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PART 1/2

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

Accompanying the document

Proposal for a regulation of the European Parliament and of the Council

establishing a carbon border adjustment mechanism

{COM(2021) 564 final} - {SWD(2021) 644 final} - {SWD(2021) 647 final} -
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Glossary

Term or acronym	*Meaning or definition*
CAT	Carbon Added Tax
CBAM	Carbon Border Adjustment Mechanism
CN	Combined Nomenclature
CO_2	Carbon Dioxide
ETS	Emissions Trading System
GDP	Gross Domestic Product
GHG	Greenhouse Gas
MRV	Monitoring, Reporting and Verification
NDC	Nationally Determined Contribution
PEF	Product Environmental Footprint
SMEs	Small and Medium-sized Enterprises
TFEU	Treaty on the Functioning of the European Union
VAT	Value Added Tax
WTO	World Trade Organisation

1 INTRODUCTION: POLITICAL AND LEGAL CONTEXT

The world is facing a profound climate crisis and the challenges of climate change require a global response. Strong international cooperation will strengthen the joint climate action needed by all the Parties of the Paris Agreement to meet the goal of holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels[1].

The European Union's international leadership must go hand in hand with bold domestic action. To meet the objective of a climate-neutral EU by 2050 in line with the Paris Agreement, the EU needs to increase its ambition for the coming decade and update its climate and energy policy framework. As announced in the European Green Deal[2], the Commission has proposed a new EU target for 2030 of reducing greenhouse gas ('GHG') emissions by at least 55 % compared to levels in 1990[3], based on a comprehensive impact assessment[4]. This objective has been endorsed by the European Council[5]. To deliver on these GHG emissions reductions, the Commission proposes to revise where necessary all relevant policy instruments by June 2021 in a 'Fit for 55 Package', which covers in particular the review of sectorial legislation in the fields of climate, energy, transport, and taxation[6]. The initiative for a Carbon Border Adjustment Mechanism ('CBAM'), which is subject to examination in this impact assessment, is part of that package and will serve as an essential element of the EU toolbox to meet the objective of a climate-neutral EU by 2050 in line with the Paris Agreement by addressing risks of carbon leakage following the increased EU climate ambition.

The European Green Deal underlined that 'should differences in levels of ambition worldwide persist[7], as the EU increases its climate ambition, the Commission will propose a CBAM, for selected sectors, to reduce the risk of carbon leakage[8]'. Indeed, carbon leakage could result in an overall increase in non EU emissions hence undermining the effectiveness of EU climate policies.

The 2015 Paris Agreement on climate change, as well as strong international diplomacy and leadership, are part of the EU's toolbox to achieve higher climate ambition globally. The Paris Agreement commits the international community to a continuous increase in the ambition of climate action to limit global average temperature rise in order to significantly reduce the risks and impacts of climate change. Each Party must prepare its own nationally determined contribution ('NDC') towards this global goal, reflecting its

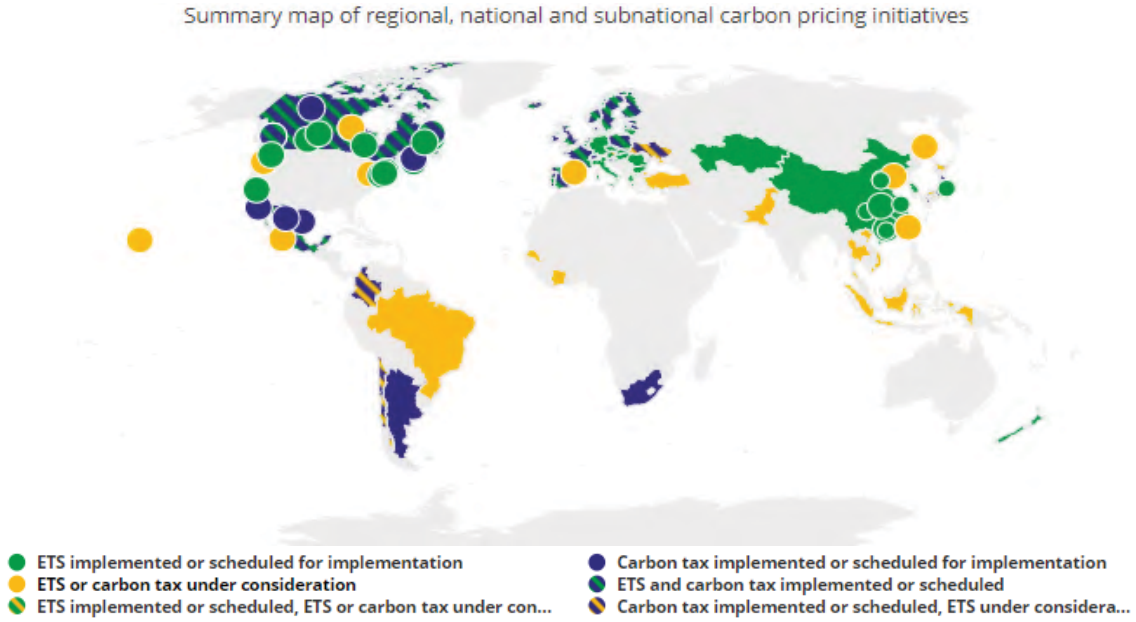
[1] Article 2(1)(a) of The Paris Agreement.
[2] European Commission. (2019). The European Green Deal. (COM(2019) 640 final), p. 4.
[3] The Commission put forward the proposal COM(2020) 563 final, amending the initial Commission proposal on the European climate law to include a revised EU emission reduction target of at least 55 % by 2030. On 10-11 December 2020, the European Council in its conclusions endorsed this increased EU target.
[4] European Commission. (2020). Stepping up Europe's 2030 climate ambition. (COM(2020) 562 final: Part 1/2).
[5] European Council. (2020). Conclusions of the European Council of 11 December 2020. (EUCO 22/20 CO EUR 17 CONCL 8).
[6] European Commission. (2020). Commission Work Programme 2021. (COM(2020) 690 final). Annex I outlines all the instruments to be proposed which includes among others the review of energy taxation.
[7] The level of ambition refers to the commitment towards climate neutrality and the implementation of transformative agenda to that end.
[8] European Commission. (2019). The European Green Deal. (COM(2019) 640 final), p. 5.

'highest possible ambition' as well as its 'common but differentiated responsibilities and respective capabilities, in the light of different national circumstances[9]'. Heterogeneity in climate action among countries is therefore inevitable. However, a number of independent evaluations suggest that the aggregate impact of Parties' current NDCs, if fully implemented, will not put the world on a pathway to achieve the Paris Agreement goals. Therefore, as long as the EU's international partners do not share the same level of climate ambition, and differences in the price put on GHG emissions remain, there is a risk of what is generally referred to as carbon leakage. Carbon leakage refers to the situation that occurs if, for reasons of differing ambitions related to climate policies, businesses in certain industry sectors or subsectors were to transfer production to other countries with less stringent emission constraints or imports from these countries would replace equivalent but less GHG intensive products due to the difference in climate policy stringency. This could lead to an increase in their total non-EU emissions, thus jeopardising the reduction of GHG emissions that is urgently needed if the world is to keep the global average temperature to well below 2 degrees Celsius above pre-industrial levels.

Currently, the risk of carbon leakage is being addressed in the EU under the EU Emissions Trading System ('EU ETS'). This is the world's first international emissions trading system and it has been in place since 2005. For the sectors covered by this system in the EU and most at risk of carbon leakage, this risk is currently managed through the granting of free allowances and compensations for the increase in electricity costs under state aid rules. It should be noted that carbon pricing mechanisms can also include carbon taxation, which outside the EU may cover the same sectors that are covered in the EU by the ETS.

Figure 1 shows the different carbon pricing mechanisms that exist or that are under consideration[10] around the globe.

Figure 1: Carbon pricing around the world



[9] The Paris Agreement 2015, Article 4(3).
[10] Some of the mechanisms under consideration are likely to be implemented by the time CBAM enters into force.

Source: World Bank, summary map of regional, national and subnational carbon pricing initiatives (Last update: 1 April 2021), the World Bank Group, Washington. https://carbonpricingdashboard.worldbank.org/

The EU ETS revision is assessed by the European Commission in a separate impact assessment. Among others, this involves the possible extension of the EU ETS to maritime transport, as well as emissions from buildings and road transport[11]. Most notably, a higher environmental contribution of the EU ETS translates into a more stringent cap on emissions, meaning that the volume of allowances available will decline. A more stringent cap will likely imply an increase of the EU ETS carbon price at which allowances' supply and demand match. The EU objective of climate neutrality and the decision to raise climate ambition for 2030 also lead to a broader reconsideration of existing measures against carbon leakage. In particular, free allocation of allowances prevents carbon leakage risks but also weakens the carbon price signal for EU industry compared to full auctioning.

As an alternative to free allocation, as indicated by the Green Deal Communication, the CBAM 'would ensure that the price of imports reflects more accurately their carbon content. This measure will be designed to comply with World Trade Organization (WTO) rules, including as regards the principle of non-discrimination, and other international obligations of the EU[12]'. Further, President von der Leyen has underlined that 'Carbon must have its price – because nature cannot pay the price anymore. This Carbon Border Adjustment Mechanism should motivate foreign producers and EU importers to reduce their carbon emissions[13]'. To this end, active outreach to third countries and businesses would be important with regard to the understanding of and compliance with CBAM requirements.

In the special European Council of 17-21 July 2020[14], EU leaders agreed on the recovery instrument NextGenerationEU. The instrument will provide the EU with the necessary means to address the challenges posed by the COVID-19 pandemic and, therein, support investment in the green and digital transitions. In order to finance it, the Commission will be able to borrow up to EUR 750 billion on financial markets. In that context, EU leaders agreed to provide the EU with new own resources, notably to facilitate the repayment of NextGenerationEU funds.

As part of the mandate received, the Commission was invited to put forward a proposal for a CBAM in the first semester of 2021, with a view to its introduction at the latest by 1 January 2023. The envisaged timetable was confirmed in the roadmap towards the introduction of new own resources agreed by the European Parliament, the Council and the Commission on 16 December 2020[15].

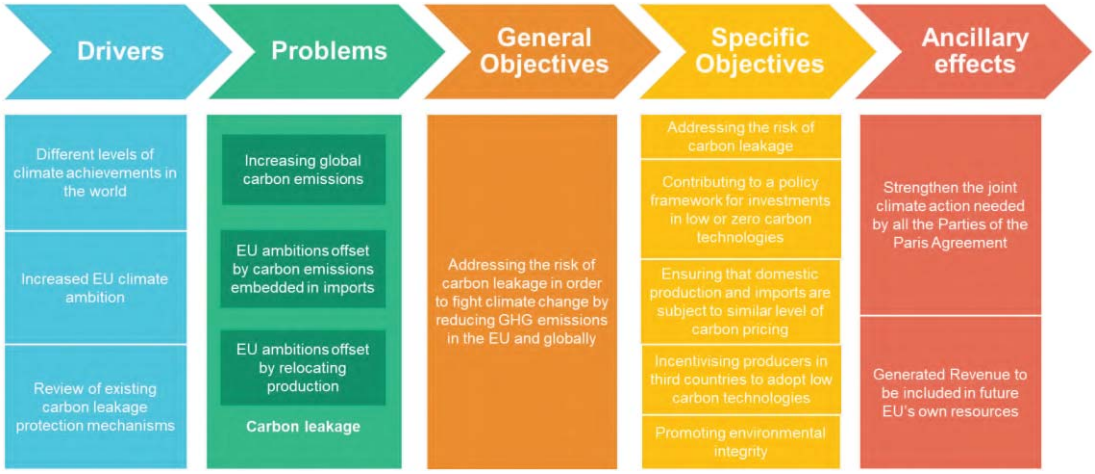
[11] European Commission 2020. Inception Impact Assessment: Amendment of the EU Emissions Trading System (Directive 2003/87/EC). (Ares(2020)6081850).
[12] European Commission. (2019). The European Green Deal. (COM(2019) 640 final), p. 5.
[13] State of the Union Address by President von der Leyen at the European Parliament Plenary on 16 September 2020. https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_20_1655
[14] See European Council conclusions, 17-21 July 2020.
[15] See Interinstitutional agreement between the European Parliament, the Council of the European Union and the European Commission on budgetary discipline, on cooperation in budgetary matters and on sound financial management, as well as on new own resources, including a roadmap towards the introduction of new own resources, adopted on 16 December 2020.

2 PROBLEM DEFINITION

This section will define and analyse the problems and the problem drivers as well as assess the evolution of the problems in the absence of EU policy intervention. The 'Intervention Logic' (

Figure 2 below) presents visually the problems, their drivers, as well as the objectives of the proposed mechanism.

Figure 2: Intervention Logic



2.1 What is the problem?

2.1.1 Overall positioning of the problem

The problem addressed by this impact assessment is how to succeed in reducing GHG in the EU and avoiding that these emissions reduction efforts are offset by emissions increases outside the EU. As indicated in Section 1, if differences in levels of climate ambition are to persist worldwide, the EU's increased ambitions will reinforce the risk of carbon leakage from the EU. Such leakage is caused by the relocation of production of energy-intensive products from the EU to other countries with lower environmental compliance costs, and of these same EU products being replaced by more carbon-intensive imports from these countries[16]. These manifestations of carbon leakage are sometimes referred to as the increase or reallocation of GHG emissions embedded in imported goods[17]. GHG emissions embedded in imports are a great concern as they are expected to increase both as a result of the relocation of production outside of the EU but also as there might be increased demand of such products due to price differences. The resulting overall increase in global emissions undermines the effectiveness of EU climate policies. The risk of carbon leakage increases as the EU raises the ambition of its climate policies above that of its trading partners.

The public consultation on the CBAM, for which the Commission received over 600 contributions from companies and business associations, EU and non-EU citizens, civil society and public authorities suggested that carbon leakage is already perceived as a reality and that the risk is likely to increase in view of the raising of the EU climate

[16] The relocation of production is one of the channels leading to carbon leakage.
[17] Embedded emissions refers to the production of goods but not physically incorporated in the goods.

ambition. Overall, respondents agreed that a CBAM can be justified by differences of ambition between EU and third countries to fight against climate change and can contribute to both EU and global climate efforts. The results of the consultation are highlighted throughout this report and discussed in more detail under Annex 2.

Firstly, rising GHG emissions across the world are a global problem as they lead to climate change, which has a devastating effect on the planet and its people. In particular, carbon dioxide emissions from human activities contribute about 80 % to the anthropogenic warming of the atmosphere together with other GHGs such as methane or nitrous oxide. Recognising the need to address climate change, the EU and 189 countries have become Parties to the Paris Agreement in order to keep global temperature rise well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 °C. To contribute to this objective, the EU has increased its targets and efforts to reduce its GHG emissions, and to achieve climate neutrality (net zero emissions) by 2050[18].

Secondly, the risk of EU effort being offset by relocating production and increase of carbon-intensive imports could increase due to a variety of factors[19]. The evidence of the existence of carbon leakage is not always conclusive or suggests that it is difficult to isolate carbon leakage as a single factor in relocation decisions. One reason for this is because different studies use different methodologies. In particular, as explained in Annex 11, *ex-post* studies do not find substantial evidence of carbon leakage as a result of free allocation under the EU ETS and of the low carbon price until phase 3 of the EU ETS. By contrast *ex-ante* analyses using simulation models, often find a substantial risk of carbon leakage in the absence of protection mechanisms such as free allocation of carbon allowances. This is especially so, in studies focusing on specific industries (e.g. partial equilibrium) which tend to focus on emission-intensive and trade-exposed sectors and find higher leakage rates for these sectors in particular. The differences in results between the types of studies indicate that carbon leakage protection measures have been effective to date, while higher carbon prices and declining free allocation can result in an increased leakage risk and thus alter the results. These considerations align the results of *ex-ante* and *ex-post* studies by explaining the differences. *Ex-ante* studies often assume the absence of carbon-leakage protection mechanisms. However, in practice carbon pricing mechanisms have always been accompanied by special provisions, such as free allowance allocation or carbon tax exemptions, to avoid the risk of carbon leakage. In *ex-post* studies of existing carbon pricing mechanisms, these leakage protection measures are therefore included. Additionally, analytic and empirical evidence shows that as a result of the existing leakage protection mechanisms, the carbon price signal has been significantly reduced. Notwithstanding the above considerations, as the EU increases its climate ambitions, existing mechanisms in place to address carbon leakage are being reconsidered, allowances available for free allocation will become scarce, the carbon price signal will become stronger and industries will therefore have to reduce their emissions. This view is also supported by the OECD which argues that 'this literature, however, has been, by definition, based on past climate policies, which have not embodied the same level of ambition that is now being put forward by some countries. Thus, while carbon leakage and competitiveness effects of climate policies have been

[18] European Commission. (2020). Stepping up Europe's 2030 climate ambition. (COM(2020) 562 final: Part 1/2) p.8. European Council Conclusions of December 2020. (EUCO 22/20 CO EUR 17 CONCL 8).
[19] See section 2.2 below.

very modest so far, increased policy stringency divergence in the future may amplify these issues. The small effects identified may partly reflect the low stringency of climate policies to date. Yet threats posed by climate change require policies that lie outside the bounds of past experience. Another explanation for the small effects observed so far is that the climate policies are designed so as to prevent potential competitiveness effects[20]'.

2.1.2 The CBAM in the context of the Paris Agreement

While each Party to the Paris Agreement sets its own level of ambition, at the same time we need to make sure that Parties are not undermining the effectiveness of each other's policies. By introducing a CBAM, the EU will ensure that goods imported into the EU follow the same rules as the goods produced in the EU without interfering with policy choices in third countries.

In order to respect the Paris Agreement and the principle of nationally determined contributions (NDC) therein as well as the principle of Common but Differentiated responsibility, the CBAM would be designed in such a manner that it does not directly depend on the overall level of ambitions of a country nor on the policy choices made by a country.

