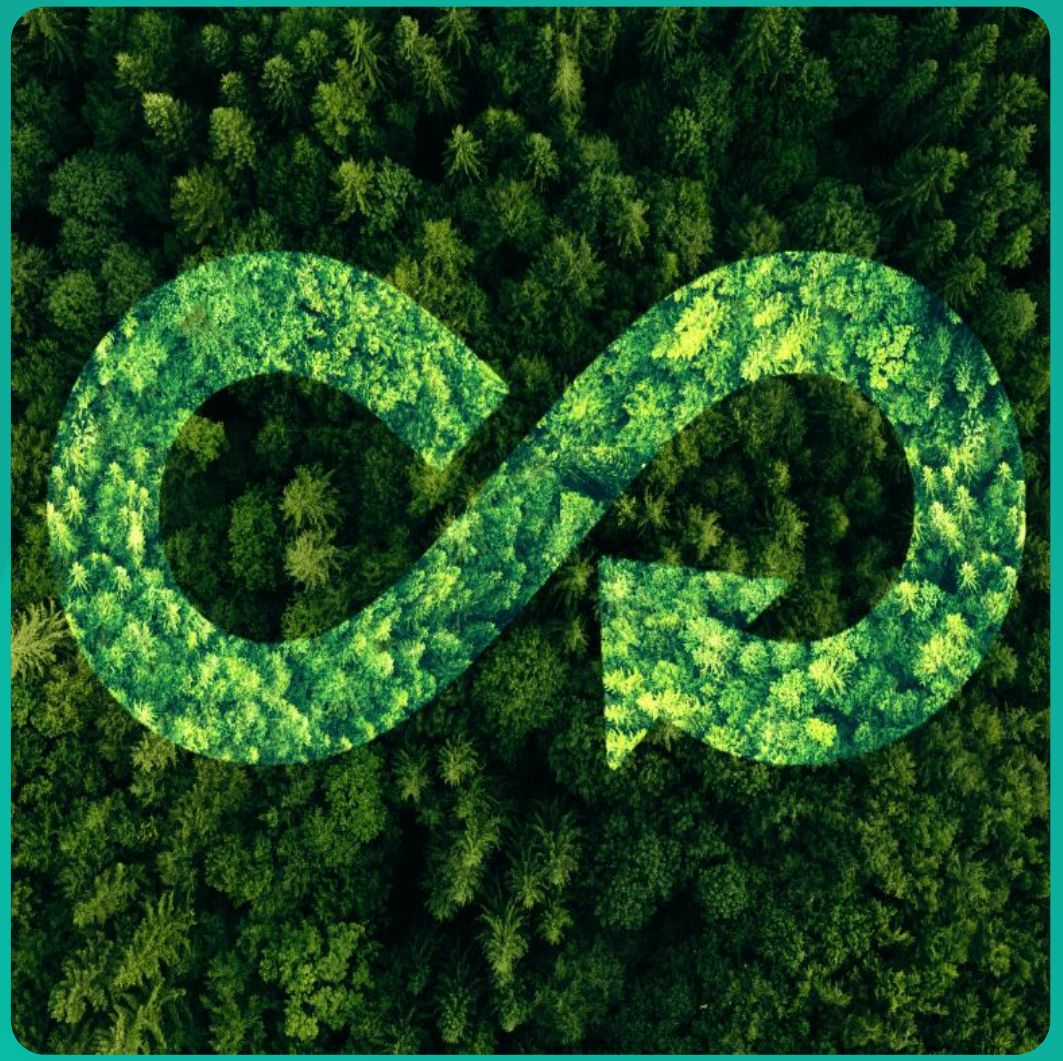
Compliance & Risks



Webinar

Emerging Requirements & Standards for Measuring Product Circularity and Supply Chain Data Collection

29th January, 2025

→ | complianceandrisks.com

Compliance & Risks

Q&A Session

Slides & Webinar Recording

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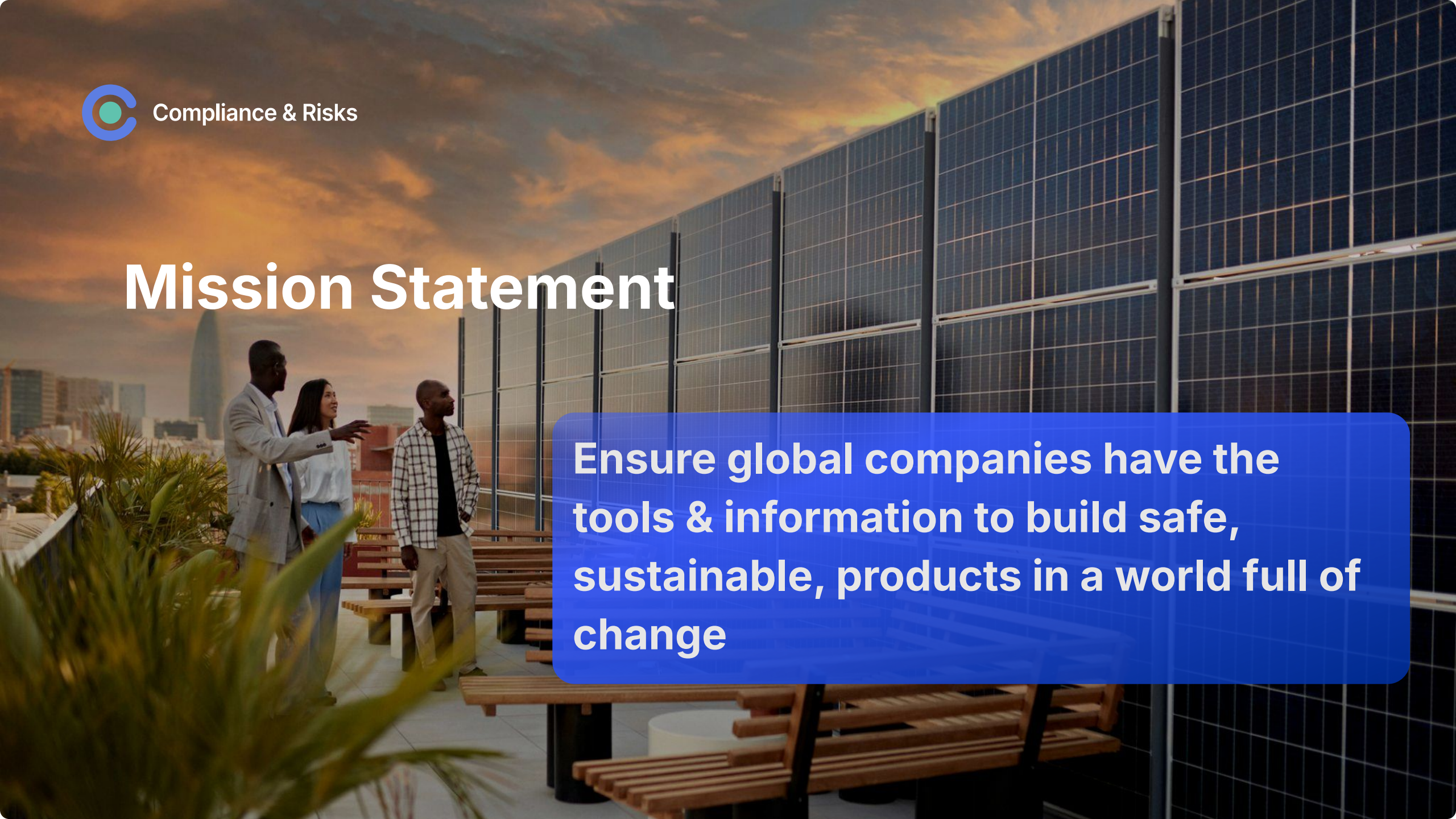
Meet the Team

Walter Jager,
Principal Consultant,
ECD Compliance

Orlaith Morris,
Content Marketing Manager,
Compliance & Risks


Compliance & Risks
Mission Statement
Ensure global companies have the tools & information to build safe, sustainable, products in a world full of change

