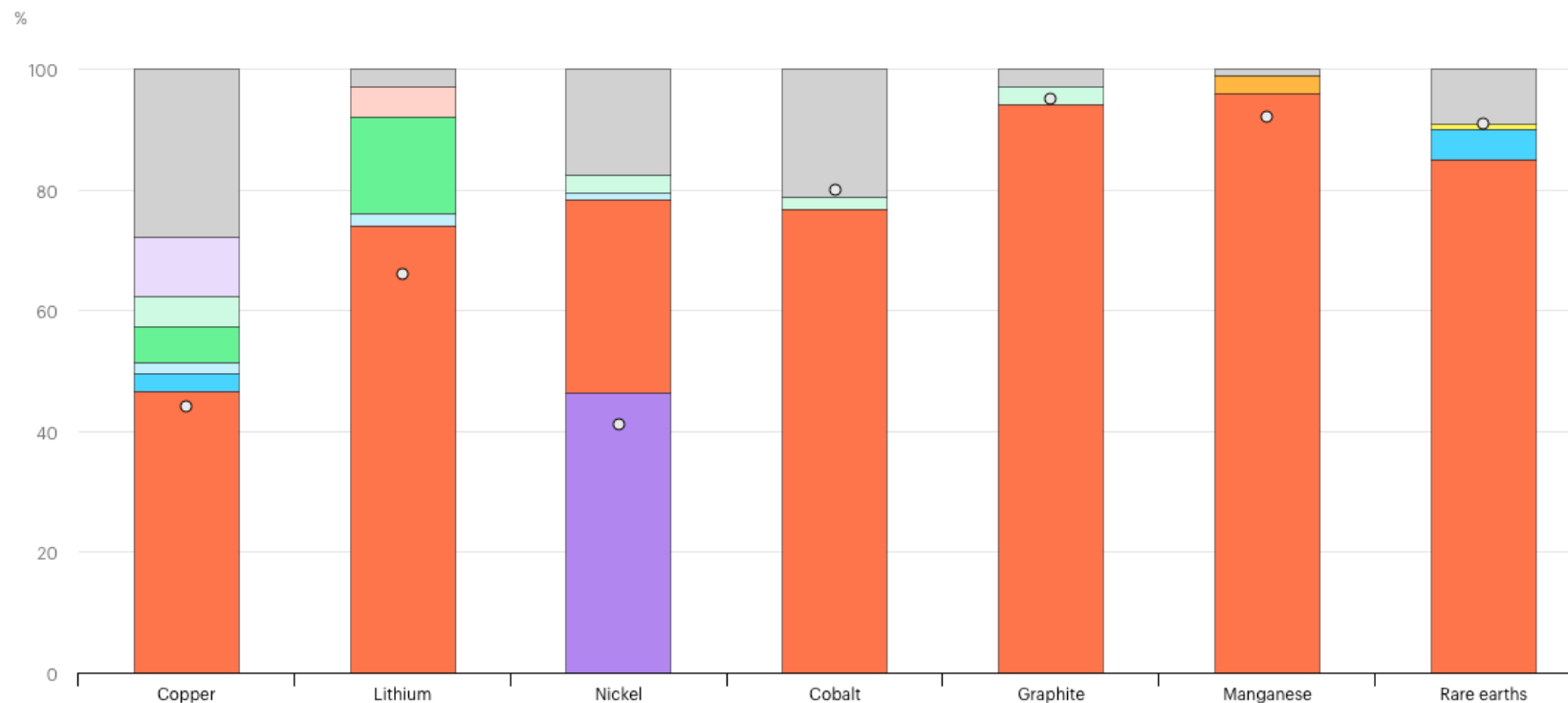
IEA (2025), The Role of Traceability in Critical Mineral Supply Chains

?

Traceability Deep-Dive Tasking: What does it mean?

Share of refined material production by country with the top producer's share, 2023 versus 2025

Why is traceability **important** in the context of critical minerals?



OECD (2026),
<https://doi.org/10.1787/d5ca8f62-en>.

IEA.

