

Decarbonising aluminium in Albania, Bosnia and Herzegovina and Serbia

September 2026

Authors

Eoin Quill, Olivia Waterton, Kim Coetzee

Contributors

Mihallaq Qirjo (REC, Albania), Melina Kalem (REIC, Bosnia and Herzegovina), Ksenija Todorović (RERI, Serbia)

Reviewer

Claudio Forner

About Climate Analytics

Climate Analytics is a global climate science and policy institute. Our mission is to deliver cutting-edge science, analysis, and support to accelerate climate action and keep warming below 1.5°C.

Acknowledgments

The authors would like to thank the industry experts who participated in the interview process and contributed their perspective to this report, and Richard Anderson for his editorial input.

Copyright

You are welcome to reproduce this publication in whole or part for non-commercial purposes. We ask that you duly acknowledge Climate Analytics and link to the original publication on our website when publishing online. This content cannot be resold or used by for-profit organisations without prior written consent from Climate Analytics.

Licensed under CC BY-NC-ND 4.0

How to cite: Climate Analytics (2026). Decarbonising aluminium in Albania, Bosnia and Herzegovina and Serbia.

Supported by



This project is part of the [European Climate Initiative \(EUKI\)](#). EUKI is a project financing instrument by the German Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN). The EUKI competition for project ideas is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. The overarching goal of the EUKI is to foster climate cooperation within the European Union (EU) in order to mitigate greenhouse gas emissions.

Summary

The global aluminium industry accounts for roughly 2% of global greenhouse gas emissions each year. With applications in electric vehicles, renewable energy infrastructure, construction, and packaging, aluminium is one of the most important materials to the energy transition. As demand is expected to grow, so are emissions, so it is critical to decarbonise the full supply chain to align with the Paris Agreement's 1.5°C temperature limit.

Technological innovation, renewable energy (via direct electrification or power purchase agreements), greater recycling, and emerging low-carbon smelting technologies offer distinct pathways to decarbonise the aluminium industry.

At the same time, the introduction of the European Union's Carbon Border Adjustment Mechanism (CBAM) fundamentally alters the economic incentive to reduce the carbon intensity of aluminium production for exporters to the European Union (EU). CBAM places a price on the embedded carbon emissions of aluminium imported into the EU, increasing the cost of more carbon-intensive products while improving the competitiveness of lower-carbon alternatives.

Albania, Bosnia and Herzegovina (BiH), and Serbia all export aluminium and/or aluminium products to the EU. Aligning with CBAM therefore presents each country with a clear opportunity to gain competitive advantage and develop new revenue streams by decreasing the carbon intensity of their production, which is additionally necessary to comply with EU laws and obligations on the road to accession.

This paper assesses potential decarbonisation pathways for the aluminium industry in Albania, BiH, and Serbia while aiming to enhance broader economic competitiveness. It provides an overview of the aluminium sector in the three target countries, examines international developments in low-carbon aluminium production, and identifies opportunities and challenges for decarbonisation in the Western Balkans. The paper forms part of a broader series examining the implications of CBAM for the electricity, iron and steel, cement, chemical, and aluminium sectors in Albania, BiH, and Serbia.

Table of contents

Introduction	1
Current state of play in the aluminium sector	2
International overview	2
Overview of supply chain emissions	3
Implications of CBAM for aluminium exporters	6
National contexts	10
Albania	10
Bosnia and Herzegovina	11
Serbia	12
Good practices	14
Technical pathways to low-carbon aluminium	14
Options for primary and secondary production	14
Technical pathways for secondary production	16
Improving the policy environment	17
Conclusions	21
References	23

Introduction

The global aluminium industry is estimated to generate annual emissions of around 1.1 billion tonnes of CO₂-equivalent (CO₂e), amounting to roughly 2% of global greenhouse gas emissions.¹ Demand is expected to rise significantly, due to its application in electric vehicles, renewable energy infrastructure, construction, and packaging. While many of these applications are directly relevant to reducing global emissions, it is critical to decarbonise the full supply chain.

Aluminium has traditionally been considered a ‘hard-to-abate’ sector – an industry where meaningful emissions reductions are difficult to achieve. This is due to both the sector’s massive electricity demand, which requires continuous supply at extremely high temperatures, and emissions from chemical reactions during the process itself. These emissions have long been challenging to reduce with current low-carbon technologies. However, through technological innovation, renewable energy (via direct electrification or power purchase agreements), greater recycling, and emerging low-carbon smelting technologies, viable pathways now exist to decarbonise the aluminium industry.

The introduction of the European Union’s Carbon Border Adjustment Mechanism (CBAM) fundamentally alters the economic incentive to reduce the carbon intensity of aluminium production for exporters to the European Union (EU). CBAM aims to equalise carbon costs between domestic EU producers and foreign producers exporting into the EU, so that domestic producers are not disadvantaged as they incur near-term transition costs. In doing so, CBAM places a price on the embedded carbon emissions of aluminium imported into the EU, increasing the cost of more carbon-intensive products while improving the competitiveness of lower-carbon alternatives. In short, the carbon intensity of production increasingly affects market access and profitability.

As the EU is a critical export market for neighbouring Balkan countries, CBAM creates a strong incentive to reduce the carbon intensity of production. Albania, Bosnia and Herzegovina (BiH), and Serbia all export aluminium and/or aluminium products to the EU. Aligning with CBAM therefore presents each country with a clear opportunity to increase competitive advantage and develop new revenue streams while decreasing the carbon intensity of their production on the road to EU accession.

This paper assesses potential decarbonisation pathways for the aluminium industry in Albania, BiH, and Serbia while aiming to enhance broader economic competitiveness. It provides an overview of the aluminium sector in the three target countries, examines international developments in low-carbon aluminium production, and identifies opportunities and challenges for decarbonisation in the Western Balkan context. The paper forms part of a broader series examining the implications of CBAM for the electricity, iron and steel, cement, chemical, and aluminium sectors in Albania, BiH, and Serbia.

¹ International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050* (International Aluminium Institute, 2021), <https://international-aluminium.org/resources/aluminium-sector-greenhouse-gas-pathways-to-2050-2021/>.

Current state of play in the aluminium sector

International overview

Aluminium is the second most widely used metal globally, after steel, and is a foundational material for modern industrial economies. Its distinctive combination of corrosion resistance, high strength-to-weight ratio, electrical conductivity and remarkable recyclability makes it an increasingly essential material in a wide variety of sectors from construction, transport, and packaging to consumer products and electrical infrastructure.² About 70% of total demand comes from the construction industry (25%), transport (23%), electrical applications (12%), and use in machinery and equipment (10%).³

With its widespread use in renewable energy technologies, electricity transmission and distribution networks, electric vehicles, battery systems, and energy-efficient buildings, aluminium is increasingly fundamental to the global energy transition.⁴ In 2024, for example, the EU designated bauxite, alumina and aluminium as strategic and critical raw materials with the goal of securing supply chains essential to the green transition and reducing dependence on imports.⁵

Worldwide demand for aluminium has grown steadily over recent decades and this growth is expected to continue as countries expand the electrification of their economies and invest in infrastructure to support the energy transition. Demand is projected to grow by about 30% in this decade, mainly due to the large-scale promotion of renewable energy-related technologies and the adoption of electric vehicles.⁶ Demand projections from a study conducted by the International Aluminium Institute in 2021 anticipate an 80% increase by 2050 in scenarios where economic growth and a shift to a low-carbon economy are sustained.⁷ Similarly, the International Renewable Energy Agency (IRENA) projects growth in global aluminium production of more than one-third by mid-century, driven primarily by demand from renewable energy systems, electric mobility, and expanding electricity networks.⁸ While this rise in demand underpins decarbonisation throughout

² IRENA, *Reaching Zero with Renewables: Aluminium Industry* (2025), https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2025/Apr/IRENA_TEC_Reaching_zero_with_renewables_aluminum_2025.pdf.

³ IRENA, *Reaching Zero with Renewables: Aluminium Industry*.

⁴ IRENA, *Reaching Zero with Renewables: Aluminium Industry*; International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050*.

⁵ European Parliament, "Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024," Document 32024R1252, April 11, 2024, <https://eur-lex.europa.eu/eli/reg/2024/1252>.

⁶ CRU Consulting, *Opportunities for Aluminium in a Post-Covid Economy*, nos. ST2342-21 (CRU International Limited, 2022), <https://international-aluminium.org/wp-content/uploads/2022/03/CRU-Opportunities-for-aluminium-in-a-post-Covid-economy-Report.pdf>.

⁷ International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050*.

⁸ IRENA, *Reaching Zero with Renewables: Aluminium Industry*.

the wider economy, it also presents a significant challenge for reducing emissions from aluminium production itself.

