Report

Emerging Circular Economy Imperatives: Regulatory Landscape for A&D Industry

IAEG

Work Group 14
Circular Economy

Emerging Circular Economy Imperatives: Regulatory Landscape for the A&D Industry

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EXECUTIVE SUMMARY

This report series provides an analysis of the global shift from voluntary circular economy (CE) principles to binding regulations. The aerospace and defence (A&D) industry is defined by long-lived products, complex international supply chains, and exacting safety standards. The evolution of circularity related requirements introduces a new class of regulatory risk and strategic complexity. This document is designed to provide IAEG members with the necessary foresight to navigate this changing landscape. This report provides an assessment of the CE regulatory landscape as of October 2025, and updates should be closely reviewed and monitored.

The global landscape of CE regulation is fragmented. To provide clear and actionable insight, this report is structured into three sections:

- **The European Union: A Legally Integrated Lifecycle Model.**
  The EU's strategy creates an interlocking system of corporate and product-level transparency. The Corporate Sustainability Reporting Directive (CSRD) mandates corporate disclosures, while the Eco-design for Sustainable Products Regulation (ESPR) establishes binding, lifecycle-wide rules for products governing durability, recycled content, and data access. Together, such regulations create a complex compliance regime that is setting a de facto international standard.
- **North America: A Patchwork of State- and Province-Driven Mandates.**
  This report analyses the regulatory environment in the U.S. and Canada, where federal strategies provide guiding principles, but the most pressing compliance obligations arise from a fragmented landscape of state and provincial laws. Extended Producer Responsibility (EPR) for packaging is the primary driver, creating immediate and complex challenges for A&D supply chains.
- **China, Brazil, and South Korea: CE as National Industrial Strategy.**
  This report investigates how these key economies embed CE principles into broader national strategies for industrial development and resource security. Circularity is emerging as a geostrategic imperative in these regions, creating a unique set of risks and opportunities for A&D firms operating within or sourcing from these areas.

Collectively, these reports offer a strategic assessment of the regulatory landscape shaping the global CE. They are intended to help A&D stakeholders anticipate compliance demands, secure market access, and align long-term business strategy with complex and dynamic policies.

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1 THE EUROPEAN UNION

Why is this Report Important?

In the European Union, Circular Economy (CE) principles have been codified into a framework of binding legal requirements that moves beyond traditional waste legislation to govern the entire product lifecycle. This report provides a strategic analysis of this advanced regulatory system and its direct implications for the aerospace and defence (A&D) sector. The EU's approach mandates measurable actions on product durability, reparability, and material efficiency, creating new compliance obligations for component suppliers, dual-use systems (e.g. systems have both commercial and military applications), and ground support equipment. This analysis focuses on key regulations to help A&D stakeholders anticipate specific legal duties and align their operational and supply chain strategies with Europe's evolving regulatory landscape

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1.1 EU Circular Economy Action Plan 2020

Executive Summary

The EU Circular Economy Action Plan (CEAP) establishes the strategic direction to achieve climate neutrality and decouple economic growth from resource use. As a high-level framework under the European Green Deal, it has initiated a wave of legislation introducing obligations around sustainable product design, recycled content, and end-of-life management. For A&D stakeholders, the CEAP and its daughter regulations have made compliance planning and material traceability core operational considerations. The next legislative phase, a proposed Circular Economy Act, will likely deepen these requirements.

Background

The European Commission published the current Action Plan on 11 March 2020 to accelerate the EU's shift toward a resource-efficient economy. It serves as an umbrella initiative, laying the groundwork for binding legal instruments across various value chains. While the CEAP itself is a policy document, its influence is realized through the specific regulations it has spawned.

Timeline (Updated)

- December 2015: The First CEAP is adopted by the European Commission.
- 11 March 2020: The new CEAP is adopted.
- May 2023: The circular economy monitoring framework is revised.
- 1 August 2025: The European Commission launched a public consultation on a forthcoming Circular Economy Act. This consultation period is open until 6 November 2025.

Impact

The CEAP outlines the EU's broad ambitions (the 'what and why'), but the "daughter regulations" define the tangible legal requirements (the 'how and when'). These regulations translate the CEAP's policy goals into explicit mandates that could impact A&D operations, supply chains, and product design. WG9 and WG14 members should consider directing their primary focus towards these current and draft regulations to assess legal and commercial impact. Key examples include:

- Ecodesign for Sustainable Products Regulation (ESPR): Empowers the Commission to set binding sustainability requirements for nearly all goods placed on the EU market.
- Batteries Regulation: Enforces a comprehensive life-cycle approach, mandating recycled content thresholds and end-of-life collection schemes.
- Packaging and Packaging Waste Regulation (PPWR): Introduces rules for businesses aimed at preventing waste and reducing the environmental footprint of packaging through greater recycling, reuse, and refill efforts.

Risks

While the CEAP itself does not impose mandatory requirements, the regulations derived from it do. Non-compliance with these daughter regulations may result in:

- Penalties for non-compliance with product sustainability requirements.
- Reputational harm from a lack of transparency or non-adherence to environmental performance standards.
- Supply-chain disruptions caused by shortages of compliant materials.
- Operational challenges from adapting to new extended producer responsibility schemes.

Horizon Scanning

A continuous expansion of regulatory requirements under the CEAP framework is expected. For example, the European Commission is expected to extend eco-design requirements to new product groups, while sector-specific directives (packaging, electronics, etc.) will see stricter mandates. New legal frameworks, such as the Critical Raw Materials Act and the Sustainable Products Initiative, are increasing compliance burdens.

The most important development on the horizon is the new Circular Economy Act, expected for adoption in 2026. The public consultation launched in August 2025 indicates this Act will aim to create a functional single market for secondary raw materials, address waste streams not yet covered (such as e-waste), and potentially harmonize Extended Producer Responsibility (EPR) schemes across the EU.

For the A&D sector, these developments signal a deepening commitment to circularity in the EU. Responding effectively to this evolving landscape requires more than adjusting to reporting practices. A deep integration of circularity principles into the core corporate sustainability strategy of organizations is increasingly warranted. A&D companies will find it beneficial to continue embedding circularity metrics, life-cycle assessments, and material footprinting into foundational business processes. A proactive approach will maintain future market access and enhance competitive positioning within the EU.

Links

- Circular Economy Action Plan
- CEAP Communication (2020)
- Consultation and call for evidence for the upcoming Circular Economy Act

1.2 Regulation (EU) 2024/1781 of the European Parliament and of the Council Establishing a Framework for Setting Eco-Design Requirements for Sustainable Products (ESPR)

Executive Summary

Regulation (EU) 2024/1781 (ESPR) introduces a new EU-wide framework that broadens the scope of ecodesign requirements to nearly all physical goods placed on the market. While it provides an exemption for products intended for exclusive defence or national security purposes, A&D manufacturers of dual-use products must assess future delegated acts for applicability. Compliance mechanisms, such as the Digital Product Passport and new sustainability disclosures, are expected to impose operational and data management burdens on supply chains.

Background

Ecodesign for Sustainable Products Regulation (ESPR) is a core element of the EU's Circular Economy Action Plan (CEAP). It replaces and expands Directive 2009/125/EC by applying ecodesign requirements to products beyond energy-related applications. The aim is to enhance product circularity and reduce environmental impacts. As a framework regulation, it empowers the European Commission to adopt delegated acts with specific requirements per product group. These acts will guide industry adaptation to evolving sustainability norms, including recyclability, durability, and repairability.

Timeline

- Date Published: 28 June 2024
- Entry into Force: 18 July 2024
- First ESPR Working Plan Adopted: April 2025
- First Disclosure Requirements on Unsold Goods Apply: 19 July 2026 (for large enterprises)
- Destruction Ban for Unsold Apparel & Footwear Begins: 19 July 2026 (for large enterprises)
- Regulatory Review Deadline: By 19 July 2030

Impact

This Regulation establishes a framework for binding ecodesign requirements for nearly all physical goods. While products designed specifically for military or security use are exempt, A&D products with dual-use applications could fall within scope, contingent on the specifics of future delegated acts.