Indonesia China Europe United States Australia Chile Japan India DRC Argentina Rest of world Top producer's share (2023)



Traceability Deep-Dive Tasking: Risks and pain points

Traceability can uncover risks and pain points related to PFEs for:

- **National security:** domestic defense tools (drone batteries; BMSs) come from a rival.
- **Geopolitics:** critical minerals can be used as leverage.
- **Energy independence:** beholden to another power *for* power.
- **Technical competitiveness:** compromised when we do not directly own digital infrastructure.

What do we want our future to look like?

Through traceability critical minerals can be tracked seamlessly across global supply chains, providing trusted information on origin, custody, movement, and key attributes that supports transparent trade, strengthens buyer confidence, and creates resilient and competitive markets. This enables secure, diversified, and allied critical mineral supply chains that support U.S. technology leadership, economic growth, and national security objectives.

Key Characteristics:

- **End-to-end insight**– Minerals can be tracked across the entire value chain.
- **Trusted information** – Data on origin, movement, and attributes is reliable and verifiable.
- **Interoperability** – Systems and standards work seamlessly across organizations and jurisdictions.
- **Transparency** – Relevant supply chain information is accessible and understandable.
- **Market confidence** – Buyers can make informed decisions, supporting efficient and thriving trade.

With which products or industries should we start to reach this end state?

Industries

- Defense (e.g., military equipment batteries)
- Digital infrastructure (e.g., data center energy storage)
- Energy (e.g., grid storage)
- Healthcare (e.g., medical devices)
- Transportation (e.g., magnets)
- All of the above?

2 Compliance Expectations | Traceability

- *What regulatory frameworks, trade requirements, and conformity assessment approaches (e.g., testing, verification, inspection, certification, audit) apply?*
- *Are there additional needs or gaps within these frameworks?*

Feedback Prior to Workshop:

1. EU Battery Regulation & Digital Product Passport requirements
2. OECD responsible sourcing and due diligence frameworks
3. DFARS, NDAA, FEOC, and defense sourcing requirements
4. Chain-of-custody certification and conformity assessment programs
5. Independent verification and third-party audit requirements
6. Product-level critical mineral disclosure expectations
7. Recycled-content verification and reporting requirements
8. Cross-border trade and traceability reporting obligations

These appeared across responses from automotive, electronics, defense, battery, government, and standards organizations.

- Which products of critical minerals should be our **priorities**?
- What **data** should be collected about those products?
- How should we support priorities and data collection with **processes and practices**?
- Which should be **standardized**?
- How should those standards work? As part of **regulations**? **Voluntary**?
- How should use of traceability standards be incentivized?
- How will we know they are being followed?

Workshop Whiteboard:

1. Discussion captured here
2. Discussion captured here

3

Implementation Experience & Barriers | Traceability

- *What challenges have stakeholders encountered when **implementing practice**?*
- *What factors (e.g., technical, operational, or commercial) limit adoption across different stages of the value chain?*

Feedback Prior to Workshop:

1. Traceability frequently breaks below Tier 1 suppliers
2. Lack of visibility into midstream processing operations
3. Multiple incompatible reporting systems
4. High implementation and verification costs
5. Data-sharing restrictions and commercial confidentiality concerns
6. Inconsistent definitions across jurisdictions
7. Difficulty validating material origin and sustainability claims
8. Long qualification timelines limit supplier diversification
9. Challenges tracking blended and recycled materials

3

Implementation Experience & Barriers Discussion | Traceability

- *How are standards applied today? Is it effective implementation?*
- *What challenges have stakeholders encountered when implementing measures in practice?*
- *What factors (e.g., technical, operational, or commercial) limit adoption across different stages of the value chain?*
- *How should we balance communicating **need to know** information with **secret sauce**?*

Workshop Whiteboard:

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2. Discussion captured here

Standards Utilized:

1. **Copper Mark** Chain of Custody
2. **EU Battery Regulation** (traceability provision)
3. Initiative for Responsible Mining Assurance (**IRMA**)
4. **ISO 17887:2025** Mineral Traceability and Due Diligence
5. **OECD** Due Diligence Guidance
6. **OECD** Centre for Responsible Business Conduct initiatives
7. Responsible Minerals Initiative (**RMI**) Frameworks
8. **SAE J3327** Battery Traceability Record
9. UN Transparency Protocol (**UNTP**)