Trusted by the World’s Leading Brands

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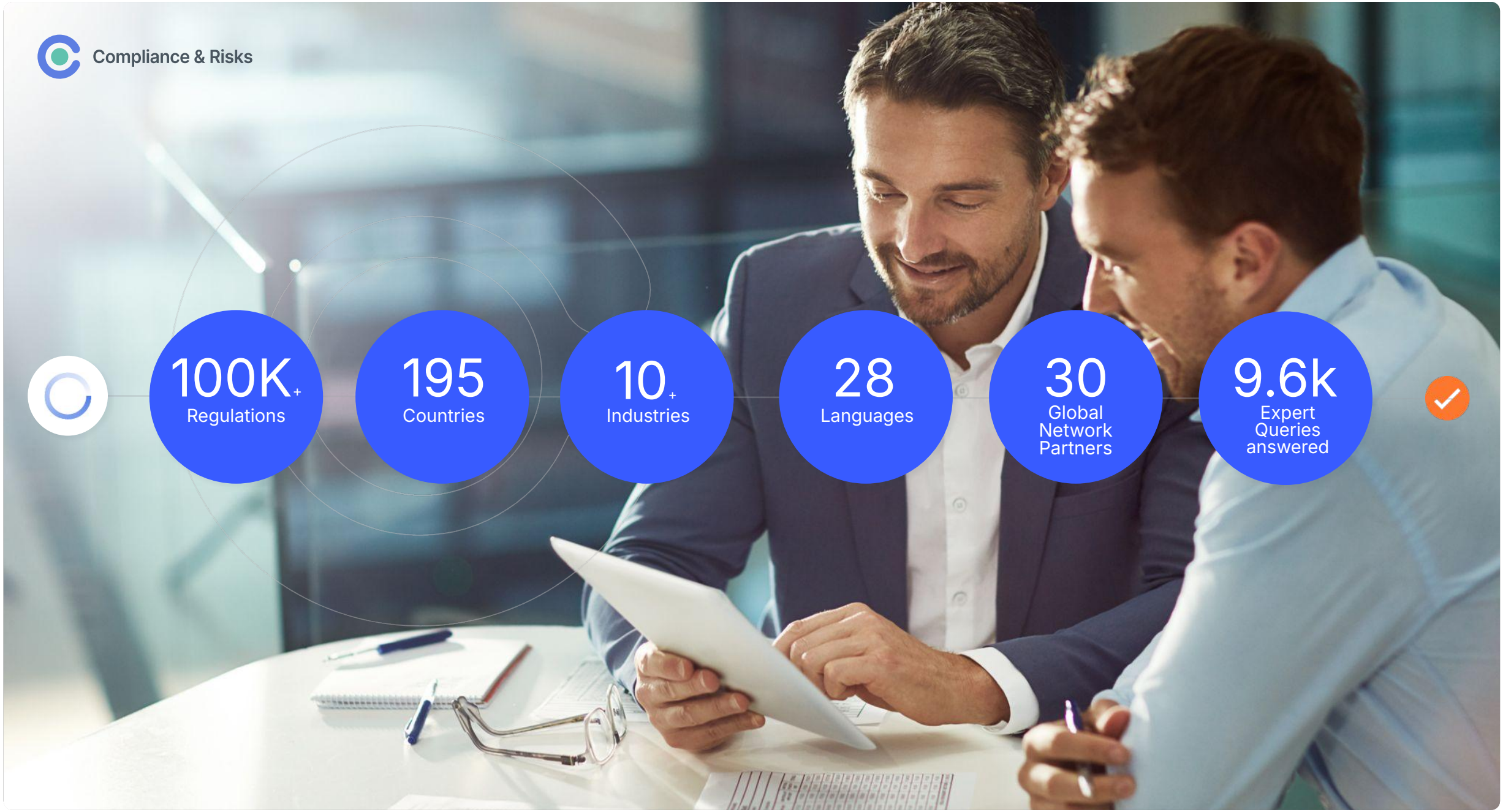
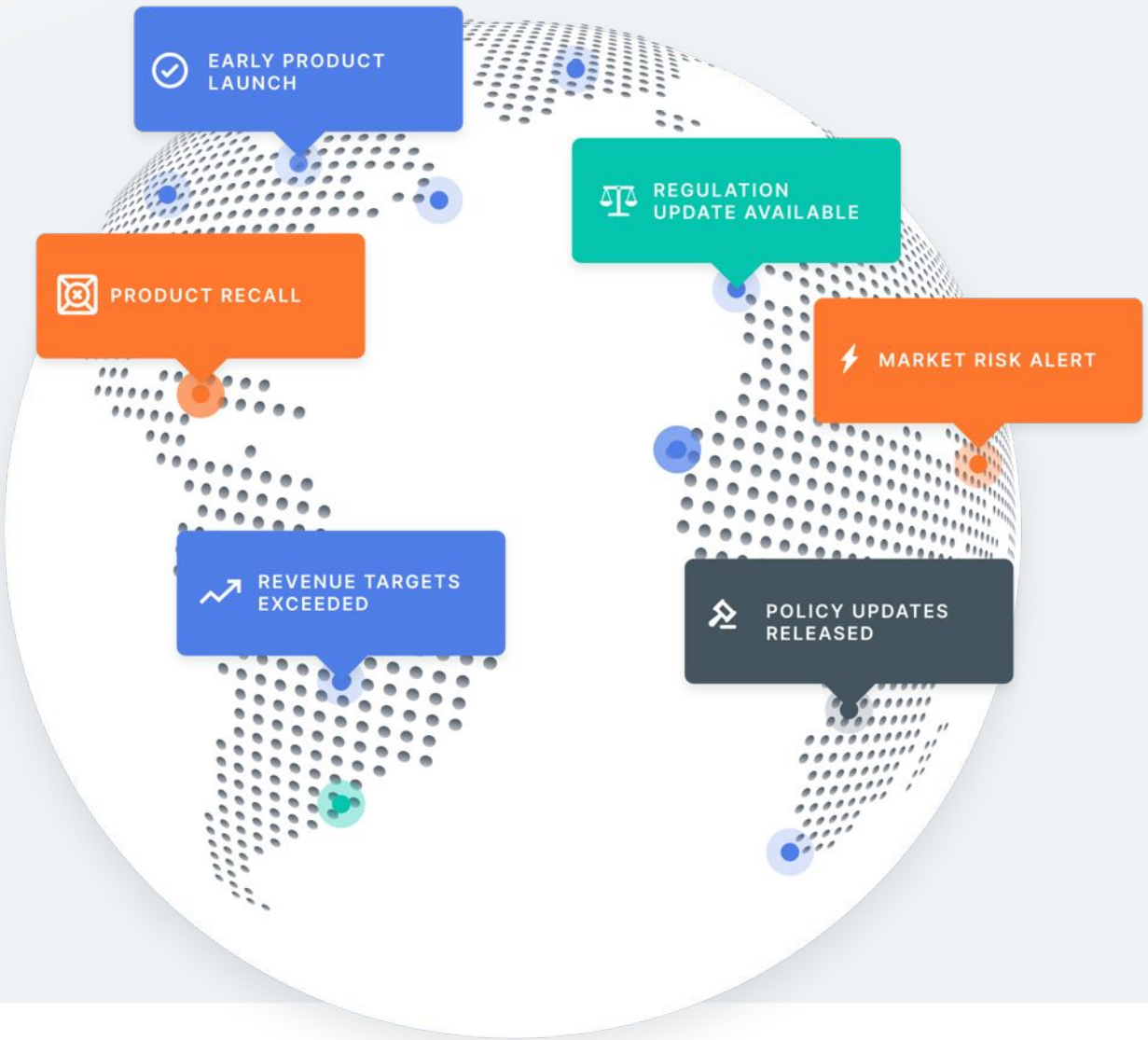


WHAT WE DO

Unlocking Market Access

Keep on top of regulatory changes and their impact worldwide. Early warning alerts, impact probability, productivity workflow tools and so much more.



