



Ministry of Economic Affairs and Employment (TEM)

## National impacts of the Carbon Border Adjustment Mechanism

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## National Impacts of the Carbon Border Adjustment Mechanism

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## Preface

This report has been commissioned by the Ministry of Economic Affairs and Employment (TEM) between February and May 2025. The report represents the views of the authors, and the results of the work and report do not, as such, represent the collective view of the Ministry of Economic Affairs and Employment or its staff. During the project, views from the Ministry's personnel and other steering group members were consulted in several meetings.

AFRY Management Consulting Ltd

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<b>Tekijät:</b>	Elias Länsisalo ja Leena Sivill		
<b>Työn nimi:</b>	Hiilirajamekanismin kansalliset vaikutukset		
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**Tiivistelmä:**

EU:n hiilirajamekanismin (Carbon Border Adjustment Mechanism, CBAM) tavoitteena on ehkäistä hiilivuotoa ja kannustaa EU:n ulkopuolisia maita tiukempiin päästövähennysten ohjaukeinoihin. Mekanismissa asetetaan tietyille EU:n ulkopuolisille tuontituotteille EU:n päästökauppaa vastaava maksu vuodesta 2026 alkaen. Vuosien 2026–2034 aikana CBAM-maksut kasvavat niin, että vuodesta 2034 alkaen maksut kattavat tuotteiden täyden päästösäällön. Samalla päästöoikeuksien ilmaisjako EU:n sisällä poistuu CBAM:in piiriin kuuluvilla sektoreilla. Hiilirajamekanismissä asetuksen mukaisesti EU:n komissio selvittää mekanismin laajentamista alavirran tuotteisiin, epäsuoriin päästöihin, logistiikkaan, sekä täysin uusille aloille kuten orgaanisiin kemikaaleihin ja polymeereihin.

Tässä selvityksessä tutkittiin CBAM:in nykyisen soveltamisalan sekä mekanismin mahdollisen alavirran tuotteisiin ja kokonaan uusiin tuoteryhmiin laajentamisen vaikutuksia Suomessa. Tavoitteena oli ymmärtää case-yritysten haastattelujen ja julkisiin tilastolähteisiin perustuvien case-esimerkkien avulla erilaisia tuote- ja tuotearvoketjuja ja näiden muodostamia kilpailukykyvaikutuksia, joita CBAM voi synnyttää suomalaisille toimijoille. Haastattelu- ja tilastoaineistoa täydennettiin AFRY:n ja selvityksen ohjausryhmän asiantuntijoiden näkemyksillä sekä muilla julkisilla lähteillä.

Selvityksen perusteella CBAM voi suojata EU:ssa valmistettuja tuotteita päästökaupan ilmaisjaon poistumisen tai vähähiilisemmän tuotannon lisäkustannusten aiheuttamalta kilpailukykyä heikentämiseltä ja siten hiilivuodon riskiltä. CBAM voi suojata erityisesti energiaintensiivisen perustuotannon yrityksiä, joiden tuote- ja tuotearvoketju valmistuksesta loppukäyttöön on lyhyt ja lopputuotemarkkina on pääasiassa EU:n sisämarkkinoilla.

Toisaalta tulokset viittaavat hiilivuotoriskin säilyvän yrityksillä, jotka toimivat EU:ssa osana tuote- ja tuotearvoketjuja, joita CBAM ei kattavasti suojaa EU:n sisämarkkinoilla, tai joiden tuotteet suuntautuvat vientiin EU:n ulkopuolelle, jossa kilpailevat tuotteet eivät tyypillisesti kohtaa vastaavaa päästöjen hinnoittelua. Tämän lisäksi EU:n sisämarkkinoilla CBAM-maksuja on mahdollista välttää tuomalla EU:hun arvoketjussa pidemmälle jalostettuja tuotteita, joihin CBAM ei ulotu. CBAM ei tarjoa ratkaisua suojaamaan EU:ssa valmistettuja tuotteita päästökaupan tai vähähiilisemmän tuotannon kustannusliskä EU:n ulkopuolella.

CBAM:in laajentaminen alavirtaan tai uusiin tuotteisiin ei automaattisesti johtaisi kustannustehokkaimiin päästövähennyksiin, koska päästökaupan ilmaisjaon poistumisen tai CBAM:in aiheuttamia lisäkustannuksia voidaan kiertää, kuten yllä esitetään. Toisaalta CBAM:in laajentaminen koskemaan kaikkia EU:n ulkopuolelta tuotavia tuotteita ei todennäköisesti olisi perusteltua, sillä käytännön toteutettavuuden haasteet (mm. tuotekohtainen päästöraportointi) voisivat kasvaa huomattaviksi suhteessa saavutettaviin päästövähennyksiin.

CBAM:in laajentamisen ja rajoittamisen kesken vallitsee jokaisessa arvoketjussa yksilöllinen kohta, jossa soveltamisen kustannukset ylittäisivät höydyt joko suoraan tai verrattuna vaihtoehtoon, jossa sama yhteiskunnallinen panos käytettäisiin EU:ssa puhtaaseen tuotantoon tuottavammin. CBAM:in laajentamisen vaihtoehtoja tulisi siksi arvioida laaja-alaisesti kattaen kokonaiset tuote- ja tuotearvoketjut raaka-aineista loppukäyttöön ja käytännön toteutettavuuteen. Tuotteita ja arvoketjujen osia, joihin CBAM:ia kannattaa laajentaa, voi edelleen löytyä. Tämän lisäksi on tärkeää arvioida CBAM:in ja sille vaihtoehtojen ja täydentävien ohjaukeinojen yhteiskunnallisia kokonaisvaikutuksia.

Selvityksen tulokset ja johtopäätökset perustuvat valitun tutkimusmenetelmän mukaisesti rajalliseen määrään case-esimerkkejä. Lisäksi selvityksessä esitetyt CBAM-kustannusliskä esimerkkilaskelmat ovat ainoastaan suuntaa antavia.

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**Abstract:**

Carbon Border Adjustment Mechanism (CBAM) aims to prevent carbon leakage in the EU and encourage non-EU countries to adopt stricter emissions reduction policies. The mechanism will impose a tariff equivalent to the EU ETS on certain non-EU imported products from 2026 onwards. Over the period of 2026-2034, CBAM tariffs will increase so that from 2034 onwards, the tariffs will cover the full emission content of the products. At the same time, the free allocation of emission allowances in the EU will be removed from the sectors covered by the CBAM. In line with the CBAM regulation, the EU Commission will investigate possible extension of the mechanism to downstream products, indirect emissions, logistics, and completely new sectors such as organic chemicals and polymers.

This study examined the implications of the current scope of the CBAM and the possible extension of the mechanism to downstream products and completely new product categories in Finland. The objective was to assess – via case company interviews and case examples based on public statistical sources – different product value chains and the competitiveness impacts that the CBAM could generate for Finnish companies. Interviews and statistical data were complemented with expert views both from AFRY and the steering group of the study, as well as with other public sources.

Based on the study, the CBAM may protect products manufactured within the EU from a loss of competitiveness and thus the risk of carbon leakage, caused by the removal of free allowances or additional costs of low-carbon production. In particular, the CBAM may protect energy-intensive basic manufacturing companies that have short product value chains from production to end-use and sell their products mainly to the EU markets.

On the other hand, findings suggest that the risk of carbon leakage remains for companies operating in the EU as part of product value chains that are not fully protected by the CBAM in the EU markets, or whose products are exported outside the EU, where competing products do not typically face equivalent emissions pricing. In addition, in the EU markets, it is possible to avoid the CBAM tariffs by importing products downstream in the value chain that are not covered by the scope of the CBAM. The CBAM does not provide a solution to protect EU-manufactured products from the cost premium of EU ETS or low-carbon production outside the EU.

Extending the CBAM to downstream products or new products would not automatically lead to cost-effective emission reductions, as the additional costs of removing free allowances or CBAM tariffs can be avoided, as outlined above. On the other hand, extending the CBAM to all products imported from outside the EU would not probably be justified, as the challenges in feasibility (e.g., product-specific emissions reporting) could turn out considerable compared to the emissions reduction potential.

A unique point exists in each value chain between extending and limiting the CBAM, where the costs of application would exceed the achievable benefits, either directly or compared to an option where the same societal contribution could be spent more productively on cleaner production in the EU. The possible extension of the CBAM should therefore be assessed comprehensively, covering product value chains from raw materials to end use and feasibility aspects. There may still be products and parts of value chains to which the extension of the CBAM would be beneficial. In addition, it is important to assess the overall societal impacts of the CBAM and its potential alternative or complementary policy mechanisms as a whole.

The findings and conclusions of the study are based on a limited number of case studies, in line with the chosen research methodology. In addition, the presented examples of the CBAM tariff premiums should only be considered as indicative.

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<b>Författare:</b>	Elias Länsisalo och Leena Sivill		
<b>Rapportens namn:</b>	Nationella konsekvenser av gränsjusteringsmekanism för koldioxid		
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**Abstrakt:**

Syftet med EU:s gränsjusteringsmekanism för koldioxid (Carbon Border Adjustment Mechanism, CBAM) är att förebygga koldioxidläckage och uppmuntra striktare utsläppskrav utanför EU. Mekanismen innebär en avgift motsvarande EU:s utsläppshandel för vissa icke-EU importerade varor och tas i bruk i början av år 2026. Mellan 2026–2034 ökar CBAM avgiften så att år 2034 täcker avgiften varans totala utsläpp. Samtidigt avskaffas gratis tilldelning av utsläppsrätter inom de sektorer som omfattas av CBAM. I enlighet med gränsjusteringsmekanismen för koldioxid utreder Europeiska kommissionen utvidningen av mekanismen så att den även skulle täcka produkter i senare led (downstream products), indirekta utsläpp, logistik samt nya produktgrupper som organiska kemikalier och polymer.

Denna studie undersökte hur CBAM:s nuvarande tillämpningsområde och en möjlig utvidgning av mekanismen påverkar Finland. Syftet var att genom intervjuer med case-företag och case-exempel baserade på offentligt tillgänglig statistik, förstå olika produktvärdekedjor samt hur CBAM kan påverka finska aktörers konkurrenskraft. Det ovannämnda materialet kompletterades med AFRY och studiens ledningsgrupps experters syner samt med andra offentligt tillgängliga källor.

Resultatet visar att CBAM kan skydda EU-tillverkade produkter från försämrade konkurrenskraft som orsakas av extra kostnader från avskaffningen av gratis utsläppsrätter eller produktion med lägre koldioxidutsläpp, och därmed minska risken för koldioxidläckage. CBAM har speciellt möjlighet att skydda energiintensiva företag inom basindustrin vars produktvärdekedja från tillverkning till slutanvändning är kort och vars marknad, i huvudsak, är EU:s inre marknad.

Samtidigt tyder resultaten på att risken för koldioxidläckage kvarstår för företag som är en del av värdekedjor som CBAM inte fullständigt skyddar inom EU:s inre marknad eller för företag vars produkter exporteras utanför EU där konkurrenter ofta inte betalar för liknande utsläpp. Det är även möjligt att undvika CBAM-avgifter på EU:s inre marknad genom att importera produkter från ett senare stadiet i sin värdekedja som inte omfattas av CBAM. CBAM erbjuder heller ingen lösning utanför EU för de extra kostnader som uppstår för EU-tillverkade produkter till följd av utsläppshandel eller produktion med lägre koldioxidutsläpp.

En utvidgning av CBAM leder inte automatiskt till kostnadseffektiva utsläppningsminskningar eftersom CBAM-avgifter och avskaffandet av gratis tilldelning av utsläppsrätter går att kringgå på ovannämnda sätt. Å andra sidan skulle det inte vara motiverat att utvidga CBAM till att omfatta alla produkter som importeras utanför EU, eftersom de praktiska utmaningar (bland annat produktspecifik utsläppningsrapportering) sannolikt skulle öka betydligt i förhållande till de utsläppsminskningar som kan uppnås.

Mellan utvidgning och begränsning av CBAM finns en unik punkt i varje värdekedja där genomförandekostnaderna överstiger direkt nytta eller där samma samhällsliga insats skulle kunna användas mera effektivt för att främja renare produktion inom EU. Alternativ till utvidgningen av CBAM bör utvärderas brett och omfatta hela produktvärdekedjan, från råvara till slutanvändning, med hänsyn till praktisk genomförbarhet. Det finns ännu produkter och delar av värdekedjor där en utvidgning av CBAM kan vara fördelaktig. Dessutom är det viktigt att bedöma helheten av den samhällsliga påverkan CBAM och dess alternativa och kompletterande mekanismer har.

Utredningens resultat och slutsatser baseras på, i enlighet med forskningsmetoden, ett begränsat antal case-exempel. Beräkningarna av extra kostnader som orsakas av CBAM är vägledande.

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## Abbreviations

Abbreviation	Explanation
CBAM	Carbon Border Adjustment Mechanism
CN	Combined Nomenclature (EU's Combined Nomenclature)
CO2	Carbon dioxide
ETLA	Research Institute of the Finnish Economy (Elinkeinoelämän Tutkimuslaitos)
EU ETS	EU Emissions Trading System
IRENA	International Renewable Energy Agency
LCOE	Levelised Cost of Electricity
NREL	National Renewable Energy Laboratory
TEM	Ministry of Economic Affairs and Employment (Työ- ja elinkeinoministeriö)
UM	Ministry for Foreign Affairs (Ulkoministeriö)
VATT	Government Institute for Economic Research (Valtion taloudellinen tutkimuskeskus)
VM	Ministry of Finance (Valtiovarainministeriö)

## 1 Introduction

### 1.1 Background

The regulation concerning the European Union's Carbon Border Adjustment Mechanism (CBAM) entered into force in 2023. The objective of the mechanism is to prevent carbon leakage by ensuring that the prices of imported products into the EU better reflect their greenhouse gas emissions. In addition, the carbon border mechanism aims to reduce emissions associated with imports into the EU from third countries and foreign manufacturers. Through the mechanism, certain imported products (iron and steel, fertilizers, aluminium, cement, hydrogen, and imported electricity) are subject to a charge equivalent to the EU Emissions Trading System, based on their embedded emissions.