The key strategic development is the adoption of the first ESPR Working Plan (2025-2030) in April 2025. This plan prioritizes specific product groups for the development of delegated acts, providing a clearer roadmap for the A&D sector to monitor for supply chain and material impacts.

Delegated Acts relevant to A&D (Indicative Timelines for Adoption):

- 2026: Iron and steel
- 2027: Aluminium, textiles (apparel), tires; repairability-score
- 2029: Recycling requirements for electronic devices

A&D manufacturers should anticipate indirect impacts from these initial priorities, particularly concerning raw and intermediate materials like steel and aluminium. Requirements will likely cover

performance (e.g., durability, recycled content) and information (e.g., Digital Product Passport). Furthermore, the Commission is already revising existing ecodesign rules.

Additional Notes

- Defense-related Exemption and Dual-use:
  - The ESPR explicitly exempts products whose sole purpose is to serve defense or national security.
  - The exemption may not apply to dual-use products, components, or raw materials that also have a civilian application. Companies will need to carefully track the origin of these items to ensure compliance.
- Digital Product Passports (DPP):
  - ESPR mandates the DPP, a structured digital record that stores a product's lifecycle data to increase transparency and drive the circular economy.
  - For the A&D sector:
    - Products made solely for national security purposes are exempt from DPP.
    - Dual-use products and components supply chains are significantly impacted by DPP.
  - DPP functions as a digital identity for products containing comprehensive data points, including:
    - Product identification
    - Material composition
    - Environmental impact
    - Performance and durability
    - Repairability and circularity
    - Compliance data

Risks

- Fines: Non-compliance may result in penalties imposed and enforced by Member States.
- Exclusion from Public Procurement: Non-compliant businesses may be temporarily excluded from participating in public tenders.
- Reputational Risk: National authorities may publish lists of non-compliant operators.
- Supply Chain Disruption: Inaccurate or missing Digital Product Passport data could delay product movement at customs.
- Cost Recovery: If breaches are found, economic operators may be charged for compliance verification costs.

Horizon Scanning

A&D firms should closely monitor the development of delegated acts, especially for prioritized materials such as iron, steel, and aluminium. Exemptions for dual-use products will likely be determined by their specific function and are not guaranteed. The 2030 review of the ESPR may further expand its scope, potentially increasing traceability and circularity mandates. Engagement with industry associations and monitoring the Ecodesign Forum will be instrumental in anticipating future compliance obligations.

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Links

- ESPR Regulation
- Ecodesign for Sustainable Products and Energy Labelling Working Plan 2025-2030

1.3 The European Union's Critical Raw Materials Act (CRMA) and Regulation (EU) 2024/1252 of the European Parliament and of the Council Establishing a Framework for Ensuring a Secure and Sustainable Supply of Critical Raw Materials

Executive Summary

The EU's Critical Raw Materials Act (CRMA) and Regulation (EU) 2024/1252 establish a framework to ensure a secure and sustainable supply of essential materials for the European economy. A key strategic action within the Act is the creation of a two-tiered materials list to focus resources. While the Act maintains a broad list of critical raw materials for the entire EU economy, it establishes a distinct and more vital subset of strategic raw materials. These are designated as indispensable for Europe's green, digital, defence, and aerospace ambitions.

Background

This regulation is a response to rising global competition for raw materials. It establishes a coordinated EU-wide approach to mitigate supply risks and reduce strategic dependencies. The legally binding framework defines lists of strategic and critical raw materials, enhances risk monitoring, creates a pathway for "Strategic Projects" to receive permitting and financial support, and promotes circularity throughout the supply chain. A key governance body, the European Critical Raw Materials Board, has been established to advise the Commission and oversee implementation.

Additional Note on Materials as Defined in the Annexes of the EU CRMA

Critical Raw Materials

This is the broad list of materials deemed to be of high economic importance for the EU and are subject to high supply risk. It also includes all the strategic raw materials listed below.

- Antimony
- Arsenic
- Bauxite/Aluminium
- Baryte
- Beryllium
- Bismuth
- Boron / Borate
- Cobalt
- Coking Coal
- Copper
- Feldspar
- Fluorspar
- Gallium
- Germanium
- Hafnium
- Helium
- Heavy Rare Earth Elements
- Light Rare Earth Elements
- Lithium
- Magnesium

- Manganese
- Natural Graphite
- Nickel
- Niobium
- Phosphate rock
- Phosphorus
- Platinum Group Metals (PGMs)
- Scandium
- Silicon Metal
- Strontium
- Tantalum
- Titanium metal
- Tungsten
- Vanadium

Strategic Raw Materials

This list identifies materials of high strategic importance due to use in key technologies (green, digital, defence, aerospace) and their significant potential for supply risks.

- Bismuth
- Boron (metallurgy grade)
- Cobalt
- Copper
- Gallium
- Germanium
- Lithium (battery grade)
- Magnesium metal
- Manganese (battery grade)
- Natural Graphite (battery grade)
- Nickel (battery grade)
- Platinum Group Metals (PGMs)
- Rare Earth Elements (for magnets)
- Silicon Metal
- Titanium metal
- Tungsten

Timeline

- Formal Adoption: 11 April 2024
- Official Journal Publication: 3 May 2024
- Entry into Force: 23 May 2024
- Member States Identify Large Companies: By 24 May 2025
- Commission to Review Materials Lists: By 24 May 2027 (and every 3 years thereafter)

Impact

The regulation will impact A&D manufacturers through several mechanisms. The primary near-term impact falls on specific large companies (defined as having over 500 employees and a net worldwide turnover exceeding €150 million) that use strategic raw materials to manufacture strategic technologies, including aircraft.

By 24 May 2025, Member States must identify these companies. Subsequently, these firms will be required to perform a comprehensive risk assessment of their strategic raw material supply chains at least every three years. This assessment includes:

- Mapping the supply chain from extraction to processing.
- Conducting a stress test to assess vulnerability to supply disruptions.

For the broader A&D industry, the CRMA signals a structural shift towards greater supply chain transparency and circularity. This aligns with WG14 goals by encouraging the recovery of secondary raw materials from waste and promoting lifecycle materials management.

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Risks

- Compliance Burden: The mandatory risk assessment and stress-testing obligations for identified large companies create a new, recurring compliance requirement with associated administrative and operational costs.
- Supply Chain Scrutiny: Increased transparency requirements may expose vulnerabilities in sourcing strategies, potentially leading to market or stakeholder pressure.
- Procurement Risk: While not explicit, firms unable to demonstrate secure and sustainable sourcing in line with CRMA principles may face a competitive disadvantage in future EU-funded or defence-related public procurement.
- Operational Constraints: Future measures to promote circularity could influence design and material choices, requiring adjustments to manufacturing processes to meet potential recycling or substitution benchmarks.

Horizon Scanning

The Commission will review and potentially update the lists of strategic and critical raw materials by May 2027. The A&D sector should monitor these updates, as the inclusion of new materials could broaden the scope of company obligations. Furthermore, the development of "Strategic Projects" for extraction, processing, and recycling will offer insight into the EU's priority value chains. A&D stakeholders may find it prudent to monitor the guidance and decisions issued by the European Critical Raw Materials Board to anticipate future policy directions

Links

- Critical Raw Materials Act
- Regulation Text (EU) 2024/1252
- European Critical Raw Materials Board
- RMIS–Raw Materials Information System

1.4 Corporate Sustainability Reporting Directive (CSRD) – Directive (EU) 2022/2464 and Amending Omnibus Directive

Executive Summary

The Corporate Sustainability Reporting Directive (CSRD) establishes a mandatory EU framework for sustainability reporting, requiring detailed, audited disclosures on environmental, social, and governance (ESG) matters. For A&D firms, this entails new obligations to report on impacts, risks, and strategies according to a double materiality principle. While recent amendments have adjusted specific timelines and the scope of companies, the core requirement for transparent reporting on topics like climate change and circular economy presents significant compliance and strategic challenges.