Agenda

1. Introduction
2. What does Circular Economy (CE) actually mean?
3. Upcoming requirements and opportunities for measuring and improving product circularity
4. Emerging International Standards for measuring circularity and communicating circularity information through value networks (e.g. supply chains)
   - 4.1. ISO 59020 - Measuring and assessing circularity performance
   - 4.2. IEC/ISO 82474-1 - Material declaration – Part 1: General requirements
   - 4.3. IEC standards on assessing and improving product circularity
5. A framework for circularity measurement and data acquisition using ISO 59020 and IEC/ISO 82474-1
6. Considerations and Challenges for product manufacturers
   - 6.1. Trade-offs in ecodesign to improve circularity
7. The importance of CE for Critical Raw Materials (CRM)
8. Summary

Compliance & Risks

About ECD Compliance

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About ECD Compliance

- **Consulting and technical support on global environmental regulations**
  - Global regulatory requirements
  - Impact on products and markets
  - Education and training seminars
  - Development and implementation of compliance programs
- **Environmental standards**
  - Awareness of emerging standard, implementation, and representation
  - IEC/TC111 – Environmental Standardization
  - IEC 62474, IEC 63000, IEC TR 62476
  - IPC E-31 Supplier Declaration Subcommittee (IPC-175x standards)
  - ISO/IEC JTC1/SC39 – Sustainability, IT & Data Centres
  - ISO/TC323 – Circular Economy
- **Eco-labels and sustainability programs**
  - Ecolabel standards: IEEE 1680.X, NSF, UL
  - EPEAT and Voluntary programs
- **Environmentally Conscious Design (ECD) and Circular Economy**
  - Ecodesign , energy efficiency, LCA

What Does Circularity Economy Actually Mean?

There are a variety of definitions of Circular Economy (CE) and sometimes different expectations of what needs to happen to achieve it.

IEC 60050-193 *[under development]* **: circular economy**
economic system that uses a systemic approach to circulate products and materials at highest value for as long as possible by aiming to eliminate waste and pollution, while contributing to sustainable development and giving the opportunity for natural systems to regenerate themselves
Note 1 to entry: The inflow of primary materials is kept as low as possible.

ISO 14009: circular economy
economy that is restorative and regenerative by design, and which aims to keep *products*, components and *materials* at their highest utility and value at all times, distinguishing between technical and biological cycles
[SOURCE: ISO 6707-3, ISO 20400, ISO 21401, ISO 21404, etc.]
[Based on Ellen MacArthur explanation]

ISO 59004: circular economy
economic system that uses a systemic approach to maintain a *circular flow of resources*, by recovering, retaining or adding to their *value,* while contributing to *sustainable development*
Note 1 to entry: *Resources* can be considered concerning both stocks and flows.
Note 2 to entry: The inflow of *virgin resources* is kept as low as possible, and the circular flow of resources is
kept as closed as possible to minimize *waste*, *losses* and *releases* from the economic system.

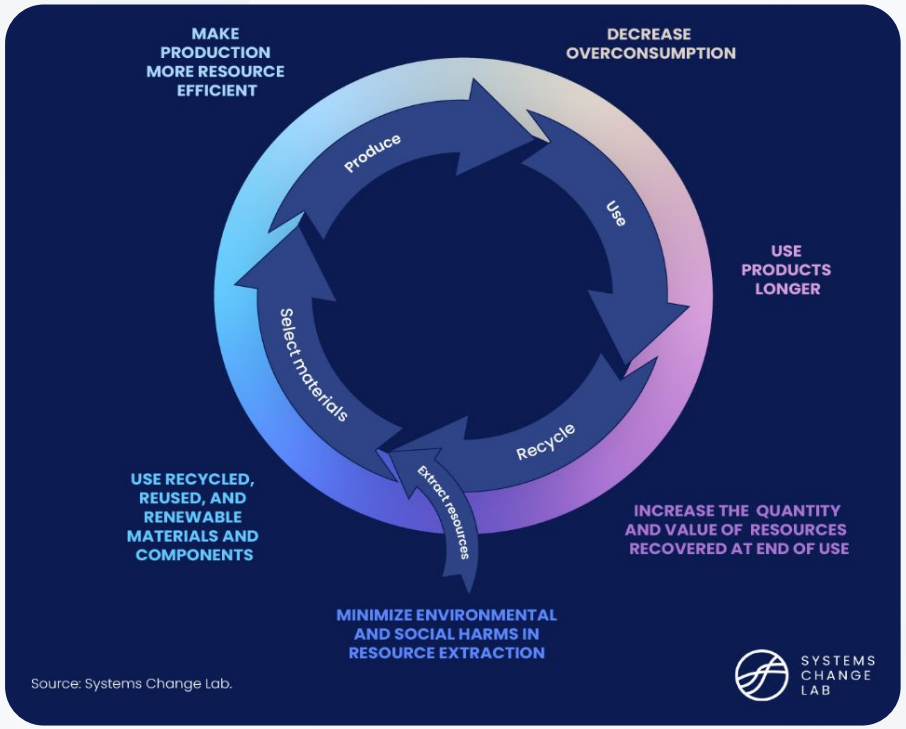
Requirements and Opportunities for Products

- **Ecolabel requirements have been emerging over the past 20 years**
  - Procurement requirements
- **European Ecodesign Directive → ESPR**
- **U.S. State and Canada right to repair regulations**

- **Some of the circularity aspects addressed:**
  - Recycled materials
  - Extending product life → repair, update, upgrade, reuse, refurbishment
  - Design for recycling → reduce hazardous substances, disassembly
  - EOL treatment instructions, recyclability rate
  - Product reuse and recycling programs
  - Remanufacturing

Why isn’t Circular Economy Easy?

- **Systems Change Lab (SCL) Circular Economy System tracks global progress on CE**
  - Went live in April 2024
  - https://systemschangelab.org/circular-economy
  - Identify metrics, targets, enablers and barriers
  - Significant data gaps and methodology gaps were identified
- **Six shifts identified as necessary for CE**
  - Reduce overconsumption
  - Use reused, recycled, and renewable materials and components
  - Minimize environmental and social harms in resource extraction
  - Make production more resource efficient
  - Use products longer
  - Increase the quality and value of resource recovered at end of use



About Systems Change Lab
Systems Change Lab is a collaborative initiative that aims to spur action at the pace and scale needed to tackle some of the world’s greatest challenges: limiting global warming to 1.5°C, halting biodiversity loss and building a just economy. Convened by World Resources Institute and the Bezos Earth Fund, Systems Change Lab supports the UN Climate Change High-Level Champions and works with key partners and funders including Climate Action Tracker (a project of Climate Analytics and NewClimate Institute), ClimateWorks Foundation, Global Environment Facility, Just Climate, Mission Possible Partnership, Systemiq, University of Exeter, and the University of Tokyo’s Center for Global Commons, among others. Systems Change Lab is a component of the Global Commons Alliance

Circular Economy Challenges for a Manufacturer

- Availability of data ← supplier data and internal data
- Many circularity characteristics are ambiguous and open to interpretation
  - Raises concern about misleading circularity claims.

Robust definitions, criteria, methods, and exchange protocols are needed to ensure consistency in interpretation and due diligence.

- Both IEC and ISO have been developing International Standards related to the Circular Economy
  - IEC TC111 – Environmental Standardization for Electrotechnical Products and Systems
  - ISO TC207 – Environmental Management
  - ISO TC323 – Circular Economy

IEC TC111 Standardization for Circularity Economy

Six areas of standardization for Circularity Economy (CE)

- Circular Economy terminology (TC1/JWG2)
- Ecodesign for CE
- Circularity of resource inflows (reused, recycled, renewable)
  - Assessment methods for circular content used in making EE Products
- Durability and lifecycle extension assessment methods
- Circularity of Resource Outflows
  - WEEE Management
  - Assessment methods and guidance for end-of-life material recovery, recycling, recyclability
- Communication of circularity information through value chains