Until the end of 2025, CBAM will apply solely as a reporting obligation, with the requirement to purchase actual CBAM certificates entering into force in 2026. During the transitional period from 2026 to 2034, the CBAM charge will be gradually increased so that from 2034 onwards, it will cover the full emissions content of the products within its scope. Simultaneously, the free allocation of emission allowances within the EU will be phased out at the same pace in the sectors covered by the carbon border mechanism.

The European Commission is also assessing the potential extension of the mechanism to downstream products, indirect emissions, logistics, and entirely new sectors—such as organic chemicals and polymers—by the end of 2025.

### 1.2 Objectives

This report examines the effects of the current scope of application of the Carbon Border Adjustment Mechanism, as well as the potential expansion of the mechanism to downstream products and entirely new product groups, in the context of Finland. The objectives were to understand, through selected case companies and examples, various value chains related to CBAM products and the resulting economic and competitiveness impacts that the carbon border mechanism may generate for Finnish actors. The study provides necessary background information to support the preparation of Finland's positions in anticipation of the revision of the CBAM regulation.

### 1.3 Methods

The study is based on interviews with case companies, insights from AFRY's experts, as well as public statistics and other sources. The methods used are described in more detail below.

#### 1.3.1 Current Scope of the Mechanism

Regarding the current scope of application, five case companies were interviewed. These companies import CBAM-covered products into Finland, process them domestically, or export them from Finland abroad. The movement of CBAM products within each company's value chain is illustrated using flow charts. In addition, the impacts on competitiveness experienced and anticipated by each company have been described qualitatively. Due to the confidentiality of the interviews, the report presents only generalised conclusions derived from the results. The interviewed companies represent actors involved in the production and/or processing of steel, iron, aluminium goods, and fertilizers product groups that constitute the largest share of CBAM imports into Finland in terms of both value and emissions (see Chapter 3.1).

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### 1.3.2 Potential Expansion of the Mechanism to Downstream Products and New Product Groups

Regarding the potential expansion of the mechanism, the impacts were assessed based on publicly available data. In addition, during the interviews with the case companies within the current scope, the actors were asked for their views on possible product groups suitable for downstream expansion, the feasibility of such expansion, and the anticipated competitiveness impacts. To support the quantitative analysis of new product groups, one expert interview was also conducted.

The impacts of a potential downstream expansion were assessed through three case examples, while the effects of expanding to new product groups were examined using one case example. The downstream products selected were iron or steel nails and similar articles (customs code 7317), taps, valves and similar appliances (8481), and wind-powered generator units (i.e., complete wind turbines) (8502 31). For new product groups, plastics and plastic articles (customs code 39) were examined as a whole. For each case example, the value chains were modelled to the extent that statistical or other supplementary data were publicly available. Additionally, the anticipated competitiveness impacts of each product group were described with a focus on the significance of the cost increase caused by CBAM and the intensity of trade outside the EU. These key factors have been used as indicators in the EU Emissions Trading System's assessment of carbon leakage risk (EU, 2021), and, for example, in a recent European study assessing the impacts of CBAM (Orgalim, 2025).

The case examples were selected together with the study's steering group using the following criteria:

- Proximity and emissions intensity: the product contains as many items as possible within the current scope of application;
- Trade intensity: the product is imported into Finland in significant quantities from outside the EU, and both the product and the next-stage products in the value chain manufactured in Finland are exported in significant volumes outside the EU;
- Prevalence: the analysis aimed to ensure that the product under review would not pertain only to a single or a few companies and their value chains in Finland; and
- Complexity: products were chosen to represent a variety of value chains, ranging from simple products (e.g., nails) to highly complex ones (e.g., wind turbines).

The report was carried out on behalf of the Ministry of Economic Affairs and Employment (TEM) and in close cooperation with a steering group consisting of members from TEM, the Ministry of Foreign Affairs (UM), the Ministry of Finance (VM), and Customs. The members of the steering group were Katja Tuokko (TEM), Valtteri Härmälä (TEM), Sari Tasa (TEM), Juhani Tirkkonen (TEM), Petri Kuurma (UM), Ilari Valjus (VM), and Tuula Tasala-Lappalainen (Finnish Customs).

## 1.4 Structure of the Report

Chapter 2 presents a detailed overview of the EU Carbon Border Adjustment Mechanism. Chapter 3 reviews the results of the study regarding the impacts of the current scope of application on Finnish companies, while Chapter 4 presents findings on the potential effects of expanding the mechanism to both downstream products and new product groups. Chapter 5 summarizes the conclusions of the study and assesses its key limitations.

## 2 Carbon Border Adjustment Mechanism

### 2.1 Current Scope of the Carbon Border Adjustment Mechanism

The purpose of the Carbon Border Mechanism is to prevent carbon leakage, i.e., the relocation of emissions outside the EU to third countries as a result of stricter climate policies (EU, 2023a). The mechanism aims to ensure that the prices of goods imported into the EU more accurately reflect their greenhouse gas emissions. At the same time, it seeks to encourage third countries, foreign manufacturers, and imports into the EU to reduce their emissions. CBAM complements the EU Emissions Trading System and replaces existing mechanisms designed to prevent carbon leakage. Prior to CBAM, the risk of carbon leakage was addressed through the free allocation of emission allowances and by compensating for emission costs passed on to electricity prices.

The mechanism applies to so-called CBAM goods imported from outside the EU, which include certain iron and steel products (as well as goods manufactured from these products, such as screws, nuts, and washers), fertilizers, aluminum and cement products, as well as hydrogen and imported electricity (see Appendix 1 for a detailed list). CBAM imposes a charge on these goods based on their carbon content, which is linked to the price within the EU Emissions Trading System.

The implementation of CBAM is being carried out gradually. The so-called transitional phase began on 1 October 2023, from which date importers of CBAM goods are required to report quarterly on the quantities and emissions of these goods to the CBAM transitional registry. During the transitional phase, the mechanism applies only as a reporting obligation until the end of 2025. The obligation to purchase CBAM certificates will take effect in 2026, at which point the import of CBAM goods will also become subject to authorization. Between 2026 and 2034, the mechanism will progressively expand to cover the full carbon content of the goods subject to CBAM, starting in 2034. Simultaneously, the free allocation of emission allowances within the EU for sectors covered by the Carbon Border Adjustment Mechanism will be phased out at a corresponding pace.

CBAM applies to the carbon dioxide emissions generated during the production of CBAM products. For certain products, other greenhouse gases (nitrous oxide and perfluorocarbons) are also considered. For iron and steel products, aluminum products, and hydrogen, only direct emissions are taken into account, whereas for other CBAM goods, indirect emissions are also included; these refer to emissions resulting from the production of electricity consumed during the manufacturing process. Emissions can be determined based on actual emissions or default values set by the Commission. The number of CBAM certificates to be surrendered can be reduced by the carbon price already paid on emissions in the country of origin. If the corresponding amount of CBAM certificates is not surrendered, a penalty payment will be imposed.

CBAM applies only to goods released for free circulation within the EU internal market. Therefore, CBAM does not apply to goods brought into the EU customs territory under the inward processing procedure, which are further processed and eventually exported outside the EU (Customs, 2025b). When goods are placed under the inward processing procedure, no import duties or other charges are levied on them. However, if a CBAM good is removed from the procedure and released into the EU internal market, an obligation to submit a CBAM declaration arises. CBAM also applies in cases where a product placed under the inward processing procedure is processed into a non-CBAM product and this product is released into the EU internal market. In such cases, the emissions of the original CBAM good must be reported.

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### 2.1.1 Latest Proposed Amendments to the Mechanism

#### **Omnibus Package**

On 26 February 2025, the European Commission published a proposal for the so-called Omnibus Package (EU, 2025a), which includes amendments to the Sustainability Reporting Directive, the Corporate Sustainability Due Diligence Directive, the Taxonomy Regulation, and the EU Carbon Border Adjustment Mechanism. Regarding CBAM, the proposal aims to reduce the administrative burden and costs for small and medium-sized enterprises without significantly compromising emission reduction targets.

The central proposed amendment is that CBAM would only apply to importers whose annual volume of CBAM goods imported into the EU internal market exceeds a threshold set by the Commission (initially 50 tonnes of CBAM goods per importer, compared to the current threshold of €150 per CBAM import consignment). The new threshold is designed so that 99% of emissions from imported goods would still fall within the scope of CBAM. As a result, it is estimated that approximately 90% of current CBAM importers at the EU level would be exempt from CBAM obligations. However, all CBAM importers would still be required to monitor these thresholds and their compliance. Since a mass-based threshold could increase the risk of manipulation, the Omnibus proposal also includes rules to monitor, and sanction attempts to circumvent registration or the procurement of CBAM certificates. Additionally, the Omnibus Package proposes other changes aimed at reducing the administrative burden of reporting, including certain simplifications in emissions reporting.

In connection with the Clean Industrial Deal in February 2025, the Commission announced that it would conduct a broader review of CBAM later in 2025 to assess the potential expansion of the mechanism (EU, 2025c). The Commission also stated that it would examine the position of exporters of CBAM goods vulnerable to carbon leakage and may subsequently propose legislation in the first half of 2026.

#### **Action Plan to Support the Competitiveness and Low-Carbon Transition of the Steel and Metal Industry**

In addition to the above, on 19 March 2025 the European Commission published an action plan to support the competitiveness and low-carbon transition of the steel and metal industry, which includes two significant announcements regarding CBAM: 1) the Commission will publish a communication on addressing carbon leakage in relation to exports outside the EU by Q2 2025; and 2) it will conduct a comprehensive assessment of the potential extension of CBAM's current scope to certain steel- and aluminium-intensive downstream products, and propose additional methods to prevent circumvention of the mechanism by Q4 2025.

## 2.2 Possible Expansion of the Mechanism

By the end of 2025 (before the end of the CBAM transitional period), the Commission will assess the possible expansion of CBAM to cover (EU, 2023a; EU, 2025c):

- Downstream products within the value chains of the goods listed in Annex I ((EU) 2023/956);
- Emissions from the transportation of Annex I goods;
- Other production inputs (precursors) of Annex I goods;
- Indirect emissions associated with the Annex II goods (iron and steel, aluminium, and hydrogen from the current scope); and
- Other goods at risk of carbon leakage, such as organic chemicals and polymers.

A possible legislative proposal following the assessment is expected to be presented in early 2026, as previously stated (EU, 2025c).

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### 3 Impacts of the Current Scope of the Carbon Border Adjustment Mechanism in Finland

#### 3.1 Introduction

The current scope of the Carbon Border Adjustment Mechanism (CBAM) covers certain iron and steel products (including goods manufactured from these products, such as screws, nuts, and washers), fertilizers, aluminum and cement products, as well as hydrogen and imported electricity (see Appendix 1 for a detailed list). In 2024, CBAM imports from outside the EU accounted for approximately 1.7% of the total value of imports to Finland. Among CBAM products imported into Finland from outside the EU, the most significant in terms of both import value and emissions are iron and steel products, fertilizers, and aluminum products (**Virhe. Viitteen lähde ei löytnyt.**).

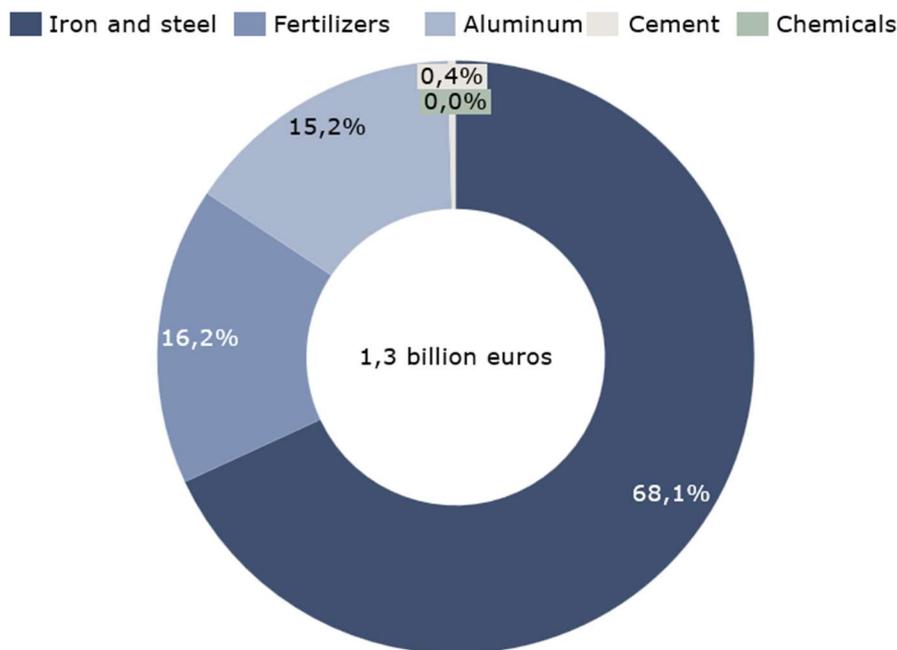


Figure 1. Imports of CBAM products within the current scope into Finland from outside the EU in 2024 (source: Customs, 2025c)

In 2023, 3,247 companies imported CBAM products into Finland. Imports were highly concentrated among a few companies when measured by both emissions generated in the production of CBAM products and the value of imports (VATT, 2025). The imports of thirteen companies accounted for five-sixths (approximately 1.7 MtCO<sub>2</sub>) of the total emissions produced during the manufacturing of CBAM products. At the same time, these companies represented two-thirds of the total import value of all CBAM products, indicating that the largest CBAM importers have, on average, been more emissions-intensive. Numerically, most importers were companies whose CBAM product manufacturing generated less than 1 ton of carbon dioxide. However, these small importers accounted for only one ten-thousandth of the total emissions generated in the production of all imported CBAM products.

