The EU Carbon Border Adjustment Mechanism and Indian Industry: Legal Design, Sectoral Impact and Policy Options

CA. Gagan Diwan
Suresh Gyan Vihar University (SGVU), Jaipur, India

***Abstract*—The European Union's Carbon Border Adjustment Mechanism (CBAM) entered its payment phase on 1 January 2026. Importers of iron and steel, aluminium, cement, fertilisers, hydrogen and electricity must now buy certificates priced in line with the EU Emissions Trading System. This article sets out how the mechanism works, how it treats exporters from every country, and what it means for Indian industry. It reads Regulation (EU) 2023/956, as amended in 2025, alongside public trade, emissions and price data, and builds a simple, transparent cost model for Indian hot-rolled steel. Steel is clearly India's most exposed sector. When an exporter relies on the Commission's default emission values, the charge on hot-rolled coil is about €278 per tonne in 2026 and about €458 per tonne in 2034, holding the carbon price constant. Verified plant data lower this charge by roughly 60 per cent. Aluminium is less affected for now, since only direct emissions are charged; cement and fertilisers have little exposure; and green hydrogen may benefit. Small and medium exporters bear the highest cost relative to sales. India's Carbon Credit Trading Scheme, the India–EU trade agreement and the United Kingdom's recognition of the Indian scheme each provide a foundation to build on. The article offers practical suggestions for policymakers, regulators and industry. They include stronger verification capacity, a national CBAM help desk, monitoring rules for the domestic carbon market that match those of CBAM, a carbon price that partners can recognise, support for small firms and closer India-EU technical cooperation. A phased action plan brings these suggestions together.**

***Index Terms*—Carbon Border Adjustment; CBAM; Carbon Leakage; EU ETS; Embedded Emissions; India; Steel; Carbon Pricing; Trade And Climate**

Highlights

- CBAM charges imports at the EU carbon price from 2026, phased in fully by 2034.
- Default values for Indian steel products are three or more times the EU benchmarks.
- Verified plant data cut the CBAM cost on Indian hot-rolled coil by about 60 per cent.
- Aluminium, cement, and fertilisers are far less exposed than steel for now.
- A phased action plan sets out suggestions for government, industry and India–EU work.

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I. INTRODUCTION

Climate policy is increasingly shaping trade. In the European Union (EU), producers of steel, cement and other energy-intensive goods pay for their greenhouse gas emissions under the EU Emissions Trading System (EU ETS). Producers in most other countries do not. This difference creates a risk that production, and the emissions that come with it, will move out of the EU. Economists call this risk carbon leakage (Branger & Quirion, 2014).

For almost two decades the EU addressed this risk mainly by giving its industry free emission allowances. The Carbon Border Adjustment Mechanism (CBAM) replaces that approach. From 2026, an importer must buy certificates for the emissions embedded in certain goods, at a price linked to the EU ETS (Regulation (EU) 2023/956, 2023). Free allocation to EU producers falls in step, and ends in 2034.

India has a large stake in this change. It is the world's second-largest steel producer, and its steel is more carbon-intensive than the global average (Mercom India, 2025). The EU is India's largest goods trading partner, and in 2025 it took almost 40 per cent of India's rolled steel exports (GMK Center, 2026c). Indian steel exports to the EU had already started to decline before the payment phase began (Alcircle, 2025).

The timing makes this study useful. The rules for the payment phase were completed only in late 2025, when the Commission adopted the acts on default values, benchmarks and certificate prices. The first certificate prices were published in 2026. Indian firms, regulators and researchers therefore need a clear account of what the rules now say and what they cost. Public discussion in India has often focused on the India-EU trade agreement and on the role of India's domestic carbon market. Both matters, but this article shows that, in the short run, the choice between default values and verified data has the largest effect on cost, and it is a choice that Indian firms and institutions can act on directly.

This article asks three questions. First, what does the CBAM Regulation require, and how has it changed since 2023? Second, how does it apply to exporters in different countries? Third, which Indian industries are most affected, by how much, and what practical steps Indian policymakers and firms can take, including in cooperation with the EU? The article adds to a growing literature on border carbon adjustment (Cosbey et al., 2019; Mehling et al., 2019). It focuses on the first year of the payment phase. It uses the default values and benchmarks published in late 2025, and it estimates costs for Indian products.

Section 2 reviews the literature. Section 3 describes the data and method. Section 4 sets out the legal design. Section 5 explains how CBAM applies to all countries. Section 6 presents the results for India. Section 7 discusses India's policy response, Section 8 sets out policy suggestions and a phased action plan, Section 9 notes the limitations and Section 10 concludes.

II. LITERATURE REVIEW

2.1 Carbon leakage and border adjustment

A large body of modelling work has studied whether border carbon adjustments prevent leakage. A multi-model study by the Energy Modeling Forum found that border adjustments reduce leakage and protect output in energy-intensive sectors, but shift part of the cost of climate policy to exporting countries (Böhringer et al., 2012). A meta-analysis of 25 studies reached a similar view: border adjustments lower leakage rates, although the size of the effect depends on model design (Branger & Quirion, 2014). Cosbey et al. (2019) reviewed the main design choices and concluded that coverage, emissions accounting and the treatment of foreign policies shape both the effectiveness and the fairness of a border adjustment.

2.2 Legal design and trade law

Legal scholars have focused on whether a border adjustment can comply with World Trade Organization (WTO) rules. Mehling et al. (2019) argued that a measure designed for environmental purposes, applied without discrimination between countries and with due process, has a reasonable chance of being justified under the general exceptions of the General Agreement on Tariffs and Trade (GATT). They also noted that recognising carbon prices paid abroad is central to that defence. Fischer and Mehling (2026) examined the European Commission's draft rules of May 2026 on foreign carbon prices. They found the approach broadly defensible but more restrictive than necessary, and proposed ways for trading partners to close the gap between their own carbon price and the EU price.

A related discussion concerns the principle of common but differentiated responsibilities in the climate regime. Many developing countries have expressed concern that charging their exporters the EU carbon price may not reflect differences in national circumstances and capacities. Others point out that the measure applies equally to all origins and that partners which price carbon at home can retain the revenue (Mehling et al., 2019). Both views suggest that dialogue on how foreign policies are recognised is central to making a border adjustment work well. The legal literature broadly agrees that the way a border adjustment treats foreign carbon prices and default

values will largely decide both its legality and its acceptance by trading partners (Cosbey et al., 2019).