The CBAM would be designed to reduce the risk of carbon leakage resulting from the climate ambition of the EU while taking into account the effects of the policies carried out by our partners across the globe. As most of the CBAM options, considered in the sections bellow, would apply to the actual emissions of imported goods or offer the possibility to be applied to actual emissions of imported goods, this would imply that when a country decides to reduce emissions through a regulatory approach, its goods would be subject to a lesser CBAM obligation when exported to the EU. In addition, in practice the possibility to account for any carbon price effectively paid outside the Union will be taken into account when determining the CBAM obligation. Therefore, policies based on carbon pricing approaches will be taken into account.

2.2 How is the problem currently being addressed?

The risk of carbon leakage is inherent to any carbon pricing policy carried out in an open economy, unless all countries have the same level of ambition to fight against climate change. This risk has been identified from the beginning of the EU ETS and addressed through two mechanisms, namely the free allocation of ETS allowances to sectors at highest risk of carbon leakage and the possibility for Member States to give state aid to electro-intensive undertakings active in a sector exposed to international trade, compensating the higher electricity costs resulting from the ETS. Both of these mechanisms are described in the impact assessment of the ETS revision[21]. The ETS Directive, however, clearly states that both mechanisms are to be transitional and the Commission is obliged to assess the effects of these measures by revision clauses in the ETS Directive.

[20] OECD (2020) Climate Policy Leadership in an interconnected world: What Role of Border Carbon Adjustments? Paragraph 30.

[21] See section 5.2.1.4 and Annex 9 in European Commission 2020. Inception Impact Assessment: Amendment of the EU Emissions Trading System (Directive 2003/87/EC). (Ares(2020)6081850).

2.2.1 Free allocation of allowances

Free allowances are an effective way to deal with carbon leakage. However, the combination of competition in global supply chains and the provision of free allowances results in a reduced and uncertain carbon price incentive for climate-neutral production processes and for the efficient use and choice of materials in manufacturing and recycling. Furthermore, they result in a situation where carbon emissions embedded in goods placed on the EU market are not priced consistently, but depending on the material and its origin, thus limiting the incentives to reduce emissions.

The European Court of Auditors report 18/2020, 'the EU's ETS: free allocation of allowances need better targeting', found that the share of free allowances still represented a very significant part of the total amount of ETS allowances, while the stated objective of the ETS is that auctioning should be the default method for attribution of allowances. In addition, the same report found that free allocation could have a negative effect on the incentive to decarbonise. The ETS revision impact assessment compares the results of the ETS in the power sector, where allocation is mostly auctioned, with the industry sector, where the vast majority of allowances are allocated for free, to note that decarbonisation has progressed faster in the former than in the latter.

It should be noted that carbon leakage risks through relocation of production are also addressed in existing carbon pricing mechanisms outside the EU. The instrument of free allowance allocation is used in all major jurisdictions with emission trading systems in place. Besides the EU ETS, the emission trading schemes in California, Quebec, New Zealand and the Republic of Korea allocate parts of their allowances for free at varying methods and shares (between 21 % and 97 %[22]). The same applies to the ETS pilots in China, which also allocate allowances to the covered power plants for free[23].

All economic literature confirms that free allocation is an effective instrument to address the risk of carbon leakage, however handing allowances for free has a cost both financially and in terms of effectiveness of the ETS. As the EU is raising its climate ambition, both these costs will increase, which will risk to make it more difficult for the EU to reach the set climate targets.

2.2.2 Compensation of indirect carbon costs

The guidelines on certain State aid measures in the context of the system for greenhouse gas emission allowance trading post 2021 identify the sectors found at risk of carbon leakage due to their indirect emissions, and the Member States which are allowed to provide compensation for indirect carbon costs[24].

Like free allowances, state aids by nature are a regime of exception. This is outlined in the excerpt of the Communication: 'The primary objective of State aid control in the context of implementation of the EU ETS is to ensure that the positive effects of the aid

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[22] Acworth et al., Achieving Zero Emissions Under a Cap-And-Trade System, EUI Policy Brief, Issue 2020/26 June 2020, https://icapcarbonaction.com/en/?option=com_attach&task=download&id=695

[23] IEA, The Role of China's ETS in Power Sector Decarbonisation, 2020, April https://www.iea.org/reports/the-role-of-chinas-ets-in-power-sector-decarbonisation

[24] European Commission. (2020). Communication from the Commission Guidelines on certain State aid measures in the context of the system for greenhouse gas emission allowance trading post-2021 (2020 C/2020/6400).

outweigh its negative effects in terms of distortions of competition in the internal market. State aid must be necessary to achieve the environmental objective of the EU ETS (necessity of the aid) and must be limited to the minimum needed to achieve the environmental protection sought (proportionality of the aid) without creating undue distortions of competition and trade in the internal market.'

It should be noted that only 13 Member States and Norway avail this possibility to grant indirect cost compensation[25].

2.3 What are the problem drivers?

There are three interconnected drivers that may induce an increased risk of carbon leakage, namely: the different levels of climate ambitions in the world and the actions in place to achieve them, the increased EU ambitions and the reconsideration of existing carbon leakage protection mechanisms, in particular the gradual decrease of allowances available for free allocation under the EU ETS. When looking at those drivers in the context of the globalised value chain, the risk of carbon leakage becomes even more acute.

2.3.1 Different levels of climate achievements in the world

At present, international climate action is characterised by different stages of achievements. The Paris Agreement, however, aims to create a coherent dynamic by strengthening the global response to the threat of climate change. Each Party to the Paris Agreement defines its own NDCs to reduce GHG emissions. While NDCs reflect Parties' 'highest possible ambition', they also reflect their 'common but differentiated responsibilities and respective capabilities in the light of different national circumstances'. This means that the global response to the climate challenge will inevitably differ between the Parties in the short and medium term perspectives. However, this does not mean that these differentiated approaches should be an obstacle to each Party's achievement of its own objectives. As pricing carbon emissions is a key instrument to reach emission reductions in a cost-effective way, global cooperation aiming at agreements on such mechanisms could serve as a powerful tool in the fight against climate change. Such agreements would also level the global playing field and reduce potential negative effects following from differences in compliance costs across the economies of different Parties.

2.3.2 Increased EU climate ambition

The EU is increasing its climate ambition consistently with the goal of reaching climate neutrality by 2050, in accordance with its commitment to the Paris Agreement. This is the key climate target set by the European Green Deal. In the process of achieving this target, intermediate goals for 2030 have been proposed to reflect the increased ambition[26]. On 11 December 2020, the European Council raised the EU target for 2030

[25] SWD/2020/0194 final - Evaluation accompanying the document Impact assessment on Guidelines on certain State aid measures in the context of the system for greenhouse gas emission allowance trading post 2021.

[26] European Commission. (2020). Amended proposal for a Regulation of the European Parliament and of the Council on establishing the framework for achieving climate neutrality and amending Regulation (EU) 2018/1999 (European Climate Law). (COM(2020) 563 final), p. 1.

from 40 % to 55 %[27] compared to 1990 and this new target was communicated to the UNFCCC as the EU's NDCs under the Paris Agreement. This new target will put the EU on a path to climate neutrality. Higher emissions reduction targets require revisions of existing climate policy instruments to achieve the new objectives.

2.3.3 Review of existing carbon leakage protection mechanisms

In order to achieve these targets, the EU considers the pricing of GHG emissions as an important instrument of a cost-effective policy package to support the transformation of industries towards climate neutrality. Since 2005, direct GHG emissions of industrial installations and the power sectors are priced in the EU ETS. The risk of carbon leakage has been effectively addressed for those sectors regulated under the EU ETS that are exposed to the risk of carbon leakage. This was done by granting free emissions allowances up to 100 % of determined benchmarks representing the average emissions per unit of the relevant product of the best 10 % producers in the EU. The EU ETS Directive provides for this system to continue at least until 2030[28]. Free allocation of allowances is an effective tool to address the risk of carbon leakage; however, it has two principal drawbacks: first it is a costly measure[29], second it limits the carbon price signal for industry and hence the incentive to decarbonise. In addition, in the context of the EU's higher 2030 target and objective to become carbon neutral by 2050, the level of free allowances available will decline further as a function of the overall declining EU ETS cap. Moreover, since the carbon price is passed on in electricity prices and as such on to consumers, possibly becoming an indirect driver of carbon leakage for some energy-intensive sectors, Member States have the possibility to compensate some electro-intensive industries for the increase in electricity prices resulting from the EU ETS, provided they comply with EU state aid rules.

2.4 How will the problem evolve?

2.4.1 Carbon leakage in view of the evolution of leakage protection in the EU

The EU's leadership in reducing its GHG emissions may result in higher carbon cost differences with its trading partners. This increases the risk of carbon leakage.

As discussed in the previous section, the current approach to addressing the risk of carbon leakage relies on free allocation of allowances, and in some cases financial measures to compensate for the carbon cost of indirect emissions to operators of installations from sectors and sub-sectors at a significant risk of carbon leakage. For that purpose, the EU has established a list of such sectors and sub-sectors[30]. This means that there are currently mechanisms in place to address the risk of carbon leakage in these sectors.

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[27] European Council. (2020). European Council Conclusions of December 2020. (EUCO 22/20 CO EUR 17 CONCL 8).

[28] Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814, OJ L 76, 19.3.2018, pp. 3-37.

[29] In 2020, 724 million allowances were allocated for free.- Report from the Commission to the European Parliament and the Council on the functioning of the European carbon market (COM 2020(740) Final)

[30] Commission Delegated Decision (EU) 2019/708 of 15 February 2019 supplementing Directive 2003/87/EC of the European Parliament and of the Council concerning the determination of sectors and subsectors deemed at risk of carbon leakage for the period 2021 to 2030, OJ L 120/20, 8.5.2019, pp. 20-26.

However, two already ongoing developments may reduce leakage protection. First, as laid out in the intervention logic, the increasingly ambitious GHG emissions reduction targets should reduce the overall number of allowances. This may lead to a higher carbon price in the EU ETS, which in turn creates an even larger difference to countries without carbon pricing mechanisms. Second, the cap on emissions and therefore the total amount of allowances will be reduced to meet new targets under the increased ambition. This means that free allocation will also decline over time and therefore carbon costs should increase for industrial installations, which may lead to an increase in the risk of carbon leakage.

Therefore, domestic industries may face higher production costs compared to international producers. In the absence of action, businesses could transfer their production to countries with laxer emission constraints, thus increasing GHG emissions in third countries, or import more as carbon-intensive products of EU firms are being replaced by carbon-intensive imported products from non-EU firms. The effectiveness of the EU's climate policies could thus be undermined and the ultimate outcome could then be no effect or even an increase in global emissions.

The above is also reflected in the views of stakeholders, as recorded in the CBAM public consultation. On the whole, stakeholders participating in the consultation believe that carbon leakage is already a reality and, to some extent, that the CBAM can address carbon leakage, foster consumption of the less-carbon intensive product in the EU and stimulate the deployment of low-carbon technologies and ambitious climate policies in third countries. They have a mixed opinion on the effectiveness of current measures in the context of the EU ETS and state aid rules to limit carbon leakage and on the ability of other regulatory measures (e.g. performance standards for products placed on the EU market) to effectively reduce greenhouse gas emissions. The analysis of the CBAM public consultation results by geographic area indicates that respondents from bordering countries are relatively more convinced that current mitigation measures for carbon leakage in the context of the EU ETS are effective and will also stay effective in the future. By contrast, stakeholders based in other non-EU countries are relatively more sceptical about the current measures to address the risk of carbon leakage and more convinced about the effectiveness of an EU CBAM.

2.4.2 Interdependence of the CBAM and the EU ETS revision in the context of problem evolution

In the context of the 'Fit for 55 Package' the CBAM is not a self-standing measure. It is a support measure aiming at enabling the climate ambition of the EU. Under the assumptions of this impact assessment, the CBAM would be complementary to the EU ETS, with a view to addressing the risk of carbon leakage and reinforcing the EU ETS itself. There is a strong interdependence between the revision of the EU ETS and the possible introduction of a CBAM. Indeed, in case a CBAM is introduced it will have an effect on the share between auctioning and free allocation in the ETS.

Since phase 3 of the EU ETS, auctioning is the default approach to allocating allowances and free allocation remains as a transitional derogation aiming at addressing the risk of carbon leakage. Under phase 4, 43 % of allowances are still allocated for free. This illustrates the size of the derogation, which is reflected in the ETS impact assessment

quoting the European Court of Auditors report on the ETS[31], whereby 94 % of the emissions from industry come from sectors considered at risk of carbon leakage. The ETS impact assessment presents approaches to better target free allocation, either to sectors where the risk of carbon leakage is the highest or by reinforcing benchmarks. The CBAM, as an alternative to free allocation, builds on the ETS logic that auctioning is the default ETS approach, starting with sectors where emissions are the highest and therefore where it would matter most. The criteria used in the CBAM impact assessment to select sectors to which the CBAM should apply are aligned to the criteria used to better target free allowances. Notwithstanding the above, the EU has set itself the very ambitious goal of becoming climate neutral by 2050 and of reducing its emissions by 55 % by 2030. This will necessarily have an impact on the availably of free allowances and will require increasing the effectiveness of all instruments aiming at reducing greenhouse gas emissions.

It is in this context of a phase-out of the current measures to avoid carbon leakage that the CBAM becomes a necessary tool to mitigate the risk of carbon leakage as long as third countries do not share the same level of ambition, or in other words that they do not have a similar carbon price in place. The question is not whether one measure or the other is more effective to deal with the risk of carbon leakage but whether the CBAM will be an effective tool in a new scenario without the current measures. However, as also stated in the ETS revision impact assessment, the CBAM and options presented in the ETS revision impact assessment are complementary.

3 WHY SHOULD THE EU ACT?

3.1 Legal basis

The Treaty on the Functioning of the European Union ('TFEU') confers to the European institutions the competence to lay down appropriate provisions intended, inter alia, to preserve and protect the environment (Article 192(1) TFEU), including, in particular, measures combating climate change at global level.

Appropriate provisions of fiscal nature intended for environmental purposes can be adopted by the EU according to Article 192(2), first paragraph, of the TFEU.

Article 113 of the TFEU permits the EU to lay down harmonised rules in order to ensure the proper functioning of the internal market.

Depending on the nature of the instrument proposed the legal basis may be Article 192 or Article 113 of the TFEU.

3.2 Subsidiarity: Necessity of EU action

Reducing GHG emissions is fundamentally a trans-boundary issue that requires effective action at the largest possible scale. The EU as a supranational organisation is well-placed to establish effective climate policy in the EU, like it has done with the EU ETS.

[31] European Court of Auditors, the EU's Emission Trading System: free allocation of allowances need better targeting, 2020.

There exists already a harmonised carbon price at EU level. This consists of the price resulting from the EU ETS for the sectors covered by the system[32]. These sectors are energy-intensive and subject to international competition. In order to ensure a well-functioning single market when the EU increases its climate ambition, it is essential that a level playing field is created for the relevant sectors in the internal market. The single effective way to do this is by taking action at the level of the EU. Any initiative needs to be implemented in a way that provides importers, regardless of country of origin and port of entry or destination within the EU, with uniform conditions and incentives for carbon emission reductions that are equivalent to those of domestic producers.

The only meaningful way to ensure equivalence between the carbon pricing policy applied in the EU's internal market and the carbon pricing policy applied on imports is to take action at the level of the Union.

3.3 Subsidiarity: Added value of EU action

In parallel to the EU ETS, reduction of GHG emissions and protection against the risk of carbon leakage in the EU single market can be established most adequately at the EU level. Additionally, the need for minimal administrative costs is best achieved by establishing consistent rules for the entire single market, further underlining the added value of an intervention at the EU level.

Moreover, as the CBAM is inherently a border measure there is a clear added value in placing the intervention at EU level in view of the fact that external trade is an exclusive competence of the EU. At the same time, as the CBAM also needs to be implemented consistently in the EU market and in view of its close links to the EU ETS there is further justification of intervention at EU level. The public consultation has confirmed the added value of taking action on the CBAM at EU level. In particular, stakeholders agree that a CBAM is needed due to existing differences of ambition between the EU and the rest of the world and in order to support the global climate efforts. In addition, in view of the EU's position in international trade, if it introduces a CBAM the environmental effect on international climate ambitions will be most effective as a potential example to follow.

Thus, the objective of reducing emissions and climate neutrality requires – without equally ambitious global policies by third countries – action by the European Union.

4 OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1 General objectives

Considering the problems described above, a CBAM has the overarching objective of addressing the risk of carbon leakage in order to fight climate change by reducing GHG emissions in the EU and globally.

4.2 Specific objectives

The overarching objective of addressing climate change is further articulated in a number of specific objectives, namely:

[32] Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814, OJ L 76, 19.3.2018, pp. 3-37.

- Addressing the risk of carbon leakage under increased EU ambition, which would ensure that EU climate policies, as translated in the carbon price of the EU ETS, can be fully effective without resulting in increasing emissions abroad, which would undermine climate mitigation efforts. The applied carbon price reflects the polluter-pays-principle[33] and supports the reduction of GHG emissions from industry through the internalisation of external costs from GHG emissions that is achieved by the carbon price;
- Contributing to the provision of a stable and secure policy framework for investments in low or zero carbon technologies;
- Ensuring that domestic production and imports are subject to similar level of carbon pricing;
- Encouraging producers in third countries who export to the EU to adopt low carbon technologies.
- Minimising the risk of the measure being circumvented, thus providing environmental integrity;

4.3 Ancillary effects

The CBAM, as envisaged by the above-mentioned objectives, may also give rise to a number of secondary and ancillary positive effects. These refer to the relevance of the CBAM as a climate tool to push third countries to adopt more stringent climate measures, as well as to the possibility to obtain revenues from the introduction of the measure. Specifically the ancillary positive effects of the CBAM include:

- Strengthening the joint climate action needed by all the Parties of the Paris Agreement to meet the goal of holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels;
- While not introduced with revenue raising as its purpose and it not playing a role in the design of the measure, the CBAM will raise revenue on GHG emissions at the border. This is acknowledged in the Interinstitutional agreement including the CBAM in the list of future own resources in the context of NextGenerationEU[34]. The introduction of a CBAM would also incentivise key trading partners to consider the revenue generation dimension of carbon pricing policies.