Background

To understand its full impact, it is essential to view the CSRD not as a single rule, but as a framework with four interconnected components:

- The CSRD (The Directive):
    - This is the overarching law that replaces the previous Non-Financial Reporting Directive (NFRD).
        - It mandates that in-scope companies report on sustainability issues. Its foundational principle is double materiality, requiring companies to report on both how sustainability issues affect their business (financial materiality) and how their business impacts people and the planet (impact materiality).
- The ESRS (The Standards):
    - The European Sustainability Reporting Standards (ESRS) are the detailed, mandatory rules for how to report.
        - They specify the exact structure and content of the disclosures required under the CSRD, covering topics from climate change (ESRS E1) to resource use and circular economy (ESRS E5).
        - This is aimed at ensuring consistency and comparability of information disclosure across companies.
- The EU Taxonomy (The Classification System):
    - The taxonomy details what companies must report.
        - The EU Taxonomy is a classification system that defines which economic activities can be considered environmentally sustainable. Under the CSRD, companies must disclose the extent to which their turnover, CapEx, and OpEx align with the Taxonomy. This directly links a company's sustainability report to its financial data and is highly relevant for the A&D sector's circular economy activities (e.g., circular design, value recovery).
- The Omnibus Directive (The Adjustment):
    - Adopted to reduce the administrative burden, this recent directive made two key adjustments:
        - Raised Thresholds: It increased the size thresholds for companies to qualify as "large," slightly reducing the number of entities in scope.
        - Standards are still being negotiated.

Timeline

Note: The original CSRD timeline has been adjusted by the Omnibus Directive, primarily by delaying the adoption of sector-specific standards.

- Date adopted: 28 November 2022
- Entry into Force (CSRD): 5 January 2023
- Member State transposition deadline: 30 June 2024
- Phased implementation: 2025–2028
- Amendments under Omnibus Package
    - New Deadline for Sector-Specific ESRS Adoption: By 30 June 2026

Impact

The CSRD applies to most companies operating in the EU, including non-EU parent companies with a significant presence or revenue within the EU. It requires in-scope companies to begin with a holistic double materiality assessment. This assessment is the critical first step that determines which specific ESRS topics and data points must be disclosed.

For an A&D firm, if its materiality assessment identifies the circular economy as a material topic, it must report on relevant policies, targets, and KPIs under ESRS E5: Resource use and circular economy. This includes disclosures on resource inflows (e.g., recycled content), resource outflows (e.g., products and materials for reuse/recycling), and waste management. This directly aligns with and provides a legal mandate for the objectives of WG14.

Risks

- Regulatory Non-Compliance: Member States will enforce financial penalties for reporting failures.
- Market Access: Failure to align with ESG standards may increasingly restrict access to capital and public procurement contracts.
- Reputational Risk: Inaccurate or incomplete reporting can harm trust with investors, customers, and regulators.
- Operational Complexity: The double materiality assessment process itself is a significant undertaking. Furthermore, integrating supply chain traceability and Scope 3 emissions data imposes high administrative demands.
- Audit Scrutiny: Mandatory third-party assurance (initially limited assurance) of sustainability reports increases the compliance burden and requires robust internal controls.

Horizon Scanning

The primary development to monitor is the postponed adoption of sector-specific ESRS by June 2026. While delayed, these standards will eventually introduce more granular requirements for the A&D sector. Stakeholders should also monitor the Commission's announced efforts to streamline and simplify the existing ESRS data points. The integration with the EU Taxonomy will continue to be a key driver, linking sustainability reporting directly to sustainable finance flows and investment decisions. Digital readiness for collecting auditable ESG data remains a critical priority.

Links

- Corporate Sustainability Reporting Directive (CSRD)
- European Sustainability Reporting Standards (ESRS)
- EU Taxonomy Regulation
- Omnibus Directive Amending CSRD

1.5 France’s Anti-Waste and Circular Economy Law (LOI AGEC)

Executive Summary

France’s Anti-Waste and Circular Economy Law (Loi AGEC), enacted in 2020, translates the country's circular economy ambitions into binding legal obligations. It moves beyond the strategic goals of the

2018 roadmap (FREC) to impose concrete requirements on producers. For the A&D sector, the law introduces impact related to product reparability, extended producer responsibility (EPR) schemes, and information disclosure on environmental qualities, particularly for suppliers of electronics and dual-use goods.

Background

The 2018 Circular Economy Roadmap (FREC) established France's strategic direction. However, the Loi AGEC of 10 February 2020 is the primary legal instrument that codifies these ambitions into enforceable law. The law is structured around five main objectives: ending wasteful practices, improving consumer information, combating planned obsolescence, enhancing production systems, and promoting the reuse of goods. While it is a cross-sectoral law, its provisions on producer responsibility and product information have direct and indirect consequences for A&D supply chains operating in France.

Timeline

- 10 February 2020: Loi AGEC is adopted.
- 1 January 2021: A mandatory Reparability Index is introduced for specific categories of electrical and electronic equipment.
- 1 January 2022: A ban on the destruction of unsold non-food products (including electronics and textiles) comes into force.
- 1 January 2024: The Reparability Index begins its transition into a more comprehensive Durability Index, adding criteria for reliability and robustness.
- By 2025, the law aims for 100% of plastics to be recycled.

Impact

The Loi AGEC creates direct legal obligations that were only aspirations under the previous roadmap.

- Reparability & Durability Index: Suppliers of electronic components and ground support equipment that fall into covered product categories must calculate and display this index. This may require design changes to improve the availability of spare parts and ease of disassembly.
- Ban on Destruction of Unsold Goods: A&D suppliers of electronics, textiles, or other covered non-food products are now legally prohibited from destroying their unsold inventory and must donate or recycle it.
- Extended Producer Responsibility (EPR): The law expands the number of sectors subject to EPR schemes. A&D suppliers of products like packaging, batteries, and electronic equipment must participate in and finance systems for the collection and recycling of their products at end-of-life.
- Consumer Information: Companies must provide consumers with information on the environmental qualities of their products, such as the incorporation of recycled material or the presence of hazardous substances.

Risks

- Non-Compliance Penalties: Failure to comply with Loi AGEC provisions, such as incorrect reparability indexing or not participating in required EPR schemes, can result in financial penalties.
- Procurement Disadvantage: Public procurement contracts in France increasingly include environmental criteria. A poor durability score or non-compliance with AGEC could render a supplier ineligible for tenders.

- Supply Chain Complexity: The requirement to track recycled content and manage end-of-life obligations for a wider range of products adds a layer of operational complexity

Horizon Scanning

The implementation of the Loi AGEC is ongoing and progressive. The A&D sector should monitor the expansion of the Durability Index to new product categories that may be relevant to dual-use or support equipment. Furthermore, the list of products covered by Extended Producer Responsibility (EPR) schemes is expected to grow. Stakeholders should anticipate that the principles embedded in the Loi AGEC, particularly around durability and producer responsibility, will increasingly influence both French and broader EU defence procurement standards.

Links

- France's Law relating to Fighting Waste and the Circular Economy (Loi AGEC)
- France Roadmap for the Circular Economy
- The Anti-waste Law for a Circular Economy

1.6 Germany's National Circular Economy Strategy (NKWS)

Executive Summary

Germany's primary strategic focus for the circular economy is now the National Circular Economy Strategy (NKWS), adopted in December 2024. While the 2020 Circular Economy Act (KrWG) remains the foundational law for waste management, the NKWS sets a more ambitious, economy-wide transformation agenda. For the A&D sector, the strategy signals a long-term shift in Germany towards resource efficiency, supply chain resilience, and the integration of circularity into core business models, driven by concrete national targets.

Background

The 2020 revision of the Circular Economy Act (KrWG) aligned German law with the EU's waste framework. However, the NKWS now serves as the country's overarching strategic and political framework. It moves beyond waste management to address the entire value chain, from product design to the creation of markets for secondary materials. The strategy establishes clear national objectives, including a significant reduction in primary raw material consumption and doubling the share of secondary materials in production, aligning with the EU's Critical Raw Materials Act goals. The KrWG provides the legal mechanisms (e.g., producer responsibility, waste hierarchy) through which the NKWS's strategic goals will be implemented and enforced.