2.3 Effects on developing countries

Studies of the EU mechanism find small average effects but large effects on particular products and countries. In an International Monetary Fund working paper, Dolphin and Ferrucci (2025) estimated that CBAM adds about 0.1 per cent to the value of EU imports on average, but up to 1.2 per cent for some products; the largest effects fall on iron, steel and aluminium. Magacho et al. (2024) showed that Russia, China, Türkiye and Ukraine are the most exposed in absolute terms, while several smaller economies, such as Mozambique, are more exposed relative to the size of their economies. A World Bank exposure index likewise places Mozambique, Ukraine and Egypt at the top in terms of gross domestic product (Maliszewska et al., 2025). Earlier, the United Nations Conference on Trade and Development found that CBAM could reduce developing-country exports while cutting global emissions only modestly, and suggested that its revenue could help spread cleaner technology to developing countries (UNCTAD, 2021). Zhong and Pei (2022) found that the effects on trading partners vary widely and depend on the carbon intensity of their exports.

2.4 Studies on India

Work on India has relied mostly on trade data and simple cost estimates. Kher and Gupta (2026) report that India's exports of CBAM goods to the EU were worth US$6.3 billion in 2024, equal to 8.2 per cent of India's exports to the EU, down from 10.5 per cent in 2023. The Global Trade Research Initiative (GTRI) reported a 24.4 per cent fall in the value of India's steel and aluminium exports to the EU in 2024–25, and suggested that exporters may need to cut prices by 15 to 22 per cent (Alcircle, 2025; Maritime Gateway, 2026). Sandbag estimated that, after allowing for the rise in EU steel prices that CBAM itself causes, the net cost for Indian flat steel at full phase-in would be around €89 per tonne (Sandbag, 2026).

Other studies place this exposure in context. The World Bank estimates that India sent about 7 per cent of its steel output, 4 per cent of its aluminium output and only 0.12 per cent of its cement output to the EU (Carbon Copy, 2026). ICRA (2026) finds that Indian primary steelmakers average about 2.5 tCO2 per tonne of steel and expects a reduction of around 19 per cent by 2030, mainly through efficiency gains and renewable power. These figures suggest that the impact of CBAM on India will be concentrated in a few products and firms rather than spread across the economy.

2.5 Research gap

Most of these studies were written before the Commission published country-specific default values, product benchmarks and the first certificate prices in late 2025 and 2026. Few separate the effect of using default values from the effect of using verified data, which is the main choice open to exporters in the short run. This article fills that gap for India.

III. DATA AND METHOD

3.1 Data sources

The article uses only publicly available sources. The legal analysis is based on the CBAM Regulation, the 2025 amending regulation, and the Commission's implementing regulations on emissions calculation, certificate prices, benchmarks and default values. Price data come from the Commission's quarterly certificate prices for 2026. Trade data come from Indian and European sources reported by research institutes and the trade press. Emission factors for Indian products come from the Commission's default values. Where a figure comes from a secondary source, the article cites that source.

3.2 Cost model

The number of certificates an EU importer must surrender for one tonne of a product in year t is calculated as follows:

$$N_t = SEE \times MU_t - CF_t \times BM - D_t \quad (1)$$

Here SEE is the specific embedded emissions of the product in tonnes of carbon dioxide equivalent (tCO2e) per tonne, MU_t is the mark-up applied to default values (one for verified data), CF_t is the CBAM factor that reflects the free allocation still given to EU producers, BM is the CBAM benchmark for the product, and D_t is any deduction for a carbon price already paid by the producer at home. The cost per tonne is this number multiplied by the certificate price P.

The model applies this formula to hot-rolled flat steel (Combined Nomenclature code 7208), India's largest

CBAM export. It compares three cases. The first uses India's default value of 4.28 tCO2e per tonne with the scheduled mark-up and the default benchmark of 1.370 (Commission Implementing Regulation (EU) 2025/2621, 2025; Eurometal, 2025a). The second uses an illustrative verified value of 2.30 tCO2e per tonne for a well-run integrated plant, with the benchmark for actual data of 1.168 (Neder, 2026). The third uses 1.40 tCO2e per tonne to represent a lower-carbon route, such as gas-based direct reduction. The certificate price is held at the third-quarter 2026 price of €82.32 per tonne (GMK Center, 2026a), so that the results show the effect of the policy schedule alone. No deduction for an Indian carbon price is assumed, because none is recognised by the EU at present.

3.3 Limitations of the method

The model is deliberately simple. It does not forecast the carbon price, trade volumes or plant-level emissions. It treats all steel exports as if they were hot-rolled coil. It ignores the rise in EU prices that CBAM may cause, which would offset part of the cost for exporters (Sandbag, 2026). Its results should be read as orders of magnitude, not forecasts.

3.4 Analytical framework

The analysis proceeds in three steps. The first is legal: it identifies the obligations that the Regulation and its implementing acts place on importers, and the ways in which the charge can be reduced. The second is comparative: it asks how the same rules produce different results for exporters from different countries, using published measures of exposure. The third is quantitative: it estimates the charge for Indian products under different assumptions about data quality and production routes. Each step informs the policy discussion in Sections 7 and 8.

IV. THE LEGAL DESIGN OF CBAM

4.1 Purpose and scope

Article 1 of the Regulation states that the mechanism addresses emissions embedded in listed goods "in order to prevent the risk of carbon leakage" (Regulation (EU) 2023/956, 2023, Art. 1). The stated aim is environmental, not fiscal. This purpose is relevant to how the measure is assessed under trade law (Mehling et al., 2019).

The Regulation applies to goods listed in Annex I that originate in a non-EU country (Art. 2). Liability depends on where the goods originate, not where they are shipped from. Table 1 summarises the goods covered and the emissions charged.