By industry, chemical manufacturing, construction, metal processing, wholesale and retail trade, as well as the electrical and electronics industry are key Finnish sectors in CBAM imports, measured by emissions generated in the production of the imported products (Figure

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2). The large share of emissions in chemical manufacturing is explained by the inclusion of both direct and indirect emissions for fertilizer imports, whereas for steel and aluminum products only direct emissions fall under the current scope of CBAM.

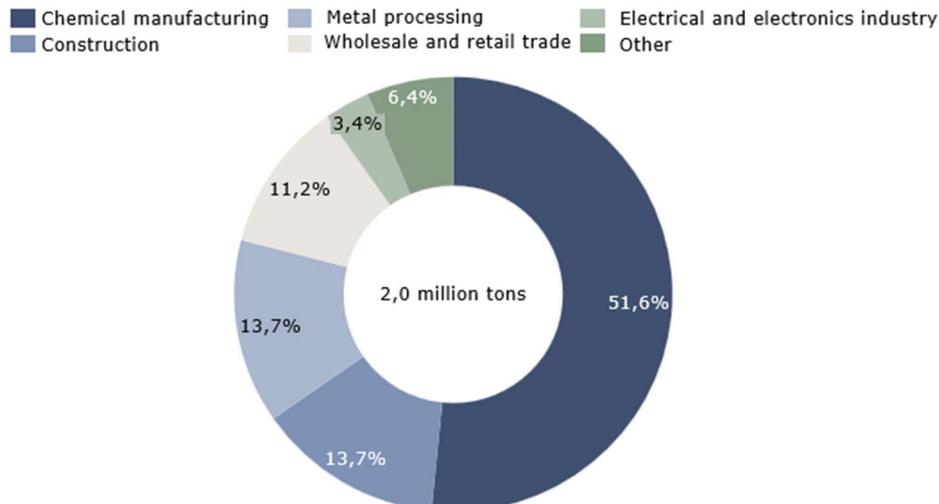


Figure 2. Emissions generated in the manufacturing of CBAM goods imported to Finland from outside the EU by sector in 2023 (Source: VATT, 2025).

Finnish companies utilizing CBAM-covered products in their manufacturing processes are primarily concentrated in the production of metal products, machinery and equipment, petroleum and other chemical industry products, paper and cardboard products, electrical equipment and electronics, as well as vehicles. Finland also produces goods that compete with CBAM-covered imports, particularly iron and steel products. Additionally, production of aluminum products and fertilizers is significant, though smaller in scale compared to the metal industry.

## 3.2 Effects of the Current Scope

Companies importing CBAM products to Finland represent a wide range of industries, covering actors from manufacturers of simple basic products to those producing highly complex, high value-added final products. Due to this diversity, the impacts experienced by these companies regarding CBAM are mostly individual, based on case company interviews, with only a few exceptions that can be generalized. The following chapters present views raised during the interviews with the case companies.

### 3.2.1 CBAM Products in Companies' Value Chains

Based on interviews with case companies, the share of CBAM products in all necessary production inputs varies significantly between companies. Similarly, the proportion of CBAM products imported from within the EU internal market versus outside the EU varies considerably depending on the company. In terms of the use of Finnish companies' final products, the case examples highlight the export orientation of the companies. The majority of exports by the interviewed case companies are directed to the EU internal market, but on the other hand, significant quantities of products processed from CBAM goods in the next stage of the value chain are also exported outside the EU.

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### 3.2.2 Effects on companies' competitiveness and the risk of carbon leakage

CBAM roughly divides the interviewed case companies into two groups in terms of competitiveness impacts: 1) companies for which CBAM may create opportunities through improved competitive positioning, and 2) companies that primarily view CBAM as a challenge to their business:

- 1) CBAM is seen as creating opportunities for actors whose end-product customers are mainly located within the EU internal market, and whose competitive position in the EU internal market is currently challenged by competing imported products from outside the EU that may be cheaper but have higher emissions. For these actors, CBAM is perceived to level the competitive playing field or even increase their competitive advantage within the EU internal market. In terms of competitiveness, CBAM may benefit most those actors who already produce low-emission products. In such cases, the removal of free emission allowances has less significance for them, while the costs of competing higher emission imported products from outside the EU rise more due to CBAM.
- 2) CBAM is seen as a significant challenge for globally operating companies whose end products are largely directed outside the EU. Typically, competitors outside the EU do not face equivalent carbon pricing in their production. The removal of free emission allowances and the introduction of CBAM without compensatory protection for exports outside the EU therefore places products exported from the EU at a competitive disadvantage.

According to the case company interviews, there is a particular risk of carbon leakage if a company's production in Europe faces a significant cost increase due to CBAM or the emissions trading system, this cost increase cannot be passed on to the prices of end products without negatively affecting competitiveness, the products are exported in significant volumes outside the EU, and the company has production facilities outside the EU suitable for producing equivalent products, to which production can be shifted to maintain cost competitiveness. However, the risk of carbon leakage can be mitigated if the company's products are so-called specialty products (typically high value-added products requiring special expertise), whose prices can absorb the cost increase caused by CBAM or emissions trading without significantly weakening competitiveness in international markets.

The CBAM cost increase estimated by the case companies varies significantly between companies depending on their upstream supply chains and the share of CBAM products in their end products. Generally, even a small additional cost that cannot be passed on to the end product's price without compromising competitiveness is seen as detrimental from the companies' perspective. According to the interviews, limiting the risk of carbon leakage would require compensation for the CBAM or emissions allowance cost increase in exports outside the EU, for example through export rebates and/or maintaining free allocation of emission allowances or some other mechanism that preserves export competitiveness.

Utilizing the inward processing procedure can reduce the competitiveness challenge of exports outside the EU described above, under certain conditions. However, the usefulness of this special procedure divides opinions among the case companies. Some actors do not use the procedure due to its administrative complexity relative to the cost savings it offers (e.g., tracking import and export flows and manual reporting for complex end products containing thousands of CBAM goods). The perceived benefit of the procedure was emphasized if the company's volumes of imported CBAM products are large, the number of imported CBAM product categories is small, the CBAM-induced cost increase for the company is significant, and a large share of the company's end product exports is directed outside the EU.

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### 3.2.3 Administrative Burden Caused by Reporting

CBAM's required emissions reporting and the administrative burden it causes are, based on interviews with case companies, key challenges of the mechanism in addition to the direct effects related to cost competitiveness described above.

Based on the interviews, collecting reliable emissions data from suppliers of CBAM products is considered challenging. This often requires close dialogue with suppliers and training due to a lack of experience in emissions reporting and inconsistent practices. Even if emissions data can be collected, there remain significant uncertainties about the accuracy of the information. As a result, companies express concerns about errors and potential sanctions, since the responsibility for the accuracy of emissions data ultimately remains with the importers of CBAM products.

The emissions reporting required by CBAM and the level of detail demanded are considered challenging even among experienced companies. Many of the interviewed companies have long been assessing the emissions impacts of their value chains in close cooperation with their suppliers, but despite their experience, they still highlight the challenges mentioned above. Additionally, companies emphasized the difficulty of reporting especially for small businesses, which often lack the experience and/or resources to assess the emissions impacts of their value chains.

Based on the case examples, the perceived burden of reporting depends significantly on how many different products and how many different suppliers the CBAM products are procured from. The perceived benefit of CBAM in terms of emission reductions, in turn, depends on the volume of imports. If there are numerous products and suppliers but import volumes are low, the reporting burden is emphasized while CBAM's potential for emission reductions is limited. Conversely, if a company perceives its competitive position to improve because of CBAM, the administrative burden caused by reporting is considered reasonable relative to the benefit. This was especially emphasized in the interviews with companies whose products are primarily sold on the EU internal market.

### 3.2.4 Stakeholder's Views on Potential Areas for Development in CBAM

In addition to the challenges and opportunities described above, the case companies also highlighted potential areas for development related to CBAM during the interviews. This report does not take a position on the applicability of these development proposals. The case companies raised the following points as suggestions for improvement:

- 1) **Emissions covered by the mechanism.** In particular, actors selling their products to the EU's single market believe that the mechanism should consider indirect emissions (emissions from electricity consumption in production) of all products, as the significance of emissions caused by electricity use will increase as industry becomes more electrified. Currently, the risk of carbon leakage has partly been mitigated by compensating emission costs passed on in electricity prices. In Finland, related support for the electrification of energy-intensive industry has been provided (Energy Authority, 2025) (this support will end at the end of the current year). On the other hand, some case companies argue that including indirect emissions would increase the costs incurred by industry using CBAM products.
- 2) **Default emission values.** According to the views of case companies selling their products primarily to the EU internal market, the default emission values used in reporting should be higher than the current ones in order to create incentives to collect actual emission data from suppliers. The companies believe that the current default values are set based on global average emission levels, which do not always

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reflect the true emission content of all competing imported products. On the other hand, it was also pointed out that if the default values were higher, this would increase costs for those actors who procure CBAM products and make significant efforts to obtain real emission data but are still unable to receive it from their suppliers.

- 3) **Downstream products.** According to case companies, if the downstream products of CBAM goods are not included in the mechanism, there is a risk of production shifting outside the EU. The most important downstream products to be included would be those where the share of emissions content from products currently covered by CBAM is significant. On the other hand, case companies assess that expanding the mechanism to cover downstream products would increase costs for industries using these CBAM goods and could exacerbate the administrative challenges related to reporting, especially as products become more complex and the number of suppliers increases. Similarly, expanding the product scope could also complicate the use of the internal processing procedure, as the administrative burden in this regard would likely increase as well.
- 4) **Avoidance/circumvention of CBAM fees.** A common concern among stakeholders is the potential to avoid or circumvent CBAM fees. Avoidance can occur, as described above, by shifting production outside the EU and importing the goods into the EU internal market only at the next stage in the value chain, which is currently outside the scope of CBAM. Additionally, the mechanism can be circumvented by directing low-emission products to the EU market while exporting higher-emission products to markets without equivalent carbon pricing, and by further processing products before import into the EU in countries where emission default values are as low as possible (emissions are calculated based on the last processing location before import into the EU internal market). Possible responses to these concerns could include including downstream products in the mechanism (see above) or other potential mechanism
- 5) **Treatment of exports outside the EU.** According to the case companies, the additional costs imposed by CBAM generally cannot be passed on to the prices of products competing in global markets with products that are not subject to equivalent carbon pricing (note: in the responses from case companies, the possibility of utilizing the internal processing procedure for CBAM products was not considered here, so CBAM in this context may rather refer to the additional costs caused by emission allowances or clean production). According to the interviewed case companies, possible ways to compensate for the additional costs could be maintaining the free allocation of emission allowances for exports outside the EU, or some other mechanism that preserves the competitiveness of exports, such as export refunds.

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## 4 Impacts of the Possible Expansion of the Scope of the Carbon Border Adjustment Mechanism in Finland

### 4.1 Introduction

The European Commission has announced that by the end of 2025 (before the end of the transition period set for the Carbon Border Adjustment Mechanism), it will assess the possible expansion of CBAM to cover the downstream value chain of products currently within its scope, as well as other goods vulnerable to carbon leakage risks, particularly organic chemicals and polymers (EU, 2023a; EU, 2025c) (see Chapter 2.2). Additionally, in the steel and metal industry competitiveness and low-carbon action plan published on 19 March 2025, the Commission states it will evaluate expanding CBAM's current scope to include certain downstream steel- and aluminum-intensive products (see Chapter 2.1.1). However, no decisions have yet been made regarding the possible inclusion of downstream products or new products in the mechanism's scope.

This study assessed the impacts of a potential downstream expansion using three case examples, and the expansion to new product categories was examined with one case example (see Chapter 1.3 for a more detailed description of the approach). The downstream products selected were iron or steel nails and similar articles (customs code 7317), taps, valves, and similar devices (8481), as well as wind-powered generator sets (i.e., complete wind turbines) (8502 31). For the new product categories, plastics and plastic goods (customs code 39) were examined as a whole.

For the downstream products selected as case examples, wind turbines accounted for the largest imports to Finland in 2024, measured both by volume and emissions (Figures 3 and 4; emissions are based on estimates of steel production emissions contained in the products only). Taps and valves had the highest import value and the second highest emissions. Nails were the smallest imported product of the three in terms of volume, value and emissions in the case examples. Imports from outside the EU accounted for about 39% of the imports of the selected downstream products to Finland by volume and approximately 0.3% of the total Finnish imports in term of value.