Overview of supply chain emissions

The aluminium value chain consists of four principal stages: mining for bauxite, alumina refining, primary aluminium smelting, and downstream fabrication, as depicted in the figure below. While emissions occur throughout the value chain, they are highly concentrated in the production of primary aluminium, particularly during alumina refining and the electrolytic smelting process, for reasons explained below.⁹

The International Aluminium Institute estimated that 71% of emissions were generated during primary production, 15% during mining and refining, 6% during the production of the carbon anodes used in the smelting process, 4% in recycling and remelting, and only 3% in the downstream value chain in which a wide variety of semi-fabricated (termed “semis” in the industry) products are made.¹⁰

Various stages of the aluminium value chain and production process

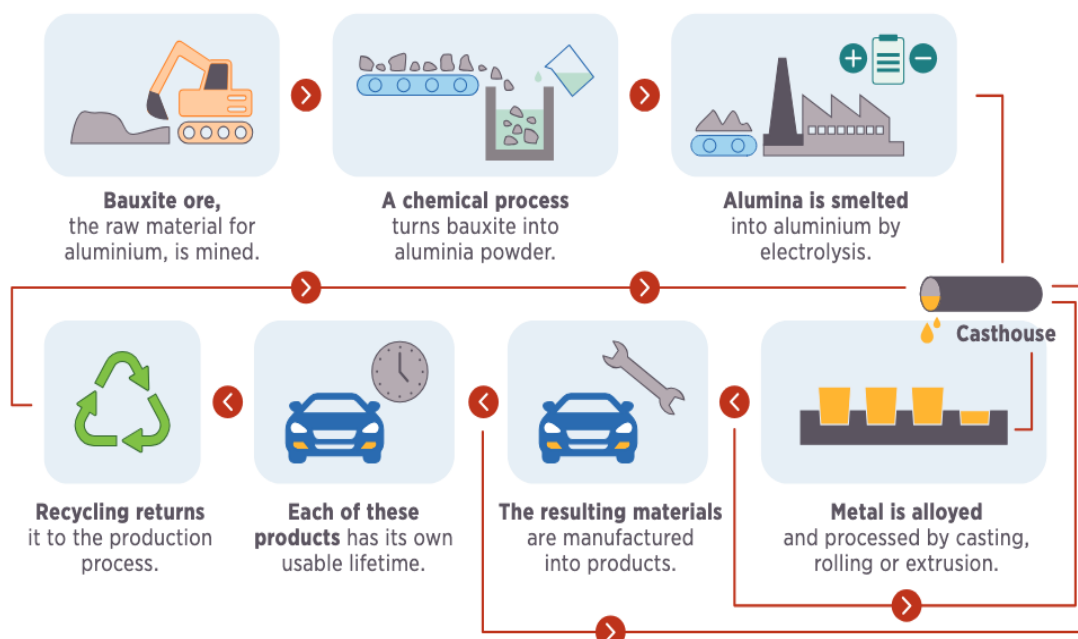


Figure 1: Illustration of the aluminium value chain.¹¹

⁹ Lovro Zore, *Decarbonisation Options for the Aluminium Industry.*, no. JRC136525 (Publications Office of the European Union, 2024), <https://doi.org/10.2760/880>.

¹⁰ International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050*.

¹¹ IRENA, *Reaching Zero with Renewables: Aluminium Industry*.

Benchmarking low-carbon aluminium

The global aluminium industry has broadly coalesced around a benchmark level of maximum 4 tCO₂e/t Al to define low carbon aluminium.¹² However, the emissions scope and systems boundaries, traceability and carbon accounting methodologies used to demonstrate whether a low-carbon aluminium product reaches that benchmark is highly variable.

Some industry coalitions are seeking higher ambition in emissions reductions. The First Movers Coalition for aluminium has committed to pursuing primary aluminium at a level of less than 3 tCO₂e/t Al but is technology-agnostic.¹³ The benchmark is aligned with International Aluminium's Carbon Footprint Methodology.

Stage 1: Bauxite extraction

Aluminium does not occur naturally as metal, but exists as very stable oxides in minerals like bauxite that need to be extracted through mining. Mining the bauxite produces the least emissions in the supply chain, as activities include handling the material and transporting the ore from mining sites to refineries, usually using diesel-powered equipment.¹⁴

Stage 2: Alumina refining

At the refinery, the Bayer process is used to dissolve the bauxite using sodium hydroxide to precipitate alumina that is then calcined at high temperatures. This process uses substantial quantities of heat to break the strong oxygen bonds of the alumina, heat that is typically generated using coal or natural gas. Thus, fuel combustion is the dominant source of emissions at this stage, estimated to be ±15% of the sector's total emissions.¹⁵

Stage 3: Alumina smelting

The most emissions intensive stage is the smelting of the alumina using the 130-year-old, Hall-Héroult electrolysis process.¹⁶ Here the alumina is dissolved in molten cryolite and separated into aluminium metal using a continuous electric current. This process is exceptionally electricity-intensive, requiring approximately 13–15 MWh of electricity per tonne of aluminium produced, with some variation depending on the specific technology employed and the age of the plant.¹⁷ In

¹² "Low Carbon Aluminium Factsheet," *International Aluminium Institute*, n.d., accessed September 3, 2026, <https://international-aluminium.org/landing/low-carbon-aluminium-factsheet/>.

¹³ World Economic Forum, "Aluminium | First Movers Coalition," accessed September 3, 2026, <https://initiatives.weforum.org/first-movers-coalition/aluminium>.

¹⁴ International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050*.

¹⁵ International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050*; Dareen Dardor et al., "Decarbonizing the Aluminium Industry: A Comprehensive Review of Pathways and Process Integration Perspectives," *Energy Strategy Reviews* 61 (September 2025): 101853, <https://doi.org/10.1016/j.esr.2025.101853>.

¹⁶ Houshang Alamdari, "Aluminium Production Process: Challenges and Opportunities," *Metals* 7, no. 4 (2017): 133, <https://doi.org/10.3390/met7040133>.

¹⁷ Dardor et al., "Decarbonizing the Aluminium Industry."

short, the carbon intensity of the electricity supply largely determines the overall emissions intensity of primary aluminium production.

Emissions occur throughout the aluminium production process

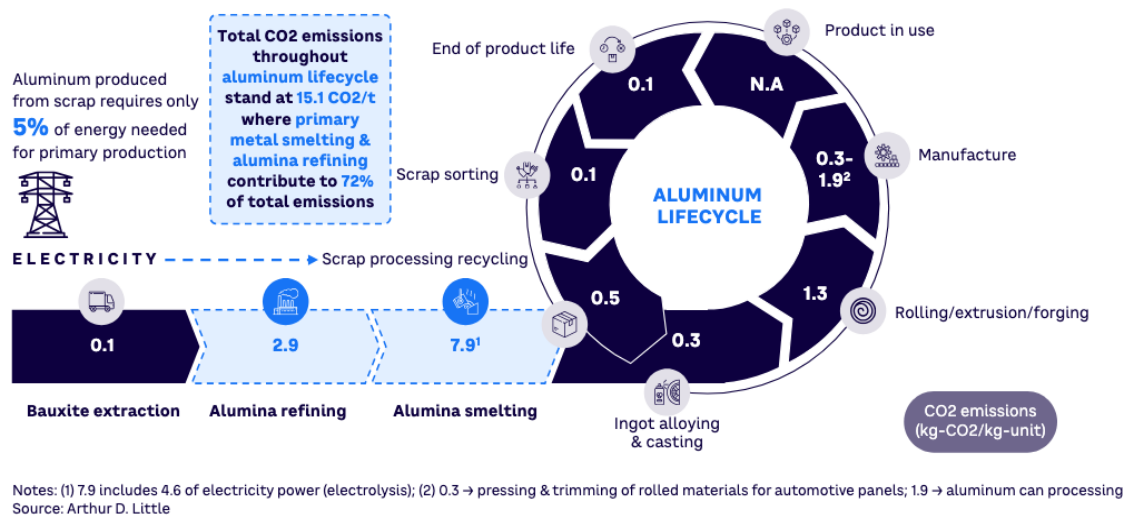


Figure 2: Estimated CO₂ emissions at each stage of the aluminium lifecycle, whereby total emissions amount to 15.1 CO₂/t.¹⁸

In addition to electricity-related emissions, the electrolytic reduction of alumina generates process emissions - specifically, the carbon contained within the anodes reacts with oxygen released from alumina to produce carbon dioxide.¹⁹ Under certain operating conditions, the process can also emit perfluorocarbons (PFCs), potent greenhouse gases with significantly higher global warming potential than carbon dioxide.²⁰ These process emissions cannot be eliminated simply by switching to renewable electricity, making inert anode technologies a key part of decarbonisation.²¹

Stage 4: Downstream fabrication

Downstream processing, including casting, rolling, extrusion, and fabrication, contributes comparatively little to overall sector emissions. Similarly, transport of intermediate products between production stages represents only a small proportion of the lifecycle emissions of aluminium.²²

One of the sector's greatest advantages is aluminium's exceptional recyclability, as aluminium can be recycled repeatedly without significant loss of material quality. Recycled aluminium, or 'secondary aluminium' production, requires only about 5% of the energy needed to produce primary

¹⁸ Ilya Epilkhin et al., *Aluminium: The Path to Green* (Arthur D. Little, 2024), <https://www.adlittle.com/en/insights/viewpoints/aluminum-path-green>.

¹⁹ Arne Petter Ratvik et al., "Aluminium Production Process: From Hall-Héroult to Modern Smelters," *ChemTexts* 8, no. 2 (2022): 10, <https://doi.org/10.1007/s40828-022-00162-5>.

²⁰ Chang Tan et al., "Different Technology Packages for Aluminium Smelters Worldwide to Deliver the 1.5°C Target," *Nature Climate Change* 15, no. 1 (2025): 51–58, <https://doi.org/10.1038/s41558-024-02193-x>.

²¹ IRENA, *Reaching Zero with Renewables: Aluminium Industry*; International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050*.

²² International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050*.

aluminium by avoiding the emissions-intensive alumina refining and smelting stages, making secondary aluminium one of the lowest-emission production methods for meeting future demand.²³

Despite already high recycling rates, however, secondary production alone cannot satisfy projected global demand, partly because of the long life of aluminium products, which means there are not enough products to be recycled. Primary aluminium production will therefore remain necessary for several decades, reinforcing the importance of decarbonising the electricity supply, refining processes, and smelting technologies alongside expanding recycling capacity.²⁴

Unlike cement, where process emissions are largely unavoidable, or steel, where reducing agents remain a major challenge, aluminium production itself has relatively few direct combustion emissions.²⁵ Instead, emissions are dominated by electricity consumption during electrolysis and by process emissions that are associated with the electrolysis of the carbon anodes. Aluminium produced using hydropower, or other low-carbon electricity, can thus have a carbon footprint several times lower than that produced using coal-fired electricity.