Table 1. Goods covered by CBAM and emissions charged in the definitive period

Sector	Main goods (CN headings)	Gases	Emissions charged
Iron and steel	Iron ore pellets (2601 12), pig iron, DRI, ferro-alloys, semi-finished and finished steel (Chapter 72), tubes, structures, fasteners (7301–7311, 7318, 7326)	CO2	Direct only
Aluminium	Unwrought aluminium and products (7601, 7603–7614, 7616)	CO2, PFCs	Direct only
Cement	Clinker, Portland and other cements, kaolinic clay (2507, 2523)	CO2	Direct and indirect
Fertilisers	Ammonia, nitric acid, urea, nitrogen and compound fertilisers (2808, 2814, 2834 21, 3102, 3105)	CO2, N2O	Direct and indirect
Hydrogen	Hydrogen (2804 10)	CO2	Direct only
Electricity	Electrical energy (2716)	CO2	Direct only

Note. Based on Annexes I and II to Regulation (EU) 2023/956 as amended by Regulation (EU) 2025/2083. The list of codes is abridged; see Annex I for the full list.

Only direct emissions are charged for iron and steel, aluminium, hydrogen and electricity. Indirect emissions from electricity use are charged for cement and fertilisers. This rule is important for Indian aluminium, because most of its total footprint comes from captive coal-fired power.

4.2 How the charge is calculated

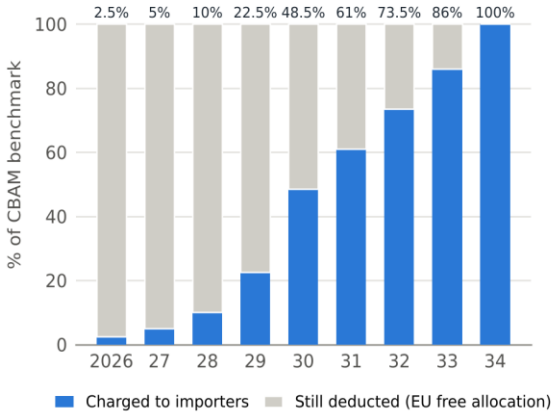
Embedded emissions can be declared on the basis of verified actual data or default values set by the Commission (Art. 7). Default values are set for each product and each country of origin, and carry a mark-up of 10 per cent in 2026, 20 per cent in 2027 and 30

per cent from 2028 (Commission Implementing Regulation (EU) 2025/2621, 2025). Actual data must be checked by an accredited verifier (Art. 8).

The calculation follows the boundaries used in the EU ETS. For a simple good, embedded emissions are the emissions of the production process divided by output. For a complex good, such as hot-rolled coil, they also include the emissions embedded in its inputs, called precursors, such as pig iron or crude steel. A producer that buys semi-finished steel from another plant therefore inherits that plant's emissions. Where the supplier has no verified data, the precursor's default value is used. This rule is important for India's many small re-rolling mills, which buy billets and slabs from other producers.

The number of certificates is then reduced in two ways. First, Article 31 adjusts the obligation to reflect free allowances still given to EU producers. This adjustment is calculated from product benchmarks, not from the importer's own emissions (Commission Implementing Regulation (EU) 2025/2620, 2025). The share of the benchmark that is deducted falls from 97.5 per cent in 2026 to zero in 2034 (Figure 1). Emissions above the benchmark are charged in full from the first year.

Figure 1. Share of the CBAM benchmark charged to importers, 2026–2034



Note. The share deducted equals the CBAM factor that mirrors the phase-out of free allocation under Article 10a of Directive 2003/87/EC. Emissions above the benchmark are charged in full in every year.

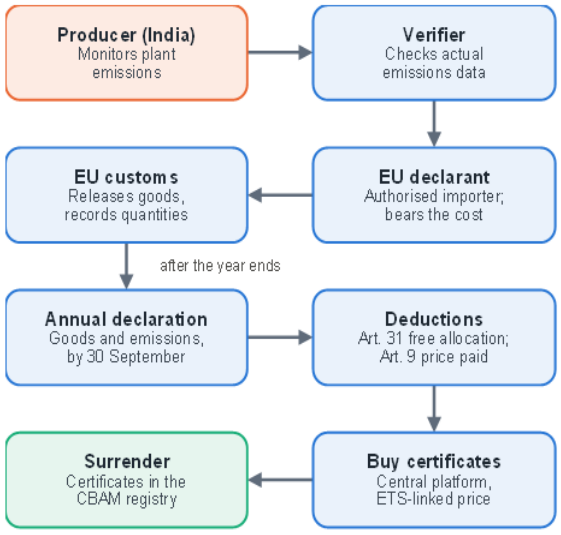
Second, Article 9 allows a reduction when the producer has already paid a carbon price at home. The key test is short: the reduction "may be claimed only if the carbon price has been effectively paid in the country of origin" (Regulation (EU) 2023/956, 2023, Art. 9(1)). Rebates and other forms of compensation must be considered. A draft implementing regulation published on 13 May 2026 sets out how foreign prices convert into fewer certificates. It requires a binding domestic scheme, nets off free allocation and rebates, and caps the use of international credits under Article 6 of the Paris Agreement at 10 per cent (Fastmarkets, 2026a).

4.3 Certificates and compliance

Certificates are sold by Member States on a common central platform. For goods imported in 2026, the price is set each quarter as the average of EU ETS auction prices; from 2027 onwards, it will be a weekly average (Commission Implementing Regulation (EU) 2025/2548, 2025). The prices published for 2026 were €75.36 for the first quarter, €75.28 for the second and €82.32 for the third (Environmental Protection Agency [EPA], 2026; GMK Center, 2026a). Importers must file an annual declaration and surrender certificates by 30 September of the following year. An importer that surrenders too few certificates is liable to a penalty set at the level of the EU ETS excess-emissions penalty (Art. 26). Figure 2 shows the compliance chain.

Two further rules shape cash flows. From 2027, an importer must hold certificates covering at least 50 per cent of the embedded emissions of goods imported since the start of the year, at the end of each quarter (Art. 22). Within limits, a Member State will buy back certificates that are not needed, and certificates left unused for two years are cancelled. In practice, the liability arises at the moment of import, even though certificates for 2026 imports can be bought only from February 2027. Importers were therefore advised to provide for the cost in their 2026 accounts (EY, 2025), and buyers and suppliers have begun to agree in their contracts how the cost is shared.

Figure 2. The CBAM compliance chain in the definitive period



Note. Author's diagram based on Regulation (EU) 2023/956 as amended. The diagram is an editable Word drawing.