Timeline

- 28 October 2020: The revised Circular Economy Act (KrWG) is published.
- December 2024: The German Federal Cabinet adopts the National Circular Economy Strategy (NKWS).

Impact

While the KrWG imposes direct legal obligations regarding waste classification and management, the NKWS creates a broader strategic impact for the A&D sector. The strategy's key targets will drive future legislation and policy:

- Reduced Primary Material Consumption: The NKWS sets a goal to reduce Germany's per capita raw material consumption from ~16 tonnes to 6-8 tonnes by 2045. This will likely translate into future ecodesign requirements and incentives for using lighter, recycled, or remanufactured materials.
- Increased Use of Secondary Materials: The strategy aims to double the use of secondary raw materials by 2030 (from a baseline of 13%). This will create pressure and opportunities for A&D supply chains to validate and certify recycled materials for use in components and systems.
- Focus on Strategic Sectors: The NKWS identifies priority areas, including metals and electronics, which are highly relevant to the A&D industry. Future regulatory measures will likely target these value chains specifically.
- Extended Producer Responsibility (EPR): The legal basis for EPR in the KrWG will be used to implement the NKWS's goals. A&D suppliers of products like batteries and electronics must comply with take-back and recycling obligations, as recently detailed in the new Battery Law (BattDG).

Note: The specific legislative measures, delegated acts, or ordinances that will be created to implement the targets set by the NKWS have not yet been published.

Risks

- Stricter Procurement Standards: Public procurement, a key driver for the A&D sector, will increasingly incorporate NKWS-derived circularity criteria, potentially disadvantaging suppliers unable to demonstrate resource efficiency.
- Material Sourcing and Qualification Costs: The push for secondary materials may create new costs associated with the testing, certification, and qualification of recycled inputs for high-performance applications.
- Regulatory Uncertainty: While the NKWS sets the direction, the specific laws and ordinances to achieve its targets are still under development, creating a period of regulatory uncertainty.

Horizon Scanning

The NKWS is a long-term roadmap. The A&D sector must monitor how its strategic goals are translated into concrete legislative proposals.

Key areas to watch include:

- The development of product-specific requirements for priority sectors like metals and electronics.
- The potential introduction of mandatory recycled content quotas for industrial goods.
- The implementation of digital tools, such as the Digital Product Passport, to enhance material traceability.

The strategy positions "Circularity made in Germany" as a strategic economic goal, indicating that future policies will aim to create a competitive advantage for industries that adopt circular business models.

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Links

- Circular Economy Strategy Germany
- Law on the Promotion of the Circular Economy and Ensuring the Environmentally Sound Management of Waste (Circular Economy Act-KrWG)

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2 NORTH AMERICA

Why is this Report Important?

In North America, the circular economy (CE) is advancing through a dual track of federal strategies and targeted sub-national legislation. While national plans in the U.S. and Canada signal a long-term shift toward lifecycle-based models, the most immediate and enforceable compliance requirements for the aerospace and defence (A&D) sector are emerging at the state and provincial level. This report provides a high-level overview of these developments, focusing on the rise of Extended Producer Responsibility (EPR) laws. These regulations are creating a complex patchwork of obligations for packaging and products that impact supply chain governance and materials management, requiring diligent monitoring by A&D stakeholders to mitigate compliance risks.

2.1 National Circular Economy Developments

This section highlights federal CE initiatives that promote lifecycle design, extended producer responsibility (EPR), and data-driven oversight. For the A&D sector, these plans signal growing pressure to design for durability and recyclability, improve material recovery at the end of a product's life, and adopt sustainable manufacturing practices.

2.1.1 U.S. Circular Economy Strategy: National Recycling Strategy & National Strategy to Prevent Plastic Pollution

Executive Summary

The U.S. Environmental Protection Agency (EPA) developed strategies to advance a CE, including the National Recycling Strategy and the National Strategy to Prevent Plastic Pollution. The goal is to enhance recycling infrastructure, reduce plastic pollution, and promote the use of sustainable materials. For the A&D sector, these strategies indicate an increase in regulatory expectations for material use, product design, and end-of-life management.

Background

The National Recycling Strategy aims to strengthen the U.S. recycling system by improving markets for recycled materials, enhancing collection and processing, and reducing contamination in the recycling stream. At the same time, the National Strategy to Prevent Plastic Pollution examines the entire lifecycle of plastic products to reduce pollution, innovate materials and design, and enhance waste management. Both are part of the EPA's broader Circular Economy Strategy Series.

Timeline

- November 2021: Release of the National Recycling Strategy.
- November 2024: Final National Strategy to Prevent Plastic Pollution released.

Impact

These strategies will push many sectors to adopt sustainable practices and comply with new regulations. For the A&D industry, this could mean incorporating more recycled materials into product designs, enhancing material traceability, and adopting environmental standards such as Environmental Product Declarations (EPDs) and Life Cycle Assessments (LCAs). While there are no specific mandates for the

A&D sector yet, the strategies indicate a shift toward greater accountability in manufacturing and supply chains, opening up new opportunities for innovation and market leadership.

Risks

- Regulatory Compliance: Failure to comply with new recycling and plastic pollution regulations could result in penalties and limit market access.
- Operational Adjustments: Transitioning to sustainable materials may necessitate significant changes to manufacturing and supply chain operations.
- Reputational Impact: Failing to engage with circular economy initiatives could harm how stakeholders perceive your brand.

Horizon Scanning

In 2025, US federal executive orders have resulted in regulatory rollbacks that are impacting federal circular economy-related efforts. There has also been an increase in emerging US state-level EPR, plastic pollution and packaging responsibility requirements for certain US states. It is crucial to monitor updates, participate in consultations, and collaborate with industry groups to stay informed and compliant with relevant regulations.

Links

- National Recycling Strategy
- National Strategy to Prevent Plastic Pollution
- Circular Economy Implementation Plan Online Platform

2.1.2 Canada's Circular Economy Strategy and Value-Retention Processes (VRPs)

Executive Summary

Canada is advancing its circular economy goals by focusing on value-retention processes (VRPs), including reuse, repair, refurbishment, and remanufacturing. The goal is to extend product lifecycles, cut waste, and use resources more efficiently. For the A&D sector, this means new expectations around product design, lifecycle management, and meeting sustainability standards.

Background

Canada's commitment to a CE is detailed in plans like "A Healthy Environment and a Healthy Economy," which links environmental goals with economic growth. The focus on VRPs extends product value in the economy, which in turn reduces environmental impact and drives innovation. These initiatives align with national and global sustainability goals.

Timeline

- December 2020: Release of "A Healthy Environment and a Healthy Economy" plan.
- Ongoing: Implementation of VRP-focused strategies and consultations on extending product lifecycles.

Impact

The focus on VRPs prompts industries to design products for longer lifecycles and to develop infrastructure for repair and remanufacturing. For the A&D sector, this may lead to more scrutiny of material use, design for disassembly, and end-of-life management. Aligning with these goals helps ensure regulatory compliance and can be a competitive advantage in government procurement.

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Risks

- Regulatory Compliance: Failing to follow VRP principles could lead to fines and exclusion from specific markets.
- Operational Adjustments: Transitioning to circular practices may necessitate substantial changes to manufacturing and supply chain operations.
- Reputational Impact: Failing to engage with circular economy initiatives could negatively impact stakeholder perceptions and brand value.

Horizon Scanning

Canada's circular economy policies are still in development and could have a further impact on the A&D sector. Monitoring government strategies, participating in consultations, and engaging with industry groups are key to staying informed and compliant.

Links

- A Healthy Environment and a Healthy Economy
- Value-Retention Processes
- Retaining Product Value in a Circular Economy

2.2 State/Provincial Circular Economy Developments

This section examines the increasing number of state and provincial regulations aimed at promoting the CE. EPR laws for packaging present the most immediate compliance challenges. For the A&D sector, examining the details of who is considered a "producer" and specific exemptions for industrial packaging is crucial for managing risk and maintaining a stable supply chain. This snapshot provides A&D stakeholders with an overview of key developments in a complex and evolving landscape, rather than an exhaustive review.

Note: A future IAEG report will provide more detailed coverage of plastics packaging and batteries.