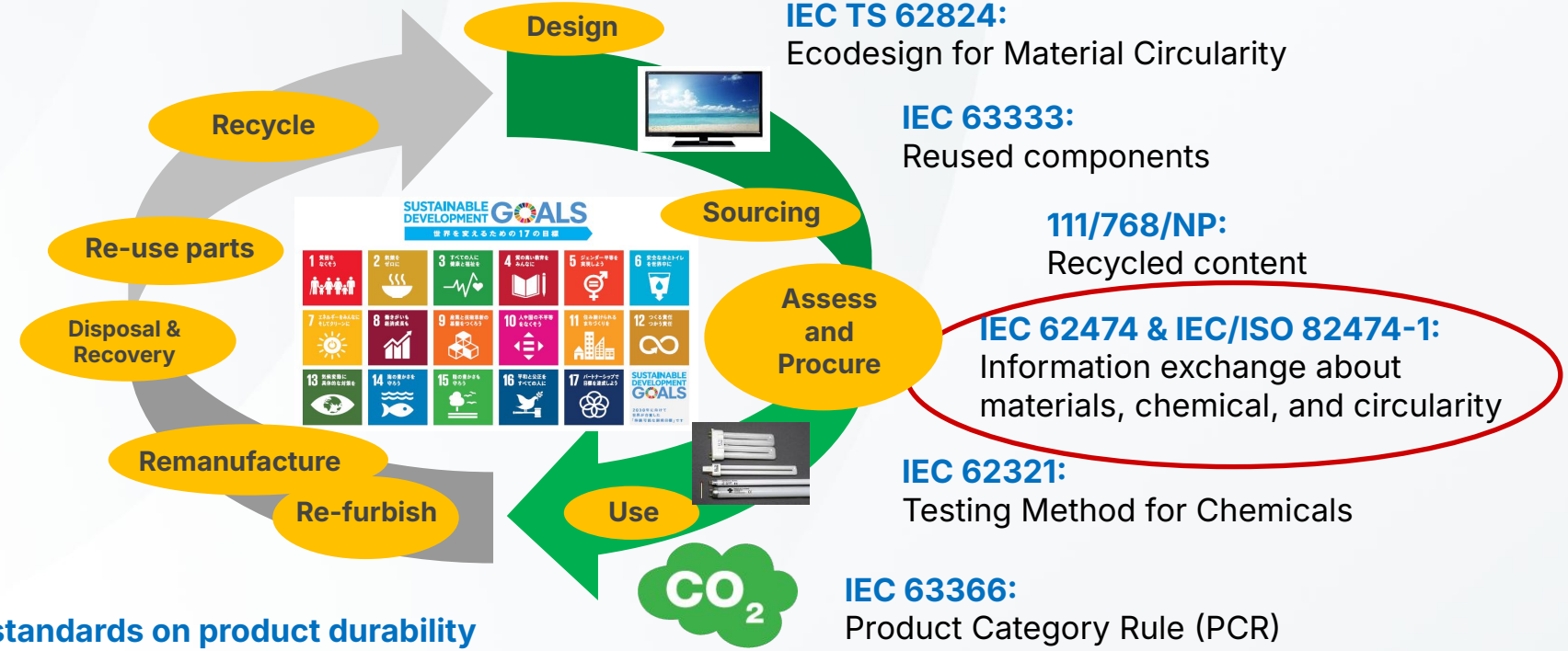
IEC International Electrotechnical Commission

TC 111 Contribution to the Environmental Standards

Transition to a Circular Economy

IEC 62430:
Eco design (Life Cycle Thinking)

IEC 62635:
Recyclability and EOL information



IEC TS 62824:
Ecodesign for Material Circularity

IEC 63333:
Reused components

111/768/NP:
Recycled content

IEC 62474 & IEC/ISO 82474-1:
Information exchange about materials, chemical, and circularity

IEC 62321:
Testing Method for Chemicals

IEC 63366:
Product Category Rule (PCR)

IEC 63395:
E-waste Management

E-waste

Planned standards on product durability
(framework, reliability, repair, update)

IEC CDV 63372:
Greenhouse gas

ISO Standards to Support Circular Economy

- **ISO TC 323 Circular Economy standards were published May 2024**
  - ISO 59004 Circular economy – Vocabulary, principles and guidance for implementation
  - ISO 59010 Circular economy – Guidance on the transition of business models and value networks
  - ISO 59020 Circular economy – Measuring and assessing circularity performance
- **ISO TC 207 Circularity Standard**
  - 14009:2020 Environmental management systems — Guidelines for incorporating material circulation in design and development

ISO 59020 Measuring and Assessing Circularity

Scope:

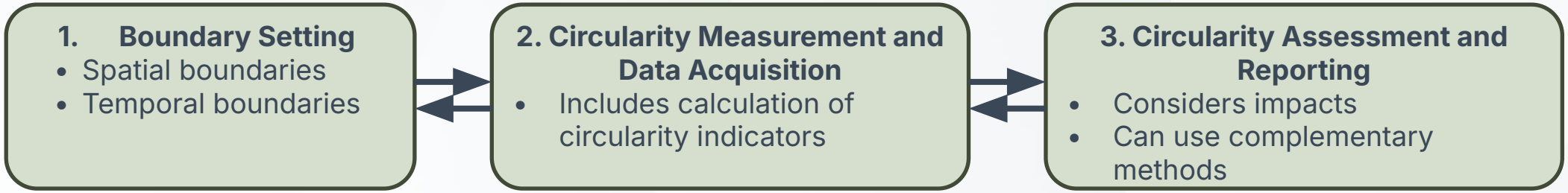
- ISO 59020 "*provides a **framework** to guide users within **organizations of all types and sizes** through the **measurement and assessment process**, including **system boundary** setting and choice of **indicators**, as well as processing and interpreting data in a consistent and reproducible manner to **generate meaningful and verifiable results**.*"
- Four system levels for measuring circularity.
  - Regional, interorganizational, Organizational, and Product
- Circularity assessment looks at the social, environmental and economic impacts caused by actions to achieve circularity using complementary methods.

Principles of measuring and assessing circularity

- Leverages the ISO 59004 principles
- Two additional principles: (1) Relevant boundaries and (2) meaningful outcomes

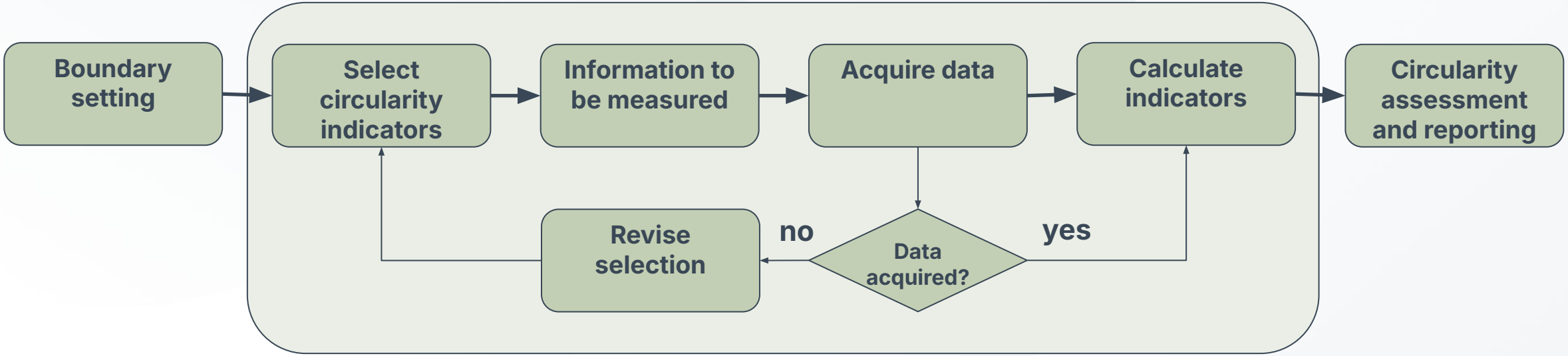
Framework for Measuring and Assessing Circularity

- **Measuring circularity has a similar framework to conducting a Life Cycle Assessment (LCA).**



- **Step 1: setting goal, scope, system boundaries, and quality requirements, etc.**
  - Used to identify resource flows and characteristics to be measured
  - Spatial and temporal boundaries are particularly important for circularity measurement of products
- **Step 2: is the actual circularity measurement**
- **Step 3: uses complementary methods to assess and account for changes to environmental, social, and economic impacts**
  - LCA: ISO 14040, 14044, 14067
  - Water: ISO 14046
  - LCC: ISO 15686-5