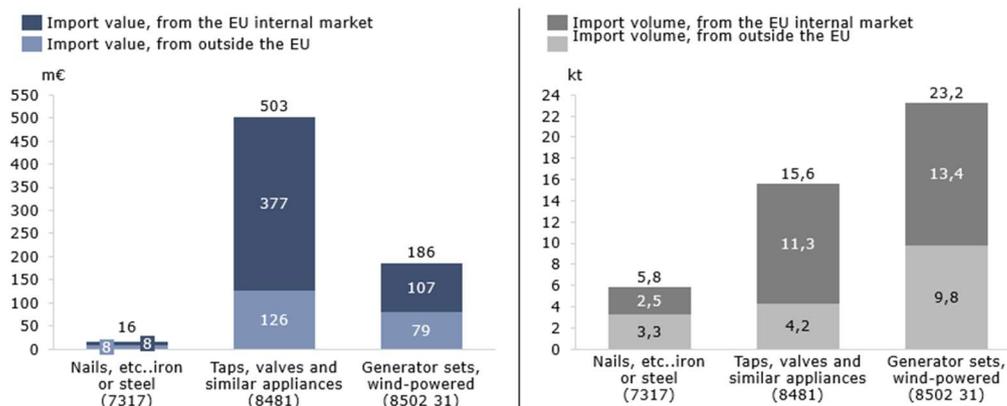


Figure 3. Imports of downstream case example products to Finland in 2024, measured by both import value and import volume (source: Customs, 2025c)

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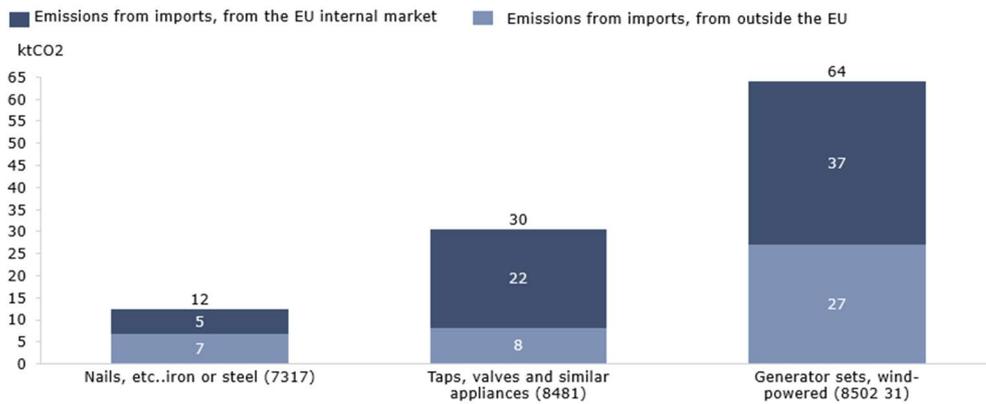


Figure 4. Emissions from imports of downstream case example products to Finland in 2024 (sources: Customs, 2025c; Stede et al., 2021 [steel content in product materials]; EU, 2023b [steel emission intensity in benchmark products according to CBAM default values])

Regarding the new products selected as case examples, in 2024, the majority of plastics and plastic goods imported into Finland came from the EU internal market, accounting for about 80% both in terms of import volume (tons) and value (Figure 5). Imports from outside the EU made up the remaining approximately 20% of plastics and plastic products imported into Finland, corresponding to about 0.7% of the total value of Finnish imports. The largest share of non-EU imports consisted of raw materials for plastics, which accounted for about 61% of imports by volume. In terms of import value in 2024, the distribution was reversed between raw materials and plastic products, with plastic products covering about 62% of the import value.

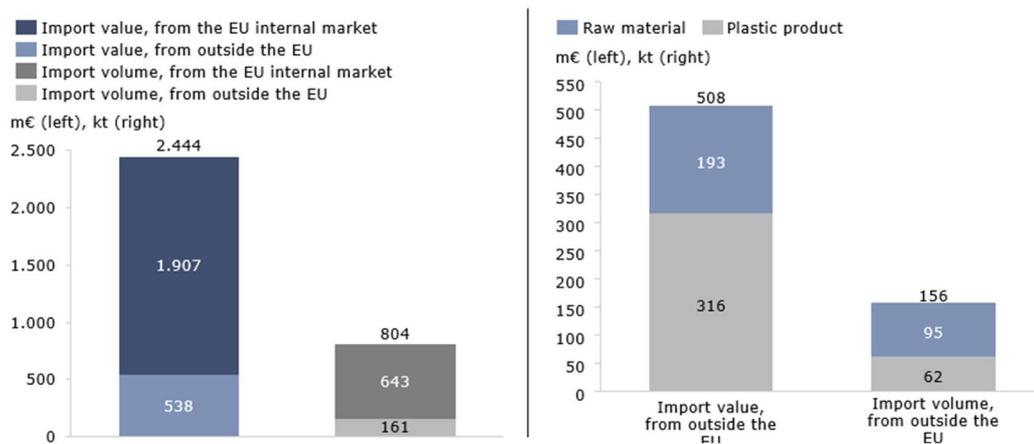


Figure 5. Imports of new product group case examples (plastics and plastic goods) to Finland in 2024, measured both by import value and volume (the right-hand chart breaks down non-EU imports into plastic raw materials and plastic products) (source: Customs, 2025c)

The following case examples examine the formation of value chains in Finland, as well as the competitiveness impacts on Finnish companies resulting from a possible expansion of CBAM, primarily from the perspective of companies using CBAM products as production inputs. For example, in the first case example presented below (nails and similar goods), the competitiveness impacts are analyzed from the viewpoint of actors importing nails into Finland and those manufacturing the next stage products in the value chain (e.g., wooden structures). In addition to this perspective, the competitiveness impacts are briefly examined from the viewpoint of a Finnish manufacturer of a CBAM product (e.g., a valve manufacturer).

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## 4.2 Effects of a Possible Downstream Expansion

### 4.2.1 Case Example 1: Nails (7317)

Iron or steel nails and similar articles (customs code 7317) represent very simple downstream products among the selected case examples. Nails are comparable to the simple downstream products already included in CBAM's current scope, such as other fasteners (e.g., screws, bolts, and nuts).

The share of CBAM products within the current scope is very significant for nails, as an estimated 96% of their material content is steel (Stede et al., 2021<sup>1</sup>).

#### Value Chain in Finland

In 2024, most nails and similar articles imported into Finland came from outside the EU, accounting for about 56% of imports measured by volume (Figure 6). Nails and similar articles are widely used in various downstream products within the value chain. Key application areas include the construction industry (e.g., structures, cladding, and finishing), machinery and equipment manufacturing (e.g., frameworks and protective casings), vehicle manufacturing (e.g., lightweight structures, joints, and upholstery), and packaging materials manufacturing (e.g., pallets and wooden or cardboard boxes). In Finland, the industry with the largest output value, construction, is targeted at the domestic market. In contrast, a significant portion of the output from companies manufacturing machinery and equipment, vehicles, and furniture in Finland is destined for export (about 51%), particularly outside the EU (54% of exports and 28% relative to the total production value).

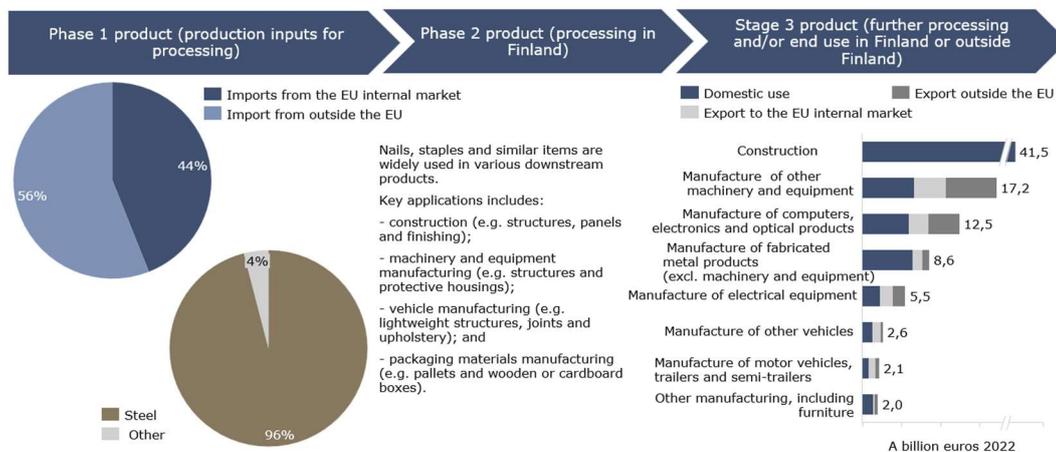


Figure 6. Value chain of nails and similar goods in Finland (import percentages relative to tonnage, material content based on Stede et al., 2021; domestic use and exports of key industries based on production value) (data sources: Statistics Finland, 2025; Customs, 2025c)

In addition to imports, nails and similar articles are also manufactured in Finland by a few companies, although nail production is largely concentrated abroad. In 2024, approximately two-thirds of nails and similar goods exported from Finland were shipped to the EU internal market, while about one-third went outside the EU, measured by export tonnage. Regarding import-export balance, around 5,800 tons of nails and similar articles were imported into Finland, and approximately 3,100 tons were exported from Finland.

<sup>1</sup> The source referenced by the European Commission for assessing the material content of downstream products.

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**Significance of the CBAM Cost Addition**

Nails and similar articles are essential in many structures and products and are typically used in large quantities. Below (Table 1) is a simplified estimate of how significant the CBAM cost addition targeting the material costs of nails could be (the assumptions of the calculation are described in the footnote of the text).

Based on the estimate, the CBAM cost addition targeting the material costs of nails could be significant (40% in 2034, when the CBAM charge covers the full carbon content of the included goods), and the material costs are assumed to cover the majority of the total manufacturing costs of nails. However, nails and similar items typically represent only a very small share (estimated <5%) of the production costs of the next-stage product in the value chain (excluding special uses, such as custom-made fasteners). Other materials used alongside nails, such as wood, metals, and composites, as well as labor costs, are assumed to cover the largest share. Therefore, the CBAM cost addition related to nails in relation to the production costs of the next-stage value chain product is significantly more moderate than the cost addition estimated in the table, which targets material costs only.

Table 1. Simplified estimate of the CBAM cost addition on the material costs of nails<sup>2</sup>

Component	Value
Material cost of nails (€/t)	833
Market price of steel (€/t)	800
Share of steel in material content and costs (%)	96
CBAM cost addition (€/t)	332
Price of emission allowance (€/tCO <sub>2</sub> )	150
Emission intensity of steel (tCO <sub>2</sub> /t)	2,21
CBAM cost addition as material costs (%)	40

**Impacts of a Potential CBAM Expansion on Competitiveness from the Perspective of an Operator Using Nails as an Input**

The impact of the cost premium caused by CBAM on competitiveness depends on whether the product of the next stage of the value chain using nails and similar articles is sold within the EU internal market or outside the EU. The options are illustrated below:

- 1) If the next-stage product in the value chain is sold within the EU internal market, including nails and similar articles in CBAM would increase the production costs of that product and the risk of carbon leakage in its manufacturing. This is because without including the downstream stages of the value chain in the mechanism, the next-stage product imported from outside the EU can avoid the CBAM cost increase and thus benefit from a relative competitive advantage compared to a product manufactured in the EU. However, the risk of carbon leakage remains low if the share of nails and similar articles in the production costs of the next-stage product is small.

<sup>2</sup> The emission allowance price used in the estimate is based on AFRY's forecast for the year 2034 (at which point the CBAM charge covers the full emission content of the goods concerned); the steel emission intensity is based on CBAM default values (EU, 2023b (product code 7318 23 00: rivets)); the share of steel in the material content of nails is taken from the EU Commission-referenced source (Stede et al., 2021); and the steel market price is based on publicly available global market price sources. The estimate assumes that the share of steel is the same in both the material content and the material costs of nails. It also assumes that steel costs cover the majority of the material costs of nail manufacturing, and steel emissions account for the majority of the total emissions from nail production, although other cost and emission components do exist in reality. In the subsequent impact analysis, it is assumed that the CBAM cost increase is fully passed on to the product price.

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- 2) If the next-stage product in the value chain is sold outside the EU, the manufacturer can utilize the inward processing procedure and thereby avoid the CBAM charge on nails imported from outside the EU used as production inputs. However, due to the administrative burden described earlier, utilizing the inward processing procedure may not be cost-effective relative to the benefits gained, since the share of nails and similar items in the production costs of the next-stage product is typically small, and the significant volume involved makes reporting laborious. If the inward processing procedure is not utilized, the competitiveness of the next-stage product outside the EU will deteriorate due to the CBAM cost increase, creating a risk of carbon leakage.

In summary, the typically very small share of nails and similar articles in the production costs of the next stage product in the value chain suggests that the CBAM cost increase—and thus the risk of carbon leakage—would not be significant for these products (for example, logistics costs from outside the EU could exceed the CBAM cost increase allocated to the product through nails). Furthermore, the low risk of carbon leakage is supported by the fact that nails and similar items are predominantly used in the construction industry, which mainly serves the Finnish domestic market (see Figure 6). On the other hand, a significant portion of the output from other listed sectors is directed to exports outside the EU, and as described above, the use of the internal processing procedure for nails may not necessarily be cost-effective. However, the small share of nails and similar articles in the costs of these sectors also indicates that the risk of carbon leakage for them would be low.

Besides focusing only on nails, it is important to note that in products that use many different CBAM production inputs (e.g., steel structures and smaller steel components in machinery and equipment), the total CBAM cost increase could become significant. The cumulative cost impact from the use of various CBAM products was also highlighted in interviews with case companies under the mechanism's current scope.