2.2.1 United States

In the absence of strong federal frameworks, several U.S. states are passing their own ambitious CE laws, particularly for EPR.

2.2.1.1 California: Plastic Pollution Prevention and Packaging Producer Responsibility Act (SB 54)

Executive Summary

California's major EPR law sets tough source reduction and recycling targets, shifting the cost and responsibility of managing single-use packaging to producers. Because the law's definitions of "producer" and "packaging" are broad, A&D companies may need to review materials they sell into the state comprehensively. Be prepared for significant compliance costs and reporting duties starting in 2027.

Background

Passed in June 2022, SB 54 aims to transform California's approach to packaging waste. It creates a producer-funded system run by a single Producer Responsibility Organization (PRO). The law is a broad initiative for packaging, with the California Department of Resources, Recycling, and Recovery (CalRecycle) responsible for detailed regulations. In January 2024, the Circular Action Alliance (CAA) was

selected as the state's PRO, thereby becoming the central administrative body for the state. In March 2025, following concerns from the business sector about high costs and administrative burdens, the government directed CalRecycle to amend its regulations.

Timeline

- June 30, 2022: SB 54 is signed into law.
- January 8, 2024: CalRecycle selects Circular Action Alliance (CAA) as the single PRO.
- November 1, 2025: Proposed deadline for producers to submit 2023 supply-baseline data to the PRO.
- Beginning 2027: Producers must start paying $500 million annually into the California Plastic Pollution Mitigation Fund, totalling $5 billion over 10 years.
- By 2032: Key targets must be met:
    - 100% of single-use packaging sold in the state must be recyclable or compostable.
    - 65% of single-use plastic packaging must be recycled.
    - A 25% reduction in the sale of single-use plastic packaging compared to 2023 levels.

Impact

SB 54's aggressive 2032 recycling targets directly mandate material circularity, making the law's implications relevant to WG14. It requires design-for-environment principles, as the PRO's fee structure will penalize the use of hard-to-recycle materials and reward the use of recycled content. The law also requires producers to fund robust end-of-life management systems. It applies to "producers" of "covered material," defined as single-use packaging sold, distributed, or imported into California. The law identifies the brand owner as the producer, but if the brand owner isn't in the U.S., responsibility can shift to the manufacturer, licensee, or importer. Obligated producers must join the state PRO, pay annual fees, and report on the materials they place on the California market.

The law's definitions of "packaging" and "single-use" do not have an explicit exemption for B2B, industrial, or commercial packaging. This means packaging for components, spare parts, and sub-assemblies sold in California is likely covered. An exemption for sellers of "empty or unused packaging materials" was added in the March 2025 draft regulations, which could be relevant for A&D suppliers that sell specialized packaging itself, not the products inside. We have not found any explicit exemptions for military-specific, hazardous materials, or export packaging, which creates regulatory risk and uncertainty for the A&D sector.

Risks

- Penalties: CalRecycle is authorized to impose administrative civil penalties of up to $50,000 per day, per violation. A violation is defined as persisting for each day of non-compliance and applies to each product that uses a non-compliant material.
- Supply-Chain Disruption: Failure to register with the PRO and comply with reporting and fee obligations can result in a prohibition on the sale, distribution, or importation of covered materials into the state of California.
- Reputational Damage: Non-compliance with this high-profile environmental law in an important market like California could result in significant reputational damage, affecting stakeholder perceptions and potentially impacting eligibility for government contracts.

Horizon Scanning

Keep a close eye on the rulemaking process, which is set to restart in 2025. A&D stakeholders must track the final regulatory text to clarify definitions, such as "packaging," "producer," and "single use," to

understand their obligations. Future updates may introduce stricter rules for recycled content or expand the law to other products, necessitating ongoing monitoring and compliance with requirements.

Links

- CalRecycle SB 54 Regulations Page
- Full Bill Text
- CalRecycle Draft Regulations
- CalRecycle Partially Recirculated Draft Program Environmental Impact Report for public review and comment.

2.2.1.2 Maine: An Act to Create a Stewardship Program for Packaging (LD 1541), as amended by An Act to Improve Recycling by Updating the Stewardship Program for Packaging (LD 1423).

Executive Summary

Maine passed the first U.S. packaging EPR law in 2021, creating a system where producers fund municipal recycling. Amendments in 2025 added exemptions for packaging used for long-term storage of durable goods and for certain federally regulated products, which could be relevant to the A&D sector.

Background

On July 12, 2021, Maine passed LD 1541, the nation's first EPR law for packaging, to address rising municipal recycling costs by shifting the financial burden from taxpayers to producers. The program requires producers to join a Stewardship Organization (SO) that collects fees to reimburse municipalities for managing packaging waste. In response to industry feedback, the amending act LD 1423 was signed into law on June 20, 2025, which updated key definitions and exemptions.

Timeline

- July 12, 2021: Original EPR law, LD 1541, passed.
- May 2026: Deadline for producers to register with the SO and report their 2025 data.
- September 2026: Producers are required to remit start-up fees to the SO.
- October 2027: The SO is slated to make its first reimbursement payments to participating municipalities.

Impact

The law requires producers of consumer packaging to join an SO and pay fees based on the weight and type of packaging they sell in Maine. The fee structure will be adjusted to encourage the use of more environmentally friendly and recyclable materials. The law's scope determines how it applies to the A&D sector. While it targets consumer packaging, its definitions are broad, but the 2025 amendments introduced several potentially relevant exemptions.

Exemptions

- Producer Exemptions: The law exempts small producers with annual gross revenue of less than $2,000,000 or those who sell less than 1 ton of packaging in Maine each year.
- Packaging Exemptions:
  - Long-Term Storage of a Durable Product: Packaging "intended for the long-term storage or protection of a durable product" is exempt. This may apply to certain goods in the A&D sector.

- Federally Regulated Products: The law requires the DEP to review the packaging of certain federally regulated products to determine if exemptions apply. This could be particularly important for the A&D industry, as many of its products are heavily regulated by agencies such as the FAA and DoD. It may create a path for A&D-specific packaging, which often must meet strict military or aviation standards, to be exempted.
- The 2025 amendments also explicitly excluded packaging for hazardous or flammable products.

The law's principles align with WG14 objectives by promoting material circularity and end-of-life management. Its fee system encourages producers to design for recyclability, aligning with LCA and EPD goals. The exemptions show how EPR laws can be tailored for highly regulated sectors.

Risks

- Compliance for Non-Exempt Packaging: Companies will be required to register, report, and pay fees for any A&D-related packaging that is not exempt from these requirements.
- Ambiguity in Definitions: The interpretation of "long-term storage" and the outcome of the DEP's review of federally regulated packaging will be critical. An unfavourable interpretation could bring a lot of A&D packaging into scope.

Horizon Scanning

The A&D sector should actively monitor and engage with the Maine DEP's review of packaging for federally regulated products. Providing industry-specific data on the need for certain A&D packaging will be essential to secure exemptions. Companies should also document their use of packaging for "long-term storage of durable products" to prepare for a potential audit. The selection of the SO in 2026 and the development of the fee schedule should also be monitored.

Links

- Maine DEP EPR for Packaging Page
- Circular Action Alliance - Maine

2.2.1.3 Other US states

Several other U.S. states are also passing laws related to CE and EPR. See the links below for a few examples.

Links

- Oregon
  - Plastic Pollution and Recycling Modernization Act (SB 582)
- Colorado
  - Producer Responsibility Program for Statewide Recycling Act (HB22-1355)
  - Colorado Department of Public Health and Environment (CDPHE) EPR Program
- New Jersey
  - Packaging and Paper Product Stewardship Act

2.2.2 Canada

This section reviews the CE and EPR frameworks in key Canadian provinces.

2.2.2.1 Resource Recovery and Circular Economy Act, 2016 (Ontario, Canada)

Executive Summary

Ontario's Resource Recovery and Circular Economy Act establish the framework for transitioning from a waste-based model to a circular economy. It requires EPR, enforces lifecycle accountability, and strengthens the role of the Resource Productivity and Recovery Authority (RPRA). For A&D stakeholders, this could create obligations for managing hazardous substances, packaging recovery, lifecycle reporting, and EPR for transport and electronic components.