5 WHAT ARE THE AVAILABLE POLICY OPTIONS?

5.1 What is the baseline from which options are assessed?

The basis against which the different CBAM options are analysed in this impact assessment reflects the dynamic framework against which the CBAM is proposed. In particular, it aims at capturing the fact that the measure is put forward in the context of existing climate legislation that implements the ‘at least 40 % GHG emission reduction

[33] Article 191(2) TFEU – e.g. a principle of EU legislation.
[34] See Interinstitutional agreement between the European Parliament, the Council of the European Union and the European Commission on budgetary discipline, on cooperation in budgetary matters and on sound financial management, as well as on new own resources, including a roadmap towards the introduction of new own resources, adopted on 16 December 2020; European Council. (2020). Multiannual Financial Framework 2021-2027 and NextGenerationEU. https://www.consilium.europa.eu/en/press/press-releases/2020/12/17/multiannual-financial-framework-for-2021-2027-adopted/

target' by 2030, but also against the new agreed upon EU target of reducing GHG emissions by at least 55 %, and an evolving policy framework to implement the latter, which at the time of preparing this impact assessment is under consideration within the 'Fit for 55 Package'.

Calibrating the analysis and modelling of the CBAM, to account for the above considerations necessitates a stepwise approach. This first involves setting the foundations based on the current policy framework, and second an additional counterfactual based on the new agreed climate targets for 2030 - the latter balanced to account for policies that are under an ongoing assessment and which will, in turn, have an impact on the specific objective of the CBAM, namely to address the risk of carbon leakage.

The first step therefore involves setting the baseline of this assessment consistently with all other exercises under the 'Fit for 55 Package'. This consists of the EU Reference Scenario 2020 ('REF'), the main elements of which are depicted in Annex of the impact assessment for the revision of EU ETS Directive.

The baseline as reflected in the REF assumes the continuation of free allocation of allowances to operators of installations from sectors and sub-sectors at a significant risk of carbon leakage. At the same time, the baseline includes current climate and energy legislation that implements the 'at least 40 % GHG emission reduction target', notably the revised EU ETS Directive which regulates GHG emissions mainly from the power and industry sectors plus aviation, the Effort Sharing Regulation that sets national targets for emissions outside of the EU ETS and the Regulation on the inclusion of GHG emissions and removals from land use, land use change and forestry ('LULUCF'). With regard energy, the baseline includes the Energy Efficiency Directive and the Renewable Energy Directive, as well as other key policies covered in the Energy Union and the 'Clean Energy for All Europeans' package, including the internal electricity market policy.

The second step involves a counterfactual to account for the raising of EU ambition and thereby the motivation for the CBAM itself. Under this counterfactual, emission allowances under the EU ETS will be reduced in the coming years, to achieve an overall reduction of at least 55 % by 2030 and beyond, so as to ensure a balanced pathway to reaching climate neutrality by 2050. In the modelling, this result is achieved, until 2030, through a mix of measures consisting of both an expansion in carbon pricing, be it via EU ETS or other instruments, to the transport and buildings sectors and a moderate ambition in regulatory-based measures including energy efficiency, renewables and transport policies. For the purposes of modelling the impacts of alternative CBAM options, this counterfactual is based on the MIX scenario as depicted in the impact assessment for the revision of EU ETS Directive.

Under the MIX scenario the free allowances to industry at risk of carbon leakage continues as the main instrument to address this risk. As such, free allowances are assumed to cover 100 % of emissions at benchmark level of the industries in question. In modelling terms, this results in the MIX scenario keeping carbon leakage at a relatively low level[35]. In view of this, the third step of the analysis involves a variant to the counterfactual, which allows for the disentangling of impacts. Specifically a variant of

[35] Except energy leakage as discussed below.

the MIX is also modelled depicting the case of complete removal of free allowances in the CBAM sectors[36], in the absence of a CBAM.

This full auctioning variant of the MIX serves as an additional reference point to compare different leakage protection options under the CBAM. The motivation of this derives from the fact that under the European Green Deal free allocation in the CBAM sectors and a CBAM at the border are clear alternatives. The impact assessment of the EU ETS extension does not include any scenario in which free allocation is phased-out by 2030. Therefore, it would not be possible to assess with fairness any of the CBAM options if the case of full auctioning in the absence of a CBAM was not also presented for comparative purposes.

5.2 Description of the policy options

5.2.1 Design elements common to all options

This sub-section outlines certain design elements which are common to all of the policy options and are applied in a similar manner across the options. In identifying the options, account has been taken of WTO requirements and of the EU's international commitments such as free trade agreements concluded by the EU or the Energy Community Treaty. It should also be noted that a number of notions are used in the analysis below which call for specified definitions which can be found in Annex 5.

5.2.1.1 Scope of emissions

The emissions to be covered by the CBAM should correspond to those covered by the EU ETS Directive[37], namely carbon dioxide (CO2) as well as, where relevant, nitrous oxide (N2O) and perfluorocarbons (PFCs). Regarding the scope of those emissions, different possibilities can be envisaged:

- **Direct emissions** are emissions taking place as part of a production process on which the producer has direct control. These include emissions from heating and cooling.
- **Indirect emissions** refer to emissions from the production of electricity which is consumed in a certain production process.
- **Full carbon footprint** (often termed a 'cradle to grave' approach) includes all GHG emissions relating to the mining of raw materials, all emissions from the production of materials and components needed for manufacture of the product, the emissions caused by the production process, including emissions from providing the necessary energy, emissions from the transport of raw materials and interim products to the site of the production process and of the product to the consumer, emissions caused during the use phase and emissions related to the disposal / end-of-life phase of the product.

As an instrument to prevent carbon leakage, the CBAM seeks to ensure that imported products are subject to a carbon price equivalent to the one they would have paid under the EU ETS, had they been produced in the EU. In the EU, the EU ETS applies to the

[36] By CBAM sectors the analysis considers the sectors where CBAM is considered possible alternative to free allocation of allowances under the EU ETS.

[37] Annex 2 of Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (OJ L 275, 25.10.2003, p. 32).

direct emissions of installations where carbon intensive products are produced. The EU ETS also applies to the production of electricity that may be used in the production process. Conversely, the EU ETS does not apply to mining activities in the EU[38], neither does it, for now, directly apply to transport[39] in the EU other than air transport. While the EU ETS may apply to certain activities related to the disposal and recycling of products, this is not related to whether these products are produced in the EU or imported. Therefore, the most appropriate scope when the CBAM is applied in the EU is to include direct emissions from the production of basic materials and basic material products up to the time of import, as well as related indirect emissions when they are significant. A threshold will have to be defined to determine when indirect emissions constitute an important part of an imported product's embedded emissions in order to limit the administrative burden. This is the approach that will be followed in most CBAM options.

In the longer term, when the material scope of the CBAM would be extended, as more information will be easily available on the carbon content of products and as carbon pricing policies of different countries may become more easily comparable, an extension of the carbon emission scope to cover the full carbon footprint of imported products may be considered.

Such a possible future extension would also be of relevance to transport emissions as the EU ETS may be extended to transport. Indeed, emissions resulting from transport may be significant for imported goods and are certainly a relevant issue in the fight against climate change. However, as long as emissions from transport are not included in the scope of the EU ETS, it would be complicated to include them in the scope of the CBAM. As the ETS revision impact assessment foresees such extension[40], there is a case for including transport emissions in the CBAM. This could be done when the CBAM will be revised. Respondents to the Open Public Consultation somewhat agree that the CBAM should cover direct emissions and indirect emissions from electricity used in the production process, emissions recorded in all links of the value chains and emissions from international transport of goods. Conversely, they somewhat disagree that the CBAM should differentiate the treatment of imports of finished products, intermediate products and primary inputs.

5.2.1.2 Measuring the carbon content

The carbon content of products is an essential element of the CBAM as it indicates the GHG emissions released during the production of the materials produced abroad. This is used to ensure that imported products are treated no less favourably than domestic products produced in EU ETS installations. The carbon content of products will be multiplied by the reference carbon price for determining the obligation to be paid under the CBAM.

Carbon content does not refer to carbon physically contained in a product in any chemical state, but rather to the GHG emissions released during the production of the material or product subject to the CBAM, or indirectly during the production of electricity used in the process. A carbon content is usually expressed with respect to the corresponding scope of emissions, products and sectors.

[38] Unless the mining includes combustion units with a total rated thermal input of more than 20 MW.
[39] The impact assessment on the revision of the EU ETS Directive considers the possible extension of the EU ETS to transport and buildings.
[40] Specifically under policy options EXT1 and EXT2

As installations covered by the EU ETS are subject to a carbon price assessed on their actual emissions, imported products in the scope of CBAM may also be assessed based on their actual GHG emissions. Such an approach offers advantages relating to a fair and equal treatment and would also serve well to give incentives to foreign producers to develop low-carbon production. Furthermore, requesting to document the carbon content of all imports could serve well to fulfil the aim to closely mimic the functioning of the EU ETS. It may, however, also entail a significant administrative burden for importers. To limit this, a default value representing the emissions of imported products may be established with the possibility for the importer to demonstrate that its products were produced with actual emissions lower than the default value, and therefore be subject to a lower adjustment. Both approaches will be explored in this impact assessment.

For options where imported products in the scope of the CBAM are to be assessed based on actual GHG emissions, there would still be a need to set objectively determined default values to be used in situations when sufficient data to determine the actual GHG emissions are not available. This could be the case when importers cannot provide actual emission data or when the CBAM monitoring and verification of those given are not considered to fulfil laid down criteria.

For options where the default value is predominantly used, the level of this default value for each covered sector/product will have to be set taking into account the level of emissions attributable to a given sector in the EU, comparing it to the emissions of this sector outside of the EU. In addition, the higher the default value will be set, the more claims for individual treatment there may be, generating an additional administrative burden. This latter element also needs to be taken into account in setting the level of the default values.

The level of the default values may be defined as dynamic values, for example taking the EU average or median per sector as a reference. Alternatively, it could be a fixed value subject to revision after a defined number of years[41].

Both default values and actual emissions must be calculated on the basis of robust Monitoring, Reporting and Verification (MRV) procedures. These can be based on major elements of existing EU ETS mechanisms such as the Monitoring and Reporting Regulation[42], Free Allocation Rules Regulation[43] and Allocation Level Change Regulation[44] of the EU ETS, and complemented by further data requirements.

The reference flow/declared unit for the calculation of the carbon content should be the unit of weight (e.g., tonne CO_{2eq}/tonne material[45]), specific per production site. Once the

[41] Under the EU ETS values are recalculated every 5 years.
[42] Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 601/2012 (OJ L 334, 31.12.2018, pp. 1–93).
[43] Commission Implementing Regulation (EU) 2018/2067 of 19 December 2018 on the verification of data and on the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council (OJ L 334, 31.12.2018, pp. 94–134).
[44] Commission Implementing Regulation (EU) 2019/1842 of 31 October 2019 laying down rules for the application of Directive 2003/87/EC of the European Parliament and of the Council as regards further arrangements for the adjustments to free allocation of emission allowances due to activity level changes (OJ L 282, 4.11.2019, p. 20–24).
[45] Except in the case of electricity where different specifications apply.

digital product passport announced in the Circular economy action plan will have become operational[46], the information could be specific to the produced consignment. In the meantime, it could be acceptable to declare the yearly average carbon content.

It may be necessary to develop sectoral rules (for the sectors in the scope of the CBAM) detailing how to calculate both direct and indirect emissions. These rules could be developed following the approach already used for PEF Category Rules and international standards on carbon footprint[47], focusing on the production steps in scope. For direct emissions, the calculation should follow the principles of the EU ETS calculation rules. For indirect emissions (related to electricity use), the approach may build on PEF rules. The existing rules cover both the use of electricity from the grid and from specific producers, as well as the production of own electricity (including through Guarantees of Origin certificates). The sectoral rules would also include the verification procedure to be followed.

The above considerations highlight the underlying compromises inherent in the design of the CBAM. Determining the CBAM obligation based on actual GHG emissions could more closely reflect the functioning of the EU ETS, but would involve higher administrative costs. Methods need to be developed and communicated to traders, while the costs associated with the management of the system are higher. In addition, verifiers in third countries may be limited in number in the short term and this could create bottlenecks for the verification of emission in these countries, which would have consequences on the functioning of the system. Default values would allow for determining the CBAM debt based on the volume of product imported according to an average of emissions in the EU. Considering that the average carbon intensity outside the EU is higher, most importers would accept these estimations, which would reduce costs upon them but also upon the EU. In any case, importers would still have the possibility to claim that the emissions embedded in their products are below the default value, however the burden to prove it could be placed on them.

5.2.1.3 Sectors

The specification of the CBAM's sectoral scope will be central to its effective implementation. The methodological approach to the specification of this sectoral coverage should not differ between the different options considered. In this respect, the measure may be understood as sector-neutral in its design – allowing for its potential extension to further sectors and products in the future. However, as discussed later, it is also recognised that some of the design options would allow the measure to move further down the value chain. Reaching further downstream of the supply chain may help mitigating certain weaknesses of some CBAM options, such as the risk of substitution of domestic products by imports downstream of the supply chain. In the modelling exercise, variants of the main options considered allow for exploring this effect.

The focus of the measure is on basic materials and basic material products[48]. The choice of the CBAM's coverage is framed by the sectors and emissions covered by the EU ETS.

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[46] See: https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf

[47] ISO 14067:2018, Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification.

[48] Basic materials refer to materials that are either a (technically pure) substance or a mixture of substances in a physical form that can be sold, which has been derived from raw materials in an industrial process, during which their chemical composition is modified. By contrast basic material products are formed

This is dictated by the motivation behind the measure, namely to ensure that imports of energy intensive products into the EU are on equal footing with EU products in terms of EU ETS carbon pricing, and to mitigate risks of carbon leakage. In this regard, it makes sense to ensure a coherent administrative approach with EU ETS sectors, as the EU ETS price is fully harmonised at EU level and also covers emission-intensive activities competing globally.

Furthermore, narrowing the scope to a first shortlist of aggregated sectors relies on three additional criteria. The first is relevance in terms of emissions, namely whether the sector is one of the largest aggregate emitters of GHG emissions; the second is the sector's exposure to a significant risk of carbon leakage[49], as defined pursuant to the EU ETS Directive[50]; and the third is balancing broad coverage in terms of GHG emissions while limiting complexity and administrative effort. This results in the 12 aggregated sectors illustrated in Figure 3. As can be seen, a few sectors are responsible for the majority of the emissions.

Figure 3: Initial shortlist of aggregated sectors sorted by emissions

Short sector name	Number of installations	Emissions [kt CO2/yr]	Cumulated emissions
Iron & Steel	485	159 861	22.8%
Refineries	130	132 164	41.7%
Cement	214	118 164	58.6%
Organic basic chemicals	331	64 877	67.8%
Fertilizers	99	36 995	73.1%
Pulp & Paper	672	27 233	77.0%
Lime & Plaster	193	26 151	80.7%
Inorganic chemicals	149	22 483	84.0%
Glass	326	18 226	86.6%
Aluminium	89	13 755	88.5%
Ceramics	350	7 810	89.6%
Polymers	121	5 655	90.4%
Other sectors	1 200	66 902	100.0%

Source: Commission Analysis
Sectoral emissions as share of the EU ETS industry sectors emissions.

Comprehensiveness in the CBAM's scope has to be further balanced with the technical feasibility and the actual enforceability of the system. As discussed in more detail in Annex 7, when an imported material or product becomes subject to the CBAM, it will be necessary that the authority in charge can identify the product imported, check whether it is to be covered by the measure, and then determine the relevant amount of embedded emissions which are to be covered by CBAM certificates or an excise duty. Two key dimensions are critical in this respect. The first dimension relates to the need to unambiguously identify and distinguish materials or products, and not sectors per se, that will be covered by the measure. By way of example, we could note pig iron or 'iron and steel primary forms' as opposed to the iron and steel sector, or for the case of cement, clinker as opposed to the cement sector. This needs to be defined to a sufficient degree in order to allow for easily determining the amount of emissions that should be subject to

products which consist overwhelmingly of one single basic material, and which are usually produced in a process closely coupled and performed in the same installation as the basic material (Annex 5 provides a full list of relevant definitions).

[49] As shown in the Annex 7 this list of sectors is based both on trade intensity and carbon intensity.

[50] Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814, OJ L 76, 19.3.2018, pp. 3–37.

the CBAM when goods enter in the EU. The second dimension relates to whether materials or products can be sufficiently identified in practice to make the CBAM enforceable. This means that for the effective application of the CBAM, it will be critical that a product or material is unambiguously linkable to its definition and that sufficient information is available to determine its reference values of embedded emissions. For example, 'clinker' under the cement could be linked to the EU ETS benchmark of grey cement clinker and, based on good availability of data, allow for the calculation of embedded emissions based on clinker. These benchmarks could then be linked to specific imported products determined at Combined Nomenclature (CN) codes level such as cement clinkers (2523 10 00) and Portland cement (2523 29 00), cement, whether or not coloured (2523 90 00).

Once products or materials are defined and it is ensured that they can be identified, the next critical step involves the ability to define reference levels for the embedded emissions of materials and products. The feasibility to define reference values for the embedded emissions is indeed the decisive argument for a product or material's inclusion in the CBAM. Without such reference values it is impossible to calculate the CBAM obligation to be paid upon import. Some high-emission industrial processes such as those of refineries produce several products simultaneously. For such processes, in order to define reference values that may be used for output products, a decision would first have to be made on how to attribute the emissions of the industrial process to the different output products. For this reason these products are not considered for the first stage of the CBAM.