Historically, many smelters were located near hydroelectric resources in countries such as Canada, Norway, and Iceland.²⁶ More recently, however, production has increasingly shifted towards regions where electricity is supplied by coal-fired captive (e.g. owned by smelters) power plants, particularly in parts of Asia.²⁷ Almost half of global primary aluminium production is now supported by captive fossil fuel-based power generation, with coal accounting for approximately 85% of installed captive generating capacity. Although modern smelters have become significantly more energy efficient through improvements in cell design and operating practices, these efficiency gains have been undermined in many regions by increased reliance on fossil fuels to produce electricity.²⁸

The following sections examine the principal decarbonisation options available to the industry and assess their relevance for aluminium production in Albania, BiH, and Serbia in the context of CBAM and the broader transition to a low-carbon economy.

Implications of CBAM for aluminium exporters

CBAM scope

As the EU progresses with decarbonising its hard-to-abate industries, it has introduced CBAM as a means to prevent carbon leakage (i.e. the movement of industrial emissions to countries with weaker environmental regulations).²⁹ CBAM is designed to rectify the risk of carbon leakage by placing a price on carbon-intensive products being imported into the EU ([see Decarbonising](#)

²³ IRENA, *Reaching Zero with Renewables: Aluminium Industry*; International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050*.

²⁴ International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050*.

²⁵ Find the papers in this series about these sectors on the [Climate Analytics website](#)

²⁶ International Aluminium Institute, *Aluminium Sector Greenhouse Gas Pathways to 2050*.

²⁷ IRENA, *Reaching Zero with Renewables: Aluminium Industry*.

²⁸ Tan et al., "Different Technology Packages for Aluminium Smelters Worldwide to Deliver the 1.5 °C Target."

²⁹ European Commission, "Carbon Leakage," 2021, https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation/carbon-leakage_en; European Commission, "Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 Establishing a Carbon Border Adjustment Mechanism (Text with EEA Relevance)," May 10, 2023, <http://data.europa.eu/eli/reg/2023/956/oj/eng>.

electricity in Albania, Bosnia and Herzegovina and Serbia, the first paper in this series, for an introductory analysis of CBAM).³⁰

Initial coverage of aluminium focused only on raw aluminium and an array of unwrought and semi-finished products.³¹ However, this carried the possibility of foreign producers simply manufacturing their goods into finished products and then exporting them, thereby avoiding CBAM costs. To close potential loopholes, EU governments, and subsequently the European Parliament, agreed to extend CBAM to hundreds of products with a high steel and aluminium content. This is expected to come into effect in 2028.^{32,33}

EU-based companies that import aluminium must purchase certificates that cover the cost of the embedded carbon in the products that fall under CBAM's scope. Critically, CBAM only covers direct emissions produced in the aluminium manufacturing process (from electrolysis of carbon anodes and direct fuel use in furnaces). Indirect emissions from electricity purchased from the grid, which generate the lion's share of aluminium's embedded emissions, are excluded.³⁴ Key reasons for this include aligning CBAM with the EU Emissions Trading System (ETS) (which offsets indirect electricity costs for domestic producers) and managing cost increases for downstream European producers, as aluminium prices could significantly increase if CBAM were to include indirect emissions.³⁵

Additionally, pre-consumer scrap³⁶ will fall under CBAM's scope from 2028, though post-consumer scrap³⁷ will not. This has ignited heated debate in Europe. While the Commission suggests that placing a carbon price runs against circular economy principles by disincentivising recycling, industry groups argue this unfairly disadvantages domestic producers. In the EU, secondary aluminium made from scrap closely follows the price of primary aluminium: when the price of primary aluminium goes up, so too does the price of secondary. So, while EU-based producers that

³⁰ Eoin Quill et al., *Decarbonising Electricity in Albania, Bosnia and Herzegovina and Serbia* (Climate Analytics, 2025), <https://climateanalytics.org/publications/decarbonising-electricity-cement-iron-and-steel-and-chemicals-in-albania-bosnia-and-herzegovina-and-serbia>.

³¹ For a full list of the aluminium products which were covered from the beginning of CBAM's definitive phase, see section 5.7 of the following source: European Commission, "Guidance Document on CBAM Implementation for Importers of Goods into the EU."

³² Asuene, *What Is the CBAM Downstream Expansion and What Do Importers Need to Do Before 2028?*, 2026, <https://asuene.com/us/blog/what-is-the-cbam-downstream-expansion-and-what-do-importers-need-to-do-before-2028>.

³³ Peacock Tariff Accounting, "EU Widens CBAM," 2026, <https://www.peacocktariffconsulting.com/eu-widens-cbam/>.

³⁴ CBAM Guide, "CBAM Compliance for Aluminium Importers: Annex II Rules Explained," 2026, <https://cbamguide.com/importers/aluminium/>.

³⁵ European Aluminium, "CBAM Scope Extension & Anti-Circumvention Measures," European Aluminium, 2026, <https://european-aluminium.eu/wp-content/uploads/2026/03/2026-02-17-EA-Position-Paper-on-CBAM-Downstream-scope-extension.pdf>.

³⁶ Industrial leftovers which retain the same properties as primary aluminium and have never been made into a finished product.

³⁷ Aluminium which has completed its lifecycle as a product, such as old car parts, window frames, drinks cans, or cables.

use post-consumer scrap must pay an indirect carbon price, this cost is avoided for exporters to the EU, hence potentially creating an imbalance.³⁸

The precursor input³⁹ a plant uses, therefore, has a major impact on a company's CBAM exposure. For instance, the aluminium Even in a case where a plant's operations are efficient, if it uses carbon-intensive primary aluminium then it remains highly exposed to CBAM. However, using high shares of recycled aluminium gives a plant a strong competitive advantage when exporting to the EU.

Critically for small-and medium-sized enterprises (SMEs), only companies that import over 50 tonnes of CBAM covered goods per year are obligated to purchase certificates.⁴⁰ In effect, this exempts many SMEs, but for larger companies, which are responsible for the vast majority of emissions, there is a clear economic incentive to purchase lower carbon products.

CBAM is not a static policy and continues to develop as the Commission aims to ensure that loopholes are closed and domestic European companies are not disadvantaged compared to foreign producers. That means clear guidance and communication from Western Balkan governments is critical for companies to meet the reporting requirements and ensure alignment with CBAM.⁴¹

How the EU classifies aluminium products under CBAM

The EU's imports of aluminium products are defined by the Combined Nomenclature (CN) customs classification codes in Table 1 below as these products are subject to CBAM. Note, however, that the value chain is process-based (as discussed above), whereas CN codes are product-based. Thus, for example, one smelter could produce primary ingots, billets, slabs, and foundry alloys, all of which originate from the same production stage (smelting), but are categorised into different CN codes when exported. Likewise, recycled aluminium and primary aluminium can both be classified under CN 7601, even though their respective production routes - and therefore their embedded carbon emissions - are dramatically different. This is, for instance, common in Albania where unwrought aluminium tends to be produced from secondary scrap.

The CN code alone does not indicate whether aluminium is primary or secondary, whether renewable electricity was used, the carbon intensity of production, or whether carbon or inert anodes were used. EU regulations identify which goods are subject to CBAM by the CN codes, while the embedded emissions methodology determines how much carbon liability is associated

³⁸ European Aluminium, "CBAM Scope Extension & Anti-Circumvention Measures"; Lambert Guilbault et al., "CBAM's Aluminium Scrap Loophole – An EU Circular Economy Cannot Be Built by Weakening the Industries That Sustain It," *Carbon Pulse*, 2026, <https://carbon-pulse.com/501458/>.

³⁹ Precursor inputs most commonly refer to unwrought aluminium. If a manufacturer is producing finished downstream products, then precursors can include aluminium products such as wire, rods, sheets, tubes, etc.

⁴⁰ European Commission, "Officially Published: Simplifications for the Carbon Border Adjustment Mechanism (CBAM)," 2025, https://taxation-customs.ec.europa.eu/news/officially-published-simplifications-carbon-border-adjustment-mechanism-cbam-2025-10-20_en.

⁴¹ Eoin Quill, "Decarbonising Cement in Albania, Bosnia and Herzegovina and Serbia," Climate Analytics, 2025, <https://ca1-clm.edcdn.com/publications/Decarbonising-cement-in-Albania-Bosnia-and-Herzegovina-and-Serbia.pdf?v=1766029391>.

with those products.⁴² For detailed, sector-specific guidance, see the European Commission's [CBAM guidance document](#) for aluminium.⁴³

The Commission allocates default values to each product for most countries. That price will gradually scale up until 2034, when the full carbon cost is reached. Both BiH and Serbia have been assigned specific default values for aluminium products, though Albania has not. These are outlined in Table 1 below.

Aluminium products subject to CBAM and their default values for Albania, Bosnia & Herzegovina, and Serbia

Product type	Position in value chain	CN	Albania (default values, tCO ₂ e/t)	Bosnia & Herzegovina (default values, tCO ₂ e/t)	Serbia (default values, tCO ₂ e/t)
Unwrought aluminium	Upstream	7601	-	1.7	0.36
Powders and flakes	Upstream / semi-finished	7603	-	3.28	1.51
Bars, rods, profiles	Semi-finished	7604	-	3.06	2.24
Wire	Semi-finished	7605	-	3.7	2.24
Plates, sheets, strip	Semi-finished	7606	-	4.53	3.69
Foil	Semi-finished	7607	-	4.53	3.69
Tubes and pipes	Semi-finished	7608	-	3.72	2.27
Tube and pipe fittings	Semi-finished	7609 00 00	-	3.72	2.27
Structures and parts of structures	Downstream fabricated	7610	-	3.72	2.27
Reservoirs, tanks, vats, and similar containers	Downstream fabricated	7611 00 00	-	4.53	3.69
Casks, drums, cans, boxes, and similar containers	Downstream fabricated	7612	-	4.53	1.54
Containers for compressed or liquefied gas	Downstream fabricated	7613 00 00	-	4.53	3.69

⁴² European Commission, "Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 Establishing a Carbon Border Adjustment Mechanism (Text with EEA Relevance)."