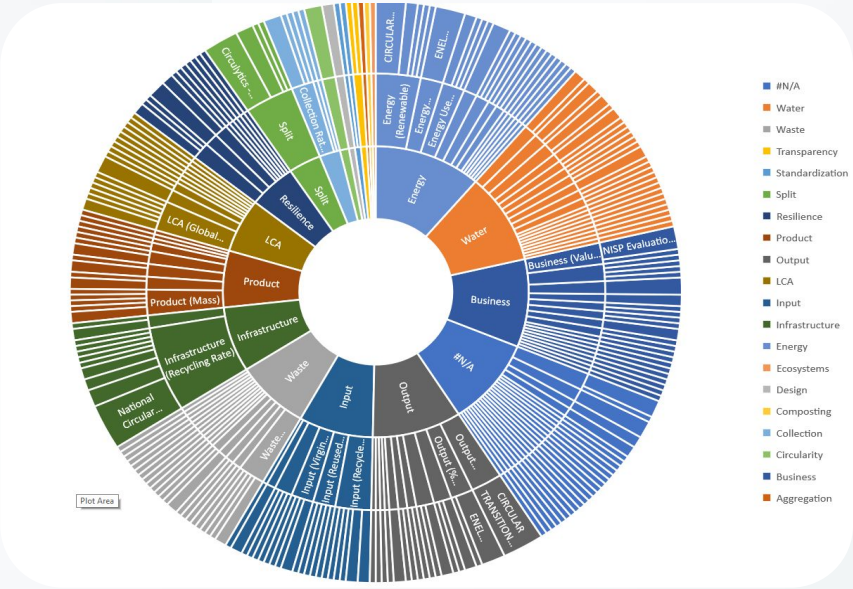
Circularity Measurement and Data Acquisition Process Steps



- Need to assess the availability of primary and/or secondary data
- Quality of the data?
- May need to revise selection of circularity indicators

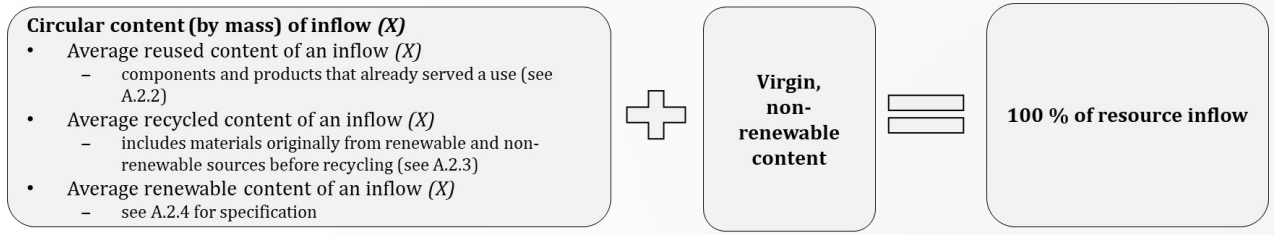
ISO 59020– Circularity Indicators

- ISO 59020 was developed from reviewing over 100 circularity indicators systems in use
- ISO 59020 identifies five categories of core circularity indicators for measurement:
  - Resource inflows – using circular resources?
  - Resource outflows – extending lifetime and end-of-life recovery
  - Energy – inflows and outflows
  - Water circularity – inflows, recirculation, and outflows
  - Economic



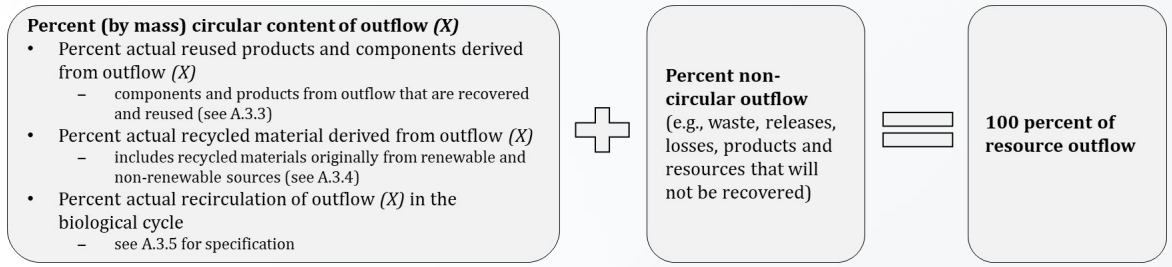
Core Circularity Indicators – Resource Inflows

Indicator category	Mandatory / Optional	Circularity indicator	Considerations
Resource Inflows	Mandatory	Average reused content of an inflow (X)	
	Mandatory	Average recycled content of an inflow (X)	• Need to consider the chain of custody and mass balance models used
	Mandatory	Average renewable content of an inflow (X)	• Needs to be sustainably produced • How to address non-biological renewable materials



Core Circularity Indicators – Resource Outflows

Indicator category	Mandatory / Optional	Circularity indicator	Additional Considerations
Resource Outflows	Optional	Average lifetime of product or material (durability) relative to industry average	Baseline average is needed
	Mandatory	Percent actual reused products and components derived from outflow (X)	
	Mandatory	Percent actual recycled material derived from outflow (X)	
	Mandatory	Percent actual recirculation of outflow in the biological cycle	Requires safe return to the biosphere and meets the qualifying conditions for recirculation



Core Circularity Indicators - Energy, Water, Economic

Indicator category	Mandatory / Optional	Circularity indicator	Additional Considerations
Energy	Optional	Average percent of energy consumed that is renewable energy	Accounts for energy inflows and energy outflows
Water	Optional	Percent water withdrawal from inflow circular sources	
	Optional	Percent water discharged in accordance with quality requirements	Percent (by volume) of total water withdrawn that is discharged in accordance with circularity principles
	Optional	Ratio (onsite or internal) water reuse or recirculation	Reuse cycles of onsite water
Economic	Optional	Material productivity (MP)	Ratio of revenue generated by total mass of all linear resource inflows
	Optional	Resource intensity index (RII)	Quantitative measure of economic growth versus total resource use

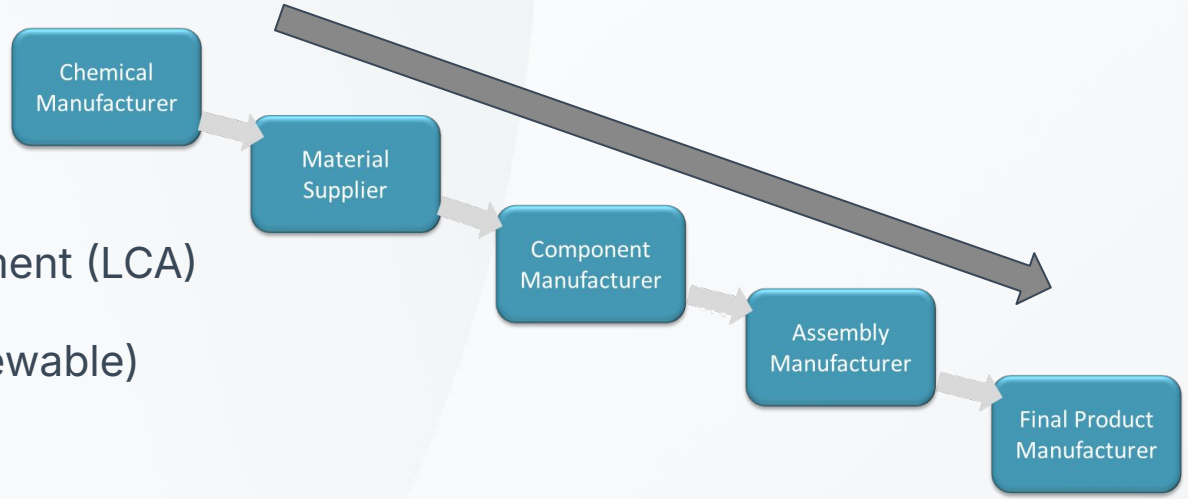
Framework for Circularity Measurement and Assessment

- Circular indicators should be selected based on significance to the system that is being measured.
- Combination of indicators selected should cover the full resource loop
  - The core circular indicators can be supplemented by additional indicators
- Measurement is conducted based on the system boundary
- Communication of data through the value network (supply chain) is needed

Increasing Need for Supply Chain Information

For Instance:

- **Substance restrictions**
- **Reporting Requirements**
  - EU SCIP Database; California Proposition 65
- **Environmental assessment**
  - Material and other data for Life Cycle Assessment (LCA)
- **Circular Economy (emerging)**
  - Use of circular content (recycled, reused, renewable)
  - Opportunities for life cycle extension
  - Recoverability and Recyclability
  - Critical Raw Materials (CRM)
- **Climate Change (emerging)**
  - Carbon footprint of products (CFP)