Background

The Act, passed in 2016, is part of Ontario's Waste-Free Ontario strategy and was most recently updated in 2023. It represents a significant shift in the province's environmental law from diversion targets to a circular economy framework focused on producer accountability and resource efficiency. The Act serves as an umbrella law, guiding sector-specific policies and regulations for various material classes. It gives the RPRA power to enforce compliance, collect data, and oversee the system.

Timeline

- Enacted: June 2016
- Amendments in Force: 2019, 2020, 2021, 2023
- Mandatory Strategy Review: Every 10 years from adoption, with public consultation required

Impact

The Act makes producers (including importers) fully responsible for the lifecycle of their products and packaging. Key areas relevant to A&D include:

- Requirements to register, report, and manage the end-of-life recovery of packaging, electronics, batteries, and other components.
- Design rules for improved durability, recyclability, and material recovery.
- Compliance obligations for transport packaging and imported components that enter Ontario's market.

The Act aligns well with WG14 objectives on material circularity, EPR schemes, and lifecycle tracking. While not A&D-specific, manufacturers of dual-use products and suppliers of complex systems with packaging or electronic parts are likely in scope.

Risks

- Non-Compliance Fines:
  - Individuals: Up to $50,000/day (first offence); $100,000/day (repeat)
  - Corporations: Up to $250,000/day (first offence); $500,000/day (repeat)
- Marketing Prohibition: Products may be banned from sale if recovery systems are not in place
- Administrative Penalties: Applied for data inaccuracies, failure to respond to inquiries, or non-compliance with mandatory responsibilities
- Reputational Risk: Non-compliance may affect eligibility for future contracts or lead to public disclosure
- Inspection and Enforcement Orders: RPRA has broad powers to enter premises, require audits, and issue compliance directives

Horizon Scanning

Future developments could include adding more material classes and setting more challenging EPR performance targets. Ontario's RPRA will likely introduce new reporting templates and upgrade its registry. Ongoing updates to packaging and electronics regulations could bring aerospace systems with embedded electronics, composite packaging, and spare parts into scope. A&D stakeholders should monitor new policy statements, blue box expansions, and cross-border issues with national EPR systems.

Links

- Resource Recovery and Circular Economy Act, 2016

2.2.2.2 Quebec: Regulation respecting the recovery and reclamation of products by enterprise

Executive Summary

Quebec has a multi-product EPR system covering electronics and batteries, with a modernized EPR system for packaging being phased in. The regulation's exemption for products designed exclusively for industrial or commercial use may be relevant to the A&D sector, but potential ambiguity regarding dual-use components needs to be managed carefully.

Background

Quebec's approach is based on extending a producer's responsibility to the post-consumer stage of a product's life. The regulation covers various products under EPR, including electronics, batteries, and paints. Producers must either run their own recovery program or join a recognized management organization (PRO) to meet their obligations. The regulation was updated in 2022 and 2023.

Timeline

- January 1, 2023: Implementation deadline for the recovery and reclamation programs for electronics and batteries under the amended regulation.
- Ongoing: Phased transition of the recycling system (packaging) to a full EPR model, expected to be complete by the end of 2027.
- Ongoing: Producers of designated products must maintain compliance with reporting and recovery rate targets.

Impact

The regulation requires producers who market designated products in Quebec to manage their end-of-life and meet minimum recovery rate targets. The rules for electronics and batteries may have implications for the A&D sector.

Scope and Exemptions

- Electronics: The regulation exempts products that are "exclusively designed and intended for industrial or commercial environments." This could apply to purely military or industrial-grade electronics, but it creates a potential grey area for "dual-use" components.
- Batteries: The rules cover single-use and rechargeable consumer batteries. They exclude batteries designed exclusively for motor vehicles or solely for industrial purposes. This could exempt large batteries used in ground support equipment or as primary aircraft batteries. However, smaller rechargeable batteries in portable diagnostic tools may not be considered

"exclusively industrial" and could fall outside the scope. The province is also studying EPR for EV batteries, which could set a precedent for larger industrial batteries.

- Packaging: While the packaging EPR system is being updated, the focus is on materials from residential and commercial curbside collection. The A&D sector should monitor the final regulations to see if specific industrial packaging exemptions will be included.

The Quebec framework is important for WG14's objectives because it enforces end-of-life responsibility and sets clear material recovery targets.

Risks

- Ambiguity of "Exclusively Industrial": The most significant risk is how regulators interpret the exemption for products "exclusively" designed for industrial or commercial use. A narrow interpretation could bring many dual-use components into the EPR program, triggering reporting and fee obligations.
- Supply Chain Complexity: For companies sourcing components globally, determining the "first supplier in Quebec" can be complex, but it is necessary for assigning EPR liability.
- Evolving Regulations: The regulatory landscape is still changing, with the packaging EPR system in transition and new products being studied. This requires continuous monitoring.

Horizon Scanning

A&D stakeholders should closely monitor the finalization of Quebec's modernized packaging EPR system for any specific exemptions for industrial or transport packaging. It may be necessary to seek legal clarification or regulatory guidance on the definition of "exclusively" for industrial products to mitigate compliance risks associated with dual-use components.

Links

- Quebec Regulation respecting the recovery and reclamation of products by enterprises:
- Full Regulation Text

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3 CHINA, BRAZIL, AND SOUTH KOREA

Why is this Report Important?

In key economies such as China, Brazil, and South Korea, the circular economy (CE) is being integrated directly into national industrial strategy, as a tool for achieving resource security and enhancing global competitiveness. This approach creates a distinct regulatory environment where CE mandates are intertwined with goals for economic development and supply chain sovereignty. For the aerospace and defence (A&D) sector, this trend introduces compliance expectations that span product design, material sourcing, and end-of-life management. This report analyses evolving national frameworks in these regions to provide A&D stakeholders with insight into a set of emerging operational risks and strategic requirements that differ significantly from traditionally environmental-focused regulations.

3.1 Law of the People's Republic of China on Promoting Circular Economy

Executive Summary

This national law establishes the legal framework for promoting a CE across China, reinforcing sustainable development as a key state strategy. The legislation mandates waste minimization, reuse, and resource recovery across industrial and consumer sectors. While not sector-specific, aerospace and defence (A&D) stakeholders must anticipate increasing obligations on resource tracking, end-of-life management, and the use of restricted substances. It also introduces a system of economic incentives and penalties for non-compliance that may affect dual-use manufacturers and high-tech suppliers.

Background

Initially enacted in 2009 and amended in 2018, this law guides China's transition toward a resource-efficient economy. It applies nationwide and is the foundational legal framework for all CE initiatives. The 2018 amendment strengthened national planning mandates, recycling quotas, extended producer responsibilities, and enforcement provisions. As an umbrella regulation, it influences subsequent measures and sectoral implementation through technology bans, extended producer responsibility (EPR) schemes, green procurement, and industrial waste tracking. The law aligns with national economic and environmental strategies and supports the UN Sustainable Development Goals (SDGs).

Timeline

- Initial Adoption: 29 August 2008
- Effective Date: 1 January 2009 (remains in force post-amendment)
- Amendment Passed: 26 October 2018

Impact

The Law affects all industrial operators across China, including foreign-invested enterprises and exporters, by requiring adherence to resource reduction, reuse, and recycling mandates. A&D manufacturers must ensure compatibility with cleaner production standards, limit the use of toxic substances in their designs, and participate in recovery schemes for components such as electronics, batteries, and composite materials. The Law supports WG14 priorities by promoting material circularity, the reuse of high-value components, and the integration of sustainability standards in procurement.