⁴³ European Commission, "Guidance Document 5e: Sector-Specific Guidance Document on Aluminium," 2026, https://taxation-customs.ec.europa.eu/document/download/590e983b-c937-41ea-bb9f-810c29e70e1e_en?filename=Guidance%20No.%205e%20-%20Sector-specific%20guidance%20document%20on%20aluminium.pdf.

Stranded wire, cables, plaited bands	Downstream fabricated	7614	-	3.7	2.24
Other aluminium articles	Downstream fabricated	7616	-	3.28	1.51

Table 1: Aluminium products subject to CBAM, including their stage in the value chain, CN code, and default values.⁴⁴

National contexts

Albania

Albania's exports are concentrated in unwrought aluminium, extrusions, structural products. and some foil/tube products. Those subject to CBAM are shown below in Table 2. Albania does not have alumina refining capacity and does not smelt primary aluminium.⁴⁵ Albania's unwrought aluminium products are produced from recycled scrap and therefore count as recycled aluminium under CBAM. Much of this is post-consumer scrap produced domestically, though pre-consumer scrap is also imported, which will probably be subject to CBAM in the coming years (see the section 'Implications of CBAM for aluminium exporters' for more on how CBAM impacts aluminium products).

According to Albania's National Environmental Agency, eight companies held licenses to process aluminium scrap in 2024 (i.e. the collection, transportation, and processing of scrap generated within Albania).⁴⁶ Out of these eight companies, five export the scrap abroad, mainly to EU markets. The largest of these is ZODIAC, an aluminium foundry in Tirana that turns recovered metal into premium, certified aluminium products for industry across Europe.⁴⁷ As an exporter of aluminium products to EU-based customers (particularly ingots, billets, and slabs), ZODIAC is actively engaged in CBAM compliance through emissions monitoring, energy efficiency measures, and the use of renewable energy.

Albania's CBAM-relevant aluminium exports are concentrated in unwrought aluminium

Product description	CN Code	Estimated exports to the EU (kt)	Trade value (1000 USD)
Aluminium: unwrought	7601	19.55	59,117

⁴⁴ European Commission, "Guidance Document 5e: Sector-Specific Guidance Document on Aluminium."

⁴⁵ Republic of Albania, *Albania. 2024 National Inventory Report* (National Environmental Agency, 2025), <https://unfccc.int/documents/645244>.

⁴⁶ Agjencia Kombëtare e Mjedisit, "Baza e Të Dhënave Për Licencat III.2.B, Janar-Maj 2024 [License Database III.2.B, January-May 2024]," 2024, https://akm.gov.al/ova_doc/baza-e-te-dhenave-per-licencat-iii-2-b-periudha-janar-2024-maj-2024/.

⁴⁷ ZODIAC sh.p.k., "Environmental & Sustainability Commitments," 2026, <https://zodiac.al/docs/Sustainability-Commitments.pdf>.

Aluminium: bars, rods, profiles	7604	4.2	19,541
Aluminium: structures and parts of structures	7610	2.43	18,854
Aluminium: other	7603; 7605-7608; 760900; 7612; 761300; 7616	0.6	3,000
All CBAM-relevant aluminium exports	-	26.78	100,512

Table 1: Albania's CBAM-relevant aluminium exports. More aluminium products will probably be added in 2028. Additionally, while these exports fall under CBAM, the share of secondary aluminium dictates whether a CBAM charge applies in practice.⁴⁸

Bosnia and Herzegovina

BiH exported roughly USD 451 million worth of CBAM-covered aluminium products in 2025, USD 400 million of which went to the EU.⁴⁹ Primary production of aluminium produced 651.1 ktCO₂e of emissions in 2022, accounting for 2.3% of overall emissions.⁵⁰ The average emissions intensity of BiH's aluminium products varies significantly due to the variety of products and production processes – official default values given for CBAM accounting range from 1.70-4.53 tCO₂e/t.⁵¹ The highest-emissions CBAM exposure is concentrated in unwrought aluminium (CN 7601) because primary aluminium production is far more carbon-intensive than downstream fabrication.

While most aluminium production is concentrated in structures, unwrought aluminium could have higher CBAM exposure due to embedded emissions

Product description	CN code	Estimated exports to the EU (kt)	Trade value (1000 USD)
Aluminium: structures (excluding prefabricated buildings of heading no. 9406) and parts (e.g. bridges and sections, towers, lattice masts, etc) plates, rods, profiles, and tubes for structures	7610	12.3	129,794
Aluminium: bars, rods, and profiles	7604	24.7	118,854
Aluminium: unwrought	7601	38.6	117,093
Aluminium: articles n.e.c. in chapter 76	7616	2.2	28,105

⁴⁸ UN, "UN Comtrade Database," 2026, <https://comtradeplus.un.org/>.

⁴⁹ UN, "UN Comtrade Database."

⁵⁰ Bosnia and Herzegovina, "2024 National Inventory Document (NID)," 2026, <https://unfccc.int/documents/660093>.

⁵¹ Commission Implementing Regulation (EU) 2026/1740 of 20 July 2026 Correcting Implementing Regulation (EU) 2025/2621 as Regards Annexes I and IV Thereto (2026), http://data.europa.eu/eli/reg_impl/2026/1740/oj.

Aluminium: other	7605-7608; 760900; 761100-7614	0.3	2508
All CBAM-relevant aluminium exports	-	78.1	396,310

Table 3: Bosnia and Herzegovina's CBAM-relevant aluminium exports. More aluminium products will likely be added in 2028. Additionally, while these exports fall under CBAM, the share of secondary aluminium dictates whether a CBAM charge applies in practice.⁵²

Aluminij Mostar is one of the most significant companies in the aluminium market and, as of 2022, is the largest exporter in BiH.⁵³ Situated just outside Mostar, it produces billets, slabs, ingots, and other products with either primary or recycled materials. The company has also developed a set of 'CBAM-ready' products, with lower carbon content and documentation aligned with EU standards. It has an annual production capacity of more than 200,000 Mt and is owned primarily by the Israeli M.T. Abraham Group (95%) and Austria-based Hammerer Aluminium Industries (5%).⁵⁴ In 2024, it reported 18.7 MtCO₂e of total scope 1 and 2 emissions, with an average emissions intensity of 0.34 tCO₂e/t.⁵⁵ Aluminij Mostar sources electricity directly from the national grid in BiH, as well as through direct combustion of petrol and fossil gas. In 2023, the company signed an agreement with Glencore and Duefro to develop a low-carbon renewable product supported by on-site solar PV, with plans to expand electricity production through further solar developments.⁵⁶ At the same time, the company continues to expand its consumption of fossil fuels to support its primary aluminium smelting operation. In early 2026, M.T. Abraham group signed a memorandum of understanding for a 20-year supply of liquefied natural gas from the United States, to feed a planned gas power plant.⁵⁷

Serbia

Serbia exported roughly USD 500 million worth of total aluminium products to the EU in 2025 (CBAM and non-CBAM).⁵⁸ As Serbia does not have any primary aluminium smelting facilities, overall emissions from the sector are not reported in national inventories. The average emissions intensity of Serbia's aluminium products varies significantly due to the variety of products and production processes – official default values given for CBAM accounting range from 1.51-2.27 tCO₂e/t.⁵⁹

⁵² UN, "UN Comtrade Database."

⁵³ "About - Aluminij," 2026, <https://aluminij.com/about/>.

⁵⁴ "About - Aluminij."

⁵⁵ Aluminij, *Sustainability Report 2024* (2025), <https://aluminij.com/v2/wp-content/uploads/2026/03/SUSTAINABILITY-REPORT-2024.pdf>.

⁵⁶ Daria Sito-sucic, "Israeli-Owned Aluminij to Sign Green Deals Worth \$141 Million with Glencore, Duferco," Middle East, *Reuters*, May 4, 2023, <https://www.reuters.com/business/sustainable-business/israeli-owned-aluminij-sign-green-deals-worth-141-mln-with-glencore-duferco-2023-05-04/>.

⁵⁷ Aluminij, "M.T. Abraham Group Signs MOU for Long-Term U.S. LNG Supply," 2026, <https://aluminij.com/m-t-abraham-group-signs-mou-for-long-term-u-s-lng-supply/>.

⁵⁸ UN, "UN Comtrade Database."

⁵⁹ Commission Implementing Regulation (EU) 2026/1740 of 20 July 2026 Correcting Implementing Regulation (EU) 2025/2621 as Regards Annexes I and IV Thereto.

Founded in 1975, the Impol Seval Aluminium Mill in Sevojno is the largest aluminium processor in Serbia and the only rolling mill (manufacturer of rolled products).⁶⁰ It produced 47,580 tonnes of products in 2025, with total scope 1 emissions of roughly 72 ktCO₂e. Scope 1 emissions come almost entirely from the combustion of fossil fuels, while scope 2 emissions are driven primarily by the highly carbon-intensive electricity coming from Serbia's grid. Impol reports an emissions intensity of 0.594 tCO₂e/t for 2025.

Of the three countries in this study, Serbia has the broadest downstream aluminium export base, with multiple companies⁶¹ producing semi-fabricated and finished downstream products like automotive and construction components (e.g. window frames, facades), profiles, and structures (like sunshades). This means that Serbia's aluminium sector under CBAM is likely to be one of the most impacted by the emissions intensity of inputs, particularly precursor materials and power. Due to Serbia's emissions-intensive power system, firms can effectively influence embedded emissions through the use of recycled content.