4.4 Enforcement and circumvention

National authorities in each Member State authorise importers, check declarations, and impose penalties. A person who imports covered goods without authorisation faces a higher penalty than one who simply surrenders too few certificates. Article 27 requires the Commission to act against practices that avoid the charge. Examples include making slight changes to a product so that it falls under a code not covered, splitting shipments to stay below the threshold, and sending only the cleanest output to the EU while dirtier output is sold elsewhere. This last practice, known as resource shuffling, is relevant to large producers with several plants. Indian exporters can build the confidence of buyers and authorities by keeping plant-level data and verification reports ready to support any claim of low emissions.

4.5 The 2025 simplification and the 2026 reform proposals

Regulation (EU) 2025/2083 entered into force on 20 October 2025 (EY, 2025; Regulation (EU) 2025/2083, 2025). It replaced the old €150-per-consignment exemption with a threshold of 50 tonnes a year per importer. It also moved the annual deadline from 31 May to 30 September, delayed the first sale of certificates to February 2027, and lowered the quarterly holding requirement from 80 to 50 per cent (Reed Smith, 2025a). The Commission estimated that the threshold would remove about 90 per cent of importers from the scheme while keeping almost all emissions within it (Umweltbundesamt, 2025). Table 2 lists the main changes.

Table 2. Main changes made by Regulation (EU) 2025/2083

Element	Original rule	Rule after the 2025 amendment
Exemption threshold	€150 per consignment	50 tonnes per importer per year (steel, aluminium, cement, fertilisers)
Annual declaration and surrender	31 May	30 September of the following year
First sale of certificates	January 2026	February 2027, for imports made in 2026
Quarterly holding requirement	80% of embedded emissions	50% of embedded emissions
Certificate price for 2026 imports	Weekly average	Quarterly average
Imports pending authorisation	Not allowed	Allowed if application filed by 31 March 2026

Note. Compiled from EY (2025) and Reed Smith (2025a).

A second amendment, proposed by the Commission in December 2025, would extend CBAM from 2028 to about 180 downstream products with a high steel or aluminium content, such as fasteners, tubes and machinery parts, and would strengthen the rules against circumvention (Mayer Brown, 2025; Reed Smith, 2025b). The Council's position covers about 200 products and the European Parliament's covers 457 (Mayer Brown, 2026). The final scope was still under negotiation at the time of writing, which gives trading partners an opportunity to contribute evidence.

V. HOW CBAM APPLIES TO ALL COUNTRIES

5.1 The same rules for every origin

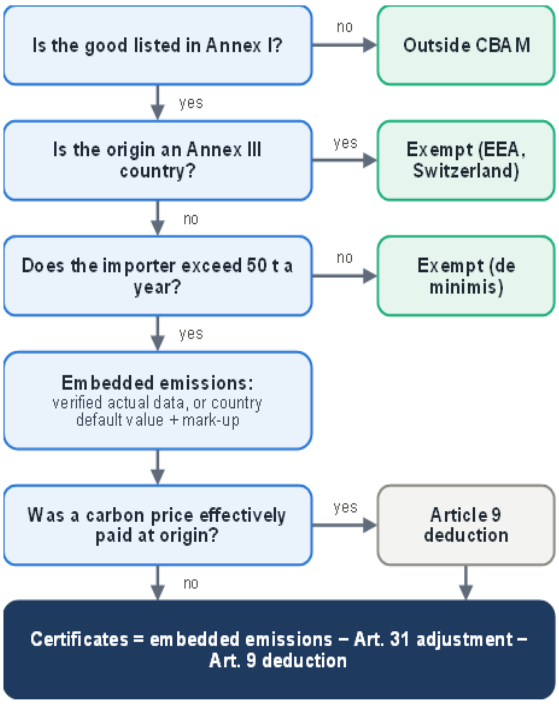
CBAM does not name target countries. Steel from Japan, Türkiye, Brazil or India faces the same obligations. Differences in outcome arise from three sources: the country default value, any carbon price paid at home, and the production route. For example, India's default value for pig iron is 2.53 tCO2e per tonne; China's is about 1.66 and Türkiye's about 1.85 (GreenSutra, 2026a).

5.2 Exemptions

Only a few exemptions exist. Iceland, Liechtenstein, Norway and Switzerland are exempt because their carbon markets are part of, or linked to, the EU ETS (Regulation (EU) 2023/956, 2023, Annex III). Importers below the 50-tonne threshold are exempt. There is no special treatment for developing or least developed countries, a point that several authors have discussed (Magacho et al., 2024; UNCTAD, 2021). Figure 3 summarises how the liability of any exporter is determined.

Article 2(12) allows the EU to make agreements with other countries so that their carbon pricing is taken into account under Article 9. A country whose emissions trading system is fully linked to the EU ETS can also be added to Annex III. These provisions give trading partners a cooperative route to lower the cost for their exporters by pricing carbon at home. The draft Article 9 rules also let the Commission set default carbon price values for countries that price carbon, so that importers using default emission values can still claim a deduction (Fastmarkets, 2026a).

Figure 3. How CBAM liability is determined for any exporting country



Note. Author's diagram based on Articles 2, 2a, 7, 9 and 31 and Annex III of Regulation (EU) 2023/956.

5.3 Country exposure

Table 3 compares selected exporters. By value, China, Türkiye and India rank among the main suppliers of CBAM goods to the EU. Relative to the size of their economies, small countries that export a single CBAM product mainly to Europe are the most exposed.

Table 3. Exposure of selected exporting countries to CBAM

Country	Main CBAM goods	Exposure indicator	Carbon pricing at home
China	Steel, aluminium	Largest supplier of CBAM goods to the EU by value in 2024	National emissions trading system
Türkiye	Steel, cement, aluminium	Second-largest supplier by value in 2024	Emissions trading system in preparation
India	Steel, aluminium	US$6.3 billion in 2024; 8.2% of India's exports to the EU	Carbon Credit Trading Scheme (intensity-based)
Mozambique	Aluminium	Highest exposure relative to GDP (about 0.6%)	None
Ukraine	Steel, pellets, cement	About 0.5% of GDP	Carbon tax
Egypt	Fertilisers, steel, aluminium	About 0.2% of GDP	None
Norway, Iceland, Switzerland	Aluminium, ferro-alloys	Exempt (Annex III)	Part of or linked to the EU ETS

Note. Value data from Kher and Gupta (2026); GDP-based exposure from Maliszewska et al. (2025).