Gaps :

- A. Traceability standards beyond batteries (magnets, semiconductors, alloys)
- B. Mass-balance methodologies for mixed-source materials
- C. Harmonized recycled-content accounting
- D. Independent origin and provenance verification methods
- E. Traceability continuity through reuse, remanufacturing, and recycling
- F. Consistent data ownership, privacy, and cybersecurity requirements
- G. Common definitions for "allied," "domestic," and sourcing classifications

4

Standards Utilized & Gaps Discussion | Traceability

- *What standards or frameworks or practices currently support this area, and how are they applied?*
 - *Organization level feedback is a great start!*
- *Where are gaps or inconsistencies observed across existing standards or systems?*

Standards Utilized:

1. Discussion captured here
2. Discussion captured here

Gaps :

1. Discussion captured here
2. Discussion captured here

5

Coordination, Alignment & Interoperability | Traceability

- *Where is alignment needed between standards, regulatory frameworks, and industry practices to support this area?*
- *What challenges exist in ensuring interoperability across systems, data formats, or supply chain participants?*

Feedback Prior to Workshop:

1. Harmonize traceability requirements across U.S., EU, and allied markets
2. Align industry, government, and standards-development efforts
3. Improve interoperability between traceability platforms and digital passports
4. Establish common approaches for chain-of-custody and mass-balance systems
5. Reduce duplication across reporting and compliance frameworks
6. Improve information exchange between upstream, midstream, and downstream actors
7. Align supplier, OEM, and regulatory reporting expectations
8. Create common approaches for conformity assessment and verification

5

Coordination, Alignment & Interoperability Discussion | Traceability

- *Where is alignment needed between standards, regulatory frameworks, and industry practices to support this area?*
- *What challenges exist in ensuring interoperability across systems, data formats, or supply chain participants?*
- *"If it were up to me, I'd _____"*

Workshop Whiteboard:

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2. Discussion captured here

6 Data & Pre-standardization Needs | Traceability

- *What research, datasets, definitions, reference materials, and technical building blocks need to exist before better standards can be written? To build the technical foundation?*

Feedback Prior to Workshop:

1. Harmonized terminology and definitions for materials, facilities, and sourcing claims
2. Standard data fields and reporting formats for traceability records
3. Provenance verification methodologies and reference datasets
4. Facility-level supply chain data and processing-stage definitions
5. Reference materials and test methods supporting origin verification
6. Data security, governance, and confidentiality frameworks
7. Validation methods for digital traceability systems
8. Recycled-content accounting methodologies
9. Standard metrics and technical criteria for traceability performance



A Minimum Common Dataset Is Beginning To Take Shape

When asked which data elements should be standardized, respondents consistently pointed to four recurring categories.

1. WHAT IS IT?

Material Identity

- Chemistry
- Composition
- Purity
- Material / BOM identity
- Batch or lot

2. WHERE DID IT COME FROM?

Origin And Provenance

- Country of origin
- Mineral source
- Mine or resource
- Processing and refining location
- Transformation history

3. WHO PRODUCED IT AND CONTROLS IT?

Supplier And Ownership Information

- Supplier
- Ownership and control
- Beneficial ownership
- FEOC status
- Manufacturing entity and location

4. HOW ARE THE RECORDS CONNECTED?

Identifiers And Linkage

- Globally unique identifiers
- Batch and lot linkage
- Material to product linkage
- Chain of custody relationships

**Additional Data May
Vary By Use Case**

Beyond the common traceability foundation, respondents identified other data that may be important for specific regulatory, commercial, sustainability, or end-of-life needs:

Carbon Footprint | PFAS | Recycled Content | Quality | Manufacturing Data | Lifecycle / End-Of-Life Status

- *What research, datasets, definitions, reference materials, and technical building blocks need to exist before better standards can be written? To build the technical foundation?*

Workshop Whiteboard:

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