Serbia's aluminium exports to the EU are concentrated in aluminium plates and sheets, but a variety of products are exported

Product description	CN code	Estimated exports to the EU (kt)	Trade value (1000 USD)
Aluminium: plates, sheets and strip, thickness exceeding 0.2mm	7606	43.24	168,000
Aluminium: casks, drums, cans, boxes etc (including rigid, collapsible tubular containers), for materials other than compressed liquefied gas, 300l capacity or less, lined, heat-insulated or not	7612	10.53	88,867
Aluminium: articles n.e.c. in chapter 76	7616	8.18	70,077
Aluminium: structures (excluding prefabricated buildings of heading no. 9406) and parts (e.g. bridges and sections, towers, lattice masts, etc) plates, rods, profiles, and tubes for structures	7610	4.99	49,837
Aluminium: bars, rods, and profiles	7604	9.79	46,729
Aluminium: unwrought	7601	6.18	17,275
Aluminium: tubes and pipes	7608	2.26	11,212
Aluminium: other	7605; 7607-760900; 761100; 761300; 7614	4.66	34,322

⁶⁰ Impol, "Annual Report 2025," 2025, <https://www.impol.com/app/uploads/2026/04/EN-Impol-Annual-report-2025-WEB.pdf>.

⁶¹ Like Aluminium Systems and Constructions (ASC), Alumil (also in Albania and Bosnia and Herzegovina)

All CBAM-relevant aluminium exports	-	89.83	486,319
-------------------------------------	---	-------	---------

Table 2: Serbia's CBAM-relevant aluminium exports. More aluminium products will likely be added in 2028. Additionally, while these exports fall under CBAM, the share of secondary aluminium dictates whether a CBAM charge applies in practice.⁶²

Good practices

Technical pathways to low-carbon aluminium

The technological pathways to develop a decarbonised aluminium sector are varied, but are likely to mirror those in other metallurgic industries: ensuring a reliable supply of renewable energy, introducing lower carbon technologies in high-heat processes, and boosting the role of recycled materials. A number of decarbonisation opportunities are being looked at, with decarbonised energy, recycling, and efficiency optimisation being actively implemented. Use of hydrogen and direct electrification of specific processes are currently in the demonstration stage, while emerging technologies such as inert anodes, innovative alloys, and improvements in spectroscopy for alloy identification in recycling are still in the research and development phase.

Options for primary and secondary production

Integrating renewable energy

Decarbonising indirect emissions from energy use (up to 55% of total sector emissions globally) is a key step to support development of a low carbon aluminium sector.⁶³ Smelting requires high amounts of continuous energy and firms that have sought to decarbonise their energy use have typically secured power purchase agreements (PPAs) with renewable energy providers.⁶⁴ Integrating on-site renewables supported by batteries has been trialled globally and can be an alternative route to integrating renewable energy into aluminium production.⁶⁵ With both options, integrating renewable energy in aluminium production relies heavily on system flexibility, availability of renewable energy in the region, potential flexibility of the smelter to adjust power demand to match shifts in renewable energy supply, and cost.

⁶² UN, "UN Comtrade Database."

⁶³ IRENA, *Reaching Zero with Renewables: Aluminium Industry*.

⁶⁴ RioTinto, "Rio Tinto, Queensland and Commonwealth Secure Long-Term Future for Boyne Aluminium Smelter at Gladstone," March 25, 2026, <https://www.riotinto.com/en/news/releases/2026/rio-tinto-queensland-and-commonwealth-secure-long-term-future-for-boyne-aluminium-smelter-at-gladstone>; Andreas, "Alcoa Signs Another PPA Deal in Norway," *WindEurope*, July 4, 2018, <https://windeurope.org/news/alcoa-signs-another-ppa-deal-in-norway/>.

⁶⁵ Cellnex, *Cellnex Successfully Tests New Renewable Energy Sources at Its Sites*, Sustainability, November 28, 2022, <https://www.cellnex.com/news/cellnex-tests-new-renewable-energy-sources-sites/>; "Hydro Sweden Generates Renewable Energy on Site," Text, *International Aluminium Journal*, June 10, 2024, <https://www.aluminium-journal.com/hydro-sweden-generates-renewable-energy-on-site>.

The cost of electricity is likely to become an increasingly significant factor for aluminium producers at the same time renewables are cheaper than conventional generation and the ongoing energy crisis is causing significant volatility in fossil fuel markets.⁶⁶ The levelised cost of electricity (LCOE) for renewables has dropped significantly, with the global LCOE for solar PV reaching 0.043 USD/kWh in 2024 compared to 0.073 USD/kWh for coal and 0.085 USD/kWh for fossil gas. Further regulatory steps in the Western Balkans, including implementing carbon pricing, de-risking renewables projects, and power market reform, could drop the LCOE of renewables even further.⁶⁷ The cost competitiveness of renewables, especially given the ongoing energy crisis due to the US-Israel war on Iran, may make it more economically viable in locations with large renewable potential.

Technology for efficiency

Process efficiency gains in both primary and secondary aluminium production over the last two decades have seen a fall in energy consumption of 24% for refining and 8% for smelting. Integration of digital monitoring technologies for smelters and potentially integrating AI for predictive analytics and energy management could offer up to a further 10% energy savings.⁶⁸ In secondary production, remelting furnaces with improved insulation can reduce heat loss and the overall amount of energy required.⁶⁹ For rolling, side-loaded pusher furnaces have a reduced door surface area and have energy savings of around 5% versus conventional furnaces.

Hydrogen

Switching fuel-to hydrogen is in the demonstration stage but is expected to play an increasing role in decarbonising high-heat processes, particularly as global hydrogen production and supply chains mature. Test cases show that emissions from melting furnaces can be reduced by 100% by using green hydrogen instead of standard air-fuel burners, using 27% less fuel.⁷⁰ In 2023, Hydro tested green hydrogen as a fossil gas replacement in its aluminium recycling plant in Navarra, Spain and are using green hydrogen in a casting plant in Norway, following a 3-year pilot project. The company is also integrating hydrogen production into its own processes, utilising renewable energy.

Hydrogen could be bidirectional in the aluminium sector, as aluminium can be used to produce hydrogen through a chemical reaction with water. Recycled aluminium can be used to reduce emissions from hydrogen production itself, with test cases in the Baltics converting waste aluminium into hydrogen and then converting waste products using carbon-free electrolysis.⁷¹

⁶⁶ Daan Walter et al., *The Age of Power* (Ember, 2026), <https://ember-energy.org/latest-insights/the-age-of-power>.

⁶⁷ For more on the cost competitiveness of renewables and the power sector, see the first report in this series: [Decarbonising electricity in Albania, Bosnia and Herzegovina and Serbia](#)

⁶⁸ World Economic Forum and Accenture, *Scaling the Industrial Transition: Hard-to-Abate Sectors and Net-Zero Progress in 2025* (n.d.), accessed July 31, 2026, <https://www.weforum.org/publications/scaling-the-industrial-transition-hard-to-abate-sectors-and-net-zero-progress-in-2025/>.

⁶⁹ Dardor et al., "Decarbonizing the Aluminium Industry."

⁷⁰ Anand Makwana et al., "Decarbonisation of Secondary Aluminium Melting," *Aluminium International Today*, 2023, <https://aluminiumtoday.com/content-images/news/Air-Products.pdf>.

⁷¹ Camila Pfa Canales et al., "A General Overview of Waste Aluminum Role in the Production of Hydrogen," *International Journal of Hydrogen Energy* 225 (April 2026): 154526, <https://doi.org/10.1016/j.ijhydene.2026.154526>.

Electric or hydrogen boilers for refining

Electric boilers can play a key role in decarbonising high-heat processes in aluminium production. Steps in the Bayer process can occur at higher temperatures with mechanical vapour recompression (MVR) or lower temperatures with electric boilers. Both replace fossil fuels to generate steam. Although neither have yet been scaled commercially, trials continue and electric boilers and MVR are expected to reach commercial operation around 2030.⁷²

Inert anodes for smelting

In smelting, anodes are one of the major sources of direct CO₂, SO₂, and PFC emissions.⁷³ Inert anodes are typically made of ceramics or alloys that are not consumed during smelting and produce oxygen instead of CO₂. They are a commercially scalable alternative that can support decarbonisation. Elysis, a Canadian firm and joint venture between Alcoa and Rio Tinto, announced in late 2025 they had deployed an industrial-scale inert anode at an existing smelter in Canada, with plans to build a demonstration plant with a further 10 cells.⁷⁴ Theoretical analysis showed inert anodes could potentially raise the total energy used during the smelting process, however Elysis reports energy use has been within a “similar bracket of operation ranges” to traditional processes. Hydro has also been investigating the use of inert anodes for its operations at the HalZero plant in Norway, finding similar levels of power consumption as traditional processes. It is planning for a pilot facility towards the end of the 2020s.⁷⁵

Technical pathways for secondary production

Replacing primary aluminium with secondary aluminium is the most effective strategy to decarbonise the supply chain. Recycled aluminium requires 95% less energy than primary aluminium and quality does not decrease.⁷⁶ Expansion of the secondary production industry within the Western Balkans could take advantage of these opportunities to support low-carbon industry growth.

The core issue is collection of pre- and post-consumer scrap for recycling. Improved circular economy policies can increase a country’s resource productivity, which measures the economic value of a natural resource per kilogram consumed. In the Western Balkans, resource productivity is around 0.35 euro/kg, well below the EU average of 2.07 euro/kg.⁷⁷

⁷² “Reducing Carbon Emissions with Electric Boilers,” Text, International Aluminium Journal, Schlütersche Fachmedien GmbH, 2025, <https://aluminium-journal.com/reducing-carbon-emissions-with-electric-boilers>.