Information flows down the manufacturing chain:

- Substance content
- Materials
- Parts
- Compliance data

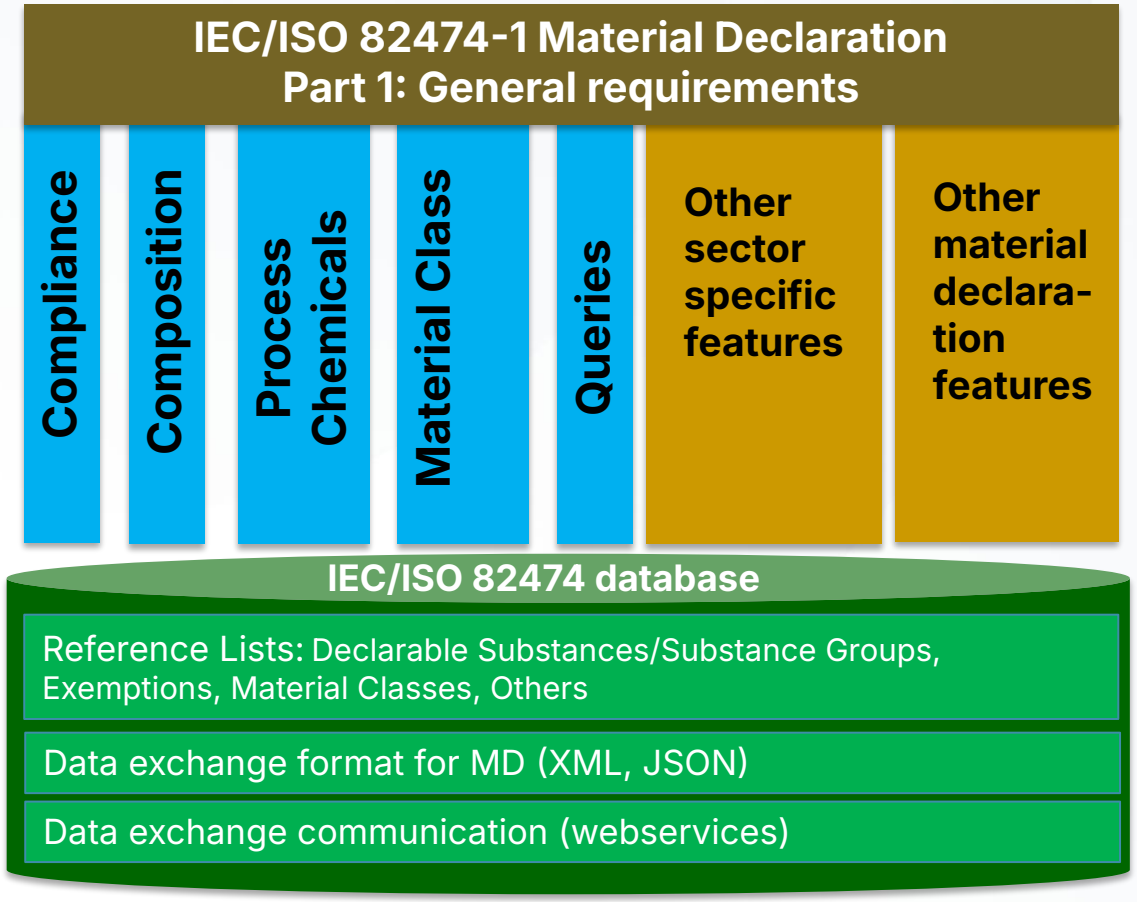
Material Declaration

- **IEC 62474 (2018): Material declaration for products of and for the electrotechnical industry**
  - First published in 2012
  - Specifies the requirements for reporting the substances and materials used in electronic and electrical products
  - Parts of the standard are in a Database (SDB) -- updated on a regular basis
  - Data Exchange Format (DXF) updated to include circularity information (June 2024)

- **IEC/ISO 82474-1 Material declaration – Part 1: General requirements**
  - Cross-sector material declaration standard (all sectors and products)
  - Jointly developed between IEC TC 111 and ISO TC 207/SC1
  - CDV/DIS approved in both ISO and IEC; publication is expected in November 2024
  - Leverages IEC 62474 as a starting point and adds Process Chemical Declaration, reference list formats, web services for S2S data exchange.
  - Includes support for reporting several circularity aspects

Supply chain management

IEC/ISO 82474-1 – Modular and Open Architecture



The dual logo standard includes:

1. The **business information** (requester, supplier, product ID...) as the foundation of the architecture.
2. Five **material declaration types**: Compliance, Composition, Material Classes, Process Chemicals and Queries.
3. Modular approach that enables integration of **sector specific features** and **other types of material declaration.**
4. **Reference lists** formats and requirements
5. Build a **data exchange format** that supports a variety of reference data.
6. Specifies **IEC/ISO 82474 web service methods** and details the applications interaction.

IEC/ISO 82474-1 – How is it Implemented

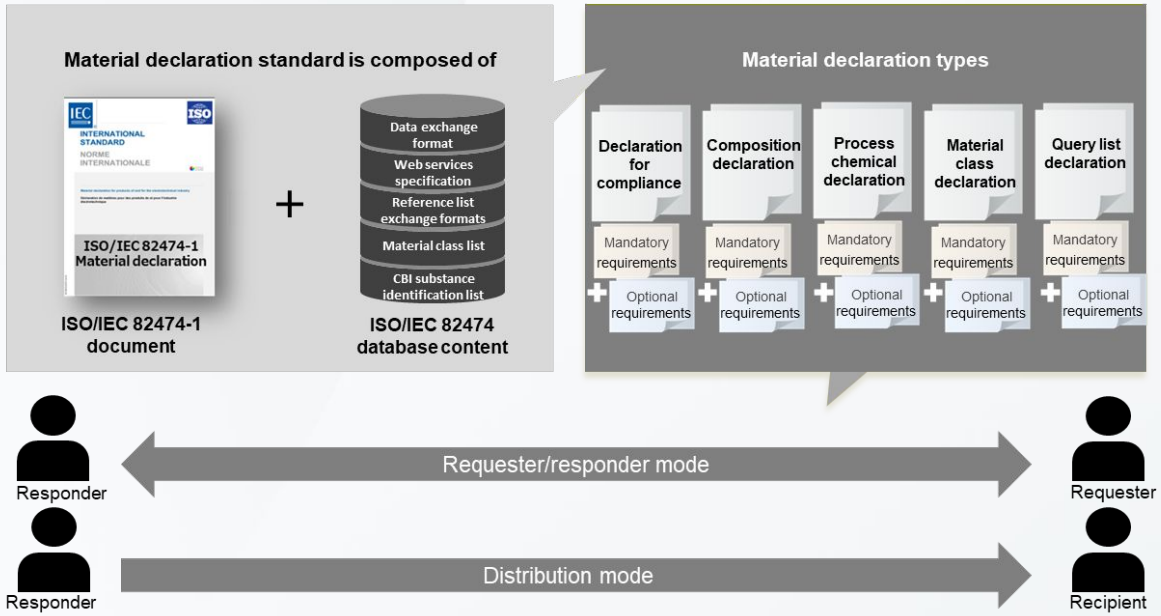
IEC/ISO 82474-1 is composed of two parts:

The IEC/ISO 82474-1 document :

- Declaration procedures, general requirements and recommendations
- Rules for updating the parts of the standard in the SDB

The IEC/ISO 82474 SDB (standard as database):

- Specifications that need periodic updates
  - **Data Exchange Format (DXF) for Material Declaration**
  - **DXF for Reference Lists (e.g. DSL)**
  - **Proprietary Substance Name List**
  - **Cross-Sector Material Class List (MCL)**
  - **Web services specification**
- Supports continuous maintenance