5.4 International responses

Partners have responded in different ways, and most have chosen to strengthen domestic carbon pricing and to engage with the EU on implementation. China has extended its national emissions trading system to steel, cement and aluminium. The United Kingdom will introduce its own CBAM in 2027 and has listed 16 foreign carbon pricing schemes, including India's, that qualify for relief (GMK Center, 2026d). Russia has requested consultations and a panel at the WTO (Interfax, 2026; Climate Case Chart, n.d.). India has stressed the principle of common but differentiated responsibilities and its concerns about unilateral trade measures, and has taken this forward through dialogue, including the cooperation provisions of its trade agreement with the EU.

5.5 Effects on developing and least developed countries

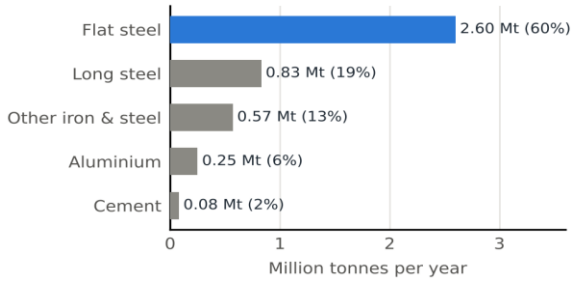
The absence of special treatment for poorer countries is one of the most debated features of CBAM. For a country such as Mozambique, where a single aluminium smelter accounts for a large share of exports, the charge can be significant relative to national income (Maliszewska et al., 2025). Several proposals were made during the legislative process to exempt least developed countries or to return part of the revenue to them, but none was adopted. The Commission must instead report on the effects of CBAM on these countries and on ways to support their decarbonisation. Fischer and Mehling (2026) suggest that a targeted derogation for least developed countries could improve fairness without weakening the mechanism, because their share of CBAM imports is small. For middle-income exporters such as India, the more relevant questions are how default values are set and whether domestic carbon prices are recognised.

VI. RESULTS: THE IMPACT ON INDIAN INDUSTRY

6.1 Trade exposure

Each year India ships about 4.3 million tonnes of CBAM goods to the EU, nearly all of it steel (Figure 4). Flat products such as hot-rolled, cold-rolled and coated coil make up about 60 per cent of the total (Sandbag, 2026).

Figure 4. India’s annual exports of CBAM goods to the EU, by product



Note. Data from Sandbag (2026).

Trade data already show an early adjustment. Of the 29.7 million tonnes of steel the EU imported in 2025, India supplied about 2.4 million tonnes, or 8 per cent (GMK Center, 2026c). India is an important supplier for the EU, and the EU is an even more important market for India. This mutual interest makes a smooth implementation of CBAM valuable to both sides. The value of India's steel and aluminium exports to the EU declined from US$7.71 billion in 2023–24 to US$5.82 billion in 2024–25, and iron and steel alone declined by 35.1 per cent (Alcircle, 2025). Indian steel shipments to the EU in the first half of 2026 were 1.01 million tonnes, compared with 1.26 million tonnes in the same period of 2025. Over the same period, total steel exports rose by 27 per cent as mills found buyers in Asia, the Middle East and Africa (GMK Center, 2026b). Other trade measures also played a part. The EU's revised steel safeguard, in force from July 2026, reduced duty-free quotas and set a 50 per cent tariff above them (Carbon Copy, 2026).

6.2 Default values against benchmarks

Table 4 compares India's default values with the EU benchmarks. The gap is widest for direct reduced iron, most of which India produces in coal-fired kilns, and for hot-rolled steel.

Table 4. India’s CBAM default values compared with EU benchmarks (tCO2e per tonne)

Product	CN code	India default value	EU CBAM benchmark	Source
Pig iron	7201	2.53	—	GreenSutra (2026a)
Direct reduced iron	7203	4.62	0.397	Fastmarkets (2026b)

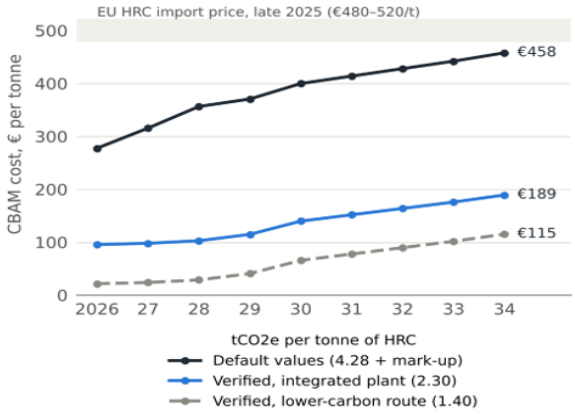
Hot-rolled flat steel	7208	4.28	1.370 (default); 1.168 (actual data)	GreenSutra (2026a); Neder (2026)
Unwrought aluminium	7601	1.87	1.464	GreenSutra (2026b); S&P Global (2025)
Aluminium plates and foil	7606–7607	4.13	—	GreenSutra (2026b)

Note. Default values are shown before the mark-up of 10% (2026), 20% (2027) and 30% (from 2028). A dash means the benchmark was not reported in the sources used.

6.3 Cost per tonne of hot-rolled steel

Figure 5 shows the results of the cost model. On default values, the CBAM cost rises from about €278 per tonne in 2026 to about €400 in 2030 and €458 in 2034. With verified data from a typical integrated plant, it rises from about €96 to €140 and €189. A lower-carbon route reduces it to about €22, €66 and €115. Hot-rolled coil imports were priced at about €480 to €520 per tonne in northern Europe in late 2025 (Eurometal, 2025b). On default values, therefore, the charge would come close to the value of the product by the early 2030s, which shows how much exporters gain by supplying verified data.

Figure 5. Estimated CBAM cost per tonne of Indian hot-rolled coil, 2026–2034



Note. Author's calculations using the inputs in Section 3.2. Certificate price held at €82.32. The shaded band shows the import price of hot-rolled coil in northern Europe in late 2025 (Eurometal, 2025b).

Applying these results to the roughly 2.4 million tonnes of steel that India exported to the EU in 2025 (GMK Center, 2026c) indicates the order of magnitude of the annual charge (Table 5). If every tonne were declared on default values, the charge would be about €0.67 billion in 2026 and €1.10 billion in 2034. With verified data, it would be about €0.23 billion and €0.45 billion.