⁷³ Ian Wells, “The Role of Inert Anodes in Aluminum Decarbonization,” NRDC, August 10, 2023, <https://www.nrdc.org/bio/ian-wells/role-inert-anodes-aluminum-decarbonization>.

⁷⁴ Maria Gallucci, “Aluminum Giants Hit Major Milestone with Low-Carbon Production,” Canary Media, November 25, 2025, <https://www.canarymedia.com/articles/clean-aluminum/alcoa-riotinto-hit-low-carbon-production-milestone>.

⁷⁵ Hydro, “HalZero Process,” accessed August 26, 2026, <https://www.hydro.com/en/global/sustainability/our-roadmap-to-net-zero-emissions-in-aluminium-production/halzero-zero-emission-electrolysis-from-hydro/>.

⁷⁶ RA Recycle Service, “Why Secondary Aluminium Is the Future of Lightweighting,” 2026, <https://www.rarecycleservice.com/blog/why-secondary-aluminium-is-the-future/>.

⁷⁷ Drini Nushi et al., “Adapting to the EU Waste Framework Directive and Extended Producer Responsibility,” Federal Ministry for Economic Cooperation and Development, 2025, <https://www.wb6cif.eu/wp-content/uploads/2025/07/1.-Publication-Adapting-to-WFD-EPR.pdf>.

Spectroscopy and other technologies for sorting

One of the key technical challenges to recycling aluminium is identification and sorting of increasingly complex and varied alloys. While some of this can be addressed through policy intervention such as product passports and labelling requirements, on a more technical level improved integration of spectroscopy in sorting processes can help secondary aluminium producers identify and process different alloys, reducing the level of contamination in end products. Since 2023, integration of laser induced breakdown spectroscopy (LBIS) systems have significantly improved sorting processes by increasing the speed and precision of analysis.⁷⁸

There are potential applications for AI, which could support computer scrap sorting systems, these require training and datasets to successfully identify and sort scrap.⁷⁹ Integrating AI into spectroscopy can help sensors identify overlapped objects and quickly process large numbers of images to sort recyclables and filter out waste.

Innovation in alloys

Innovative alloys (often called crossover or uni-alloys) can help address contamination, a key issue for use of recycled aluminium. High-performance aluminium and alloys, like those used in auto manufacturing, often have a low tolerance for contamination and, therefore, often use lower levels of recycled aluminium.⁸⁰ Innovative alloys have a higher tolerance for impurities from potentially contaminated scrap while achieving the same performance and can therefore be used for a wider range of applications.

Improving the policy environment

As well as encouraging producers and processors to relocate to the Western Balkans, decarbonising the aluminium supply chain involves a suite of policies that incentivise decarbonisation and stimulate demand for low-carbon aluminium. Rather than reinventing the wheel, policymakers can look towards Europe for tried and tested policy tools that derisk investment, increase available revenue to finance decarbonisation of heavy industry, and increase the availability of secondary aluminium.

Carbon pricing

The introduction of CBAM means the incentive to introduce some form of carbon pricing in the Western Balkans has never been greater. If a carbon price exists in the country where a good is produced, then that price is deducted from the CBAM charge when the good enters the EU. National governments are left with a straightforward choice: price carbon within their own borders and retain the revenues, or pay those revenues to the EU when goods are exported there.

⁷⁸ Tom Jansen, "AI-Powered Aluminium Sorting for High-Purity Circularity," Tomra, 2026, <https://www.tomra.com/waste-metal-recycling/media-center/news/2026/achieving-high-purity-aluminium-circularity-through-precision-ai-sorting>.

⁷⁹ Pragati B. Gedam et al., "Development of AI Based Computer Vision Scrap Sorting System for Aluminium Alloy Scrap," *2025 International Conference on Innovative Trends in Information Technology (ICITIIT)*, February 2025, 1–8, <https://doi.org/10.1109/ICITIIT64777.2025.11041574>.

⁸⁰ IRENA, *Reaching Zero with Renewables: Aluminium Industry*.

As signatories to the Energy Community Treaty, all three countries have committed to introduce some form of carbon pricing as part of their efforts to adopt EU laws and obligations. The Energy Community has assessed four potential carbon pricing mechanisms that can be implemented in the Western Balkans. These include:⁸¹

- 1) **A market emissions trading system (ETS):** Otherwise known as a cap-and-trade system, this was first introduced in the EU and remains a cornerstone of the bloc's decarbonisation efforts. A maximum cap on emissions is set, and that cap is then converted into allowances that firms can either buy from the government or trade amongst themselves. In the case of trading, companies that emit less than they are allocated can sell their surplus allowances to companies that exceed their cap. The price of an allowance is determined by supply and demand.
- 2) **A fixed price ETS:** Although structured like a standard ETS (i.e. allowances are issued and sold), the government sets a fixed price rather than allowing market dynamics to determine the price. This is helpful if a government wants to reach parity with the EU ETS in the near term.
- 3) **A carbon tax:** This serves as flat tax on carbon, providing certainty around the price while being less administratively demanding than an ETS. This system was introduced in Serbia in the beginning of 2026 at €4 per t/CO₂e. The price will gradually be increased until it reaches parity with the EU ETS in 2034.
- 4) **Integration to the EU ETS:** Instead of establishing a national carbon pricing regime, there is the possibility of integrating directly with the EU ETS. This would involve transposing all relevant EU legislation, which in reality would delay the introduction of a carbon price. As Western Balkan governments proceed with the accession process, however, full integration becomes more likely.

Monitoring, reporting, verification and accreditation

A necessary precondition for successful emissions reporting is a monitoring, reporting, verification, and accreditation system, or MRVA system. Given any Western Balkan company that exports over 50 tonnes of their product to the EU must declare their emissions, they must either monitor their own emissions or pay the default CBAM value. As the default value is generally higher than what a company would pay if it tracked its own emissions, there is a clear incentive to establish an MRVA system.

While it is possible for a company to establish its own MRV system, and indeed there are many examples where this has been done, it is a complex process.⁸² As a result, companies can also employ third party consultants to calculate their emissions for them. Independent auditors then certify the validity of the emissions reporting.

⁸¹ Energy Community, "EU Assessment Highlights Carbon Pricing Options to Accelerate EU Integration and the Energy Transition in the Energy Community," 2025, <https://www.energy-community.org/news/Energy-Community-News/2025/01/14.html>.

⁸² Zahra Awan, "EGA Implements Digital Greenhouse Gas Emissions Tracking System to Enhance Transparency and Accelerate Decarbonisation," *Aluminium International Today*, 2024, <https://aluminiumtoday.com/news/ega-implements-digital-greenhouse-gas-emissions-tracking-system-to-enhance-transparency-and-accelerate-decarbonisation>; Rio Tinto, "Rio Tinto Launches START: The First Sustainability Label for Aluminium Using Blockchain Technology," 2021, <https://www.riotinto.com/en/news/releases/2021/rio-tinto-launches-start-the-first-sustainability-label-for-aluminium-using-blockchain-technology>.

Subsidies

Subsidies are inherently connected to carbon pricing, with one feeding into the other. Revenues collected from pricing carbon can then be used to support decarbonising heavy industry. This has already been integrated into Serbian legislation, with the proceeds from its carbon tax being directed towards emissions reduction or energy efficiency measures.⁸³ A Western Balkan-style subsidy model can apply learning lessons from the EU, where ETS revenue is channelled through the Innovation Fund, which funds low carbon technologies. Through Innovation Fund subsidies, capital costs are eased for companies to roll out innovative technologies. Many of these technologies are cutting edge, helping to de-risk R&D and pilot projects as new technologies are scaled up.

A Western Balkan-style subsidy model can apply learning lessons from the EU model by funding proven technologies. As individual Western Balkan countries will inevitably have a smaller funding pool than the Innovation Fund, subsidies can instead be directed towards technologies with a proven success rate. As a result, subsidies are directed towards easing capital costs for already proven technologies.

There is an inherent feedback loop associated with decarbonising the aluminium industry, as low carbon production methods carry savings over the medium-to long-term due to lower operating costs. Upfront cost of capital remains the key barrier. By pricing carbon appropriately and directing that revenue towards low carbon technologies, transitioning to low carbon production becomes more financially viable for companies. The lower operating costs that come with low carbon technologies then provide cost savings over the medium- to long-term, increasing a company's competitiveness, particularly when exporting internationally.

Green public procurement

Through their large purchasing power, governments hold the key to decarbonising the aluminium supply chain. Integrating green public procurement into the government's contracting process, particularly for major infrastructure projects, is a critical demand-side measure to incentivise low-carbon production.

For a company to go through the logistical challenge of changing their production method, there must be a financial incentive. A favourable policy environment can stimulate demand for low-carbon aluminium, thereby increasing the economic rationale of decarbonisation. By giving low-carbon producers an advantage in the tendering process, companies are provided with an immediate incentive to reduce their emissions.

A successful example of this is the CO₂ performance ladder (CO₂PL), which originated in the Netherlands and has since been replicated in numerous countries. There are three steps in the CO₂PL. Depending on a company's level of decarbonisation, it is placed on a level between 1-3, with the third step representing the deepest decarbonisation.⁸⁴ Companies are then allocated a

⁸³ Igor Todorović, "Serbia Rolls out Decrees on Decarbonization Incentives, Tax Credits," *Balkan Green Energy News*, 2026, <https://balkangreenenergynews.com/serbia-rolls-out-decrees-on-decarbonization-incentives-tax-credits/>.