Risks

- Fines for Non-Compliance:
  - RMB 20,000–200,000 for design violations involving hazardous substances
  - RMB 50,000–500,000 for unauthorized fuel equipment or resource inefficiency
  - RMB 100,000–1 million for the import of banned technologies or equipment
- Business Closure Orders: For severe environmental breaches or repeat offences
- Loss of Government Procurement Access: Non-compliant entities may be excluded from green procurement lists
- Reputational Damage: Public and administrative scrutiny over waste mismanagement or excessive resource use
- Operational Delays: Mandatory alignment with local circular economy planning may affect project approvals

Horizon Scanning

Future developments may include sector-specific enforcement mechanisms, especially for electronics, battery systems, and dual-use components. China is also expected to implement more granular performance standards and mandatory recycling targets for industrial parks and high-emission sectors. Aerospace and defense supply chain stakeholders should monitor upcoming national catalogues for restricted technologies, product lifecycle traceability requirements, and evolving environmental labelling schemes. Harmonization with global green standards may increase as China aligns its trade policies with circular economy goals.

Links

- Law of the People's Republic of China on Promoting Circular Economy
- FAOLEX Link

3.2 China's 14th Five-Year Plan for Circular Economy Development (2021–2025)

Executive Summary

China's 14th Five-Year Plan for Circular Economy Development sets national strategic targets for resource productivity, waste reduction, and industrial system transformation by 2025. The plan builds on past achievements and introduces measures to strengthen recycling systems, remanufacturing, and clean production. For A&D stakeholders, implications include increased regulatory scrutiny of waste batteries, electronic equipment, and critical mineral recovery systems, all of which impact component supply chains and lifecycle compliance obligations.

Background

Announced on 7 July 2021 by China's National Development and Reform Commission, this plan aligns with the national 14th Five-Year strategy and supports the 2018 Circular Economy Promotion Law. It applies nationwide and aims to transform China's industrial system into a high-efficiency, resource-circular economy. The policy is driven by the need to ensure resource security, reduce dependency on imports (notably critical minerals), and improve environmental quality. The plan is an umbrella framework with national-level projects covering waste infrastructure, digital traceability, and new regulations.

Timeline

- Plan Announced: 7 July 2021
- Implementation Period: 2021–2025
- Review Target Year: 2025 (Key indicators to be met by the end of the plan period)

Impact

The plan mandates sector-wide changes in resource use efficiency, targeting a 20% increase in significant resource output rates and recycling 20 million tons of non-ferrous metals. For A&D industries, key impacts include growing obligations around:

- Circularity requirements for electronics, electric vehicles, and batteries,
- Clean production audits for high-emission sectors,
- Lifecycle management of materials used in aerospace platforms,
- Digital platforms for traceability, including for power batteries and e-waste.

The Plan also supports large-scale remanufacturing clusters and promotes circular technology pilots in advanced manufacturing zones. While not specifically aerospace-related, these system-wide reforms are likely to impact upstream component suppliers and high-specification subassemblies used in dual-use and defense applications. WG14-relevant areas include promoting green product design, extended producer responsibility (EPR), integrating recycled content, and implementing lifecycle traceability systems.

Risks

- Regulatory Non-Compliance: Failure to meet energy, water, and recycling benchmarks may result in administrative penalties and exclusion from public or defense procurement schemes.
- Data and Traceability Gaps: The absence of product lifecycle or battery traceability data may delay certification or customs clearance for A&D systems.
- Material Cost Volatility: Circular sourcing obligations may expose suppliers to fluctuations in the availability of certified recycled content.
- Reputational Risk: Poor adherence to government-led green initiatives could negatively impact market perception in China and erode OEM trust.
- Operational Delays: Local land-use constraints and mandatory integration of recycling infrastructure in industrial parks may disrupt siting and logistics planning for supply and repair operations.

Horizon Scanning

The plan promotes ongoing development in clean production and remanufacturing technologies. Future regulatory measures will likely target traceability standards for electronics, batteries, and construction materials. National pilot programs will inform broader legislative amendments to China's Circular Economy Promotion Law. A&D stakeholders should monitor developments in:

- Cross-border green compliance frameworks,
- EPR for electronics and high-performance batteries,
- Strategic mineral recovery regulations linked to export manufacturing,
- Circularity standards harmonized with international benchmarks (e.g., ISO/EPD, IEA directives).

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Link

- China's 14th Five-Year Plan for Circular Economy Development

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3.3 Brazil National Circular Economy Strategy (ENEC), Decree No. 12,082 of 27 June 2024

Executive Summary

Brazil's National Circular Economy Strategy, established in June 2024, introduces a national framework to transition from a linear to a circular production model. The strategy mandates regulatory, financial, and institutional reforms to enhance material circularity, promote waste prevention, and integrate informal recycling sectors. For A&D stakeholders, this requires a shift toward designing for circularity, establishing localized recycling infrastructure, and ensuring lifecycle accountability, particularly for imported systems, dual-use goods, and complex product assemblies.

Background

The National Circular Economy Strategy aligns Brazil's industrial, trade, and sustainability priorities with global environmental commitments. It promotes non-waste generation, resource regeneration, and systemic efficiency across all sectors. Its scope includes regulatory harmonization, financing instruments, and the integration of informal labour into formalized value chains. The strategy is grounded in inclusive development principles, addressing socioeconomic disparities and promoting participatory governance through the establishment of a new advisory board.

Timeline

- Official Gazette Publication: 28 June 2024

Impact

The strategy applies across Brazil's industrial sectors and value chains. A&D stakeholders operating in Brazil will be affected by evolving rules on product design, recycling quotas, and green procurement policies. Specific A&D-relevant elements include:

- Circularity indicators and monitoring systems may influence regulatory approvals or defence tender criteria.
- Lifecycle extension and reuse incentives, affecting complex assemblies (e.g., avionics, electronic control units),

The Strategy supports WG14 priorities by mandating regenerative product design, material recirculation, and the development of product-specific circularity metrics.

Risks

- Emerging Compliance Obligations: Mandated indicators and design standards may affect current A&D manufacturing practices.
- Tender and Contractual Risk: Non-circular suppliers may be excluded from government or defence procurement frameworks.
- Operational Disruption: Collaboration with regional recycling ecosystems may be required, which could impact disassembly, export, or repair operations.
- Reputational Exposure: Companies failing to align with equity-oriented transition mandates may face reputational scrutiny.

- Taxation Adjustments: Future tax disincentives may target non-circular goods or high-waste technologies.

Horizon Scanning

The decree provides for the creation of a National Circular Economy Forum, which will serve as an advisory body to guide implementation. Stakeholders should monitor:

- The release of sector-specific circularity indicators and design standards,
- The implementation of fiscal instruments (e.g., tax relief, public procurement mandates),
- Regulatory linkage to EPR and environmental performance disclosure,
- Future guidelines on integrating circularity into aerospace and dual-use procurement

WG9 and WG14 should track the Ministry of Development's upcoming advisory board composition and regulatory updates.

Link

Brazil National Circular Economy Strategy (28 June 2024)

3.4 Brazil National Circular Economy Plan (Plano Nacional de Economia Circular – PLANEC)

Executive Summary

Brazil's National Circular Economy Plan (PLANEC), approved on May 8, 2025, is a long-term (2025–2034) national industrial strategy designed to integrate circularity into the country's economic framework. For the A&D sector, this requires new approaches to product design, manufacturing, and lifecycle management, with future public procurement for defence likely to incorporate circularity criteria. The immediate impact is strategic, requiring proactive monitoring of forthcoming sector-specific regulations, technical standards, and fiscal incentives.

Background

PLANEC is the primary instrument for implementing the National Circular Economy Strategy (ENEC). Coordinated by the Ministry of Development, Industry, Commerce, and Services (MDIC), it integrates Brazil's "New Industry Brazil" industrial policy and the "Ecological Transformation Plan". The plan establishes the circular economy as a central pillar of the nation's strategy for re-industrialization, technological advancement, and economic competitiveness. As an umbrella framework, PLANEC will guide the creation of future regulations, sector-specific plans, and financial instruments over a ten-year horizon. It also positions leading domestic A&D firms as potential partners in developing advanced circular solutions.

Timeline

- 28 June 2024: Publication of Federal Decree No. 12.082/2024, establishing the National Circular Economy Strategy (ENEC).
- 8 May 2025: Formal approval of the National Circular Economy Plan (PLANEC) by the National Circular Economy Forum.
- 2025-2034: Ten-year implementation horizon for PLANEC.