Table 5. Estimated CBAM cost for Indian hot-rolled steel

Case	2026	2030	2034
Cost per tonne, default values	€278	€400	€458
Cost per tonne, verified data (2.30 tCO2e/t)	€96	€140	€189
Cost per tonne, lower-carbon route (1.40 tCO2e/t)	€22	€66	€115
Annual cost for 2.4 Mt, default values	€0.67 bn	€0.96 bn	€1.10 bn
Annual cost for 2.4 Mt, verified data	€0.23 bn	€0.34 bn	€0.45 bn

Note. Author's calculations. Certificate price held at €82.32 per tonne; no deduction for a carbon price paid in India. Volumes are 2025 exports of steel to the EU (GMK Center, 2026c), treated as hot-rolled coil.

These are gross costs. Part of the cost will be offset because EU producers also lose free allocation and raise their prices; Sandbag (2026) estimates this offset at about half the gross charge for Indian flat steel. The rest will be shared between EU buyers and Indian sellers through commercial negotiation.

6.4 Sensitivity of the results

The results respond in predictable ways to the main assumptions. Each change of €10 in the certificate price changes the 2034 cost on default values by about €56 per tonne, and the cost on verified data by about €23 per tonne. A lower benchmark would raise all costs. The EU ETS benchmarks that apply for 2026–2030 are lower than the 2021–2025 values, and observers have noted that cost estimates based on the earlier values may understate future charges (S&P Global, 2025). A lower verified emission value has the largest effect: every 0.1 tCO2e per tonne cut from a plant's intensity saves about €8 per tonne at today's price. Finally, a recognised Indian carbon price would reduce the charge one for one. For example, a price of €10 per tonne actually paid on all embedded emissions of a plant at 2.30 tCO2e per tonne would cut its CBAM cost by about €23 per tonne.

6.5 Sector-by-sector assessment

Iron and steel. Steel is by far the most affected sector. India's average emission intensity, about 2.5 tCO2 per tonne of crude steel, is well above the world average of roughly 1.9 (ICRA, 2026; Mercom India, 2025). Within the sector, coal-based direct reduced iron and induction furnace producers face the highest costs, because their default values are close to their actual emissions. Integrated plants can cut their costs sharply by supplying verified data. Gas-based and scrap-based producers are best placed.

The scale of the gap between default values and benchmarks also changes how EU buyers choose suppliers. Buyers now ask for verified emissions data before they sign contracts, and some prefer suppliers that can show lower emissions. Large Indian producers have begun to supply such data, but many mid-sized mills have not. The EU's steel safeguard and the steel quota in the trade agreement affect the volume India can sell; CBAM affects the price at which it can sell. Together they are likely to encourage Indian exporters to broaden their markets in Asia, Africa and the Middle East, as the 2026 data already suggest (GMK Center, 2026b).

Aluminium. For unwrought aluminium, India's default value of 1.87 tCO2e per tonne is close to the primary benchmark of 1.464 (GreenSutra, 2026b; S&P Global, 2025). Using the same method as for steel, the cost is about €52 per tonne in 2026, rising to about €200 in 2034, a small share of the metal's value. Defaults for rolled aluminium products are higher. The main uncertainty is whether indirect emissions will be charged in future, which would raise the cost several times. Indian smelters rely heavily on captive coal-fired power, so their total emissions per tonne are much higher than their direct emissions. The Commission is required to review the treatment of indirect emissions, and India's aluminium industry would gain from early investment in renewable power for its smelters.

Cement and fertilisers. India sends only about 0.12 per cent of its cement output to the EU (Carbon Copy, 2026), and it is a net importer of fertilisers. Direct exposure is negligible.

Hydrogen. Because CBAM charges direct emissions, hydrogen made by electrolysis with renewable power carries almost no CBAM cost. This gives India's planned green hydrogen exports an advantage over hydrogen made from natural gas.

Small and medium enterprises. Small exporters face the highest cost per unit of sales. Monitoring and verification costs are largely fixed, so they weigh more heavily on a firm that ships a few thousand tonnes a year than on a large producer. Small firms often lack the meters and records needed to calculate verified values, so their buyers fall back on default values with mark-ups. Many small re-rolling and forging units buy their steel from other producers and must obtain precursor data that their suppliers may not have. They also have limited scope to negotiate how the cost is shared with larger buyers. The 50-tonne threshold does not help them much, because it applies to the EU importer, not to the exporter, and most European distributors import far more than 50 tonnes in total. The proposed downstream extension would bring many engineering exporters in clusters such as Ludhiana, Rajkot, Pune and Coimbatore into the scheme from 2028, which makes early, targeted support for these clusters a priority.

VII. DISCUSSION: INDIA'S POLICY RESPONSE

7.1 The Carbon Credit Trading Scheme

India's Carbon Credit Trading Scheme (CCTS) was notified in June 2023 under the Energy Conservation Act. Binding emission intensity targets for aluminium, cement, chlor-alkali, and pulp and paper were notified on 8 October 2025 for 282 plants (ETV Bharat, 2025). Targets for further sectors followed in January 2026, and draft targets for 255 iron and steel plants were published in July 2026 (Down To Earth, 2026). Trading of carbon credit certificates on power exchanges is expected from about October 2026 under regulations notified by the Central Electricity Regulatory Commission in February 2026 (JSA, 2026).

The CCTS sets intensity targets and charges only plants that miss them. A plant that meets its target pays nothing. Under the draft Article 9 rules, which deduct only the price "effectively paid" after free allocation, such a scheme would produce little or no reduction in the CBAM charge (LiveLaw, 2026). Expected credit prices below US$10 per tonne are also far below the EU price (Alcircle, 2025). The scheme's greatest immediate value for CBAM lies elsewhere: its monitoring and verification system can provide the verified data that exporters need to avoid default values.

This point deserves emphasis. The CCTS requires each obligated plant to monitor its emissions and output and to have them verified every year. If these rules follow the boundaries and methods used under CBAM, the same verified report could serve both systems. That would let Indian exporters move from default values to actual values at a low extra cost, which the model in this article identifies as the largest single saving available. It would also give the EU a reliable evidence base if India later adds an explicit carbon price that can be deducted under Article 9.