**The impacts of a possible CBAM expansion on the competitiveness from the perspective of nail manufacturers**

Also, from the perspective of nail manufacturers, the impact of the CBAM-related cost increase on competitiveness depends on whether nails and similar goods are sold to the EU internal market or outside the EU. The following illustrates these options:

- 1) For actors manufacturing nails and similar articles including nails in the scope of CBAM could improve their competitiveness in the EU internal market, which is the primary export destination from Finland (66% of exports go to the EU internal market). Competitiveness could particularly improve if the production of nails in Finland has lower emissions compared to competitors from third countries, or if the nail manufacturer is not covered by the EU Emissions Trading System. However, it is important to note that if the downstream products in the value chain that use nails and similar articles are not covered by CBAM, the cost could be avoided as described in section 1 of the previous part. Thus, a weakening of competitiveness in the downstream part of the value chain could also lead to negative impacts upstream in the value chain if upstream stages were relocated outside the EU.
- 2) Regarding exports outside the EU, the competitiveness of nail manufacturers is at risk of weakening, since the example calculation suggests that CBAM will likely impose a significant additional cost on nail production. On the other hand, the share of nails and similar articles in the production costs of the next stage in the value chain is typically small, which reduces the risk of weakened competitiveness and thus the risk of carbon leakage related to nail manufacturing.

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### 4.2.2 Case example 2: Taps and Valves (8481)

Taps, valves or the likes (8481) represent products that fall between simple products (like nails) and very complex products in the value chain (such as complete wind turbines).

Taps and valves form a very broad product group, where the most commonly used materials include stainless steel and cast iron (especially industrial valves), brass (especially consumer products), plastics, aluminum, bronze and other metal alloys, as well as ceramics and various coating materials such as chrome. The share of CBAM products in the current scope is significant for taps and valves, as approximately 80% of their material content is steel and 3% aluminum (in addition, 4% copper, 4% plastics, and the remaining 9% other materials) (Stede et al., 2021).

#### Value Chain in Finland

Taps, valves, and similar devices were imported to Finland in 2024 primarily from the EU internal market, accounting for about 73% of imports measured by tonnage (Figure 7). Products made from taps, valves, or the likes, used in the next stage of the value chain serve numerous applications where controlling the flow of liquids or gases is necessary. These applications include industrial plants (chemical industry, pulp and paper industry, and energy production), building technology, water supply, vehicles and machinery (e.g., hydraulics), as well as household appliances and consumer devices. In Finland, for industries using taps, valves or the likes, the largest sector by production value is construction and its output is primarily directed to the domestic market. On the other hand, a significant share of the output of companies manufacturing various machinery, equipment, and vehicles in Finland is exported (approximately 49%), particularly to markets outside the EU (52% of exports and 26% in relation to the value of the entire output).

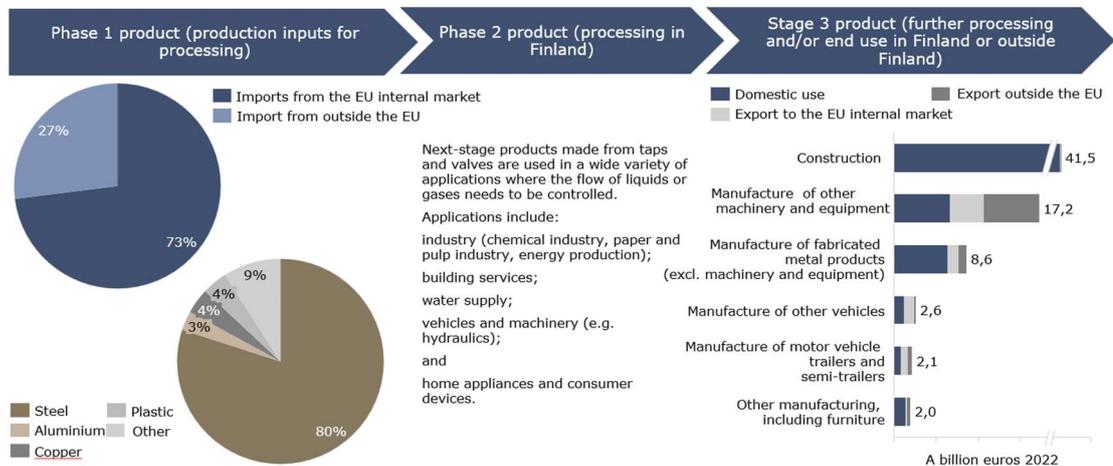


Figure 1. Value chain of taps, valves, or the likes in Finland (Import shares as percentages of tonnage, material content based on Stede et al., 2021, domestic use and exports of key industries based on production value) (statistical sources: Statistics Finland, 2025; Customs, 2025c)

In addition to imports, taps and valves are manufactured in Finland by numerous companies, with a strong tradition particularly in industrial valve production. In 2024, approximately 55% of the exports of taps and valves from Finland were directed to the EU internal market, and about 45% to markets outside the EU, measured by export tonnage. Regarding the import-export ratio, around 15,600 tonnes of taps and valves were imported into Finland, while approximately 9,100 tonnes were exported from Finland.

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**Significance of the CBAM Cost Addition**

Below (Table 2) is a simplified estimate of how large the CBAM cost addition to the material costs of valves could be (calculation assumptions are described in the footnote).

Based on the estimate, the CBAM cost addition to valve material costs could be significant (37% in 2034, when the CBAM charge covers the full emission content of the included goods), and material costs are assumed to cover a substantial portion of the total manufacturing costs of valves. However, the significance of the cost increase in the production costs of the product at the next stage of the value chain depends significantly on the varying uses of taps and valves.

As previously noted, taps and valves are used across a wide range of industries, from industrial process plants to consumer products. For example, in industrial applications, the share of valves in the total investment costs of process industries and power plants is estimated to be only a few percent (approximately less than 10%) (VALVEcampus, 2015). Typically, process equipment (e.g., reactors, tanks, heat exchangers, pumps, etc.), piping, automation and control systems, buildings and foundations, as well as labor costs, cover the majority of the costs. On the other hand, in consumer products, such as kitchen or bathroom fixtures, the share of the tap can be several tens of percent of the total fixture cost, but tap manufacturing typically involves significant use of materials other than the current CBAM products (e.g., brass and plastics). Therefore, the CBAM cost addition for valves and taps relative to the production costs of the next stage product in the value chain is more moderate than the estimate shown in the table, which considers only the cost addition on material costs.

*Table 2. Simplified estimate of the CBAM cost addition on valve material costs<sup>3</sup>*

Component	Value
Valve material cost (€/t) (€/t)	1000
Steel market price (€/t)	800
Steel share of material content and costs (%)	80
CBAM cost addition (€/t)	366
Emission allowance price (€/tCO <sub>2</sub> )	150
Steel emission intensity (tCO <sub>2</sub> /t)	2,44
CBAM cost addition as of material costs (%)	37

**Impacts of a potential extension of CBAM on the competitiveness from the perspective of an operator using valves and taps as production inputs**

As with nails (see Chapter 4.2.1), the impact of the CBAM-induced cost increase on competitiveness depends on whether the next-stage product in the value chain using valves and taps is sold on the EU internal market or outside the EU. These alternatives are illustrated below:

<sup>3</sup> The emission allowance price used in the estimate is based on AFRY's 2034 projection (by which time the CBAM charge will cover the full embedded emissions of the covered goods); the steel emission intensity is based on CBAM default values (EU, 2023b, product code 7306: other tubes and hollow profiles); the steel content in valves is based on the source referenced by the Commission (Stede et al., 2021); and the market price of steel is based on publicly available global market data. The estimate assumes that steel costs account for most of the material costs in valve manufacturing, and that steel-related emissions represent the majority of the total emissions, even though other cost and emission components do exist in practice. In the subsequent impact assessment, it is assumed that the CBAM-related cost increase is fully passed on to the product price.

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- 1) If the next-stage product in the value chain is sold on the EU internal market, including taps and valves in the scope of CBAM would increase the production costs of that product and raise the risk of carbon leakage. This is because, without the inclusion of downstream stages in the mechanism, a next-stage product imported from outside the EU can avoid the CBAM cost and thereby benefit from a relative competitive advantage compared to a similar product manufactured within the EU. However, the risk of carbon leakage depends significantly on the share of taps and valves in the value of the next-stage product, which can vary greatly depending on the application.
- 2) If the next-stage product in the value chain is sold outside the EU, the manufacturer may use the inward processing procedure to avoid the CBAM charge applied to taps and valves imported from outside the EU as production inputs. However, as noted earlier, due to the associated administrative burden, utilizing the inward processing procedure may not always be cost-effective relative to the benefits gained. The share of taps and valves in the production costs of the next-stage product can vary significantly, which in turn affects the cost-effectiveness of the procedure on a case-by-case basis. If the inward processing procedure is not used, the CBAM-related cost increase may reduce the competitiveness of the next-stage product outside the EU, thereby creating a risk of carbon leakage.

In summary, the potentially significant, but very much dependent on the intended use, share of taps and valves in the production costs of the next stage of the value chain product suggests that the CBAM cost addition and thus the risk of carbon leakage due to the cost addition could be moderate for these products. If the inward processing procedure is not utilized, the risk of carbon leakage may be further amplified by the extensive use of taps and valves in the manufacturing of machinery and equipment, where exports outside the EU account for over one-third of the output of relevant Finnish industries (see Figure 1).

**Impacts of a Potential CBAM Extension on the Competitiveness of Taps and Valve Manufacturers**

From the perspective of faucet and valve manufacturers, the impact of the CBAM-related cost increase on competitiveness depends on whether the products are sold to the EU internal market or exported outside the EU. The scenarios below illustrate these alternatives:

- 1) For manufacturers of taps and valves, inclusion of these products in the CBAM could improve their competitiveness within the EU internal market, which is the main destination for Finnish exports (55% of exports go to the EU internal market). Competitiveness could especially improve if taps and valves produced in Finland have a lower emissions intensity compared to competitors from third countries, or if the manufacturer is not subject to the EU Emissions Trading System (ETS). However, it is important to note that if downstream products that use taps and valves are not included in the scope of CBAM, the cost of CBAM could be avoided by importing these downstream products, as explained in the previous section (Scenario 1). As a result, the weakened competitiveness of downstream products could negatively impact upstream stages of the value chain, potentially leading to the relocation of upstream production outside the EU.
- 2) For exports outside the EU (45% of exports), the competitiveness of tap and valve manufacturers may decline, as the CBAM is likely to introduce a significant cost increase, as demonstrated in the earlier example calculation. On the other hand, the share of faucets and valves in the production costs of the next-stage product in the value chain depends heavily on the specific end-use case.

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### 4.2.3 Case Example 3: Wind Turbines (8502 31)

Wind-powered generating sets, i.e., complete wind turbines (8502 31), represent a complex final product within the selected case examples of the manufacturing value chain (electricity is not considered here). Thus, the impact assessment for wind turbines in this chapter differs from the two previously presented case examples, which represent intermediate products in value chains, and for which the analysis mainly considered their downstream impacts.

The main components of a wind turbine are the foundations, tower, nacelle (machine housing), and rotor (including the rotor hub and blades). Foundations for wind turbines typically use steel-reinforced concrete. The tower mainly consists of steel (in some cases also reinforced concrete), the nacelle frame is typically made of steel or aluminum, and the nacelle cover is composed of composite materials (often glass fiber composites). The rotor blades are made of glass or carbon fiber composites (often including materials such as balsa wood for stiffening), and the rotor hub is made of steel. The generator and gearbox (if used) inside the nacelle typically contain mostly steel and copper in terms of material content. It is also worth noting that some parts of wind turbines are already within the current scope of the CBAM (e.g. tariff heading 7308 20 00 (towers and lattice masts), which includes the wind turbine tower)

The share of CBAM products within the current scope is very significant in wind turbines, as an estimated approximately 55% of their material content is steel and 10% aluminum (in addition to 15% copper, 4% plastics, and the remaining 16% other materials) (Stede et al., 2021). However, when comparing the source referenced by the European Commission for assessing the material content of downstream products (Stede et al., 2021) to other public sources, significant differences are found. For example, based on the product list of a major wind turbine manufacturer, Vestas, the steel share could exceed 80% of the wind turbine's material content, whereas the aluminum share would be only about one percent (Vestas, 2023). The estimates presented above only consider the structures above the foundation of the wind turbine.

#### **Value Chain in Finland and Europe**

In 2024, complete wind turbines were imported into Finland primarily from the EU internal market (see Figure 8). This accounted for approximately 58% of imports both by tonnage and value. The largest countries of origin were Spain and Denmark. About 42% of wind turbines imported to Finland originated from outside the EU, with China and India being the main non-EU suppliers. In Finland, key components of wind turbines are manufactured, including generators, transformers, frequency converters, gearboxes, and steel structures (as well as foundations for onshore wind turbines, which are generally always produced locally), but complete wind turbines are not manufactured domestically. Components produced in Finland are therefore mainly exported for final assembly, which is dominated by leading Western industry players such as Vestas, Siemens Gamesa, Nordex, GE, and Chinese companies including Goldwind, Envision, Windey, Mingyang, and SANY, who also dominate the import of complete wind turbines into Finland.

A recent study examining the wind turbine value chain indicates that a significant portion of the global manufacturing capacity for wind turbine components is located in Europe (Rystad Energy, 2023). Notable European countries include Germany, Spain, Denmark, and France, all of which have substantial manufacturing activity for key wind turbine components such as rotor blades, nacelles, and towers.

Despite the significant European manufacturing capacity, China remains by far the largest global producer of both rotor blades and nacelles, accounting for approximately 60% of each, with European capacity representing about 15% for both. On the other hand, the majority of

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wind turbine towers installed in Europe are produced within Europe due to logistical reasons, as transporting large steel structures over long distances is typically not cost-effective. Many European wind turbine manufacturers source components from Chinese suppliers. Due to strong domestic demand in China, strategic development of local supply chains, availability of raw materials, and low labor costs, the production costs of wind turbines in China are significantly lower compared to European manufacturing.