These considerations and key steps in assessing the feasibility of different sectors are discussed in greater detail in Annex 7. On the basis of this, a possible initial shortlist of materials and material products scope of the CBAM is presented below. Based on the criteria set out above, in particular their carbon intensity, their trade intensity and the availability of necessary reference data to apply a CBAM, the list includes specified basic materials of the sectors of cement, iron & steel, aluminium and fertilisers. As noted earlier, in the future and conditional on whether data requirements for determining embedded emissions can be satisfied, further products in these sectors as well as other sectors at risk of carbon leakage could be covered by the measure.

In addition, electricity generation may also be a relevant sector to include in our analysis, although for different reasons. Electricity generation is the most important sector included in the EU ETS in terms of direct carbon emissions, and is also the largest sector responsible for carbon emissions in the wider economy. Additionally, electricity generators in principle do not receive free allowances, but have to buy them via auctions or on the secondary market. This distinguishes them from other EU ETS participants whose exposure to the risks of carbon leakage are currently mitigated with the allocation of free allowances. Finally, the infrastructure to exchange electricity with partner countries outside of the EU has been expanding over the past years, and this trend is expected to continue. Due to these physical characteristics and organisational aspects of the electricity market, the approach to electricity generation and trade differs from the approach proposed for material products. More details on this approach are given in Annex 8.

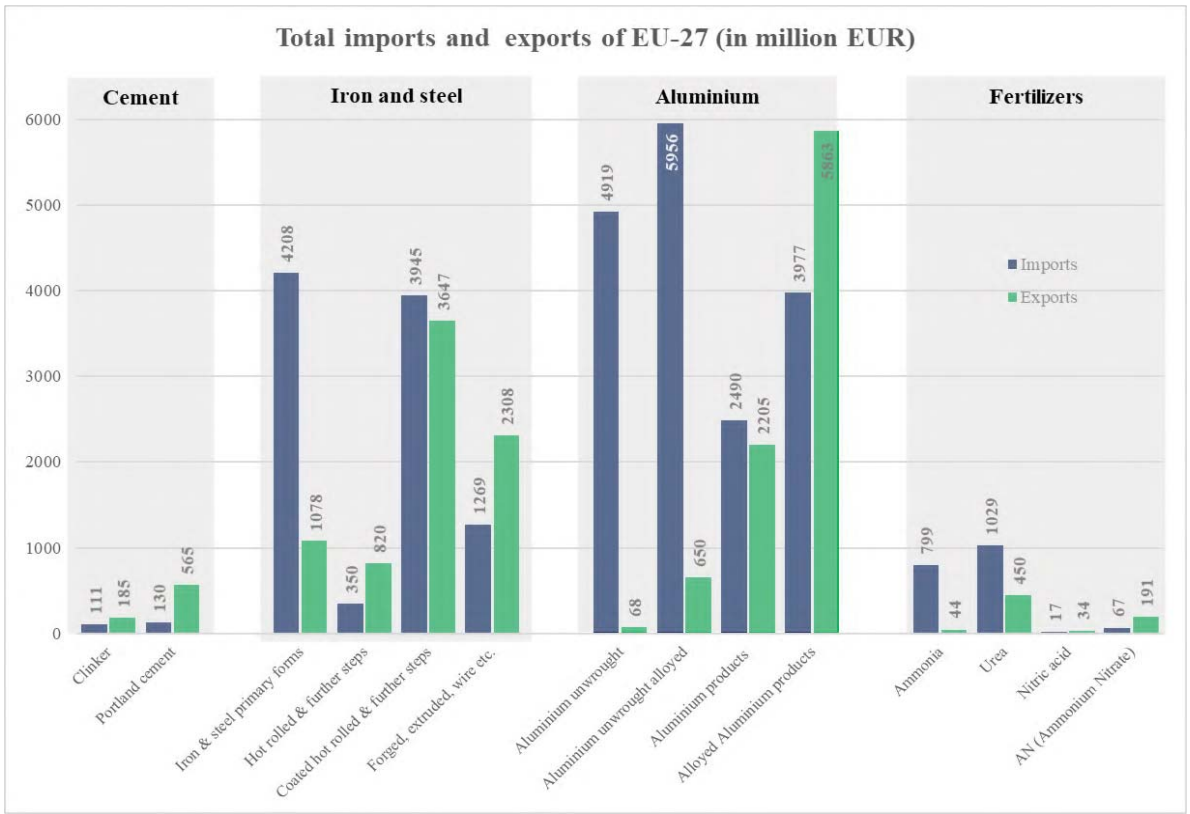
Table 1: Initial shortlist of products for CBAM

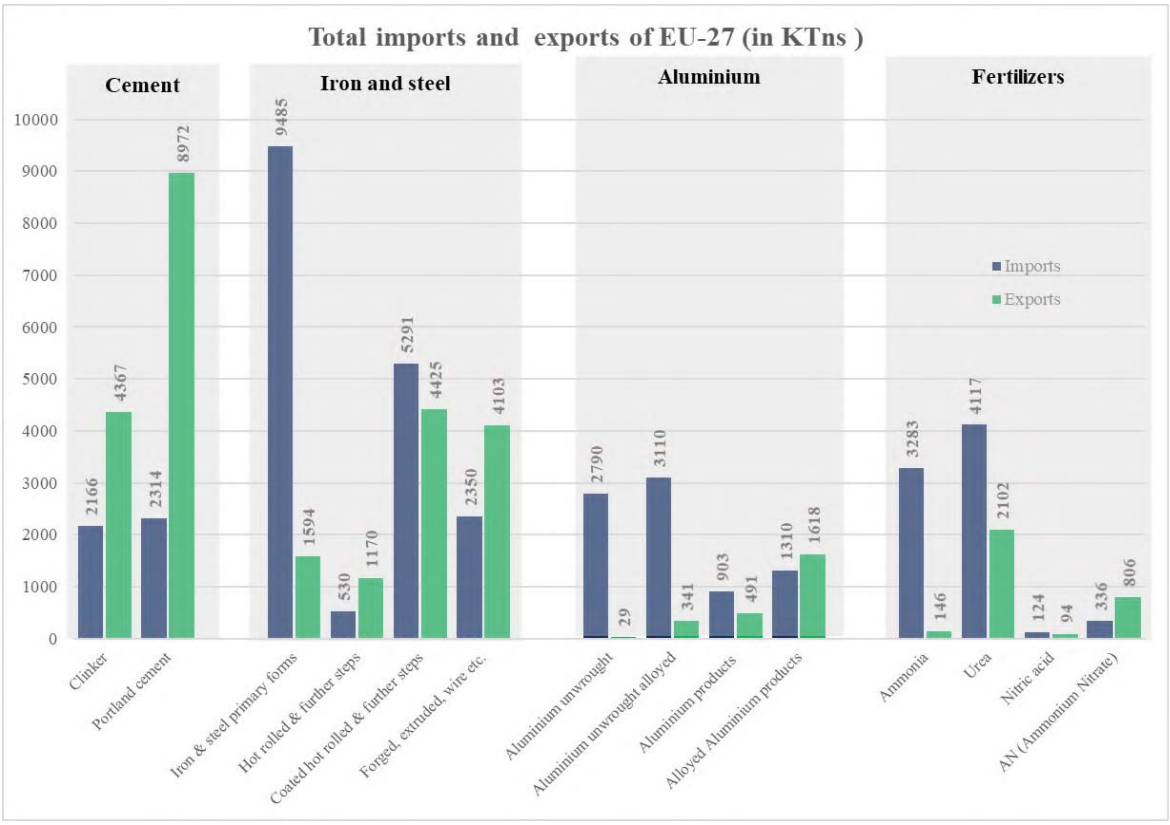
Sector	Materials or material products
Cement	Clinker Portland cement
Iron & Steel	Iron & steel primary forms Hot rolled & further steps Coated hot rolled & further steps Forged, extruded and wire
Aluminium	Aluminium unwrought Aluminium unwrought alloyed Aluminium products Alloyed aluminium products
Fertilisers	Ammonia Urea Nitric acid AN (Ammonium Nitrate)
Electricity generation	Electricity

Source: Commission Analysis

Figure 4 indicates the volume of imports and exports into and from the EU in the sectors identified as potentially falling under the initial shortlist (Table 1 above). It can be seen that in terms of the volume of imports iron & steel is the leading sector, followed by fertilisers, cement and aluminium.

Figure 4: Volume and value of total imports and exports of EU-27 in 2019





Source: Commission analysis based on data from Eurostat COMEXT

Regarding the scope of the CBAM, respondents to the Open Public Consultation somewhat agreed that the mechanism should focus on products from activities already included in the EU ETS (especially those with the highest risk of carbon leakage), and account for the entire value chain. In terms of sectoral coverage, five sectors are selected more than 50 times by the 609 consultation respondents (each respondent was allowed to select up to 10 sectors), i.e. i) electric power generation, transmission and distribution; ii) manufacture of cement, lime and plaster; iii) manufacture of iron and steel and of ferro-alloys; iv) manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber; and v) extraction of crude petroleum.

5.2.1.4 Future-proofing design of the CBAM

The CBAM will need to be fit for the future and its design should be flexible in order to meet any new targets beyond 2030 and address the rapidly changing reality of global climate politics.

As indicated earlier, among measures deployed by the EU to achieve its ambition of carbon neutrality, there needs to be a consistent carbon price to incentivise low-carbon production processes, material efficiency and substitution, as well as enhanced recycling. To that end, and while different reform options are considered for the EU ETS, a CBAM should provide protection against carbon leakage risks. It is expected that the EU ETS price will rise until 2030 and beyond, and the need for carbon leakage protection will therefore continue. CBAM and possibly other measure will be necessary, their scope may need to be extended and the mechanism reinforced. As highlighted in section 5.2.1.3, in a first phase, the mechanism could apply to a limited number of sectors. A second phase could apply the CBAM to materials further down the carbon leakage list based on the

intensity of their carbon leakage indicator[51]. This gradual approach could then cover the entire list of sectors subject to carbon leakage.

Additionally, downstream products in the EU may also be or become at risk of carbon leakage. For example, if the mechanism covers basic materials and basic material products, then downstream domestic producers whose products are not included in the scope (e.g. manufacturers of components and final products) would face higher input costs irrespective of whether they source their (covered) material inputs domestically or from abroad. If climate ambitions diverge, carbon leakage may move down the supply chain, as final consumers may decide to source their purchase from abroad. To avoid this risk of carbon leakage further down the value chain, a broad product coverage is being considered in the design of the mechanism, which could foresee an extension to downstream sectors. Some of the options considered envisage including downstream sectors in the scope of the CBAM from the beginning. In the options where it is not the case, extension to downstream sectors should be considered at a later stage as the use of international standards on defining carbon footprint will pick up and data will become more easily available for all sorts of products.

Extending the CBAM to downstream products faces the challenge of the complexity of value chains and the varying possibilities on the transformation of the product in later stages. Certain CBAM imports such as fertilisers and electricity may reach directly the final consumer with limited transformation or added value. However, for other CBAM materials such as steel and aluminium, as more manufacturing steps included downstream and the final product becomes more complex, the content of the basic material in it becomes diluted. It thus becomes difficult to monitor and verify, as well as easier to circumvent through minor transformation. At the same time, the value added of the basic material in the value of the imported product is also critical, as it would determine the importance of transferring of carbon pricing downstream.

Addressing these challenge would raise two key considerations in practice. The first relates to the number of production steps involved in the manufacturing of each product that uses the CBAM basic material downstream. This would involve intermediate products, which use more than one material or product but require more complex manufacturing steps, and final products, which are made of components and further materials and is ready for sales to end consumers. Tracing the CBAM basic material downstream of these products would involve an analysis of the value chains to determine a reasonable limit for the reach of the measure. The second consideration relates to the value of carbon relative to value generation downstream. At lower CO_2 prices during initial phases, this may be negligible. However, at higher carbon prices in the future, more complex products down the value chain may become relevant for the CBAM.

5.2.1.5 Reference carbon price

All options refer to a carbon price so as to align, to the extent possible, the price paid under the CBAM with the price paid under the EU ETS. Under different policy options, the actual reference carbon price may differ depending on the administrative feasibility

[51] https://ec.europa.eu/clima/sites/default/files/events/docs/0127/6_cll-ei-ti_results_en.pdf see also EU ETS revision impact assessment *Table 58. Carbon leakage list 2021-2030 – Carbon leakage indicators of selected sectors at risk of carbon leakage.*

and specific design of each option. However, it should be noted that the starting point would be the price of allowances in the EU ETS.

This reference carbon price may be:

- The average EU ETS allowance auctioning price over a given period (previous year, quarter, month or week).
- The daily allowance price based on the previous day auctioning price of the EU ETS.

5.2.1.6 Taking into account carbon pricing in third countries

In an ideal world, all countries would put in place the measures necessary to phase out fossil fuels in a fair and effective manner. While the Paris Agreement sets a shared goal of limiting global emissions in order to avoid a dangerous rise in global average temperature, each Party sets its own nationally determined contribution to limit its greenhouse gas emissions, reflecting its highest possible ambition.

The EU has set ambitious targets in line with preventing dangerous climate change, and among other measures has put in place a carbon pricing system, through the EU ETS, to achieve its targets in as cost effective manner as possible. However, in order to achieve its targets, the EU must also ensure that its efforts at home do not lead to emissions increases elsewhere through the risk of carbon leakage. A CBAM that ensures that covered imported products bear a comparable carbon price to domestically produced products will help manage that risk.

The CBAM as proposed would use the EU ETS price as the default value for comparing and adjusting prices at the border. Importers would have the opportunity to claim that the prevailing explicit carbon price in the country of production have addressed the risk of carbon leakage, and hence that their CBAM obligation should be reduced by this amount.

The CBAM should favour global cooperation in fighting climate change, and it should avoid situations of double carbon pricing by subjecting goods which have already paid a carbon price outside the EU based on GHG emissions in third countries to the CBAM. Therefore, the CBAM should be designed in such way that it takes into account climate policies in the form of explicit carbon pricing policies in our trading partner countries. While we recognise that reduction of GHG emissions by countries all over the globe is pursued through regulations other than carbon pricing, due to the conceptual difficulties in determining the equivalence between carbon pricing and non-price regulatory measures, and the fact that, like the EU, most countries will have both pricing and non-pricing approaches to reducing carbon emissions, the CBAM only focuses on carbon pricing. In practice, this means through a cost under an emission trading scheme or by a carbon tax, in both cases covering emissions having occurred during the production of imported materials. A carbon tax can be designed to tax the carbon content of fuels used or be more targeted at actual emissions occurring from the combustion of such fuels. In either case, the tax amount paid does not relate to the produced material being exported to the EU, and the tax would normally not be reimbursed upon export to the EU of the produced material (being for example steel).

Taking into account the carbon price paid abroad can be done either at country level or at transaction level for each individual consignment of imported materials. At country level, exemptions from having the CBAM applying to imports from such countries could be granted to countries who have in place a carbon pricing system that imposes a carbon

price at least equivalent to the price resulting from the EU ETS on products subject to the CBAM. In practice, and in view of current carbon pricing policies around the world, such an approach may be considered for countries with an ETS linked to the EU ETS (e.g. Switzerland).

At transaction level, the CBAM should allow importers to claim that they have paid a carbon price abroad on the GHG emissions embedded in the production of the goods they import. This carbon price effectively paid abroad should be deducted from the amount they would have to pay under CBAM[52].

It should be noted that the different CBAM options – outlined in section 6 below – will entail different obligations with regards to third countries pricing measures. Regulation-based options ('Import certificates') will require taking into account such measures, while indirect taxation options ('Excise Duty') will not.

5.2.1.7 The CBAM applied to imports and free allowances in the EU ETS

The CBAM and free allowances are two mechanism that serve a similar purpose, preventing the risk of carbon leakage. The two mechanisms cannot offer 'double protection' and should not coexist in the long run as this would diminish the environmental objectives of both EU ETS and the CBAM. In the options considered, either the CBAM replaces free allowances at once or the CBAM is phased in as free allowances are phased out during a limited transition period. For sectors not covered by the CBAM, protection against carbon leakage would remain under the EU ETS framework. For sectors covered by the CBAM, protection against carbon leakage would come from the CBAM.

5.2.1.8 Reconciliation procedure

As indicated under section 5.2.1.2 'Measuring the carbon content', imported products in the scope of the CBAM could either be assessed based on their actual GHG emissions or by using a default value representing the emissions of the imported products. In the case of setting default values, importers will be given the option to claim that the emissions resulting from the production of their imports are below the default value by providing verifiable data as to their actual emissions. Furthermore, even in an option where imported products are assessed based on actual GHG emissions, there would still be a need to set objective default values to be used in situations where sufficient data to determine the actual GHG emissions is not available.

Claims that actual GHG emissions are below the default value may, depending on the actual administrative design chosen for the CBAM, be treated either when goods are imported for each individual shipment or through an annual reconciliation procedure inspired by the procedure in place in the context of the EU ETS.

5.2.1.9 Elements related to administrative design

There are essentially two main options in the institutional design necessary to support the implementation and management of the CBAM. The first rests on a centralised system

[52] Taking into account possible rebates or free allowances in third countries; In case the carbon price paid abroad is higher than under the CBAM, such imports would be exempt from the obligation to surrender CBAM certificates.

and consists of a CBAM authority at EU level. This could rely on an existing agency or a Commission service. The second is a decentralised system resting on Member States' national authorities, which could be the national climate authorities or any authority specifically appointed for this task.

Overall, both approaches have their respective merits and drawbacks. A decentralised approach could facilitate faster implementation, as it would not require the establishment of new institutional structures. It would rest and build upon the competencies and tasks of the Member States' existing national climate authorities. However, it may entail a long lead time to a fully harmonised implementation of the rules. Depending on the functions foreseen for the registration of traders and foreign industrial installations, the assessment and verification of declarations of actual emissions and the collection of the CBAM obligation, coordination across 27 different national authorities could be difficult to manage. Moreover, a decentralised approach could face difficulties in view of the rigidity of the national systems and respective IT infrastructure needs. Potential changes and fine-tuning would require changes across Member States which could increase costs both at national and central levels.