⁸⁴ Stichting Klimaatvriendelijk Aanbesteden en Ondernemen, "Procurement Guide 4.0: Co2 Performance Ladder 4.0 Award Criterion," 2025, <https://www.co2performanceladder.com/blog/applying-the-co2-performance-ladder-4-0-award-criterion-in-four-steps/>.

fictitious discount that allows them to be more competitive in a tender. An illustrative example of how this would work can be seen in Table 5 below.

How the CO2PL is integrated into a tender evaluation

Company	Bidding price	CO2PL ambition level	CO2PL award advantage	Fictitious price when evaluating bids	Awarding of contract and final price
A	€ 500,000	No CO2PL ambition level	0%	€ 500,000	
B	€ 540,000	Step 1	5%	€ 513,000	
C	€ 515,000	Step 2	10%	€ 463,500	
D	€ 520,000	Step 3	15%	€ 442,000	Wins contract & receives €520,000

Table 5: Example of an evaluation process for a public tender which factors in the CO2PL, assuming different companies are on different steps on the CO2PL.

The CO2PL not only evaluates a company's internal operations, but also its broader supply chain. As aluminium-related emissions predominantly stem from electricity generation, an aluminium smelter that purchases low carbon electricity from the grid has a major advantage during a tender evaluation. This also applies to a downstream processor that sources their aluminium from a smelter with a renewable energy PPA. From a regulatory point of view, this hits two birds with the one stone: aluminium smelters consume such large quantities of electricity that a PPA provides major financial support for broader decarbonisation of the grid.

The CO2PL also offers producers of secondary aluminium a competitive advantage. This presents even greater mitigation potential, allowing innovative companies to be more competitive in the tender process.

Extended producer responsibility

Improved waste management policies can ensure aluminium scrap is reused, rather than being sent to landfill. For instance, extended producer responsibility (EPR) schemes place responsibility for end-of-life management of a product on the producer, including collection, recycling, and final disposal.⁸⁵ If a product is exported, EPR would no longer apply to the Western Balkan producer and instead fall on the company that puts the product on the market, assuming EPR legislation exists there.

All three countries have some EPR legislation, though it is not yet fully functioning:

Albania: Law No. 74/2025 aligns domestic legislation with the EU's and comes into effect in December 2026. The law serves as highly transferable legislation to other countries with low recycling rates.⁸⁶

⁸⁵ Nushi et al., "Adapting to the EU Waste Framework Directive and Extended Producer Responsibility."

⁸⁶ Interreg Europe, "Implementing Extended Producer Responsibility (EPR) for Waste-Producing Products in Albania," European Union, 2026, <https://www.interregeurope.eu/good-practices/implementing-extended-producer-responsibility-epr-for-waste-producing-products-in-albania>.

BiH: EPR legislation does exist, though it is fragmented and not fully enforced.⁸⁷

Serbia: Decent EPR legislation exists in Serbia, which institutes reporting and recycling requirements as well as paying applicable fees where appropriate. However, enforcement is weak and recycling rates remain well below government targets.⁸⁸ Ultimately, enforcing current legislation while increasing the general policy framework to match EU standards can significantly improve current resource productivity.

Conclusions

The structure of the aluminium industry varies across Albania, BiH, and Serbia, meaning CBAM's impacts also vary. BiH exports the most aluminium products to the EU and is the only one of the three countries that has primary smelting capacity, making its aluminium sector the most exposed to CBAM. Due to the carbon intensive nature of BiH's aluminium sector, it is assigned high default values under CBAM. Instituting effective emissions accounting will be critical for companies to avoid paying the highest CBAM charges.

Serbia's aluminium industry is defined by downstream production rather than primary smelting. Many of these downstream products are exported to the EU, making Serbia's aluminium industry especially sensitive to the emissions intensity of precursor materials. Sourcing low carbon aluminium to produce its finished products will be a critical way to ensure Serbia's downstream manufacturers are in a strong competitive position when exporting to the EU.

Albania is the least exposed of the three countries to CBAM. High use of secondary aluminium is a structural advantage under CBAM. Albania's other advantage – its low carbon power grid – further ensures that much of the Scope 2 emissions from electricity use are avoided. However, while this gives Albanian industry an edge in other sectors, CBAM does not price Scope 2 emissions for aluminium and therefore electricity emissions are less relevant.

Ultimately, policymakers must tailor their domestic regulatory environments to ensure their respective aluminium industries are in a strong a place as possible to maintain exports to the EU. A range of options exist to facilitate emissions reductions across the supply chain while stimulating demand for low carbon products.

A functional MRVA system is a necessity to avoid the highest CBAM values. In conjunction, domestic carbon pricing systems can ensure that revenue stays within each country rather than being lost to the EU. This money can then be directed to manufacturers as subsidies, helping to ease the upfront cost of transitioning to lower carbon production methods.

Demand for low carbon aluminium can be stimulated through strong green public procurement policies such as the CO2PL, leveraging public infrastructure projects to guarantee buyers of low

⁸⁷ Nushi et al., "Adapting to the EU Waste Framework Directive and Extended Producer Responsibility."

⁸⁸ Nushi et al., "Adapting to the EU Waste Framework Directive and Extended Producer Responsibility."

carbon aluminium. This will allow companies to scale up their use, achieving cost savings that can be translated into higher exports to the European market.

On the company level, producers should seek to integrate scrap into their production processes. Increasing scrap use is one of the most effective ways to reduce the carbon intensity of current production processes. Additionally, finding opportunities to integrate renewable energy either onsite or through power purchase agreements can help firms reduce both the carbon content of their products and the cost of electricity to make those products. This is an increasingly critical step as fossil fuel markets remain highly volatile. Process efficiency improvements can play a key role in reducing energy use, costs, and carbon footprints.

Through an improved regulatory environment that incentivises low-carbon production, the Western Balkan aluminium industry has a credible pathway towards substantial emissions reductions while continuing to supply a material that is indispensable to the global energy transition.

References

- “About - Aluminij.” 2026. <https://aluminij.com/about/>.
- Agjencia Kombëtare e Mjedisit. “Baza e Të Dhënave Për Licencat III.2.B, Janar-Maj 2024 [License Database III.2.B, January-May 2024].” 2024. https://akm.gov.al/ova_doc/baza-e-te-dhenave-per-licencat-iii-2-b-periudha-janar-2024-maj-2024/.
- Alamdari, Houshang. “Aluminium Production Process: Challenges and Opportunities.” *Metals* 7, no. 4 (2017): 133. <https://doi.org/10.3390/met7040133>.
- Aluminij. “M.T. Abraham Group Signs MOU for Long-Term U.S. LNG Supply.” 2026. <https://aluminij.com/m-t-abraham-group-signs-mou-for-long-term-u-s-lng-supply/>.
- Aluminij. *Sustainability Report 2024*. 2025. <https://aluminij.com/v2/wp-content/uploads/2026/03/SUSTAINABILITY-REPORT-2024.pdf>.
- Andreas. “Alcoa Signs Another PPA Deal in Norway.” *WindEurope*, July 4, 2018. <https://windeurope.org/news/alcoa-signs-another-ppa-deal-in-norway/>.
- Asuene. *What Is the CBAM Downstream Expansion and What Do Importers Need to Do Before 2028?* 2026. <https://asuene.com/us/blog/what-is-the-cbam-downstream-expansion-and-what-do-importers-need-to-do-before-2028>.
- Bosnia and Herzegovina. “2024 National Inventory Document (NID).” 2026. <https://unfccc.int/documents/660093>.
- Canales, Camila Pía, Christiaan P. Richter, Darius Milcius, et al. “A General Overview of Waste Aluminum Role in the Production of Hydrogen.” *International Journal of Hydrogen Energy* 225 (April 2026): 154526. <https://doi.org/10.1016/j.ijhydene.2026.154526>.
- CBAM Guide. “CBAM Compliance for Aluminium Importers: Annex II Rules Explained.” 2026. <https://cbamguide.com/importers/aluminium/>.
- Cellnex. *Cellnex Successfully Tests New Renewable Energy Sources at Its Sites*. Sustainability. November 28, 2022. <https://www.cellnex.com/news/cellnex-tests-new-renewable-energy-sources-sites/>.
- Commission Implementing Regulation (EU) 2026/1740 of 20 July 2026 Correcting Implementing Regulation (EU) 2025/2621 as Regards Annexes I and IV Thereto (2026). http://data.europa.eu/eli/reg_impl/2026/1740/oj.
- CRU Consulting. *Opportunities for Aluminium in a Post-Covid Economy*. Nos. ST2342-21. CRU International Limited, 2022. <https://international-aluminium.org/wp->

content/uploads/2022/03/CRU-Opportunities-for-aluminium-in-a-post-Covid-economy-Report.pdf.

Dardor, Dareen, Daniel Flórez-Orrego, Reginald Germanier, Manuele Margni, and François Maréchal. “Decarbonizing the Aluminium Industry: A Comprehensive Review of Pathways and Process Integration Perspectives.” *Energy Strategy Reviews* 61 (September 2025): 101853. <https://doi.org/10.1016/j.esr.2025.101853>.

Energy Community. “EU Assessment Highlights Carbon Pricing Options to Accelerate EU Integration and the Energy Transition in the Energy Community.” 2025. <https://www.energy-community.org/news/Energy-Community-News/2025/01/14.html>.

Eoin Quill. “Decarbonising Cement in Albania, Bosnia and Herzegovina and Serbia.” Climate Analytics, 2025. <https://cal-clm.edcdn.com/publications/Decarbonising-cement-in-Albania-Bosnia-and-Herzegovina-and-Serbia.pdf?v=1766029391>.

Epilkhin, Ilya, Carlo Stella, Amer Hage Chahine, Peter Kaznacheev, and Artem Malkov. *Aluminium: The Path to Green*. Arthur D. Little, 2024. <https://www.adlittle.com/en/insights/viewpoints/aluminum-path-green>.