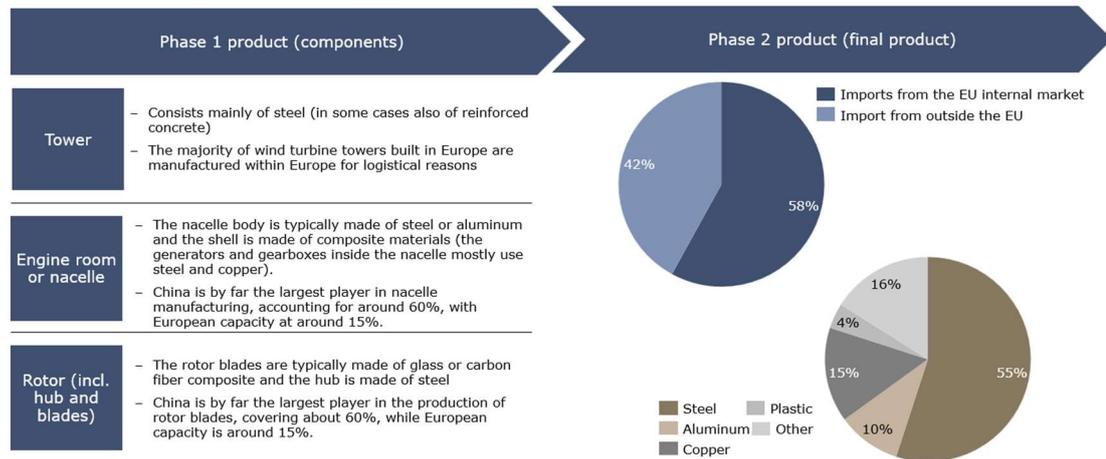


Figure 8. Wind Turbine Value Chain in Finland and at the European Level (Import share percentages to Finland relative to tonnage, material content based on Stede et al., 2021; European-level analysis of components based on multiple sources) (Statistics source: Finnish Customs, 2025c)

### Significance of the CBAM Cost Increase

Table 3 below provides a simplified estimate indicating that CBAM could moderately increase investment costs for wind turbines (by 5% in 2034, when the CBAM charge fully covers the embedded emissions of the goods concerned) (assumptions for the calculation are described in the footnote). It should also be noted that CBAM is already increasing the procurement costs of wind turbines to some extent, as certain wind turbine components are currently within the scope of CBAM.

The estimated CBAM cost increase can be related to the investment costs of alternative energy production methods. Assuming that the investment cost of the structures above the foundation of an onshore wind turbine accounts for approximately 42% of the levelized cost of electricity (LCOE) from onshore wind (around €37/MWh based on NREL, 2024), the above CBAM cost increase would raise the LCOE by approximately 14%. Despite this, wind power would remain competitive compared to solar power, whose LCOE is estimated to be approximately 30% higher than that of onshore wind (IRENA, 2023) (although this estimate does not consider any CBAM cost increase for solar power).

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Table 3. Simplified Estimate of the CBAM Cost Increase on Wind Turbine Investment Costs<sup>4</sup>

Component	Value
Wind Turbine Investment Cost (€)	4 050 000
Wind Turbine Capacity (MW)	4,5
Wind Turbine Investment Cost (€/MW)	900 000
Total Wind Turbine Mass (t)	500
Steel Share of Material Content (%)	55
Steel Mass in Wind Turbine (t)	275
CBAM Cost Increase (€/t)	752
Emission Allowance Price (€/tCO <sub>2</sub> )	150
Steel Emission Intensity (tCO <sub>2</sub> /t)	5,01
CBAM Cost Increase on Investment Cost (%)	5

### Potential Impact of CBAM Expansion on Competitiveness

A significant share of wind turbines is imported into Finland from outside the EU (42% in 2024). Additionally, as noted above, wind turbines (and their components) are imported to Europe in considerable volumes from outside the EU, particularly from China, where production costs for wind turbines are lower compared to European manufacturing. Therefore, a potential expansion of CBAM to cover wind turbines could enhance the competitiveness of manufacturers operating within the EU internal market, especially if the value chain of wind turbines produced in the EU has lower emissions compared to third-country competitors such as China.

On the other hand, it is important to note that certain wind turbine components are already covered by CBAM. Based on the example calculation presented earlier, the CBAM cost increase affecting these components is likely to be significant. If complete wind turbines remain outside the scope of the mechanism, there is a risk of carbon leakage, i.e., a shift from importing wind turbine components to importing complete wind turbines from outside the EU.

With regard to the competitiveness impacts on exports, it must be noted that complete wind turbines are the end product of the manufacturing value chain from the perspective of the operators importing them to Finland, which means that they do not pose the same risk of weakening the competitiveness of exports outside the EU as the other case examples assessed in this report.

<sup>4</sup> The size and weight of the wind turbine used in the estimate are based on Vestas' product listings (Vestas, 2023); the wind turbine investment cost (€/MW) and the emission allowance price in 2034 (when the CBAM charge fully covers the embedded emissions of the goods concerned) are based on AFRY's estimates; the share of steel in the wind turbine investment costs is derived from several public sources; the emission intensity of steel follows CBAM default values (EU, 2023b (tariff heading 7308: steel structures)); and the share of steel in the wind turbine material content is based on the source referenced by the Commission (Stede et al., 2021). The estimate only considers emissions and costs related to steel production used in structures above the wind turbine foundation, although in reality other cost and emission components exist. In the subsequent impact analysis, it is assumed that the CBAM cost increase is fully passed on to the price of the wind turbine.

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### 4.3 Potential Impacts of Possible Expansion to New Product Categories

#### Case Example 4: Plastics and Articles (39)

##### Challenges in the Operating Environment

Based on expert interviews, the plastics industry faces significant uncertainties in its operating environment, which continue to affect the competitiveness of the Finnish and European plastics sectors. In recent years, the self-sufficiency rate of European plastics production has decreased significantly, as production has moved outside Europe and production plants have been shut down. According to the interviews, the contraction of the plastics industry is driven by regulatory changes, rising energy prices due to the energy crisis, and the aging of European production equipment compared to non-European competitors. Secondly, uncertainties arise from Russia's historically significant role as a producer of hydrocarbon feedstocks for the plastics industry. It remains unclear how a possible return of Russia to the market in the future could impact the European plastics sector. Furthermore, the complexity of the operating environment is further increased by the ongoing trade war and its unpredictable effects on the plastics value chains.

##### Value Chain in Finland

The plastics industry value chain can be divided into the production of raw materials for plastics and the manufacturing of plastic products. The majority of plastics raw materials and plastic products imported into Finland in 2024 (approximately 80% measured by tonnage) originated from the EU internal market, with Germany, Sweden, the Netherlands, and Belgium being the largest source countries (Figure 9). Regarding imports from outside the EU (20% of imports), raw materials accounted for the largest share (about 61%), with the most significant imports being polymers of ethylene (tariff heading 3901), polyacetals, other polyethers and epoxide resins (3907), and vinyl acetate and other vinyl ester polymers (3905). As for plastic products, the most imported items by volume were floor coverings (3918), plastics used for transport or packaging purposes (3923), as well as various plates, sheets, films, foil and strips (3920).

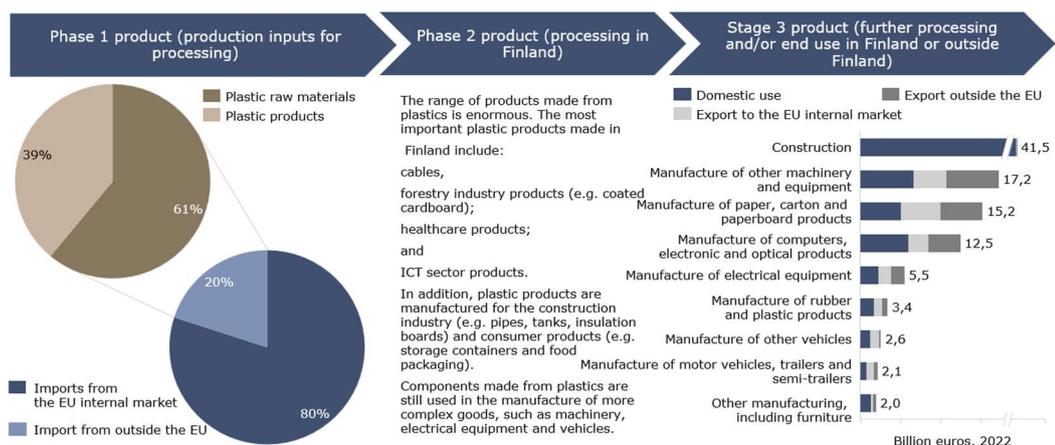


Figure 9. Plastics Industry Value Chain in Finland (Import percentages relative to tonnage, domestic use and exports of key sectors based on output value) (Statistical sources: Statistics Finland, 2025; Customs, 2025c)

In addition to imported products, Finland produces significant quantities of plastics raw materials (primarily polyolefins, including polyethylene and polypropylene), estimated by

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experts at around 600 kilotonnes per year (compared to total plastics imports to Finland of approximately 800 kt in 2024). Besides virgin raw material production, plastics recycling in Finland is estimated at around 50 kilotonnes annually. Despite this, the Finnish plastics industry accounts for only a very small share (approximately 1%) of plastics usage and production at the European level. Plastics raw materials imported into the EU are typically processed within Europe; however, semifinished products or plastic articles at the next stage of the value chain may cross EU borders multiple times before reaching final use.

The range of products made from plastics is vast. Key plastic products manufactured in Finland include cables, forest industry products (e.g., coated paperboards), healthcare products, and ICT sector products. Additionally, plastic products are produced for the construction industry (e.g., pipes, tanks, insulation boards) as well as consumer goods (e.g., storage containers and food packaging). Plastic components are further used in the manufacturing of more complex goods such as machinery, electrical equipment, and vehicles. In Finland, the largest sector by output value among industries using plastics and plastic products is construction, with most of its output directed to the domestic market (Figure 9). On the other hand, the majority of output from companies manufacturing various machinery and equipment, paper and cardboard products, rubber and plastic products, as well as vehicles, is export-oriented (approximately 59%), with a particularly high share destined outside the EU (53% of exports and 31% relative to the total output value).

**Significance of the CBAM Cost Increase**

Below (Table 4) it is estimated in a simplified way that CBAM could significantly increase the market price of polyethylene, a key raw material for plastic products (15% in 2034, when the CBAM fee covers the full emission content of the goods included in it) (the assumptions for the calculation are described in the footnote to the text).

As previously noted, plastics and plastic products are used in nearly all sectors, so the cost impact relative to the production costs of the next stage in the value chain can vary significantly depending on the application, even if the raw material price increases as indicated in the example calculation. According to expert estimates, in simple, high-volume so-called bulk products, roughly 30–50% of production costs may consist of plastic raw materials, whereas in more highly processed plastic products, the share of plastics in costs decreases substantially, to about 10% or less. Passing increased production costs on to prices is particularly challenging in the internationally competitive plastics industry, especially for bulk products with tight margins, thus posing a significant risk of reduced competitiveness and carbon leakage. However, the risk of carbon leakage can be mitigated if the product is a so-called specialty product, backed by long-term expertise development and high added value (for example, healthcare products), which allows for the cost increase to be passed on to prices.

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*Table 4. Simplified estimate of the CBAM cost premium to the market price of polyethylene<sup>5</sup>*

Component	Value
Market price of polyethylene (€/t)	900
CBAM cost value (€/t)	135
Emission carbon price (€/tCO <sub>2</sub> )	150
Emission intensity of polyethylene (tCO <sub>2</sub> /t)	0,902
Cost value on market price (%)	15

Estimating the CBAM cost increase without precisely defined calculation rules is challenging, according to expert interviews. Among the unresolved issues is how emissions from refineries producing plastic raw materials should be allocated, since plastic raw materials are by-products alongside the main refinery products, fuels, and typically represent only a small share of all hydrocarbons produced at refineries.

### **Impacts of a Potential CBAM Expansion on Competitiveness**

Based on expert interviews, the views of actors in the plastics industry regarding the competitiveness impacts of CBAM likely differ depending on their position in the value chain. For Finnish and generally European producers of plastic raw materials, CBAM could be seen as a positive change for competitiveness, since their products are typically destined for use within the EU internal market. On the other hand, for manufacturers at later stages of processing, the increase in production costs for plastics could weaken their competitiveness in exports outside the EU. This view of potential export competitiveness loss is supported by the fact that plastic products are used in many key sectors with significant exports outside the EU from Finland (see Figure 9). If downstream products in the plastics value chain are not covered by CBAM, CBAM fees could be avoided. A decline in competitiveness downstream could also have negative effects upstream in the value chain, meaning it could impact plastic raw material producers if production outside the EU becomes more competitive due to CBAM-related cost increases on downstream products.

Production equipment used in the manufacturing of plastic products could be relocated outside the EU in pursuit of better competitiveness. On the other hand, for petrochemical production facilities (refineries) that produce raw materials, there is no similar possibility to relocate production equipment if competitiveness weakens. In the case of refineries, the alternative would be to scale down or shut down local operations if demand willingness to pay is insufficient for profitable production.

Regarding the emission reporting required by CBAM, a challenge is, similar to the current scope of application, the difficulty in collecting supplier-specific emission data. According to expert interviews, ensuring the accuracy of emission data and thereby fairness among actors would be a significant challenge for the plastics industry. If CBAM were to be expanded to plastics and plastic products, the mechanism should primarily include products with the highest emission content and limit CBAM to the largest actors in the sector, since most of the

<sup>5</sup> The emission allowance price used in the estimate is based on AFRY's projection for the year 2034 (when the CBAM charge fully covers the embedded emissions of the relevant goods); the emission intensity of polyethylene is based on the Commission-referenced source on material and emission content of products (Stede et al., 2021); and the market price of polyethylene is based on publicly available global market prices. In the subsequent impact assessment, it is assumed that the CBAM cost increase is fully passed on to the product price.