A centralised approach would be based on a Central Administrative CBAM Body. Such an approach may reduce coordination burdens and have the merits of one unique approach, which could facilitate the operation of the mechanism. It may also downsize the necessary information flows, thus potentially simplifying system requirements. However, such an authority does not exist at this moment and would need to be hosted by an existing agency or a Commission service. A central authority at EU level would also need to meet a number of specifications, which would affect the pace for this establishment.

In view of the above, the envisaged institutional architecture for the CBAM would have important implications as regards the costs of its operation. Commission research estimates that the CBAM would in its first phase concern 1 000 traders realising 239 000 import transactions on an annual basis from 510 production sites outside the EU. While this represents a large number of transactions, the estimate also indicates that they are undertaken by a fairly a limited number of traders and concern a limited number of sites.

To obtain a rough estimate of the potential staffing needs to operate the CBAM at EU level, we consider three core functional areas that will need to be supported. Depending on the level of centralisation these could be carried out either by a Central CBAM Authority or shared with the Member States' national authorities. In the latter case, estimates of staffing needs would depend on the capacities of the national authorities, and thereby their ability to cover the necessary administrative requirements arising from the CBAM with current staff - or if additional positions would be needed.

The first functional area relates to the core function of reviewing, assessing and approving declarations presented by traders, including issuing requests for supplementary information and clarification. Assuming a maximum of 10 working days for the handling of each, this would require 50 full time equivalent positions. The second functional area relates to the handling of complains submitted by traders. Assuming that around one third of declarations could be subject to litigation and a maximum of 5 working days would be needed for the handling of each, this would require an additional 7.5 full time equivalent positions.

For these two functional areas, the impact of a centralised versus a decentralised approach can vary. In the case of a decentralised approach, the estimated 57.5 full time

equivalent positions may not be equally distributed across Member States. Given the location of traders, certain Member States may face higher administrative costs relative to this function. In addition, a decentralised approach may possibly require a slightly higher aggregated number of full time equivalent positions, due to forgone possibilities of economies of scale.

The third functional area relates to the maintenance of the IT system, including the keeping and updating of registries and handling of CBAM obligations (selling and buy back of certificates). It is estimated that this would require an additional 18 full time equivalent positions if the management system was fully centralised. In case of a decentralised approach, the selling and buying of certificates would need to be carried out by national authorities, which would imply a higher number of full time equivalent positions in aggregate for this functional area, with only a portion retained centrally to support the management of the central IT system.

The above considerations would imply a requirement of 75 staff on a full time basis to implement the CBAM according to the centralised approach. This number would be higher in aggregate under a decentralised approach, yet this would depend on the current human resource capacities within the national authorities that would be tasked with handling the CBAM.

5.2.1.10 Resource shuffling

Resource shuffling refers to the allocation or attribution of less emissions-intensive materials production (including materials embedded in manufactured goods) towards markets with higher carbon costs, while the overall carbon intensity of production in the home market remains constant. There exist three main mechanisms through which resource shuffling can take place:

- Attribution of low-carbon input factors (low-carbon electricity, low-carbon heat, biomass) to imported materials.
- Attribution of GHG emissions of a production process to co-products (e.g. slag, heat, flue-gases) to improve the reported carbon intensity of basic material production (unless strict MRV rules would limit such approaches).
- Attribution of shares of recycled material to imported or exported goods.

Incentives for resource shuffling exist for any emissions-related policy that includes traded goods (e.g. CBAM or product standards) where the carbon intensity of imported or exported products does not rely on default values only, but on actual emissions. For a CBAM, non-EU producers have an incentive to re-route carbon-intensive products to other markets in the world economy to avoid the levy imposed by the border measure. On the other hand, exporting low-carbon products to the EU would imply lowering the carbon costs these importers face and therefore undermine the carbon leakage protection which the CBAM provides, without leading to a decrease of global emissions.

Resource shuffling has emerged as an important problem in the Californian CBAM[53] on electricity. In addition, recent academic literature focusing on the EU approximates the scale of potential risk from resource shuffling from a CBAM at around 50 % for steel and

[53] California is the only jurisdiction that currently has implemented a CBAM as part of its climate policy framework and is based on a transaction-based approach.

80 % for aluminium - the latter driven by the higher opportunities to source or attribute the production of aluminium to clean electricity[54].

Notwithstanding the above, it should be noted that importers are perfectly entitled to direct lower-carbon products to the EU. That being said, and while resource shuffling of this scale would improve the EU's carbon footprint, it could result in higher carbon leakage, thereby undermining the effectiveness of the CBAM. At the same time, the negative implications of resource shuffling should also be balanced with the fact that third countries have to make an effort to produce low carbon-intensive products for the EU market and this will be positive from a climate perspective. As a matter of fact, beyond mere resource shuffling, third countries will have to invest in clean technologies if they want to export less polluting goods to the EU, which could result in less overall emissions and in internal synergies that will make it less expensive to shift to less polluting production for all markets. This positive effect will be larger and trigger changes more quickly the more relevant the EU market is for the total exports from that particular country.

5.2.1.11 The CBAM for Least Developed Countries (LDCs)

LDCs currently account for a minimal share of EU-external trade in the commodities that could be covered by a CBAM. Yet, it should be recognised that exports to the EU from LDCs can provide important foreign exchange earnings for these countries and represent a significant share of their GNI. Many countries in the Global South, and on the African continent in particular, are exposed to possible risks (see more detailed data in Annex 3).

While preferential treatment for LDCs is an established procedure in other areas of trade policy, it raises questions in the case of a CBAM. For example, blanket exemptions from a CBAM should be avoided, as setting up a mechanism that will encourage LDCs to increase their level of emission and run counter to the overarching objective of the CBAM. In addition, these exemptions would be temporary in nature, and would therefore prove counterproductive for LDCs in the long run: the carbon intensive industry would have to be dismantled, and if exempted now, adaptation costs for LDCs would be higher. To sum up, neither the EU nor the trading partners would have an interest in fostering the growth of carbon-intensive, industries in these countries.

To avoid new global dividing lines between countries with a low and high-carbon export structure, recent analyses[55] have highlighted the need for targeted ways to support LDCs. These could take the form of technical assistance, technology transfer, extensive capacity building and financial support, with the objective to develop industrial production structures that are compatible with long-term climate objectives. This assistance could be carried out through existing support channels (e.g. bilaterally and multilaterally, including through the mechanisms established under the UNFCCC). In the absence of such compensating mechanisms, LDCs could argue that the introduction of a CBAM will be a disproportionate burden for them and that they conflict with the UNFCCC principle of common but differentiated responsibilities and respective capabilities, in light of different national circumstances. Finally, to ease the transition, a gradual phasing in of the CBAM could be considered for existing production capacities in LDCs.

[54] Stede, J., Pauliuk, S., Hardadi, G. Neuhoff, K., Carbon pricing of basic materials: Incentives and risks for the value chain and consumers, 2021, DIW Discussion Papers, No 1935.
[55] See for example L. Lehne, O. Sartor: Navigating the politics of Borden Carbon Adjustments, E3G Briefing Paper, September 2020.

5.2.2 Option 1: Import Carbon Tax on basic materials based on EU average

Box 1: Option 1 in Brief

Depth of value chain: Basic materials and basic material products

Coverage of CBAM: Imports only

Free allocation in the EU ETS: No (full auctioning of allowances for the CBAM sectors)

Type of payment: Domestic producers buy EU ETS allowances; importers pay a tax

Reflection of actual emissions in carbon pricing: Yes for domestic production; importers pay based on a default value reflecting EU average but may opt to demonstrate actual carbon intensity of imported products

The first option for a CBAM is an import carbon tax, paid by the importer when products enter the EU. Practically, the tax would be collected by customs at the border and based on a tax reflecting the price of carbon in the EU combined with a default carbon intensity of the products. An annual average price could be favoured over e.g. daily adjusted prices, as this would provide for a simpler implementation and higher predictability for importers. For simplicity considerations, the reference value for carbon intensity would be a default value based on EU producers' averages. However, importers will have the opportunity to claim for individual treatment[56], which would be administered by a reconciliation exercise and could result in a deduction or refund of a proportion of the amount of tax to be paid. This involves the importer providing proof for any carbon price paid abroad and/or actual performance from carbon efficient technologies. Information will be subject to monitoring and verification procedures to assess whether a partial or full reimbursement of the tax should be granted.

Under option 1, a credible enforcement mechanism must be established. This would involve an existing entity with its seat in the EU, for instance an existing Agency or the Commission, to be vested with additional powers for compliance with the CBAM. In practice, the enforcement mechanism would require that for every import that falls within the scope of the CBAM, the importer nominates in the customs declaration a 'CBAM importer' (being in a similar situation as the installation operator in the EU ETS) with a business address in the EU, who would be responsible for paying the CBAM tax obligation and engaging in the reconciliation procedure.

This option assumes that the CBAM would be limited to specific imported carbon-intensive materials and basic material products. In an initial phase, in order to keep the measure simple and manageable, semi-finished and finished products would not be covered, with regard to neither the emissions from their production, nor the fact that they contain carbon-intensive materials. Option 1 reflects a scenario with full auctioning of emission allowances for the concerned sectors under the ETS. The free allocation of allowances contained in the current EU ETS would thus not be retained for the selected sectors. Under Option 1, the leakage protection currently resulting from free allocation of EU ETS allowances would therefore have to come from the CBAM.

[56] This would allow producers to demonstrate their actual carbon intensity compared to the default value.

5.2.3 Option 2: Import certificates for basic materials based on EU average

Box 2: Option 2 in Brief

Depth of value chain: Basic materials and basic material products

Coverage of CBAM: Imports only

Free allocation in the EU ETS: No (full auctioning of allowances for the CBAM sectors)

Type of payment: Domestic producers buy EU ETS allowances; importers buy import certificates (CBAM certificates)

Reflection of actual emissions in carbon pricing: Yes for domestic production; importers pay based on a default value reflecting EU average emissions or may opt to demonstrate actual carbon intensity of imported products

The second option involves the application on imports of a system that replicates the EU ETS regime applicable to domestic production. This option entails – similarly to the system of allowances under the EU ETS – the surrendering of certificates ('CBAM certificates') by importers, based on the embedded emission intensity of the products they import in the EU and purchased at a price corresponding to that of the EU ETS allowances at any given point in time. These certificates will not be linked to the EU ETS system of allowances but will mirror the price of these allowances to ensure a coherent approach to the pricing under the EU ETS.

There are a number of reasons not to use EU ETS allowances in the CBAM, all relating to the possible impact on the ETS, in terms of the functioning but also of the underlying logic. The ETS is a cap and trade system where the cap represents a total amount of greenhouse gas emissions for a given year. In line with the principle of the Kyoto protocol on accounting emissions of its parties, the cap is linked to the emissions taking place as a result of releasing greenhouse gases on the territory of the EU exclusively. Using ETS allowances to account for emissions taking place outside of the EU's territory would bring a significant number of new actors on the ETS market at the same time, as it would require revising the logic used to set the ETS cap.

In general, it is preferable to carry out extensions of the ETS scope in a prudent manner involving specific pools of allowances, as it was the case for aviation and as it may be the case for buildings and transport. Finally, as the ETS sets a maximum to the emissions taking place in the EU, using its allowance for imports could result in quantitative restrictions on imports that would raise WTO concerns. In other words, the CBAM cannot introduce a cap on emissions outside the EU, in order to avoid restricting international trade.

Importers will submit declarations of verified embedded emissions in the imported products and surrender a number of CBAM certificates corresponding to the declared emissions to a CBAM authority. Depending on the level of centralisation, this authority could be either the central CBAM authority or the national authorities tasked with managing the CBAM. Such declaration and surrendering will occur – similar to that under the EU ETS – at a yearly reconciliation exercise taking place in the year following the year of importation and based on yearly trade import volumes. The carbon emission intensity of products would be based on a default value; however, importers would be

given the opportunity, at the moment of the yearly reconciliation exercise, to claim a reduction of the CBAM on the basis of their individual emission performance. They would also be entitled to claim a reduction of the CBAM for any carbon price paid in the country of production (which is not rebated nor compensated in other ways upon export).

The data necessary to calculate the amount of CBAM certificates to be surrendered should be provided by the 'CBAM importer' to the CBAM authority[57]. If the importer intends to provide its own emission figures for the CBAM, the relevant information is also to be provided. Depending on MRV requirements defined, the relevant information here would be either:

- the confirmation from the CBAM authority that the imported good falls under the CBAM;
- the specific embedded emissions determined in line with the CBAM requirements on MRV, as well as information on the carbon price paid abroad – in this case, some form of verification report would have to be attached by the importer.

At regular intervals (e.g. annually like in the EU ETS), the CBAM importer would perform a calculation (or 'reconciliation') of its CBAM obligation by adding up all its reported embedded emissions for the previous period (e.g. the calendar year) and for all imported products covered by the CBAM, and report them.

5.2.4 Option 3: Import certificates for basic materials based on actual emissions

Box 3: Option 3 in Brief

Depth of value chain: Basic materials and basic material products

Coverage of CBAM: Imports only

Free allocation in the EU ETS: No (full auctioning of allowances for the CBAM sectors)

Type of payment: Domestic producers buy EU ETS allowances; importers buy import certificates (CBAM certificates)

Reflection of actual emissions in carbon pricing: For both domestic production and imports, importers declare the actual carbon intensity of imported products

Option 3 operates in the same way as option 2, however the carbon price of imports is based on actual emissions from third country producers rather than on a default value based on EU producers' averages. Under this option, the importer will have to report the actual emissions embedded in the product and surrender a corresponding number of CBAM certificates. In the event that a carbon price was paid abroad, the importer would be entitled to claim a reduction of his CBAM obligation corresponding to the carbon price paid abroad. Information will be subject to monitoring and verification procedures to assess the number of CBAM certificates to be purchased, as explained in option 2 above. Under this option, free allocation in the EU ETS would be discontinued.

[57] See Annex 5: Definitions.

Even if the general principle in this option is that imported products in the scope of the CBAM are to be assessed based on actual GHG emissions, there would still be a need to set default values to be used in situations when sufficient data to determine the actual GHG emissions is not available.

5.2.5 Option 4: Import certificates for basic materials based on actual emissions with parallel continuation of free allowances for a transitional period

Box 4: Option 4 in Brief

Depth of value chain: Basic materials and basic material products

Coverage of CBAM: Imports only

Free allocation in the EU ETS: Phased out for the CBAM sectors - gradual phased-out after 2025 over 10 years

Mode of payment: Domestic producers buy EU ETS allowances needed beyond free allocation; importers buy import certificates (CBAM certificates)

Reflection of actual emissions in carbon pricing: Only partially for domestic production and imports during the transition period; importers declare the actual carbon intensity of imported products

Option 4 would apply in the same way as option 3. It consists of surrendering CBAM certificates on imported goods. However, this option considers a more gradual phasing out of free allowances, which shall start after 2025, so that they decline up to 50 % in 2030 and eventually to 0 % by 2035 at the earliest. On the basis of this, the CBAM would be phased in after 2025 and reduced proportionally to the amount of free allowances distributed in a given sector.

The CBAM after 2025 would apply to the difference between actual emissions and the proportion of emissions under the EU benchmark which remain covered by free allowances. This way, at any point in time, imports benefit from the same level of free allowances as domestic productions. Such a transitional period is designed to allow businesses with installations subject to the EU ETS to have more time to adjust to a situation where the carbon price will apply fully to their production.

5.2.6 Option 5: Import certificates for basic materials also as part of components and finished products based on actual emissions

Box *5: Option 5 in Brief*

Depth of value chain: Basic materials also as part of components and finished products

Coverage of CBAM: Imports only

Free allocation in the EU ETS: No (full auctioning of allowances for the CBAM sectors)

Mode of payment: Domestic producers buy EU ETS allowances; importers buy import certificates (CBAM certificates)

Reflection of actual emissions in carbon pricing: Yes for domestic production; importers will declare the actual carbon intensity of imported products

Option 5 is a variant of Option 3 with a scope extended further down in the value chain. Adjustments would not be limited to specific imported carbon-intensive materials and basic material products. Instead, carbon-intensive materials that are part of semi-finished as well as finished products would also be covered along the value chain. For imports, the CBAM would again be based on the actual emissions from third country producers.

Under this option, no free allocation would be given to EU ETS operators.

5.2.7 Option 6: Excise duty

Box 6: Option 6 in Brief

Depth of value chain: Basic materials also as part of components and final products

Coverage of CBAM: Domestic products, imports and waiving of liability for exports of EU producers (symmetric)

Free allocation in the EU ETS: Yes (continued)

Mode of payment: EU ETS coverage for domestic producers plus liability created upon production and import, paid when product is released for consumption[58]

Reflection of actual emissions in carbon pricing: Yes for domestic production; not for imports

Option 6 goes beyond the introduction of a CBAM reflecting the effects of the EU ETS at the border. It consists of an excise duty on carbon-intensive materials covering consumption of both domestic and imported products, besides the continuation of the EU ETS including the free allocation of allowances covering production in the EU.

An excise duty would be levied on the consumption in the EU of carbon-intensive materials, regardless of whether they are produced in the EU or imported. The excise duty would be calculated by applying the relevant carbon price to the base of the assessment, i.e. the quantity of the carbon intensive material produced or imported multiplied by a carbon intensity factor. The latter would represent an irrefutable value, so that only default values are used for embedded emissions of domestic and imported goods. The carbon intensity factor should reflect the carbon content of each covered material. In order to ensure administrative feasibility across the value chain, the carbon content should not reflect the specific production processes of the specific material at hand, but be determined according to material specific reference values. Initially, such reference values could, where available, correspond to or be derived from the EU ETS product benchmarks already used for free allocation of allowances[59]. The relevant carbon price should be determined in relation with the EU ETS allowance price.

For imports, the destination principle would be achieved by making the importation of basic materials, as well as goods containing a significant share of such materials, a taxable event. The importation would thus create the same liability as if the materials had

[58] Release for consumption is a technical term defined in Article 7 of the EU Horizontal Excise Duty Directive (Council Directive 2008/118/EC). It can be roughly described as the time when the product leaves a tax warehouse and is transferred to the consumption sphere.