- Forthcoming (Post-2025): Formation of working groups to implement specific actions, development of a "National Sectoral Diagnosis" to identify priority industries, and the subsequent release of sector-specific plans and technical standards.

Impact

The impact of PLANEC on the A&D sector will be systemic and long-term. While the plan does not yet impose immediate, prescriptive compliance obligations, it establishes a directional framework that will shape future requirements for all A&D operators in Brazil. The plan's first two pillars, focused on the Regulatory Framework and Innovation, will drive changes in design, materials, and lifecycle management. PLANEC mandates the development of standards for the "circular design of products," encouraging durability, repairability, and remanufacturing. For the A&D sector, this anticipates future design requirements for complex systems to facilitate easier maintenance and end-of-life disassembly. The plan will also incentivize the use of secondary and renewable materials. The emphasis on improving material traceability will require A&D supply chains to adopt more robust digital systems, potentially aligning with digital passport concepts and supporting Life Cycle Assessment (LCA) and Environmental Product Declaration (EPD) standards.

Pillar 3, focused on Waste Reduction, will directly impact end-of-life and MRO operations. The plan's objective to strengthen take-back systems points toward the future establishment of Extended Producer Responsibility (EPR) schemes for high-value or potentially hazardous A&D components. This would make Original Equipment Manufacturers (OEMs) responsible for managing these items at the end of their service life. This national framework positions Brazil to enhance its global competitiveness. As international markets move toward stricter circularity standards, an A&D manufacturer's ability to provide LCA data and manage end-of-life will become a key competitive differentiator. Brazil's proactive approach aims to align its industrial base with future global market requirements. This approach aims to turn a potential domestic compliance burden into an international market advantage for Brazil's A&D sector. It also sets a new baseline for non-domestic A&D companies seeking to sell into the Brazilian market export-oriented A&D sector. It also sets a new baseline for non-domestic A&D companies seeking to sell into the Brazilian market, requiring them to meet these emerging standards as well.

Risks

- Emerging Compliance Costs: As sector-specific plans and standards develop, A&D companies will face costs associated with redesigning products and implementing new digital traceability systems.
- Exclusion from Public Procurement: Failure to align with emerging circularity criteria could result in being disadvantaged or excluded from future Brazilian defence tenders.
- Supply Chain Disruption: Future mandates for recycled content or material traceability could disrupt existing supply chains, requiring qualification of new suppliers and materials.
- Regulatory Uncertainty: As PLANEC is a high-level strategic document, the precise nature and timing of future regulations remain undefined, necessitating continuous monitoring.
- Taxation and Fiscal Risk: The plan proposes tax adjustments to penalize non-circular products and incentivize circular ones. This could increase the cost of products and components that do not meet future Brazilian circularity standards.

Horizon Scanning

The primary entity for monitoring is the National Circular Economy Forum, managed by the MDIC, which is responsible for overseeing the implementation of PLANEC. WG9 and WG14 must track the outputs of the working groups established under this Forum, particularly the forthcoming "National Sectoral

Diagnosis". The selection of "priority sectors" will be a key indicator of where regulatory focus will fall first. Future defence contracts from the Brazilian government are likely to incorporate circularity criteria, favouring bidders who can demonstrate effective lifecycle management, enhanced repairability, and the use of sustainable materials. Stakeholders should also monitor the development of specific fiscal instruments and technical standards for circular design through organizations such as the Brazilian Association of Technical Standards (ABNT).

Links

- Brazil National Circular Economy Plan (PLANEC)
- National Plan for Circular Economy (Government Overview)

3.5 South Korea – Act on Promotion of Transition to a Circular Economy Society

Executive Summary

South Korea's overhauled Act on Promotion of Transition to a Circular Economy Society, effective 1 January 2024, establishes a legally binding framework to transition the nation to a circular economy. The Act introduces a product circularity assessment system, a process for reclassifying waste as resources, and mandatory producer obligations for product repairability. For the A&D sector, the Act's impact is likely direct and immediate for activities under the nine targeted industries (which include machinery electronics, steel, petrochemicals, non-ferrous metals, batteries, textiles, and automobiles) in the national "CE 9 Project". The emerging requirements create compliance pressures and strategic opportunities in remanufacturing, MRO, and sustainable design.

Background

This Act is a complete legislative overhaul of South Korea's previous Framework Act on Resources Circulation. It shifts the national focus from end-of-pipe recycling to a comprehensive, whole-lifecycle approach to resource management. The legislation is driven by the need to enhance resource security for a country dependent on imported raw materials and to reduce industrial carbon emissions. The Act is the primary legal instrument for implementing the government's broader strategy, a central component of which is the "CE 9 Project". Announced in June 2023, the project targets nine industries for circular transformation, including the machinery and electronics sectors. The Act is an enforceable law supported by detailed subordinate decrees and rules.

Timeline

- 21 June 2023: Announcement of the "Strategy for Industrial New Growth through Invigoration of Circular Economy," including the "CE 9 Project".
- 1 January 2024: The overhauled Act on Promotion of Transition to a Circular Economy Society and its associated Enforcement Decree and Enforcement Rules enter into force.
- 19 August 2024: MOE formally announces a proposed amendment to the Enforcement Decree of the Act on Promotion of Transition to Circular Economy and Society
- 1 January 2025: Additional provisions of the Act came into effect, including more detailed requirements concerning the promotion of circular use of products and packaging materials, and the establishment of national waste generation reduction rate targets.

Impact

The Act's impact on the A&D sector stems from the inclusion of the "machinery" and "electronics" sectors within the CE 9 Project. This classification brings A&D manufacturing, MRO, and supply chain operations within the scope of the new regulations. Several regulatory mechanisms will significantly impact A&D operations:

- Producer Obligations for Sustainable Use (Repairability): Article 20 of the Act requires producers to ensure the sustainable use of their products, including retaining spare parts and designing for ease of repair. Circular Use Assessment System: Products deemed difficult to recycle may be subject to government assessment based on criteria such as durability and repairability. A negative evaluation can lead to recommendations for improvement, and failure to implement them may result in public disclosure of the results, posing a reputational risk.
- Remanufacturing for Export: The CE 9 Project's focus on remanufacturing machinery for export is a significant strategic development. This initiative supports the development of advanced MRO and component refurbishment, positioning South Korea as a regional hub for extending the life of high-value A&D assets.
- Circular Resource Recognition System: This system establishes a process to reclassify certain waste materials, such as scrap metal, as "circular resources," thereby exempting them from more stringent waste regulations. This streamlines the process for A&D manufacturers to source and use certified recycled metals, supporting recycled content goals.

Risks

- Penalties for Non-Compliance: The Act includes specific penalty provisions. Mislabelling a product as using circular resources can result in imprisonment of up to two years or a fine of up to KRW 20 million. Administrative penalties of up to KRW 10 million can be imposed for violations, including failure to submit required data.
- Operational and Logistical Costs: The mandate under Article 20 to ensure repairability and maintain inventories of spare parts will impose direct operational costs on OEMs and their suppliers.
- Reputational Damage: The public disclosure of negative "circular usability" assessments poses a significant non-financial risk that could damage a brand's reputation and erode customer trust.
- Supply Chain Scrutiny: The Act's requirements for using circular raw materials will necessitate greater transparency and due diligence within the supply chain.

Horizon Scanning

Stakeholders must monitor communications from two key government bodies: the Ministry of Environment (MOE), responsible for implementing the Act, and the Ministry of Trade, Industry and Energy (MOTIE), which is driving the "CE 9 Project". The development of the detailed implementation plan for the "machinery" sector under the CE 9 Project is a critical item to track, as this will likely contain specific targets and incentives for remanufacturing. It is also essential to monitor which products are selected for the "Circular Usability Assessment," as targeting electronic control units or other complex A&D components would signal an increasing regulatory scrutiny.

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Links

- A New Industrial Growth Strategy through the Activation of a Circular Economy
- Act on Promotion of Transition to Circular Economy and Society
- Enforcement Decree on the Act on Promotion of Transition to Circular Economy and Society
- Towards Improved Circular Economy and Resource Security in South Korea
- CE 9 project