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industry consists of small players whose combined emissions are small compared to a few large operators.

#### 4.4 Use of CBAM Products in Corporate Value Chains

The previous chapters describe selected examples of CBAM application based on interviews and statistics. A key finding is that due to additional costs arising from the introduction of CBAM or the removal of free emission allowances, companies operating within the EU will increasingly assess whether manufacturing their products in the EU remains cost-effective and whether EU-based production inputs remain competitive compared to equivalent inputs imported from outside the EU. According to this report, there are several critical decision points related to the location of production and the choice of production inputs at each stage of the value chain. This decision-making process is illustrated in the flowchart below (Figure 10) and explained through key points in the text, first at a general level and later through a case example.

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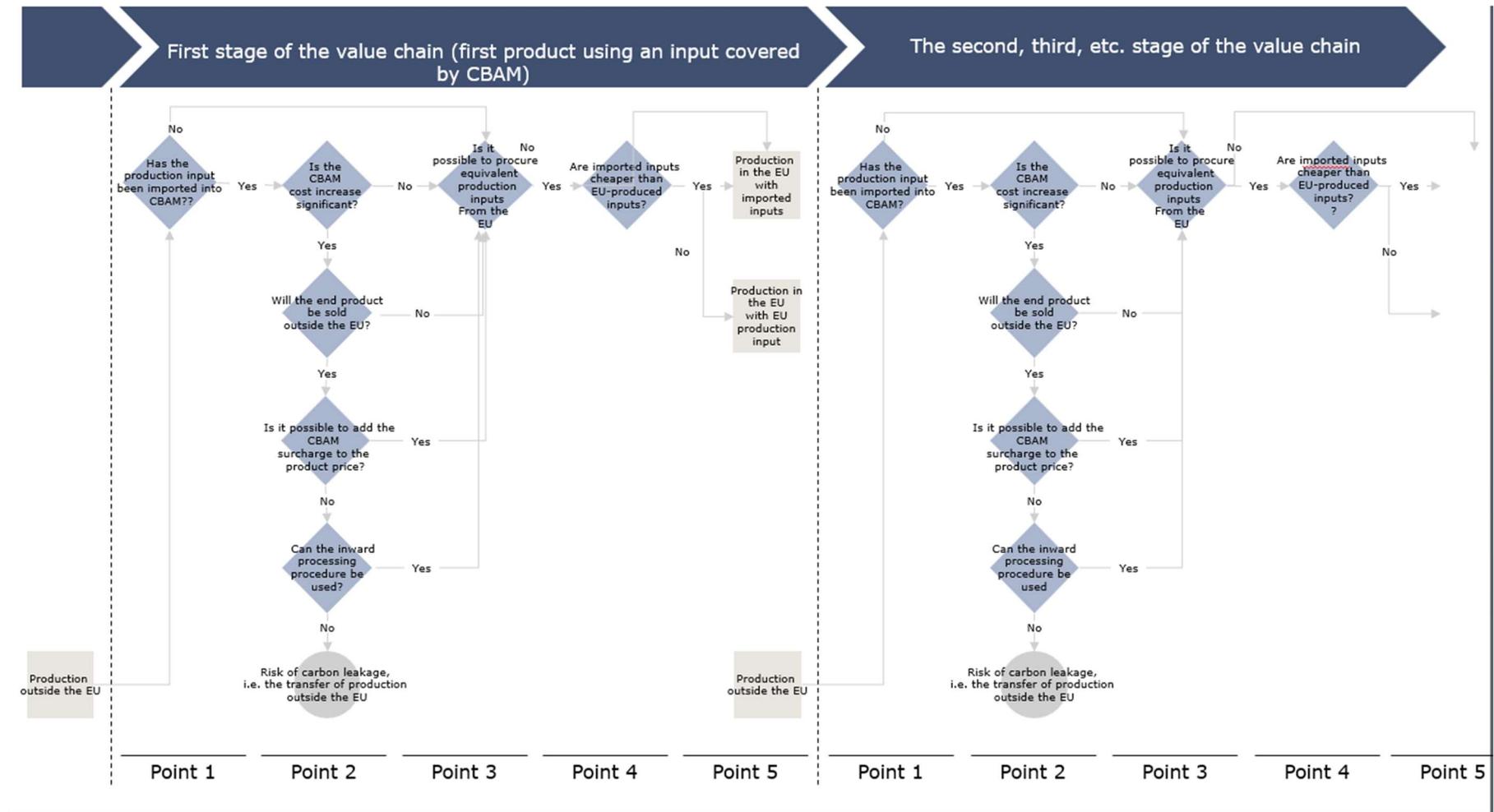


Figure 10. Use of CBAM-covered products in company value chains

The value chain presented above (Figure 10) begins with the procurement of the first production input, which, when examining CBAM, is assumed to be sourced from outside the EU. The first question related to the procurement of the production input is whether the input imported from outside the EU falls within the scope of CBAM (point 1 in the figure). If it does not, the decision-making process moves directly to point 3, where it is considered whether a corresponding input can be sourced from within the EU (the description of point 3 and onwards continues later in this section).

If the product is within the scope of CBAM, the next step is to assess whether the cost increase caused by CBAM is significant relative to the production cost of the next-stage product in the value chain (point 2). If the cost increase is not significant, the process again proceeds to point 3. If the cost increase is significant, the next consideration is whether the product using CBAM-covered inputs in the value chain is destined for sale within the EU internal market or for markets outside the EU.

If the product is sold within the EU internal market, it faces a corresponding cost increase and competitive position as a product subject to the EU Emissions Trading System (ETS) manufactured in the EU. In this case, the process moves again to point 3. If the product is sold to markets outside the EU, it is assessed whether the cost increase caused by CBAM can be passed on to the price of the next-stage product in the value chain, thereby avoiding a loss of competitiveness outside the EU.

If it is possible to transfer the cost increase forward to the next-stage product's price (for example, a high value-added specialty product), the process again proceeds to point 3. If passing on the cost increase without loss of competitiveness is not possible, the operator may, on a case-by-case basis, utilize an internal processing procedure (import of the production input from outside the EU, further processing within the EU, and export outside the EU), thereby avoiding the CBAM charge. In this case, the process also returns to point 3.

If utilizing the internal processing procedure is not cost-effective relative to the benefits achieved, the CBAM-related cost increase results in a loss of competitiveness for the company in markets outside the EU. This loss of competitiveness, in turn, leads to the risk of carbon leakage — that is, production shifting outside the EU to countries without comparable carbon pricing mechanisms.

If, after the decision points above, the process reaches point 3 and it is determined that a corresponding production input cannot be sourced from within the EU to replace the input imported from outside the EU, the value chain phase ends with production in the EU using the input imported from outside the EU (point 5). If a corresponding production input can be sourced from within the EU, point 4 compares the price of the non-EU imported input with the EU-produced equivalent. If the non-EU imported input is cheaper, the value chain phase ends with production in the EU using the imported input as described above (point 5). If the EU-produced input can compete on price with the imported product, the value chain phase ends with production in the EU using the EU-sourced input (point 5).

A similar decision-making chain repeats at each stage of the manufacturing value chain. However, it is important to note that value chains are unique, and therefore the decision points described can vary significantly between companies depending on the type of value chain and the company's position within it.

It is also important to note that the decision-making chain described considers only the procurement cost. In reality, companies take into account many factors simultaneously, such as business strategy, logistical constraints, and strengths and risks related to suppliers or countries of origin (e.g., quality, sustainability, delivery reliability, strategy, political risks).

Therefore, the risks of carbon leakage related to the application or non-application of CBAM cannot be expected to materialize in direct proportion to CBAM's cost impacts or timeline.

### **Case Example: Value Chain of the Engineering Industry Using Steel**

In the illustrative case example above, the value chain of the engineering industry using steel is simplified into three stages: 1) production of steel products (e.g., steel structures, bolts, etc., which are currently covered by CBAM) 2) production of machine components (complex components that are currently not covered by CBAM), and 3) Production of complete machines (the end products of the manufacturing value chain, currently not covered by CBAM).

In the case example, the manufacturer of steel products at stage 1 is considering importing steel from outside the EU as raw material for production. Steel as a raw material falls under the current CBAM scope and as roughly estimated earlier in this study, faces a significant additional cost. The steel products manufactured by the company are assumed to be sold for further processing to the engineering industry within the EU. Since equivalent steel can also be procured from within the EU, and the price of steel produced in the EU is assumed competitive compared to steel imported from outside the EU (EU production is assumed to be less emission-intensive than third countries, thus incurring a lower emissions trading cost than the CBAM cost on imported products), the company decides to source steel raw material from the EU and manufacture the stage 1 steel products in the EU.

In this example, no carbon leakage occurs, and CBAM improves the competitiveness of European steel product manufacturers when considering the value chain up to stage 1. However, the stage 2 product in the value chain (machine components) is currently outside the scope of CBAM. Therefore, when looking more broadly at the value chain, it is possible that the stage 3 manufacturer (complete machine manufacturer) decides to import equivalent components from outside the EU instead of using components made in the EU, thereby avoiding CBAM fees. In this case, the CBAM-related cost increase transferred downstream could reflect negatively on the carbon leakage risk upstream in the value chain, potentially affecting the stage 2 components or even stage 1 steel products — in other words, causing a wider upstream shift of the value chain outside the EU. If the above example is modified so that the stage 1 steel product manufacturer sells products outside the EU and is unable to pass the CBAM cost increase on to the product price in international competition, and does not use the internal processing procedure, there arises a risk of carbon leakage at stage 1.

At each stage of the value chain, the key factor determining the risk of carbon leakage is the significance of the CBAM cost increase relative to the production costs of the next stage product in the value chain. As noted in the example, the cost increase generated at the start of the value chain is large due to the energy- and emission-intensive nature of steel production, thus creating a strong incentive to import the next stage value chain product (machine components) into the EU, which is not covered by CBAM. On the other hand, as the value chain progresses further in the example, the energy and emission intensity of production stages can be assumed to decrease (e.g., the complete machine manufacturer assembles the final product). Thus, the CBAM cost increase further along the value chain is likely significantly smaller than at the start. The risk of carbon leakage is low from the stage in the value chain where the CBAM cost increase equals the opportunity cost of moving production outside the EU.

## 5 Conclusions and Key Limitations of the Study

### 5.1 Conclusions

The current scope of CBAM covers energy-intensive products that face a significant risk of carbon leakage due to the removal of free emission allowances under the EU Emissions Trading System. Carbon leakage risk refers to the relocation of production of emission-intensive products from the EU to countries where less stringent carbon pricing regulations apply. In addition to reducing the risk of carbon leakage, CBAM aims to encourage third countries to adopt stricter emission reduction measures and to incentivize foreign manufacturers to invest in low-carbon production methods.

CBAM protects products manufactured within the EU from a loss of competitiveness on the internal market due to additional costs caused by the removal of free emission allowances under the emissions trading system or the transition to cleaner production. However, CBAM fees can be avoided by importing more highly processed products into the EU that are not covered by CBAM. Additionally, the EU currently lacks a mechanism to protect EU-manufactured products from cost increases related to emissions trading or clean production when competing in export markets outside the EU. CBAM does not provide a solution for this issue. An exception is that no CBAM fees need to be paid on CBAM-covered inputs if the so-called internal processing mechanism is utilized (a special procedure where inputs are imported from outside the EU, further processed within the EU, and then exported outside the EU).

It is not possible to present impact assessments based on historical data on the effectiveness of CBAM at this time. However, expectations and scenarios about its strengths and weaknesses have been widely discussed in the literature and political debates from various perspectives. Within the scope of this study, the most important identified strengths and weaknesses of CBAM are as follows:

#### **Strengths**

- CBAM protects companies in energy-intensive primary production from the risk of carbon leakage, especially those whose product value chain from manufacturing to end use is short and whose end product market is mainly in the European internal market

#### **Weaknesses**

- The risk of carbon leakage remains for companies operating in Europe as part of product value chains that CBAM does not comprehensively protect within the EU internal market, or whose products are primarily destined for export outside the EU. These companies face additional costs caused by the removal of free emissions allowances under the EU ETS or by the CBAM-related extra costs on imported products within the scope of CBAM through their upstream production inputs. Meanwhile, direct and downstream competitors with products produced outside the EU can enter both the EU internal market and international markets without equivalent additional costs.

The results suggest that expanding CBAM downstream or to new products would not automatically lead to cost-effective emission reductions, since additional costs caused by the removal of free emissions allowances and CBAM can be circumvented (e.g., by relocating production to third countries). On the other hand, expanding CBAM to cover all products imported from outside the EU is unlikely to be justified, as practical implementation challenges (such as product-specific emission reporting) could become disproportionately large relative

to the emission reductions achieved. Between expansion and limitation, there is an individual tipping point in each value chain where the costs of applying CBAM would exceed the benefits, either directly or compared to the alternative of using the same societal resources more efficiently within the EU for cleaner production, both economically and in terms of emission reductions. Therefore, alternatives for expanding CBAM should be evaluated broadly, covering entire product value chains from raw material production to end use, as well as practical feasibility. It is still possible to identify specific products and parts of value chains where CBAM expansion would be beneficial. Additionally, it is important to assess the overall societal impacts of CBAM alongside alternative and complementary policy instruments. From the perspective of an individual company, the application of CBAM may bring benefits or disadvantages, but the broader societal effects when applied widely may differ from these individual experiences.