[59] For example, for steel and aluminium, several product benchmarks would have to be combined to get the carbon intensity factor.

been produced in the EU, i.e. dependent on the weight of the material and independent of the actual production process.

Exports of materials and manufactured products, on the other hand, would not be subject to the excise duty. Hence, as with the excise duties on alcoholic beverages, manufactured tobacco products and energy products, firms could be allowed a duty suspension for the liability created upon production or import. Thus, the excise duty could be waived where materials, including as part of products, are exported.

Duty suspension arrangements allow authorised entities to produce, process, hold, transport and trade excise duty goods between producers of different production stages without triggering excise duty. The duty is transferred along the supply chain until excise duty goods are finally released for consumption. As duty suspension arrangements allow for the transfer of liabilities along the value chain, efficient control mechanisms need to be in place.

As with other excise duties, this duty would become due when materials are released for consumption, as part of more processed products. A system for monitoring and verification of the carbon intensity of the products will have to be established, taking into account the material composition of the products and the carbon intensity of the materials contained therein.

Free allocation of allowances would continue, and operators of installations would receive free allowances based on the benchmark levels and the production volume of tonnes of the basic material. This approach would be compatible with the present system whereby EU operators would need to buy allowances to cover emissions exceeding the benchmark levels.

5.2.8 Options for the electricity sector

Electricity generation is analysed separately due to several factors which make it unique among the sectors considered for inclusion in the CBAM. Not only is it the most important sector included in the EU ETS in terms of direct carbon emissions, it is also the largest sector responsible for carbon emissions in the wider economy[60]. Additionally, electricity generators in principle do not receive free allowances, but have to buy them via auctions or on the secondary market. This distinguishes them from other EU ETS participants, whose exposure to the risks of carbon leakage can be mitigated with the allocation of free allowances. At the same time, as electricity generated in third countries can only be delivered into the EU through interconnectors which are subject to capacity constraints, the exported volumes are subject to the limitations of physical infrastructure. Electricity imports in the EU make up 1–2 % of total EU consumption on average, which means that exposure to international trade in this case is lower than in other EU ETS sectors. The interconnection infrastructure has, however, been expanding over the past years and the trend is expected to continue[61]. The net physical inflows of electricity into

[60] Electricity and heat generation accounted for 33 % of total CO2 emissions in the EU28 and for 42% of total CO2 emissions in the world in 2018, according to IEA data. This was a larger share than any other sector including transport.
https://www.iea.org/data-and-statistics/?country=WORLD&fuel=CO2%20emissions&indicator=CO2BySector

[61] A 2018 report by the Commission Expert Group on electricity interconnection targets identified 82 interconnectors between the EU and 10 third countries without a carbon pricing mechanism or its

the EU from third countries without an equivalent carbon pricing mechanism increased from 3 TWh in 2017 to 20 TWh in 2019[62]. In fact, a growing body of evidence points to carbon leakage already occurring in certain regions and intensifying with rising carbon prices[63]. The above-mentioned factors speak in favour of selecting electricity imports for inclusion in the CBAM.

Applying the CBAM on electricity requires taking into account its uniqueness that distinguishes it from basic materials, such as the way it is transported, a relatively broad set of technologies used to produce it with various electricity generators working within a network and the fact that only direct emissions associated with electricity generation are factored in. In line with the methodology applied to other sectors and products, a reference value for emissions embedded in imported electricity needs to be established in the context of determining the corresponding CBAM obligation. In the absence of EU ETS benchmarks for electricity generation (stemming from the absence of free allocation in the sector), two main alternative options can be used to determine the reference value for embedded emissions.

Option A: Average carbon emission intensity

The average carbon emission intensity of the EU electricity mix can be calculated as the ratio between the total amount of CO_2 emissions stemming from electricity production and the total gross electricity production in the EU over a defined period of time. Annual averages are the most widely used for measuring and comparison purposes. This metric provides information about the average carbon content of all the electricity generated within the EU in grams of CO_2 per kWh. As a default value, it can be used for calculating the corresponding CBAM obligation, after being multiplied by a concrete volume of imports and a specific carbon price.

The average carbon emission intensity calculated on the basis of the EU electricity mix would in practice very likely result in a default value that is significantly lower than the real embedded emissions of electricity generated in neighbouring third countries. This is due to the fact that the decarbonisation of the EU electricity sector (thanks to the EU ETS) has progressed much more rapidly than in neighbouring countries where efforts to fight climate change receive less attention[64]. Additionally, this would not create

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equivalents. With the completion of an interconnector between Italy and Montenegro in 2019, the list has grown to 11 countries. See Electricity interconnections with neighbouring countries: Second report of the Commission Expert Group on electricity interconnection targets, DG ENER, p. 10-18. Quarterly report on European electricity markets, Volume 13, Issue 2, second quarter of 2020, DG ENER, p. 20.

[62] Quarterly report on European electricity markets, Volume 13, Issue 2, second quarter of 2020, DG ENER, pp. 20-21.

[63] For an analysis of the situation in Romania, see Quarterly report on European electricity markets, Volume 13, Issue 3, third quarter of 2020, DG ENER, p. 22. For the case of the Baltic countries, see Quarterly report on European electricity markets, Volume 12, Issue 1, first quarter of 2019, DG ENER, p. 24-25. For the case of Ireland, see Curtis, J, et al. 'Climate Policy, Interconnection and Carbon Leakage: The Effect of Unilateral UK Policy on Electricity and GHG Emissions in Ireland'. Economics of Energy & Environmental Policy, vol. 3, no. 2, 2014, pp. 145–158. For a discussion on carbon leakage in the Balkans, see Višković, V. et al. 'Implications of the EU emissions trading system for the South-East Europe regional electricity market', Energy Economics, 65, 2017, pp. 251-261.

[64] The average carbon emission intensity of the EU electricity generation decreased by 31% between 2000 and 2018. Meanwhile in Russia and Ukraine, which are the largest sources of extra-EU electricity imports not covered by EU ETS or equivalent obligations, the average emission intensity in the electricity sector fell only by 7 % and 8 % respectively. As the trend continued in 2019 and 2020, the EU's average emission intensity is currently one of the lowest worldwide. Data available at https://www.iea.org/data-and-

incentives for the exporting countries to decrease the emissions of their electricity mix. Thus, a default value based on the average carbon intensity in the EU might not be entirely appropriate to meaningfully mitigate the risks of carbon leakage in the electricity sector.

Option B: Average CO_2 emission factor

The option B takes into account the way electricity is dispatched from different types of generation sources in a centralised management system of today. In order to minimise the cost of generation, the sources are ranked according to their marginal costs of production (the so called merit order) so that those with the lowest marginal costs are the first ones to be brought online to meet demand, and the plants with the highest marginal costs are the last to be brought online. In practice, renewable and nuclear sources with zero or low marginal costs (and zero carbon emissions) are the first ones to be called upon, while coal and gas power plants fill in the rest of the demand requirements and set the price for the all generators online. Since export capacity is only available when internal demand is satisfied, the additional demand spurred by exports is, as a rule, met with coal and gas power plants on the far side of the merit order. Therefore, it can be assumed that extra-EU electricity imports from third countries are by default generated by price-setting coal and gas power plants with a measurable carbon footprint.

Variants of option B

Variant B.1: CO_2 emission factor of the EU electricity mix

In order to establish a reference value of this footprint, an average CO_2 emission factor of corresponding price-setting fossil-based generators in the EU can be used. This CO_2 emission factor, calculated in the context of state aid granted to compensate industrial consumers for indirect costs contained in their electricity bills as a result of the EU ETS[65], is defined as the division of the total carbon emissions of the electricity sector divided by the gross electricity generation based on fossil fuels. It expresses the average carbon content of electricity generated by price-setting sources (most typically coal and gas power plants) in the EU, and better corresponds to the typical amount of emissions embedded in electricity imports from third countries. As a default value, the CO_2 emission factor can be used for calculating the corresponding CBAM obligation, after being multiplied by a concrete volume of imports and a specific carbon price. The factor could be subject to revision after a defined number of years.

The use of an EU based value would however not address the issue that countries with a lower CO_2 emission factor (with a less emitting electricity mix) would be treated equally to countries with a higher CO_2 factor (with usually a more emitting electricity mix), with the latter benefiting from using an EU-level default value, which is lower and not reflecting the real emissions of exported electricity. This is what we consider in variants B.2 and B.3.

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statistics?country=EU28&fuel=Electricity%20and%20heat&indicator=CO2IntensityPower and https://www.iea.org/data-and-statistics/charts/development-of-co2-emission-intensity-of-electricity-generation-in-selected-countries-2000-2020

[65] See Commission Guidelines on certain State aid measures in the context of the system for greenhouse gas emission allowance trading post 2021, C(2020) 6400.

Variant B.2: Countries below the CO_2 emission factor of the EU electricity mix claim to use the country factor

This variant of the Option B comprises the use of a reference value based on the CO_2 emission factor of the exporting country in the case where an emission factor of this country is below the default EU value. In other cases, the default EU value is used.

Variant B.3: The use of the exporting country electricity mix CO_2 emission factor

In this variant, a CO_2 emission factor of the electricity mix of the respective exporting country is applied to all imports. The advantage of this variant is that it better reflects the actual emissions of the country's exported electricity and provides an incentive for exporter countries to invest in clean generation of their electricity mix.

As in other sectors, importers will be given the possibility to claim that the carbon content of their product is below the default value. In view of the technical challenges associated with tracing the exact sources of electricity generated in third countries, a robust and credible system of verification will need to be established to ensure that the individual assessment procedure is reliable and reasonably accurate, without imposing too great an administrative burden on importers. Additionally, importers will also have the possibility to claim that they have paid a carbon price abroad that should reduce their CBAM obligation.

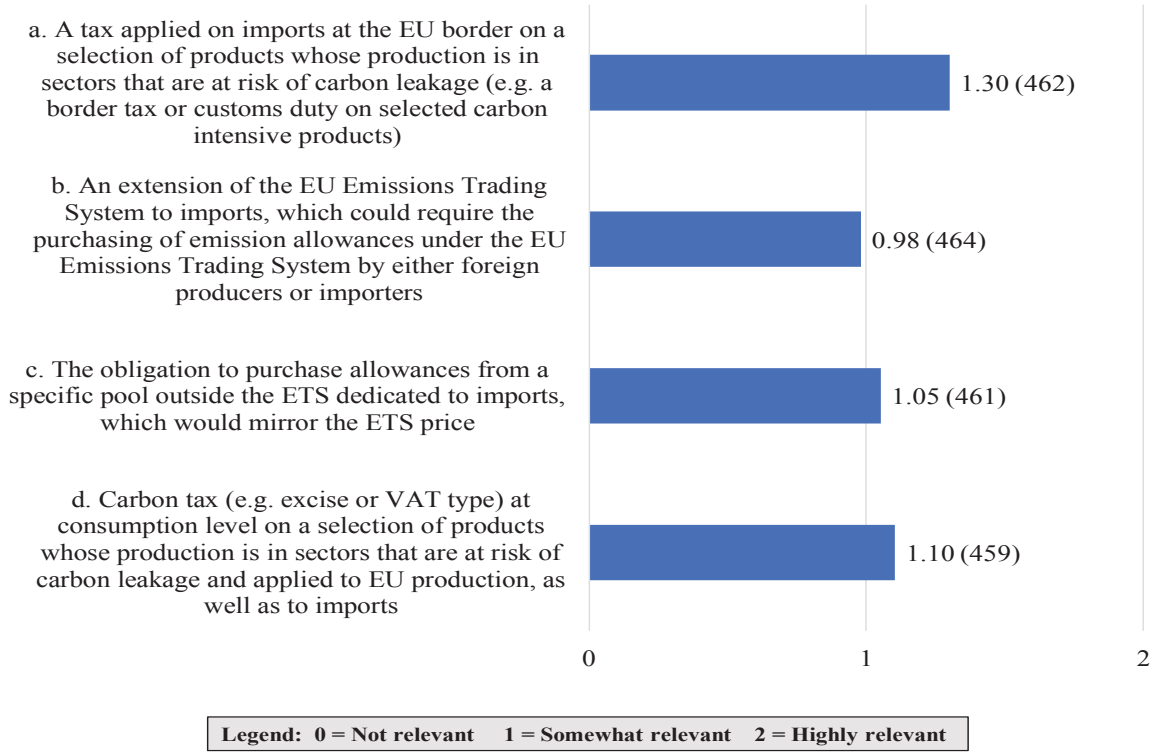
5.2.9 Feedback from the Open Public Consultation

The Open Public Consultation considered four policy options for the introduction of a CBAM: a tax applied on imports at the EU border (option 1 in the Impact Assessment), an extension of the ETS to imports (not retained in the Impact Assessment), the obligation to purchase allowances from a specific pool outside the ETS which would mirror the ETS price (options 2, 3, 4, 5 in the Impact Assessment) and a carbon tax (option 6 in the Impact Assessment). Differences in design between options 2, 3, 4 and 5 were not detailed in the questionnaire submitted to the Open Public Consultation, as these precisions were introduced at a later stage, also following feedback from stakeholders.

Consulted stakeholders on average believe that all four policy options submitted in the questionnaire are at least somewhat relevant to the design of a CBAM. On average, a tax applied on imported products belonging to sectors at risk of carbon leakage appears to be the most relevant option for stakeholders, followed by a carbon tax at consumption level applied to all products (both imported or produced in the EU) in the sectors that are at risk of carbon leakage.

When looking at different stakeholder groups, citizens, civil society organisations and public authorities seem to prefer a carbon tax on imported products, followed by a carbon tax at the consumption level. Companies are relatively less enthusiastic about all the proposed solutions and they attach limited relevance for the design of a CBAM to an extension of the ETS or a carbon tax on consumption. Responses broken down by geographical area do not show substantial differences between different clusters, except for the carbon tax on imports, which has limited relevance for respondents based in bordering countries.

Figure 5: Most appropriate options to design the CBAM (average score and number of respondents in brackets)



Legend: 0 = Not relevant 1 = Somewhat relevant 2 = Highly relevant

Source: CEPS analysis of public consultation results.

Figure 6: Most appropriate options to design the CBAM

		Civil society (all other stakeholders)	Companies & business associations	EU & non-EU citizens	Public authorities	Total
a. A tax applied on imports at the EU border on a selection of products whose production is in sectors that are at risk of carbon leakage (e.g. a border tax or customs duty on selected carbon intensive products)	Top	53.03%	38.82%	71.88%	53.85%	50.43%
	Bottom	15.15%	30.20%	3.13%	23.08%	20.35%
b. An extension of the EU Emissions Trading System to imports, which could require the purchasing of emission allowances under the EU Emissions Trading System by either foreign producers or importers	Top	40.32%	18.04%	32.84%	7.69%	25.00%
	Bottom	12.90%	36.47%	16.42%	15.38%	26.94%
c. The obligation to purchase allowances from a specific pool outside the ETS dedicated to imports, which would mirror the ETS price	Top	25.40%	30.56%	21.80%	15.38%	26.90%
	Bottom	19.05%	24.21%	18.80%	15.38%	21.69%
d. Carbon tax (e.g. excise or VAT type) at consumption level on a selection of products whose production is in sectors that are at risk of carbon leakage and applied to EU production, as well as to imports	Top	39.06%	24.70%	63.36%	38.46%	38.13%
	Bottom	18.75%	36.25%	15.27%	30.77%	27.67%

Note: Top = Highly relevant; Bottom = Not relevant.
Source: CEPS analysis of public consultation results.

On average, respondents to the Open Public Consultation somewhat agree that a tax on imported products may be effective in addressing the risk of carbon leakage; to a lesser extent as well the option to extend the ETS to imports or the obligation for imports to purchase allowances from a pool outside the ETS may counter carbon leakage (the latter option would also have limited impacts on EU producers subject to the ETS). Additionally, stakeholders somewhat disagree that the two options linked to the purchases of allowances would impose limited administrative burdens on exporters from third countries and on EU importers (especially the option considering a separate pool, outside the ETS). Finally, there is also some level of agreement on the limited room for circumventing a carbon tax (e.g. excise or value added tax -VAT- type) at consumption level on carbon-intensive products; interestingly, this is the only option where more than 50 % of respondents either somewhat agree or strongly agree about its effectiveness in addressing both carbon leakage and all carbon emissions in the sectors to which it will apply.

5.3 Options discarded at an early stage

Some options were considered not to be viable ways forward, either because they violated the EU's international obligations or because they would be very complex in application.

Table 2: Options Discarded

Option discarded	Explanation
Customs Duty	Trying to equalise the carbon cost of imported products by raising import duties on certain carbon intensive products would have required revising the EU schedules of commitments at the WTO and also a considerable number of free trade agreements. In addition, under this approach it would have been practically impossible to ensure that domestic production and imported product are at all times subject to a similar carbon cost.
Application of the EU ETS rules to all products imported in the EU	The extension of the effects of the EU ETS beyond the EU borders in the context of a joint international effort to fight climate change is a policy the EU is pursuing. However, this policy tool can be effective only in very close collaboration with our trade partners. Unilaterally applying the EU ETS rules to installations outside of the EU when their production is destined to the EU would require a level and detail of information from third countries that is not available and will not be available in the medium or long term. In addition, the EU ETS is a cap and trade system. Putting a cap on imports would create unacceptable restrictions to global trade.
Carbon Added Tax (CAT)	A CAT paid at each production step for every additional tonne of carbon dioxide (CO_2) equivalent emitted would cover products down the value chain, thus having a wider scope than the other policy options for CBAM. However, such a policy option would be, in view of the level of information available today on the carbon content of consumption goods, extremely complex to implement and would raise substantial administrative and compliance costs. For example, it would require a comprehensive system for the monitoring and verification of the carbon intensity of the products and all their intermediate products, taking into account the material composition of the products at all stages of their production and the carbon intensity of all production processes involved. In addition, the benefits of a CAT would overlap with option 6.
Import tax or import certificates with export reimbursement	A CBAM combining an import tax or import certificates with a refund for exports would not be in line with the overarching climate objective of the mechanism, which is to reduce GHG emissions in the EU and globally. The inclusion of refunds of a carbon price paid in the EU would undermine the global credibility of EU's raised climate ambitions and further risk to create frictions with major trade partners due to concerns regarding compatibility with WTO obligations.