7.2 The India–EU Free Trade Agreement

Negotiations on the India–EU free trade agreement were concluded on 27 January 2026 (Carbon Copy, 2026). The agreement does not exempt Indian goods from CBAM, but it creates several useful channels for cooperation. It does include a forward most-favoured-nation clause: any CBAM flexibility the EU gives another partner extends to India. It also has a CBAM annexure that provides for cooperation on the recognition of carbon pricing and of verifiers (Tax TMI, 2026). It also provides India with a steel quota of 1.64 million tonnes a year; the quota concerns volumes and does not change the CBAM charge (SteelOrbis, 2026). Used actively, these provisions offer a practical framework for joint work on verification, methods and the recognition of carbon prices.

7.3 Recognition by the United Kingdom

On 8 September 2026 the United Kingdom confirmed that India's CCTS qualifies for carbon price relief under the UK CBAM, which starts in 2027 (Khaitan & Co, 2026; News On AIR, 2026). Relief will depend on the carbon price actually paid on each product. Although the decision has no legal effect in the EU, it shows that an intensity-based scheme such as the CCTS can be recognised, and it offers a helpful reference for India–EU discussions.

7.4 Lessons from other countries

Other exporting countries offer useful comparisons. China has extended its national emissions trading system to steel, cement and aluminium, which may allow some deduction under Article 9 once the rules are final, although its free allocation will reduce the price effectively paid. Türkiye is introducing an emissions trading system modelled on the EUs, so that carbon revenue can support its own industrial transition. The United Kingdom has designed its own CBAM with relief for foreign carbon prices, and has applied it to schemes that, like India's, are based on intensity targets (GMK Center, 2026d). These cases show that partners are responding to CBAM mainly by building domestic carbon pricing, and that the design of those systems decides how much relief they bring.

7.5 Trade law and avenues for cooperation

India has emphasised the principle of common but differentiated responsibilities under the United Nations Framework Convention on Climate Change. The EU, for its part, stresses that the measure applies to all origins alike and allows deductions for carbon prices paid abroad. The WTO consultations requested by Russia may in time clarify some of the legal questions. Mehling et al. (2019) suggest that a border adjustment rests on the firmest ground when default values reflect real conditions and when comparable foreign policies can be recognised flexibly. These two areas are also where cooperation between India and the EU could bring the greatest mutual benefit.

In WTO terms, several provisions of the GATT are relevant. The most-favoured-nation rule in Article I concerns equal treatment of imports from different origins, which matters because default values differ by country. The national treatment rule in Article III requires that imports are not charged more than similar EU products; the CBAM deduction for free allocation, together with the gradual end of free allowances in the EU, is designed with this rule in mind. Article XX provides general exceptions for measures needed to protect life or health or to conserve natural resources, provided they are not applied in a way that causes arbitrary or unjustifiable discrimination. Transparent procedures for setting and updating default values, and flexible recognition of comparable foreign policies, therefore support both legal certainty and good cooperation (Mehling et al., 2019).

VIII. POLICY SUGGESTIONS

The results point to a set of practical, mutually reinforcing steps. They are offered as suggestions for consideration by policymakers, regulators and industry, not as prescriptions. They fall into three groups: measures that India can take on its own, areas where India and the EU can work together, and steps for industry. Table 6 brings them together in a phased action plan.

8.1 Domestic measures

- Verified data first. Moving from default values to verified data is the single largest saving available to exporters. Government and industry could jointly build monitoring and verification capacity aligned with EU methods. Common emission factors for Indian coal and grid power, shared monitoring services for industrial clusters and support for the cost of verification would especially help small firms.
- A national CBAM help desk. A single facilitation point, for example in the Ministry of Commerce and Industry with technical support from the Bureau of Energy Efficiency, could give exporters guidance, calculation templates and timely updates on EU rules.
- Stronger verification capacity. Training the accredited carbon verification agencies of the CCTS in CBAM methods, and their accreditation to international standards such as ISO 14065, would increase the number of qualified verifiers and support their acceptance by the EU.
- One monitoring system for two purposes. The monitoring, reporting and verification rules of the CCTS could follow CBAM boundaries and methods, so that one verified report serves both the domestic market and EU importers.
- A carbon price that partners can recognise. For export-oriented sectors, policymakers could consider adding to the CCTS a carbon charge on emissions above a benchmark. Such a payment could be deducted under Article 9, so the revenue would support decarbonisation in India (Fischer & Mehling, 2026). Its design, level and timing would need careful consultation with industry.
- A national database of verified product emissions. A registry of verified embedded emissions by product and plant, built on CCTS reporting, would support exporters' declarations and provide evidence for updating default values.
- Use of revenue for decarbonisation. Any such revenue could fund renewable power, greater scrap use and hydrogen-based ironmaking, which lower embedded emissions over time.
- Support for small and medium enterprises. Cluster-level help desks, simple calculation tools and financial support for metering would help small exporters, including the engineering clusters affected by the proposed downstream extension, to move from default values to verified data.
- Finance for decarbonisation. Concessional loans, credit guarantees and a clear climate finance taxonomy could help firms, especially small ones, invest in metering, energy efficiency and cleaner processes.
- Domestic demand for low-carbon steel. Public procurement that gives preference to steel meeting India's green steel taxonomy (Mercom India, 2025) would create a home market for low-carbon products and reduce reliance on any single export market.
- Clean power for industry. Easier access to renewable power, through green energy open access and round-the-clock supply contracts, would lower the emissions of steel plants and aluminium smelters, including any indirect emissions that CBAM may cover in future.
- Coordination across ministries. Close coordination among the ministries responsible for commerce, steel, mines, power, environment and finance would keep India's response consistent and give industry a single, clear message.
- Market development. Exporters can broaden their markets while keeping a presence in the EU for verified low-carbon products.

8.2 Areas for India–EU cooperation

- Recognition of Indian verifiers. The working group under the India–EU agreement could work towards EU acceptance of Indian accredited verifiers, which would lower compliance costs on both sides.
- Better data for default values. India could share representative plant-level emission data with the Commission, so that country default values for Indian products reflect actual conditions more closely.
- Recognition of Indian carbon pricing. Early technical dialogue on how CCTS obligations and any future carbon charge would be treated under Article 9 would give exporters and investors greater certainty.
- Consultation on the downstream extension. India could provide evidence on the likely effect of the proposed extension on its engineering exporters and propose practical solutions, such as longer transition periods and simplified rules for small firms.