Below are described the study's conclusions in more detail by specific areas, based on the case examples assessed in the study.

### 5.1.1 Conclusions Regarding the Current Scope of the Mechanism

Based on the study, the effects of CBAM on the competitiveness of Finnish companies depend on their individual value chains. Broadly, the actors can be divided into companies that 1) view CBAM primarily as a challenge to their global business, and on the other hand companies for whom 2) CBAM can create opportunities by improving their competitive position within the EU internal market.

- 1) For companies focused on exports outside the EU, competitiveness is at risk of deteriorating with the introduction of CBAM and the simultaneous removal of free emissions allowances. In the Finnish context, sectors such as the machinery industry—which heavily uses CBAM-covered steel products, is strongly export-oriented, and whose exports are significantly directed outside the EU—are emphasized. The competitiveness decline stems from the additional CBAM or emissions allowance costs imposed on companies operating within the EU (while machinery manufacturers typically fall outside the emissions trading system, cost increases are passed on to them upstream in the value chain), costs that competing companies outside the EU typically do not face on global markets. This deterioration in competitiveness, in turn, leads to a risk of carbon leakage.
- 2) On the other hand, CBAM can improve the competitive position of those actors whose customers are mainly located within the EU internal market and whose competitive position within the EU is currently challenged by competing imported products from outside the EU that are possibly cheaper but more carbon intensive. The greatest benefits of CBAM may accrue to those actors whose products are already relatively low emission. For these actors, the removal of free emissions allowances is less significant, while the costs of competing higher emission imported products rise more due to CBAM.

According to the study, the risk of carbon leakage is significant if at least the following conditions are met:

- 1) The company's production in the EU faces a significant cost increase due to CBAM or the removal of free emissions allowances in the emissions trading system;
- 2) The incurred cost increase cannot be passed on to product prices without negatively impacting competitiveness;
- 3) Products are exported in significant volumes outside the EU; and
- 4) The company already has production sites outside the EU suitable for manufacturing similar products, or other factors exist that make relocating production outside the

EU likely at a low threshold (e.g., production facilities in the EU nearing the end of their technical lifespan).

According to the study, several factors may be related to reducing the risk of carbon leakage, with key ones explained in more detail below:

- Protection against the risk of carbon leakage may be found if the company's products are so-called specialty products (typically high value-added products requiring special expertise), whose prices can absorb the CBAM or emissions allowance cost increase without negatively affecting competitiveness.
- Utilizing the internal processing procedure (importing production inputs from outside the EU, processing them further within the EU, and exporting outside the EU while avoiding customs and other charges) can, on a case-by-case basis, reduce challenges related to the competitiveness of exports outside the EU. However, a company should not use the internal processing procedure if the administrative burden outweighs the cost benefits achieved.
- The potential extension of the mechanism to cover downstream products of the current scope would reduce the possibility of avoiding CBAM charges but could be practically challenging to implement (see Section 5.1.2 below).
- The CBAM or emissions allowance cost increase could be compensated for in exports outside the EU, for example, through export rebates and/or maintaining the free allocation of emission allowances, or some other support or mechanism to maintain export competitiveness (the European Commission will investigate the situation of exporters of CBAM products exposed to carbon leakage risk in 2025 as part of the potential CBAM extension (EU, 2025c)). On the other hand, supporting the competitiveness of exports outside the EU could lead to unequal treatment depending on whether a company's sales are directed to the EU internal market or outside it.

In addition to the direct CBAM cost increase, a significant challenge is the administrative burden caused by the emission reporting required by the mechanism and the indirect costs arising from it. The administrative burden can prove particularly heavy for smaller companies with little experience and limited resources for emissions reporting. A similar conclusion was also presented in the ETLA impact assessment report on the carbon border mechanism published on April 15, 2025, which attempted to quantify this challenge through company surveys (ETLA, 2025). On the other hand, by utilizing CBAM default values, companies can reduce the administrative burden related to emission reporting, but this likely results in additional costs compared to companies that report actual emissions. Furthermore, the current reporting challenges may still change when the mechanism's transitional period ends and any proposed changes to reporting requirements come into effect (see section **Virhe. Viitteen lähde ei löytnyt.**).

### 5.1.2 Conclusions Regarding the Possible Downstream Extension of the Mechanism

Companies continuously optimize their supply chains to remain competitive in global markets. Consequently, as long as the CBAM mechanism does not cover the entire value chain of products within its scope — from raw materials to the final downstream processing stage — CBAM fees can be avoided by shifting production outside the EU to the value chain stage beyond the mechanism's reach. Thus, the CBAM cost increase transferred to downstream products may translate into a risk of carbon leakage for upstream products in the value chain. In practice, the risk of carbon leakage at each processing stage depends on the cost advantage gained by relocating production compared to the CBAM-related additional cost if production were to remain within the EU. The carbon leakage risk persists up to the value chain stage where the costs of relocating production are lower than the CBAM-related

additional cost. (Besides the cost increase, many other factors influence the carbon leakage risk, such as business strategy, logistical constraints, etc.).

However, expanding the mechanism to cover the downstream products of its current scope is practically challenging. The more complex the products and the broader the range of industries covered by an expansion of CBAM, the greater the need for emissions reporting. According to the study, the administrative burden related to emissions reporting is already significant even for the relatively simple products currently covered by the mechanism. Therefore, an expansion would likely further increase the administrative burden and the indirect costs arising from reporting (such as the need for product-specific emissions data and detailed understanding of product material composition). On the other hand, it might also be possible to use default values defined in connection with the expansion

## 5.2 Key Limitations of the Study

### 5.2.1 Limitations Related to Case Examples

In this study, the main research method for assessing the impacts of CBAM's current scope has been interviews with case companies, while for the possible extension of the mechanism, individual product or product group case examples collected from public sources have been used. The applied research methods pose challenges to the generalizability of the study's results in two ways:

- 1) The study draws generalized conclusions based on interviews with individual case companies (regarding the mechanism's current scope) and case examples (regarding the possible extension of the mechanism), which may not necessarily reflect the impacts on other companies or entire industries.
- 2) Conversely, conclusions drawn from industry-level analysis may not correspond to the actual, individual, and complex value chains of companies and the impacts on them. For example, in the case examples related to the possible extension of the mechanism, industry-level statistics have been used to estimate domestic use and export distribution of products manufactured in Finland, although in reality this distribution and the resulting potential competitiveness impacts are company-specific.

Due to the limitations identified above, the study has aimed to clearly present the research methods used and to distinctly separate the observations derived from interviews and other sources. Additionally, efforts have been made to utilize other complementary data sources.

### 5.2.2 Limitations Related to the Assessment of CBAM Additional Costs

The example calculations of the CBAM cost surcharge conducted in connection with the potential expansion of the mechanism are based on simplifications, where, for instance, the assumed CBAM surcharge on steel alone is considered to cover the emissions from the production of the selected example products. In reality, the potential cost impacts are company-specific and depend on the structure of their value chains, as highlighted earlier in the conclusions.

To support the assessment of the significance of CBAM additional costs, material content data of products (Stede et al., 2021) has been used, which the European Commission refers to as a source for evaluating the material content of possible downstream products and the related risk of carbon leakage. According to the study, this data contains significant simplifications, as identical material content has been assigned within product categories to products that may actually be quite different from each other. For example, for the valves examined in this

study, the material content in the dataset remains unchanged regardless of the different application areas of the valves, even though in reality the applications and required material solutions vary considerably depending on the use case. If new products are added to the scope of CBAM in the future, thereby imposing additional costs on companies, the source data underlying the cost increases should be prepared as carefully as possible to ensure fair treatment of companies.

Examining the significance of CBAM additional costs solely in relation to individual CBAM products is often insufficient, although necessary in this study for the sake of simplifying complex value chains. Even if the additional cost caused by a single CBAM product would not be significant enough to create a risk of carbon leakage (e.g., nails examined in this study), the cumulative cost impact on a company using multiple CBAM products can still become considerable (e.g., manufacturers of machinery and equipment that use numerous steel parts in their products). Moreover, the cumulative effect of cost increases would be further amplified if downstream products are included in the mechanism in the future.

### 5.2.3 Limitations Related to the Administrative Burden of Emissions Reporting

As previously noted, the administrative burden associated with the emissions reporting required by CBAM is generally perceived as a significant challenge alongside the direct cost increase's impact on competitiveness. Regarding the challenges related to reporting, it should be noted that the reporting requirements will change when the mechanism's transition period ends, in accordance with the current CBAM regulation (e.g., moving to annual reporting instead of quarterly reporting required during the transition). Additionally, the EU Omnibus proposal (published on 26 February 2025) aims to simplify reporting requirements and exclude small import volumes from the mechanism. On the other hand, companies can reduce the administrative burden related to emissions reporting by utilizing CBAM default values. Due to these factors, it is possible that the reporting challenges experienced during the transition period may still change by the time CBAM is fully implemented

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## Annex

### Annex 1. Customs headings for CBAM goods

The tariff headings (CN codes) currently covered by the Carbon Border Mechanism are as follows (Customs, 2025a):

#### **Cement**

- 2507 00 80: Other kaolinic clays
- 2523 10 00: Cement clinkers
- 2523 21 00: Portland cement: white cement
- 2523 29 00: Portland cement: other
- 2523 30 00: Aluminate cement
- 2523 90 00: Other hydraulic cement

#### **Energy**

- 2716 00 00: Electrical energy

#### **Chemicals**

- 2804 10 00: Hydrogen

#### **Fertilizers**

- 2808 00 00: Nitric acid; nitrosulphuric acids (nitric acids)
  - o 2814: Ammonia, anhydrous or in aqueous solution:
  - o 2814 10 00: Anhydrous ammonia (gas NH<sub>3</sub>)
  - o 2814 20 00: Ammonia in aqueous solution (liuos NH<sub>4</sub>OH)
  - o Both of the above in pure form
- 2834 21 00: Potassium nitrate
- 3102: Nitrogenous fertilizers, mineral or chemical. This heading includes:
  - o Urea, whether or not in aqueous solution
  - o Ammonium sulphate; double salts and mixtures of ammonium sulphate and ammonium nitrate:
  - o Ammonium nitrate, whether or not in aqueous solution: Mixtures of ammonium nitrate with calcium carbonate or other inorganic non- fertilising substances
  - o Sodium nitrate
- Mixtures of urea and ammonium nitrate in aqueous or ammoniacal solution.
- 3105: Mineral or chemical fertilisers containing two or three of the fertilising elements nitrogen, phosphorus and potassium; other fertilisers; goods of this chapter in tablets or similar forms or in packages of a gross weight not exceeding 10 kg:
  - o (excluding 3105 60 00: fertilizer containing two fertilizing substances, phosphorus and potassium)

#### **Iron and steel**

- 2601 12 00: Agglomerated Iron ores and concentrates, excluding roasted iron pyrites
- 72: Iron and steel;
  - o Raw materials; granular or powder forms
    - Excluding the following ferro-alloys 7202 2: ferro-silicon 7202 3: ferro-silico-manganese 7202 50 00: Ferro-chromium 7202 70 00: Ferro-molybdenum, 7202 80 00: Ferro-tungsten and ferro-silico-

tungsten 7202 91 00: Ferro-titanium and ferro-silico-titanium 7202 92 00: ferro-vanadium, 7202 93 00: ferroniobium, 7202 99 10: Ferro-phosphorus, 7202 99 30: Ferro-silico-magnesium 7202 99 80: other, 7204: Ferrous waste and scrap; remelting scrap ingots of iron or steel

- Iron and non-alloy steel
- Stainless steel
- Other alloy steel; hollow drill rods of alloy or non-alloy steel
- 73: Iron and steel goods;
  - 7301: Sheet piling of iron or steel
  - 7302: Railway or tramway track construction material of iron or steel,
  - 73 03 - 73 06: Iron and steel pipes
  - 7307: Tube or pipe fittings
  - 7308: Iron and steel structures and parts of structures
  - 7309: Reservoirs, tanks, vats and similar containers for any material (other than compressed or liquefied gas), of iron or steel, of a capacity exceeding 300 l, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment
  - 7310: Tanks, casks, drums, cans, boxes and similar containers, for any material (other than compressed or liquefied gas), of iron or steel, of a capacity not exceeding 300 l, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment
  - 7311: Containers for compressed or liquefied gas
  - 7318: Screws, bolts, nuts, coach screws, screw hooks, rivets, cotters, cotter pins, washers (including spring washers) and similar articles
  - 7326: Other articles of iron or steel

### **Aluminium**

- 7601: Unwrought aluminium:
- 7603: Aluminium powders and flakes:
- 7604: Aluminium bars, and profiles:
- 7605: Aluminium wire:
- 7606: Aluminium plates and strip, of a thickness exceeding 0,2 mm
- 7607: Aluminium foil not exceeding 0,2 mm
- 7608: Aluminium pipes
- 7609 00 00: Aluminium tube or pipe fittings (for example, couplings, elbows, sleeves)
- 7610: Aluminium structures and parts thereof, plates, rods, profiles, tubes and similar articles, prepared for use in structures
- 7611 00 00: Reservoirs, tanks, vats and similar containers, of a capacity exceeding 300 liters
- 7612: Aluminium casks, drums, cans, boxes and similar containers (including rigid or collapsible tubular containers), for any material of a capacity not exceeding 300 litres
- 7613 00 00: Aluminium containers for compressed or liquefied gas for example compressed air cylinder
- 7614: Stranded wire, cables, plaited bands and the like, of aluminium, not electrically insulated
- 7616: Other articles of aluminium: Nails, tacks, staples (other than those of heading 8305), screws, bolts, nuts, screw hooks, rivets, cotters, cotter pins, washers and similar articles