European Aluminium. “CBAM Scope Extension & Anti-Circumvention Measures.” European Aluminium, 2026. <https://european-aluminium.eu/wp-content/uploads/2026/03/2026-02-17-EA-Position-Paper-on-CBAM-Downstream-scope-extension.pdf>.

European Commission. “Carbon Leakage.” 2021. https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation/carbon-leakage_en.

European Commission. “Guidance Document 5e: Sector-Specific Guidance Document on Aluminium.” 2026. https://taxation-customs.ec.europa.eu/document/download/590e983b-c937-41ea-bb9f-810c29e70e1e_en?filename=Guidance%20No.%205e%20-%20Sector-specific%20guidance%20document%20on%20aluminium.pdf.

European Commission. “Officially Published: Simplifications for the Carbon Border Adjustment Mechanism (CBAM).” 2025. https://taxation-customs.ec.europa.eu/news/officially-published-simplifications-carbon-border-adjustment-mechanism-cbam-2025-10-20_en.

European Commission. “Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 Establishing a Carbon Border Adjustment Mechanism (Text with EEA Relevance).” May 10, 2023. <http://data.europa.eu/eli/reg/2023/956/oj/eng>.

- European Parliament. “Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024.” Document 32024R1252. April 11, 2024. <https://eur-lex.europa.eu/eli/reg/2024/1252>.
- Gallucci, Maria. “Aluminum Giants Hit Major Milestone with Low-Carbon Production.” Canary Media, November 25, 2025. <https://www.canarymedia.com/articles/clean-aluminum/alcoa-riotinto-hit-low-carbon-production-milestone>.
- Gedam, Pragati B., Atiya Khan, Neha Purohit, and V. K. Jha. “Development of AI Based Computer Vision Scrap Sorting System for Aluminium Alloy Scrap.” *2025 International Conference on Innovative Trends in Information Technology (ICITIIT)*, February 2025, 1–8. <https://doi.org/10.1109/ICITIIT64777.2025.11041574>.
- Hydro. “HalZero Process.” Accessed August 26, 2026. <https://www.hydro.com/en/global/sustainability/our-roadmap-to-net-zero-emissions-in-aluminium-production/halzero-zero-emission-electrolysis-from-hydro/>.
- Igor Todorović. “Serbia Rolls out Decrees on Decarbonization Incentives, Tax Credits.” *Balkan Green Energy News*, 2026. <https://balkangreenenergynews.com/serbia-rolls-out-decrees-on-decarbonization-incentives-tax-credits/>.
- Impol. “Annual Report 2025.” 2025. <https://www.impol.com/app/uploads/2026/04/EN-Impol-Annual-report-2025-WEB.pdf>.
- International Aluminium Institute. *Aluminium Sector Greenhouse Gas Pathways to 2050*. International Aluminium Institute, 2021. <https://international-aluminium.org/resources/aluminium-sector-greenhouse-gas-pathways-to-2050-2021/>.
- International Aluminium Journal. “Hydro Sweden Generates Renewable Energy on Site.” Text. June 10, 2024. <https://www.aluminium-journal.com/hydro-sweden-generates-renewable-energy-on-site>.
- Interreg Europe. “Implementing Extended Producer Responsibility (EPR) for Waste-Producing Products in Albania.” European Union, 2026. <https://www.interregeurope.eu/good-practices/implementing-extended-producer-responsibility-epr-for-waste-producing-products-in-albania>.
- IRENA. *Reaching Zero with Renewables: Aluminium Industry*. 2025. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2025/Apr/IRENA_TEC_Reaching_zero_with_renewables_aluminum_2025.pdf.
- Jansen, Tom. “AI-Powered Aluminium Sorting for High-Purity Circularity.” Tomra, 2026. <https://www.tomra.com/waste-metal-recycling/media->

center/news/2026/achieving-high-purity-aluminium-circularity-through-precision-ai-sorting.

Lambert Guilbault, Manon Esperandieu, Catherine Athenes, Ana Mingo, Jonathan Vanherberghen, and Ute Just. “CBAM’s Aluminium Scrap Loophole – An EU Circular Economy Cannot Be Built by Weakening the Industries That Sustain It.” *Carbon Pulse*, 2026. <https://carbon-pulse.com/501458/>.

“Low Carbon Aluminium Factsheet.” *International Aluminium Institute*, n.d. Accessed September 3, 2026. <https://international-aluminium.org/landing/low-carbon-aluminium-factsheet/>.

Makwana, Anand, Xiaoyi He, Russell Hewertson, and Martin Lawrence. “Decarbonisation of Secondary Aluminium Melting.” *Aluminium International Today*, 2023. <https://aluminiumtoday.com/content-images/news/Air-Products.pdf>.

Nushi, Drini, Erni Kocani, Dritan Gorica, et al. “Adapting to the EU Waste Framework Directive and Extended Producer Responsibility.” *Federal Ministry for Economic Cooperation and Development*, 2025. <https://www.wb6cif.eu/wp-content/uploads/2025/07/1.-Publication-Adapting-to-WFD-EPR.pdf>.

Peacock Tariff Accounting. “EU Widens CBAM.” 2026. <https://www.peacocktariffconsulting.com/eu-widens-cbam/>.

Quill, Eoin, Olivia Waterton, and Kim Coetzee. *Decarbonising Electricity in Albania, Bosnia and Herzegovina and Serbia*. Climate Analytics, 2025. <https://climateanalytics.org/publications/decarbonising-electricity-cement-iron-and-steel-and-chemicals-in-albania-bosnia-and-herzegovina-and-serbia>.

RA Recycle Service. “Why Secondary Aluminium Is the Future of Lightweighting.” 2026. <https://www.rarecycleservice.com/blog/why-secondary-aluminium-is-the-future/>.

Ratvik, Arne Petter, Roozbeh Mollaabbasi, and Houshang Alamdari. “Aluminium Production Process: From Hall–Héroult to Modern Smelters.” *ChemTexts* 8, no. 2 (2022): 10. <https://doi.org/10.1007/s40828-022-00162-5>.

Republic of Albania. *Albania. 2024 National Inventory Report*. National Environmental Agency, 2025. <https://unfccc.int/documents/645244>.

Rio Tinto. “Rio Tinto Launches START: The First Sustainability Label for Aluminium Using Blockchain Technology.” 2021. <https://www.riotinto.com/en/news/releases/2021/rio-tinto-launches-start-the-first-sustainability-label-for-aluminium-using-blockchain-technology>.

RioTinto. “Rio Tinto, Queensland and Commonwealth Secure Long-Term Future for Boyne Aluminium Smelter at Gladstone.” March 25, 2026. <https://www.riotinto.com/en/news/releases/2026/rio-tinto-queensland-and->

commonwealth-secure-long-term-future-for-boyne-aluminium-smelter-at-gladstone.

Schlütersche Fachmedien GmbH. “Reducing Carbon Emissions with Electric Boilers.” Text. *International Aluminium Journal*, 2025. <https://aluminium-journal.com/reducing-carbon-emissions-with-electric-boilers>.

Sito-sucic, Daria. “Israeli-Owned Aluminij to Sign Green Deals Worth \$141 Million with Glencore, Duferco.” *Middle East. Reuters*, May 4, 2023. <https://www.reuters.com/business/sustainable-business/israeli-owned-aluminij-sign-green-deals-worth-141-mln-with-glencore-duferco-2023-05-04/>.

Stichting Klimaatvriendelijk Aanbesteden en Ondernemen. “Procurement Guide 4.0: Co2 Performance Ladder 4.0 Award Criterion.” 2025. <https://www.co2performanceladder.com/blog/applying-the-co2-performance-ladder-4-0-award-criterion-in-four-steps/>.

Tan, Chang, Xiang Yu, Dan Li, Tianyang Lei, Qi Hao, and Dabo Guan. “Different Technology Packages for Aluminium Smelters Worldwide to Deliver the 1.5 °C Target.” *Nature Climate Change* 15, no. 1 (2025): 51–58. <https://doi.org/10.1038/s41558-024-02193-x>.

UN. “UN Comtrade Database.” 2026. <https://comtradeplus.un.org/>.

Walter, Daan, Sam Butler-Sloss, Kingsmill Bond, and Antoine Issac. *The Age of Power*. Ember, 2026. <https://ember-energy.org/latest-insights/the-age-of-power>.

Wells, Ian. “The Role of Inert Anodes in Aluminum Decarbonization.” NRDC, August 10, 2023. <https://www.nrdc.org/bio/ian-wells/role-inert-anodes-aluminum-decarbonization>.

World Economic Forum. “Aluminium | First Movers Coalition.” Accessed September 3, 2026. <https://initiatives.weforum.org/first-movers-coalition/aluminium>.

World Economic Forum and Accenture. *Scaling the Industrial Transition: Hard-to-Abate Sectors and Net-Zero Progress in 2025*. n.d. Accessed July 31, 2026. <https://www.weforum.org/publications/scaling-the-industrial-transition-hard-to-abate-sectors-and-net-zero-progress-in-2025/>.

Zahra Awan. “EGA Implements Digital Greenhouse Gas Emissions Tracking System to Enhance Transparency and Accelerate Decarbonisation.” *Aluminium International Today*, 2024. <https://aluminiumtoday.com/news/ega-implements-digital-greenhouse-gas-emissions-tracking-system-to-enhance-transparency-and-accelerate-decarbonisation>.

ZODIAC sh.p.k. “Environmental & Sustainability Commitments.” 2026. <https://zodiac.al/docs/Sustainability-Commitments.pdf>.

Zore, Lovro. *Decarbonisation Options for the Aluminium Industry*. No. JRC136525. Publications Office of the European Union, 2024. <https://doi.org/10.2760/880>.



www.climateanalytics.org