ECD Compliance

IEC/ISO 82474-1 – What Does it Include

Request

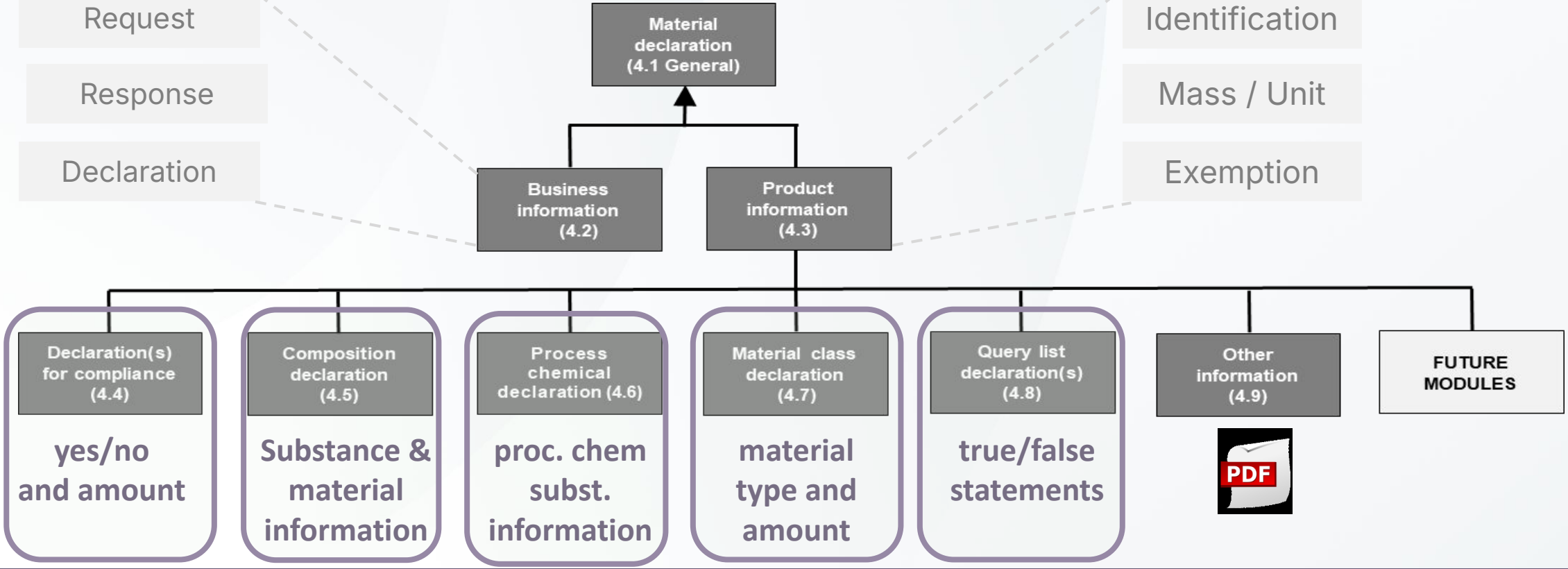
Response

Declaration

Identification

Mass / Unit

Exemption



E.g. RoHS/REACH FMD cleaner X LCA, PEF cobalt in battery Test report ?

Data Exchange Format

- **Material Declarations are exchanged as XML/JSON files**
  - Text-based file format intended for computer-to-computer data transfer
  - Initially XML → transitioning to JSON