6 WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?

6.1 Introduction

6.1.1 Modelling approach and scope

This section gives an overview of the main impacts of the options considered under the CBAM. As discussed in Section 5.1, options are compared to the baseline, which rests on the EU reference scenario, the MIX as depicted in the the EU ETS revision impact assessment and a variant of the MIX based on full auctioning of EU ETS emission allowances for the sectors that will be subject to the CBAM. The motivation of this approach, as emphasised earlier, derives from the European Green Deal, where the CBAM and free allocation are clear alternatives. The MIX as depicted in the EU ETS impact assessment does not foresee full auctioning for the sectors at risk of carbon leakage. In modelling terms, for this impact assessment it would be impossible to illustrate how the CBAM adjusts if it was not compared also to a situation where full auctioning is introduced but the border adjustment is absent. Without such a comparison the move to full auctioning, from the MIX, would blur the impact of the border measure thus making it impossible to fairly assess its contribution.

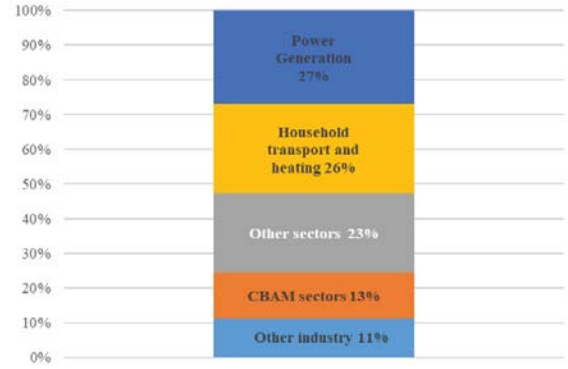
In terms of sectoral scope, the analysis focuses on the sectors of four basic material products identified earlier in the discussion (Section 5.2.1.3), namely aluminium, fertilisers, cement (and lime) and iron and steel. As discussed in Annex 4, the sectoral granularity of the JRC-GEM-E3 model was improved for the purposes of this impact assessment to explicitly account for these sectors in the model's baseline dataset. While this has greatly facilitated the analytical insight of the model, it is recognized that in modeling terms these sectors still represent more aggregate representations of the products to which the CBAM would apply. This would imply that the sectors analyzed bellow embed both the CBAM product and certain of its downstream processes.

For presentational purposes, these four material industrial sectors - namely aluminium, fertilisers, cement (and lime) and iron and steel - are collectively referred to in the analysis below as CBAM sectors. The CBAM's impacts on electricity imports is analysed separately under Annex 8, to reflect the sector's distinct characteristic pertinent to its technical character that distinguish it from material industrial sectors.

The CBAM sectors that form the scope of this analysis account for about 55 % of all industrial emissions in the EU-27 in 2020. Iron and steel is the highest emitter, accounting for nearly 30 % of industrial emissions, followed by cement and fertilisers. Aluminium is last in terms of direct emissions, albeit the sector is more heavily geared in generating indirect emissions due to its electro-intensive character. When looking at total CO_2 equivalent emissions, CBAM sectors together with electricity generated accounted for nearly 40 % of emissions in 2020.

Figure 7: Direct CO2 equivalent emissions in the CBAM sectors – EU 27 in 2020

Share of direct CO2eq emissions in the CBAM sectors in total CO2eq relative to other sectors



Share of direct CO2eq emissions in the CBAM sectors relative to total industrial emissions

Source: JRC-GEM-E3 model

The options considered include the main options discussed in section 5.2.1.3, as well as certain variations to provide greater insight on the sources and implication of impacts. All options are assumed to apply simultaneously to the CBAM sectors from the start. That is, no sequencing is introduced in the sectoral application of the measure in its initial phase.

As regards the treatment of trade partners, the modelling assumes unilateral application of the CBAM to all imports in the CBAM sectors. That is, no exemptions are granted to countries who have in place or are considering to adopt a carbon pricing system imposing a carbon price at least equivalent to the price resulting from the EU ETS on products subject to the CBAM. The CBAM is indeed proposed against an evolving landscape both internationally and in the EU. Adopting a static approach to policy developments in other countries was an intentional assumption in the approach of the impact assessment. While in practice accounting for other countries' pricing policies that are equivalent or linked to the EU ETS may be considered, this was not accounted for in the modelling. In the modelling, we approximate the actual emissions of CO_{2e} for the individual exporters outlined in the detailed description of the options (Section 5.2), with the average emission intensities of exporting country in the sectors concerned[66].

While the risk of resource shuffling from the use actual carbon intensities is recognised, this is not accounted for in the main modelling exercise. As emphasised earlier, the risk of resource shuffling exists for any emissions-related policy that affects traded goods, where the carbon intensity of imported products does not rely solely on default values, but either gives the option to demonstrate actual emissions or requires full demonstration of actual emissions from the outset. Therefore, the risk of resource shuffling is indeed present for all CBAM options considered, with the exception of the excise duty option.

[66] The average emissions of the sectors in the exporting countries are taken as a proxy to reflect actual emissions of imports. In the modelling these are drawn from the JRC-GEM-E3 model, which in turn is calibrated using the GTAP 10 database (Aguiar, A., Chepeliev, M., Corong, E., McDougall, R., & van der Mensbrugghe, D. (2019). The GTAP Data Base: Version 10. Journal of Global Economic Analysis, 4(1), 1-27) as a starting point and projections from the Global Energy and Climate Outlook 2020 for non-EU regions (Keramidas et al., Keramidas, K., Fosse, F., Diaz-Vazquez, A., Schade, B., Tchung-Ming, S., Weitzel, M., Vandyck, T., Wojtowicz, K. Global Energy and Climate Outlook 2020: A New Normal Beyond Covid-19, Luxembourg: Publications Office of the European Union, 2021, EUR 30558, ISBN 978-92-76-28417-8, doi:10.2760/608429, JRC123203).

Quantification of the risk for resource shuffling is however very difficult, and requires detailed sectoral data. For this reason, quantitative evidence on the potential scale of the problem remains scarce in the literature. However, drawing from different secondary estimates[67], robustness checks were performed, the results of which are presented in Annex 10.

Finally, it should be noted that while elements of the potential impact of the CBAM on SMEs have been considered in terms of compliance and administrative costs (Annexes 3, 4, 6), and while the views of and implications for SMEs have been assessed as part of the Commission's Open Public Consultation, this Impact Assessment did not carry out an SME test, neither did it perform a separate SME consultation. The main reasons for this are that producers and importers of CBAM products are more like likely to be large businesses, while by contrast SMEs are more likely to be in the second order of impacts, as downstream consumers.

Table 3: Simplified presentation of scenarios and options considered in the modelling exercises

Scenario	Specifications
MIX	Increased climate ambition to meet 55 % emission reduction target. Free allocation continues in the CBAM sectors at 100 % - No CBAM applies
MIX-full auctioning	MIX with full auctioning assumed in the CBAM sectors from 2023 – No CBAM applies
Options 1 and 2	CBAM on imports along with full auctioning in CBAM sectors – the CBAM applies based on EU average emission intensities
Option 3	Options 1 and 2, but using emission intensities of exporting country
Option 4	Option 3 but free allocation in CBAM sectors is phase-out after 2025 to reach up to 50 % in 2030, with the CBAM being fully phased-in by 2035 at the earliest
Option 5	Option 3 with the CBAM extended to import of downstream sectors along with full auctioning in CBAM sectors
Option 6	Excise duty on use of products of CBAM sectors, excise duty/rebate in downstream sectors at the border

Source: Commission analysis

The analysis is based primarily on the JRC-GEM-E3 model, supplemented with input from the Euromod and PRIMES models, the technical specifications and details of which are discussed in Annex 4.

6.1.2 Introducing the MIX and the MIX-full auctioning variant

The MIX scenario models a number of policies and measures to ensure that the EU reaches the agreed emission reduction of 55 % by 2030, including a strengthening of the EU ETS cap. Under the MIX, most industrial sectors face higher costs and therefore decline in output terms, which, in turn, also drives the Gross Domestic Product (GDP) down in 2030 relative to the baseline. Nevertheless, the continuation of free allocation keeps leakage at relatively low levels and imports increase only modestly in the CBAM sectors relative to the baseline. Leakage is calculated as the emission increase in non-EU regions in a specific sector divided by the emission reduction in that sector in the EU. In the MIX, the estimated leakage of 8 % in 2030 includes what may be termed as energy leakage. This is driven by the rebound effect of demand for fossil fuels in non-EU

[67] See for example Stede, J., Pauliuk, S., Hardadi, G. Neuhoff, K., Carbon pricing of basic materials: Incentives and risks for the value chain and consumers, 2021, DIW Discussion Papers, No 1935.

countries, due to lower demand in the EU[68]. Put differently, what is observed as leakage in the MIX derives in part from constraints; other than a decrease in leakage protection, the latter remaining unaltered in the scenario relative to the baseline[69]

The MIX scenario allows limited scope for insight into the impacts of a CBAM in the presence of free allocation. The MIX with full auctioning in the sectors considered under the CBAM points to a different extreme. While GDP contraction is of similar magnitude to the MIX (-0.22 % in 2030), the MIX-full auctioning leads to nearly eight times higher output losses in the CBAM sectors. A similar picture is also found on the import side. Imports are estimated to increase by nearly 9.9 % relative to the baseline in 2030, along with a strong growth in leakage to 42 % in 2030. Therefore, while the switch to full auctioning reduces carbon dioxide emissions in EU industries more (by c. 4 percentage points in 2030[70]), this - in the absence of other measures - leads to an expansion of leakage and greater pressure on the import side in the CBAM sectors.

Table 4: MIX and MIX-full auctioning scenarios - EU 27 in 2030 (% change from baseline – except for leakage rates)

	GDP	Output in CBAM sectors	Imports in CBAM sectors	Leakage in CBAM sectors*	CO_2 eq. emissions in Mt in the CBAM sectors EU 27
MIX	-0.22	-0.47	1.63	8%	-12.80
MIX-full auctioning	-0.22	-4.01	9.88	42%	-17.13

**Note: Reported leakage rates are the proportion of emission increase in non-EU regions relative to by the emission reduction in the EU (in CBAM sectors)*

Source: JRC-GEM-E3 model

6.2 Environmental Impacts

Supporting reduction of GHG Emissions in the EU and rest of the worldFigure **8** illustrates the CO_2 equivalent emissions in the CBAM sectors by 2030 in the EU and the rest of the world across the different options, in both levels and relative to the baseline. As shown, all CBAM options achieve a stronger reduction of emissions in the CBAM sectors in the EU, up to nearly 3.5 % in 2030, relative to the case of higher ambition and free allocation (MIX). The primary driver of this reduction is the decline of output in the CBAM sectors, largely a consequence of the elimination or partial phase-out of free allocation in 2030.

[68] Energy leakage is caused by changes in demand for fossil fuel as a result of reduced fossil energy consumption as in the EU.

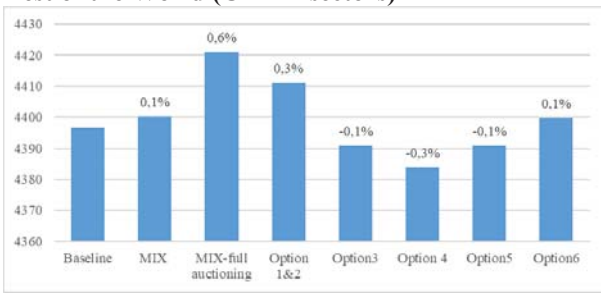
[69] Considering that the constraints imposed on EU economic activity under the MIX-55 continue to govern in the MIX-full auctioning and all the scenarios of CBAM, the leakage reported in elsewhere can be related primarily to the changes in leakage protection. That is the combination of reduced free allocation in the CBAM sectors and the imposition of CBAM.

[70] It is noted that in the context of the achievement of a 55% target, over-achievement in CBAM sectors leads to under-achievement elsewhere, so that the 55% are still achieved but not more.

Figure 8: Level of emissions in the EU-27 and the Rest of the World in CBAM sectors and relative to the baseline in 2030 (in million tonnes of CO2 equivalent and as % change from baseline)

EU-27 (CBAM sectors)

Rest of the World (CBAM sectors)



Source: JRC-GEM-E3 model

In **options 1 and 2,** with the end of free allowances and the introduction of the CBAM on import, the carbon costs increases for both imports and domestic production. Producers of basic materials have to pay a carbon price on their emissions, therefore they have a significant incentive for efficiency improvements, material recycling, more efficient use of carbon-intense materials and material substitution from the EU ETS price. Indeed, a less carbon intensive production requires purchase of fewer EU ETS allowances. Under **options 3, 4 and 5,** where foreign producers must show their actual emissions, this incentive is also present and this explains that under **options 3, 4 and 5** in the absence of resource shuffling, emissions reduce even in the rest of the world, with option 4 achieving the strongest reduction.

The incentives resulting from carbon pricing under **option 4** during the transitional phase is a combination of the increased effort achieved under the **MIX** and **option 3**. As the free allowances are phased out, the incentive to reduce emissions in the EU becomes stronger. In 2030, when free allowances are phased out by up to 50% (**option 4**), the incentive appears to be stronger that the **MIX**, but slightly lower than **under options 3 and 5**.

The EU ETS price under **option 5** incentivises both efficiency improvements of production of basic materials, recycling and efficient material use and substitution whenever materials or final goods containing basic materials are sold domestically. Due to the wider product coverage, producers can more easily pass-through carbon costs along the value chain. Domestic producers thus also face full incentives for implementing climate neutral production processes.

Similarly, manufacturers and the construction industry profit from an efficient material use and substitution when products are sold domestically, yet for exported goods there is no such incentive.

Option 6 ensures a consistent carbon price signal along the value chain even in the presence of free allocation, as it relies on a separate tax applying to domestic and imported products regardless of the EU ETS. It introduces incentives similar to a CBAM based on EU average emissions for an efficient use of raw and basic materials, and substitution with low-carbon alternatives for construction and manufacturing along the value chain. It ensures that the reference carbon intensity for basic materials is reflected in product prices where products are sold domestically. Such incentives are not present in exported products unless such a system is in place in the importing country. In addition,

the incentives described in the baseline scenario in relation to the system of free allowances remain in place.

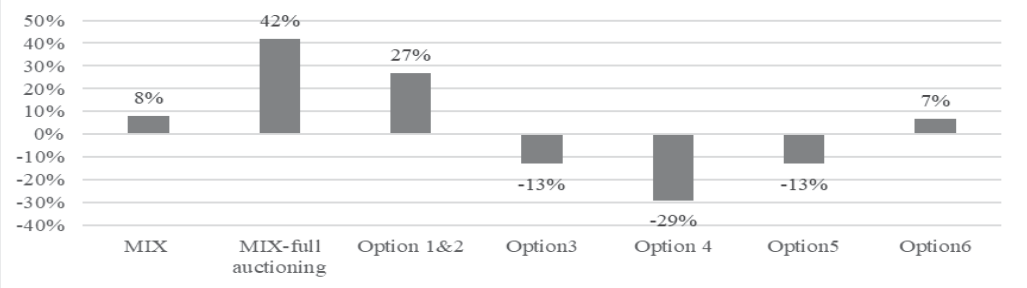
The charts in **Figure 8** illustrate that these results need to be read in conjunction with results of the different options in terms of prevention of carbon leakage. As already explained, if carbon leakage results in an increase of emissions abroad outweighing the decrease in the EU, the efficiency of our policy would be seriously undermined.

6.2.1 Preventing Carbon leakage

Under the **baseline and the MIX,** carbon leakage is addressed by free allocation. However, as already mentioned before, agreed upon climate targets will decrease the amount of free allowances available and should increase the price of carbon and could decrease the amount of free allowances available. These effects should lead to an increased risk of carbon leakage resulting in more emissions globally.

Leakage is calculated as the change in emissions in non-EU regions in a specific sector divided by the change in emissions in that sector in the EU. This leakage calculation includes indirect emissions in iron and steel, and aluminium.

Figure 9: Impact on carbon leakage in the CBAM sectors on aggregate - EU 27 in 2030



Source: JRC-GEM-E3 model

Figure 9 shows that whereas, as previously shown, the **MIX-full auctioning** is the scenario that achieves the best results in reducing carbon emissions in the EU, it is also the scenario where carbon leakage is the most significant, reaching 42 % for all CBAM sectors in 2030. In part, this is driven by the decline of output in CBAM sectors as a consequence of full auctioning in this scenario.

Compared to the MIX-full auctioning, all **options for the design of the CBAM** are effective in mitigating the carbon leakage, some even outperforming the baseline which sees no step up of overall climate ambition. Options 1 and 2 would be less effective than the others. All options based on actual emissions appear to even surpass the MIX in the mitigation the carbon leakage – achieving negative leakage rates which would mean that emissions would be reduced not only in the EU but also in the rest of the world, assuming that actual emissions are indeed attributed to the import flows.

In **options 1 and 2**, imports of basic materials from abroad face carbon costs similar to the costs of EU producers. While this means that the relative costs of EU and non-EU producers of basic materials are similar, the primary materials may still be substituted with (potentially less carbon efficient) imports at the level of components or finished

products. In the modelling, options 1 and 2 bring carbon leakage in the CBAM sectors down to 27 % in 2030 when the default value is set at the level of the EU average emissions per sector, but to -13 % under options 3, 4 and 5 where all imports would have face a CBAM based on actual emissions. The main driver behind this difference is that actual emissions are much higher than the EU average, which in turn increases substantially the size of the CABM obligation for imports.