- Joint pilot projects. A few joint pilots at Indian plants could test how a single verification can serve both the CCTS and CBAM, and could build trust in Indian data.
- Capacity-building support. UNCTAD (2021) has suggested that part of CBAM revenue could support cleaner technology in developing countries. India could propose that EU support of this kind include training and technology programmes for Indian small firms.
- Joint review of flexibilities. Both sides could keep under review any CBAM flexibility the EU extends to other partners, so that it is applied to India as the agreement's forward most-favoured-nation clause provides.

8.3 Suggestions for industry

- Start measuring now. Exporters to the EU could install metering and data systems at plant level, beginning with the products and customers that matter most, so that verified data are ready for each annual declaration.
- Collect supplier data. Firms that buy pig iron, billets or slabs could make the supply of verified precursor emissions a standard condition of purchase.
- Clear contract terms. Contracts with EU buyers could state which emission values will be used, how the CBAM cost is shared and how data are exchanged. Clear terms reduce uncertainty for both parties.
- Decarbonisation roadmaps. Steel and aluminium producers could adopt plant-level roadmaps covering energy efficiency, renewable power, scrap use and, over time, gas- or hydrogen-based ironmaking.
- Collective action. Industry associations could run cluster programmes that share the cost of meters, software, training and verification among small firms.

8.4 A phased action plan

Table 6 groups the main suggestions by timeframe and by the actors who could lead them. Short-term steps rely on existing institutions and could begin at once. Medium-term steps need new rules, agreements or funding. Long-term steps depend on investment in new production routes. The roles shown are indicative and are offered for discussion only.

Table 6. A phased action plan: suggestions, possible lead actors and benefits

Suggestion	Possible lead actors	Timeframe	Main benefit
Move from default values to verified data	Exporters; industry associations; BEE	2026–2027	Cuts the CBAM cost on hot-rolled coil by about 60%
National CBAM help desk	Ministry of Commerce and Industry; BEE	2026–2027	Lower information costs, especially for small firms
Train and accredit verification agencies	BEE; accreditation bodies	2026–2027	More verified data at lower cost; basis for EU acceptance
Align CCTS monitoring with CBAM methods	Ministry of Power; BEE	2026–2028	One verified report serves both systems
Cluster programmes and finance for small firms	MSME bodies; banks; industry associations	2026–2028	Small exporters move off default values
Recognition of Indian verifiers; joint pilots	India–EU technical working group	2027–2028	Lower compliance costs on both sides
National database of verified product emissions	BEE; Ministries of Steel and Mines	2027–2029	Evidence for realistic default values
Green public procurement; clean power for industry	Central and state governments; industry	2027–2030	Home demand for low-carbon steel; lower emissions
A carbon price that partners can recognise	Government of India, after consultation	2028 onwards	Article 9 deduction; revenue supports decarbonisation in India
Investment in low-carbon routes (scrap, renewable power, gas- and hydrogen-based ironmaking)	Industry; financial institutions	2028–2034	Lasting cut in embedded emissions and CBAM cost

Note. Author’s suggestions for academic discussion. Lead actors and timeframes are indicative only and do not represent the views of any authority. BEE = Bureau of Energy Efficiency; CCTS = Carbon Credit Trading Scheme; MSME = micro, small and medium enterprises.

IX. LIMITATIONS AND FUTURE RESEARCH

This study has four main limitations. It relies on secondary sources for some trade data. Its cost model holds the carbon price constant and treats all steel exports as hot-rolled coil. It does not model how costs are shared between buyers and sellers. Finally, several rules, including the Article 9 implementing regulation and the downstream extension, were still under negotiation when it was written. Future research could use plant-level data to estimate costs by production route, model price pass-through, and assess how recognition of the CCTS would work in practice.

A further line of work could examine whether instruments such as carbon contracts for difference, which guarantee a carbon price to investors in low-carbon production, could speed up the adoption of hydrogen-based or scrap-based steelmaking in India. Comparative studies of how other exporting countries, such as Türkiye, Ukraine and China, are adapting their carbon markets to CBAM would also help Indian policymakers.

X. CONCLUSION

CBAM has turned the EU's carbon price into a cost on imports. It applies the same rules to every country, but its effects differ widely. For India, the impact is concentrated in steel, where high default values, high carbon intensity and heavy dependence on the EU market combine. Early trade data already show exporters adjusting. Many of the most effective responses are within India's reach: accurate and verified emissions data, a domestic carbon price that the EU can recognise, and faster decarbonisation of steel. Together, these would reduce the charge, keep more carbon revenue in India, and help Indian producers compete in a market that increasingly rewards low-carbon goods. Section 8 and Table 6 set out a phased plan of practical steps towards these aims.

The findings also carry a wider lesson for trade and climate policy. Border measures such as CBAM do not act alone; their effect depends on how exporting countries respond. Where exporters invest in data and in cleaner production, and where governments build credible carbon markets, the charge falls and the revenue can stay at home. Where they do not, the charge rises each year until 2034. For India, the next few years therefore offer an opportunity. With sound domestic policy and close technical cooperation with the EU, CBAM can become less a cost to be borne than a spur towards a more competitive, lower-carbon industry, an outcome that serves the shared goal of cutting global emissions while keeping trade open.

Declarations

Disclaimer. The views expressed in this article are solely the author's own. The Central Electricity Regulatory Commission (CERC), where the author is employed, and the Government of India, including the Ministry of Power and the Bureau of Energy Efficiency, have no views on this article. This paper is not to be used for legal purposes.

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specific situations. Names of companies are mentioned only as examples drawn from public notifications and imply no judgement about them.

Competing interests. The author is employed by CERC, which has notified regulations on trading in carbon credit certificates that are mentioned in Section 7.1. The article was prepared in a personal capacity and uses only publicly available information; no confidential or unpublished official information was used. The author has no financial interest in any company, power exchange, industry body or other organisation mentioned in the article. The author declares no other competing interests.

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Data availability. All data used are publicly available from the sources cited. The cost model's inputs and outputs are reported in full in Tables 4 and 5, and all data, formulas and calculations are provided in the supplementary Excel workbook (CBAM_India_Paper_Data.xlsx), which also contains the complete data set in long format.

Prior dissemination and text overlap. This article is original. It has not been published elsewhere and is not under consideration by another journal. It develops material from the author's own unpublished academic report on CBAM and working paper on India's Carbon Credit Trading Scheme; that material has been rewritten for this article.

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