- **Declaration requirements specified in:**
  - The IEC/ISO 82474-1 document (pdf file)
    - Specifies what information is mandatory and optional to include in a declaration
  - Schema (XML / JSON)
    - Specifies how the information is structured and formatted
  - Developer's Table
    - Definition of data fields and important supplementary requirements
    - Data format and obligation (mandatory/conditional/optional)

```
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```

Reference Lists

- **Requirements and format for industry sectors to create references lists so that the information can be easily exchanged from one company to another for**
  - Declarable substances list (DSL)
  - (incl. DSG substance list)
  - Material class list (MCL)
  - Query list (QL)

- **General requirements for other types of lists such as**
  - Product class list (PCL)
  - Exemption list (EL)
  - Application list (AL)
  - Use descriptor list (UDL)

Cross-Sector Material Class List (MCL)

The IEC/ISO 82474-1 standard (Clause 7) specifies the creation of a cross-sector harmonized material class list.

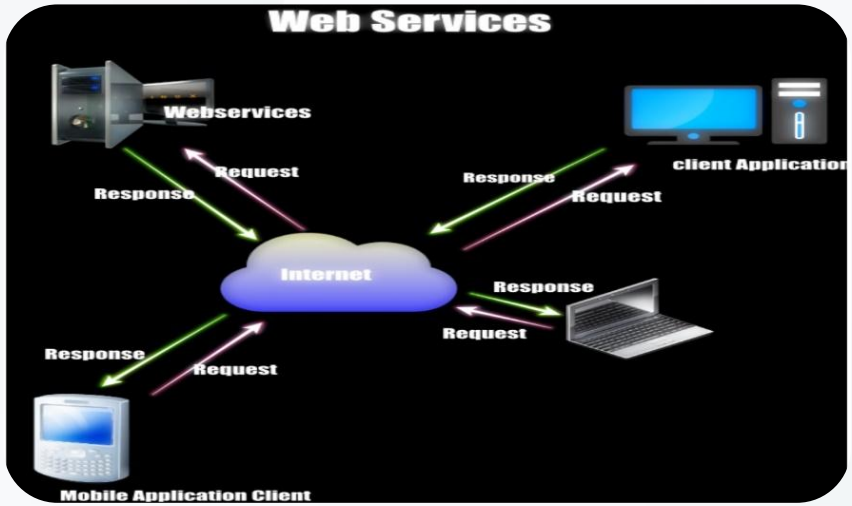
The details of the list will be created by the SDB Team 82474.

IEC/ISO 82474 – Data Exchange Web Services

The SDB 82474 Team may develop additional web services as necessary to meet emerging requirements.

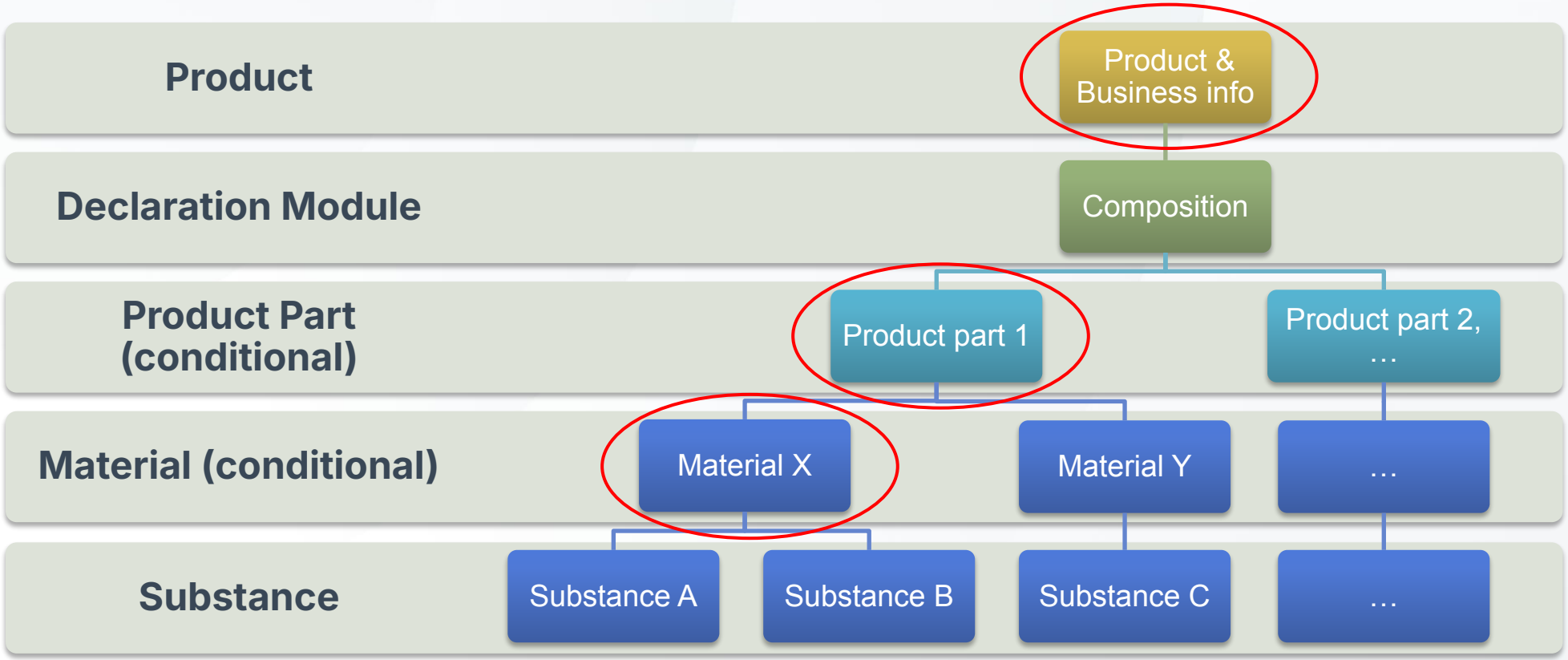
- IEC/ISO 82474 specifies web services for system-to-system data exchange:
  - Optional to use.
  - When used, they utilize XML, JSON, or both.

- IEC/ISO 82474 web services:
  - IEC/ISO 82474 authentication service,
  - IEC/ISO 82474 upload and download service,
  - IEC/ISO 82474 declaration service,
  - IEC/ISO 82474 regulation service,
  - IEC/ISO 82474 other requirements service.



Several Declaration Modules Support Circularity Information

Circularity Information in Composition Declaration



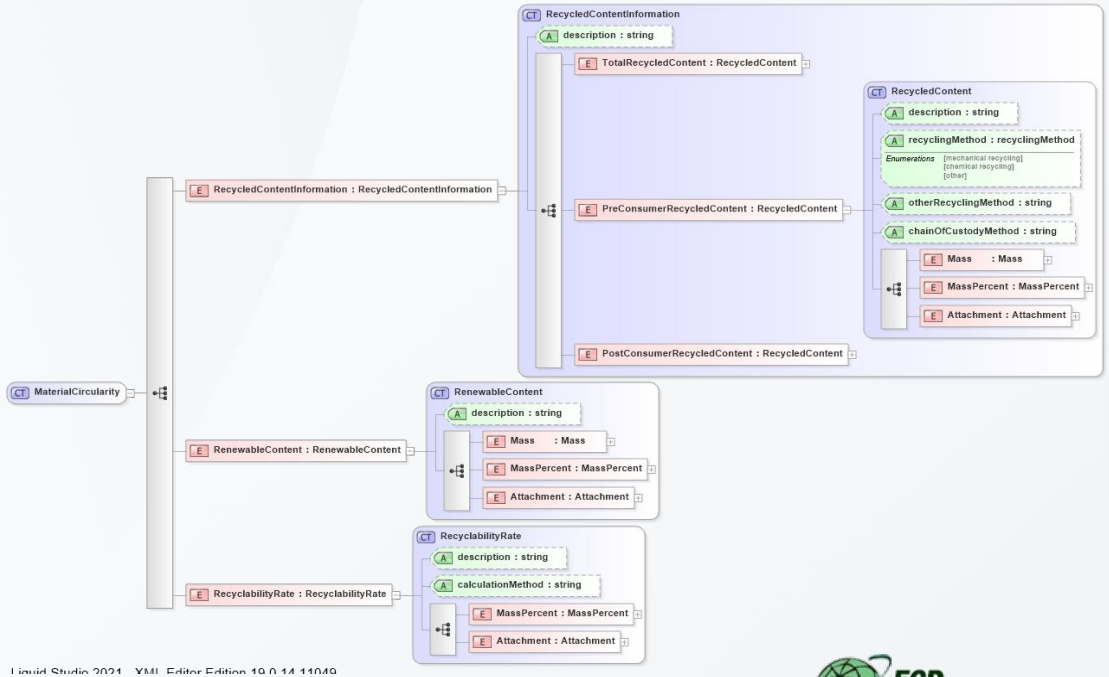
Circularity Information Through Supply Chain

- **IEC 62474 and IEC/ISO 82474-1 include data fields at both the product and material level for:**
  - recycled content (pre-consumer and post-consumer)
  - Recycling method (mechanical vs. chemical)
  - chain of custody information being considered
  - reused content (per IEC 63333), and
  - renewable content.
  - recyclability rate (per IEC 62635)

- **Reparability and other durability information is being discussed.**
  - Harmonized assessment methods are needed to ensure consistency of interpretation

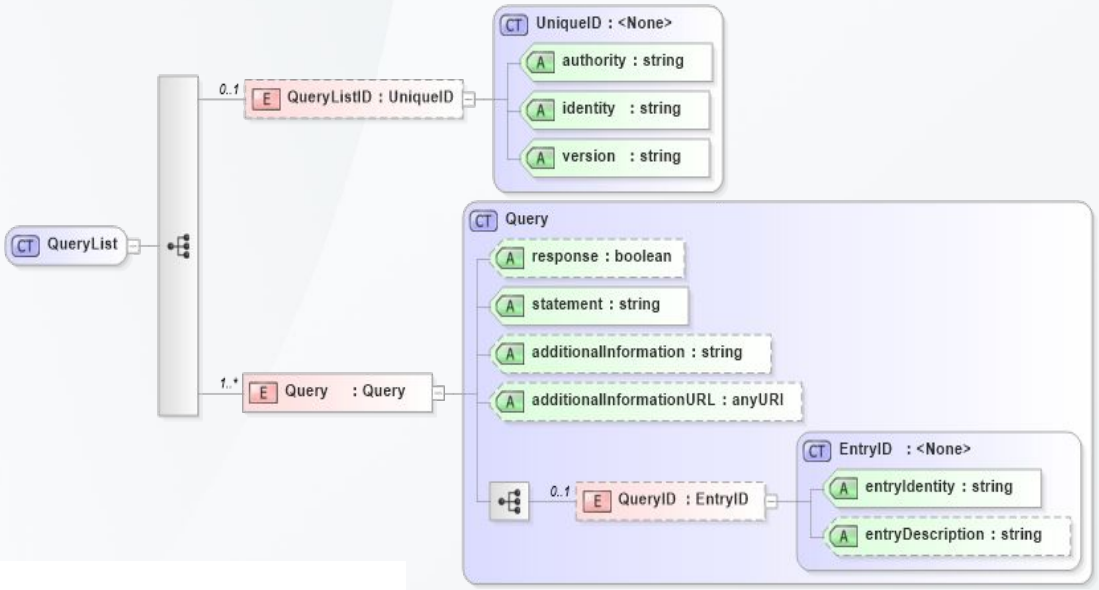
- **Context of data is needed to prevent misleading claims.**

Data structure for Material Circularity



Module: Query List Declaration

- Query List declarations support true/false
  - Reporting against predefined statements
- Examples:
  - Compliance statements for specific regulatory
    - E.g. the product contains nickel that is externally accessible
  - Critical raw material (CRM) statements
    - E.g. mass of cobalt in the battery is between 5 g and 25 g



ECD Compliance

Support for Critical Raw Materials (CRMs)

Importance of CRMs growing as regulators' mandate information about CRMs in products to facilitate recovery at the end-of-life

- Cobalt in batteries and neodymium in hard disk drives are examples of CRMs recently regulated in Europe (servers and storage regulation).
- To achieve the recyclers, CRM information needs to be passed down the supply chain
- To facilitate the exchange of CRM information in the supply chain, requirements for CRM declaration were added to the IEC 62474 and IEC/ISO 82474-1
- Additionally, a more simplified approach to declare CRM information using predefined statements (query list declaration) is being added to IEC 62474 and IEC/ISO 82474-1

Summary

- **Circularity data needed throughout the value network**
  - Needed to roll-up and characterize circular performance
    - Assessment of positive and negative impacts and trade-offs
  - Needed for consistent interpretation of circularity information
    - Avoid misleading claims and greenwashing
  - Credibility and trust of circularity data
    - Connectivity of materials/products with its circularity information
- **Material declaration systems being leveraged to support circularity data and other emerging requirements**
  - Circular content (reused, recycled, renewable)
  - Product life extension
  - End-of-Use recoverability, recyclability, regeneration
  - Tracking Critical Raw Materials (CRM)
  - Process chemicals usage

Questions?

Thank you!

Walter Jager,
Principal Consultant, ECD Compliance

Orlaith Morris,
Content Marketing Manager, Compliance & Risks

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