Under option 4, the risk of carbon leakage is addressed through a mixture of free allowance allocation and the CBAM. As free allocation are replaced by the CBAM the scenario gets closer and closer to option 3. In 2030, carbon leakage is addressed equally by free allowances and the CBAM, the combination of which appears to result in the strongest possible reduction of leakage.

Under **option 6**, the analysis should be split in two, EU ETS on one hand and excise duty on the other hand. For the EU ETS part, the risk of carbon leakage is addressed by the free allocation of allowances. Therefore, the scenario is much closer to the MIX scenario. The consumption tax, being a pure destination based tax, does not affect trade flows and does not lead to any carbon leakage.

Table 5: Impact on carbon leakage in the CBAM sectors (EU 27 in 2030)

	Iron and Steel	Cement	Fertiliser	Aluminium
MIX	8 %	4 %	24 %	24 %
MIX-full auctioning	37 %	31 %	98 %	36 %
Option 1 and 2	22 %	23 %	61 %	25 %
Option 3	-12 %	16 %	-100 %	-76 %
Option 4	-24 %	7 %	-208 %	-89 %
Option 5	-12 %	16 %	-100 %	-76 %
Option 6	7 %	3 %	18 %	25 %

Source: JRC-GEM-E3 model

In terms of sectoral effects, the highest risk of leakage when moving to the **MIX-full auctioning** is observed in fertilisers and iron and steel, followed by aluminium and cement. The proportional mitigation of this risk is similar across sectors when the CBAM is introduced in all other scenarios. Fertilisers exhibit the highest level of mitigation with leakage rates switching from 98 % in the MIX-full auctioning to -100 % in **options 3 and 5,** reaching -208 % **in option 4**[71]. Cement is the only sector that exhibits consistent but weaker impacts relative to other sectors. These differences between sectors are driven by the interplay of a range of factors – notably the relative levels of trade intensity, the sector's carbon intensity (both on the EU and with respect to partners) and the substitutability of its composite product with others.

[71] This implies emission reductions of about 2 tonnes CO_{2e} in non-EU regions in addition to each tonne of CO2eq avoided in the EU. The difference in emission intensities of EU and non-EU producers is particularly high for fertilisers, hence a CBAM based on actual emissions is best suited to reduce emissions abroad and discourage imports from the most emission intensive producers. Options 3-5 all achieve a similar reduction of leakage on the import side; in addition, option 4 leads to less leakage on the export side than options 3

Table 6: Changes in the levels of emissions in the EU in CBAM and downstream sectors (difference from baseline - in million tonnes of CO_2 equivalent in 2030)

	CBAM sectors	Other Non-ferrous metals	Other Chemicals	Electrical Goods	Transport Equipment	Other Equipment	Consumption Goods	Construction	Crops
MIX	-44.0	-0.4	-13.9	-0.4	-0.2	-0.3	-3.0	-0.3	-2.1
MIX-full auctioning	-58.9	-0.3	-12.8	-0.4	-0.2	-0.3	-3.0	-0.3	-2.2
Options 1 and 2	-56.2	-0.4	-13.0	-0.4	-0.2	-0.3	-3.0	-0.3	-2.4
Option 3	-53.5	-0.4	-13.2	-0.4	-0.2	-0.3	-3.0	-0.3	-2.6
Option 4	-47.4	-0.4	-13.6	-0.4	-0.2	-0.3	-3.0	-0.3	-2.5
Option 5	-53.5	-0.4	-13.2	-0.4	-0.2	-0.3	-3.0	-0.3	-2.6
Option 6	-46.5	-0.4	-13.6	-0.4	-0.2	-0.3	-3.0	-0.3	-2.4

Source: JRC-GEM-E3 model

Impacts on the value chain and risk of additional carbon leakage will depend on the complexity of the manufacturing process downstream and the corresponding value added in later stages. The higher the value share of the basic material subject to the CBAM in the value of a product downstream, the higher the risk of carbon leakage in that product. At the same time, the more complex the final product becomes, the more diluted the content of the basic material becomes in the downstream product and the more the risk of carbon leakage declines.

In the modelling exercise, the fairly aggregate sectors of the JRC-GEM-E3 model have allowed to provide insight on downstream impacts at a more aggregate level. This has indicated that the risk of carbon leakage downstream on aggregate is quite low. Changes in emissions in downstream sectors in the EU are found to be of much smaller magnitude and in most sectors even negligible. A similar result is observed for the output effects in the downstream sectors, discussed more detail in section 6.4.2. On the basis of this result, it could therefore be argued that the pressure from the CBAM through cost increases further down the supply chain in downstream sectors seems to be fairly low, and therefore the risk on carbon leakage down the value chain is also fairly small. This is also partly indicated by option 5, which corresponds to an extension of option 3, and further down the supply chain, where emission changes in the EU are identical to those of options 1, 2 and 3. This seems to indicate that extending the CBAM down the supply chain does not necessarily reduce carbon leakage.

Notwithstanding the above, it is recognized that the finding of low carbon leakage down the value chain is conditional on the data and modelling specifications of the JRC-GEM-E3 model. As discussed earlier, the sectors analysed in the modeling embed both the CBAM products and a number of its downstream processes. Depending on the complexity of the transformation and the manufacturing step downstream, there may be varying degrees of risk of carbon leakage downstream. This is also important in the context of the value of carbon embedded in the basic material relative to overall value generation downstream. At lower carbon prices during initial phases of the CBAM, this may be negligible. However, as the price of carbon builds up more steeply in the future, this may imply that more complex products down the value chain become more exposed to the risk of carbon leakage, thus making this more relevant to be also covered by the CBAM.

These considerations are confirmed by recent academic researches based on more detailed disaggregation at product level. This indicates that a significant share of exports, as well as downstream products sold domestically in the EU, may be at risk of carbon

leakage[72].

[72] Stede, J., Pauliuk, S., Hardadi, G. Neuhoff, K., Carbon pricing of basic materials: Incentives and risks for the value chain and consumers, 2021, DIW Discussion Papers, No 1935.

summarizes the main findings of this analysis - which was based on carbon intensities of over 4 000 commodity groups covering basic materials, material products and manufactured goods downstream (components and final products). It depicts the overall value of sales of EU manufacturing productions, as well as the value and respective shares of these sales for which carbon leakage risks exist at carbon prices of 30 EUR/tonne and 75 EUR/tonne. The analysis shows that the commodity groups downstream (components and final products) at risk of carbon leakage could in fact account for between 5 % and 15 % of all manufacturing value added.

Table 7: Literature estimates of carbon leakage risks in downstream EU manufacturing

	Number of PRODCOM categories	Value added (million EUR)	Value added at risk carbon leakage for CO_2 price of 75 EUR/tonne (in million EUR and respective share to total manufacturing value added)	Value added at risk carbon leakage based for CO_2 price of 30 EUR/tonne (in million EUR and respective share to total manufacturing value added)
Not relevant	1313	16 81 325	-	-
Basic material	90	148 105	110 691 (2 %)	**100 269 (2 %)**
Basic material products	768	882 421	472 879 (9 %)	**317 721 (6 %)**
Component of products	743	1 076 112	209 598 (4 %)	**94 868 (2 %)**
Final products	1480	1 364 615	550 256 (11 %)	**147 647 (3 %)**
Total manufacturing	4394	5 152 578	1 343 424 (26 %)	**660 506 (13 %)**

Note: Carbon leakage risks are defined as those commodity groups with cost increases relative to gross value added of more than five percent and a trade intensity of at least 10 percent. Calculations based on PRODCOM statistics from Eurostat, using EU-27 data for manufacturing (NACE codes 10-33) in 2019.
Source: Adapted from Stede, J., Pauliuk, S., Hardadi, G. Neuhoff, K (2021)[73]

6.2.2 Incentivising third country importers

Under the **baseline scenario,** which rests on the current ETS, there are no incentives for non-EU basic material producers, for the non-EU manufacturing and construction industry, nor for non-EU recycling related to materials and manufactured products imported into the EU.

Table 8: CO_2 equivalent emissions in third countries (% change from baseline in 2030)

	Iron and Steel	Cement	Fertiliser	Aluminium	CBAM sectors	Downstream sectors
MIX	0.14	0.03	0.19	0.13	0.08	0.02
MIX-full auctioning	0.72	0.27	1.70	0.25	0.55	0.01
Option 1 and 2	0.39	0.20	0.95	0.18	0.33	0.02
Option 3	-0.27	0.14	-1.24	0.01	-0.13	0.04
Option 4	-0.44	0.05	-1.79	-0.03	-0.29	0.04
Option 5	-0.27	0.14	-1.24	0.01	-0.13	0.03
Option 6	0.12	0.02	0.14	0.15	0.07	0.03

Source: JRC-GEM-E3 model

Under options 1 and 2, importers of basic materials would have the option to demonstrate that the carbon efficiency of their product is better than the default value. Consequently, this provides emission reduction incentives for the share of materials that is exported to the EU.

Options 3 and 5 provide the most incentives for third country importers, as lower emissions means they will have to buy less CBAM certificates.

The incentives for international climate action under **option 4** are a mixture of the baseline and **option 3**. For non-EU material producers exporting to the EU, there are

[73] Adapted from Stede, J., Pauliuk, S., Hardadi, G. Neuhoff, K., Carbon pricing of basic materials: Incentives and risks for the value chain and consumers, 2021, DIW Discussion Papers, No 1935. See: http://www.diw.de/documents/publikationen/73/diw_01.c.812870.de/dp1935.pdf

limited incentives to increase production efficiency or invest into climate neutral production as long as the CBAM covers only a small share of the EU reference carbon intensity. These incentives increase as the share of the CBAM increases. Recycling incentives outside of the EU also increase as free allocation is phased out (and replaced with the CBAM).

Regarding the incentives for international producers and recycling, **option 5** is similar to option 3. However, due to the inclusion of the manufacturing value chain which uses significant amounts of carbon-intensive materials, there are also incentives for efficient and climate neutral material production where it is embodied in products, or for material efficiency and substitution within manufacturing industries (for the share of products exported to the EU). These effects are however fairly small, and hence not reflected in the model results.

The default value for carbon intensity of basic materials under **option 6** means that there are no incentives for efficiency improvements, climate neutral production and recycling of basic materials produced abroad. However, there are incentives to reduce the content of carbon-intensive materials in semi-finished and final products exported to the EU.

6.2.3 Feedback from the Open Public Consultation

Stakeholders responding to the consultation somewhat agree that the CBAM would have positive environmental impacts, improving the effectiveness of policies against climate change, reducing carbon emissions globally, and promoting the adoption of ambitious climate policies in third countries.

These results are confirmed across all stakeholder groups, although the highest level of agreement is achieved among citizens and among civil society organisations, with the lowest being in the group of stakeholders representing business organisations. Results broken down by geographical area are very similar to those registered in the overall sample, except for respondents based in bordering countries, who appear to disagree on the effectiveness of the CBAM to reduce carbon emissions on a global scale, and are also uncertain regarding other types of environmental impacts[74].

When estimating the environmental impacts generated by each of the policy options under investigation, no policy option leads to significantly better environmental outcomes according to the respondents.

6.3 Impacts on the EU ETS

As the CBAM is envisaged to complement the EU ETS, it is important to assess the interaction between these two instruments. The main impact in this respect is that putting in place a CBAM will allow the reduction of free allowances, which should reinforce the price signal delivered by the EU ETS.

[74] Results from bordering countries are, to some extent, affected by the view of six Russian stakeholders that are part of campaign B (section **Error! Reference source not found.**), as they somewhat disagree with all impacts.

6.3.1 Coherence

An important issue is the risk of overlap between the CBAM and the EU ETS. The EU ETS will cover the emissions of installations inside the EU. The CBAM, on the other hand, is intended to put a price on GHG emissions taking place outside the EU, but where the emissions are of interest to the EU, because the goods produced are used inside the EU. The combination of the CBAM and the EU ETS should not lead to a double pricing of carbon, neither should it lead to a situation where carbon is not subject to any price.

In **options 1, 2, 3 and 5,** the respective scope of the CBAM and the EU ETS are clearly defined, and overlaps between free allocation and the CBAM are avoided. In all cases there is a risk of double charging when goods are initially produced in the EU subject to the ETS, exported, and reimported potentially subject to the CBAM.

In **option 4**, for the period during which a CBAM would coexist with free allocation, particular attention should be paid to the level of the CBAM to ensure that the combination of the CBAM and free allocation does not undermine the incentive to emit less carbon dioxide than the free allocation benchmark nor does it provide more protection that needed to prevent carbon leakage.

In **options 1 to 5,** the method to establish the embedded emissions of imported products will have to be designed to avoid double counting of carbon emissions.

In **option 6**, the excise duty is a complementary instrument to the EU ETS, and the main element which matters is coordinating both instruments in delivering a price signal. One possibility would be to set the level of the excise duty at the level of the free allocation benchmark, so that the carbon price for EU production would reflect the full EU ETS price. As an excise duty is not imposed on exports, the risks related to goods exported and subsequently reimported do not apply.

6.3.2 Monitoring and compliance

As regards applicable rules in the CBAM, however, there is some desirable overlap between the two instruments. The carbon price to be paid inside and outside the EU should be as comparable as possible. Thus, system boundaries and MRV rules in general should also be comparable for the determination of the emissions on which the carbon price is based. Therefore, MRV rules for the CBAM should follow the same principles as those in the EU ETS. To ensure synergies, there should be some coordination and learning between the respective competent authorities, and deadlines for the compliance cycle should be coordinated.

6.3.3 ETS price

The move from MIX to the MIX full auctioning reduces emissions in CBAM sectors as a result of declining output, which reduces the scarcity of emission permits and hence the carbon price. For **all design options** of a CBAM, the expectation would be that imports of goods with a high ‘carbon content’ take place less frequently compared to the MIX-full auctioning. As a result, emissions in the CBAM sectors are higher, and therefore carbon prices increase slightly relative to the MIX full auctioning. Nevertheless, the modeling confirms that the impact of a CBAM on the EU ETS price is relatively small by 2030.

Table 9: Impact on EU ETS price (in EUR)

	2025	2030
MIX	35.2	47.9
MIX-full auctioning	32.8	44.8
Options 1 and 2	33.2	45.4
Option 3	33.6	45.9
Option 4	35.2	47.2
Option 5	33.6	45.9
Option 6	34.7	47.3

Source: JRC-GEM-E3 model

6.4 Economic Impacts

6.4.1 Macroeconomic impact

The macroeconomic impacts under the different CBAM options are found to be generally quite limited. A number of factors contribute to this. Firstly, and most importantly, CBAM sectors - despite their high shares in total emissions - represent a relatively small part of the EU economy (see Annex 10). This means that any measure applied to these sectors alone is likely to trigger minor effects at macro level. This is reinforced by the other constraints that already apply to the EU industry, equally in all options to achieve 55 % ambition. By design, all scenarios follow the same underlying constraints as the MIX to reach the same aggregate emission reduction. Whilst sectoral differences exist, at macro level these constraints will dominate.

Given the above considerations, results from the JRC-GEM-E3 model indicate that GDP for the EU 27 contracts by 0.22 % to 0.23 % in 2030 with negligible differences between options. Impact on the investment side is modest. Investment under a CBAM is slightly lower than the MIX-full auctioning, but effects are too small to derive meaningful conclusions. On the consumption side the CBAM appears to have very similar effect to the MIX scenario.

Table 10: Impact on EU-27 main macro-economic aggregates (% change from baseline in 2030)

	GDP	Investment	Consumption
MIX	-0,222	0,413	-0,555
MIX-full auctioning	-0,224	0,362	-0,501
Options 1 and 2	-0,223	0,360	-0,518
Option 3	-0,227	0,357	-0,542
Option 4	-0,223	0,388	-0,558
Option 5	-0,227	0,356	-0,548
Option 6	-0,225	0,360	-0,561

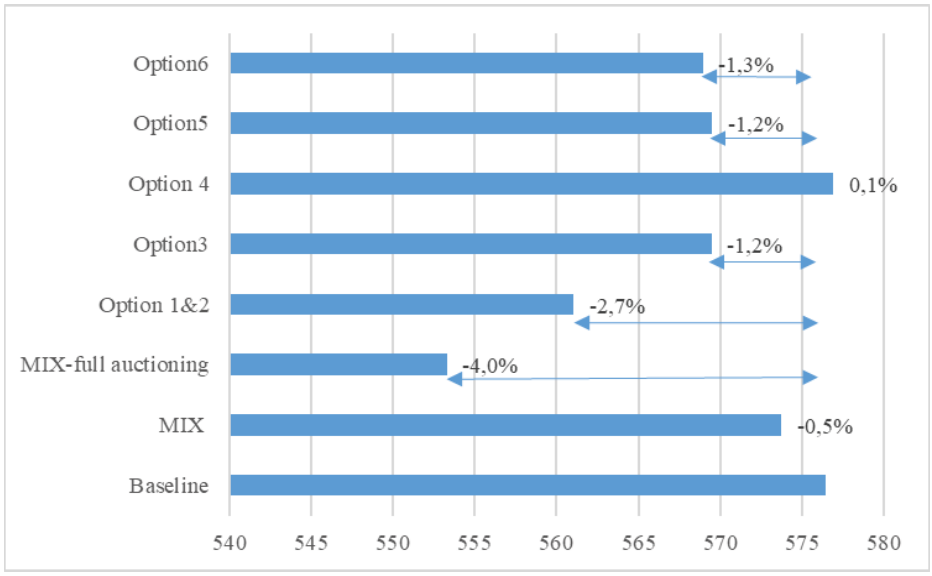
Source: JRC-GEM-E3 model

6.4.2 Sectoral impact

The impact of a CBAM on sectoral output largely follows the effectiveness of different design options in providing leakage protection. By implication this means that the extent and speed of phasing out free allocation in the CBAM sectors will have an important effect on sectoral output.

Figure 10 illustrates changes in output of CBAM sectors by scenario both in levels - billion EUR - and as percent change from baseline. As discussed earlier, the **MIX-full auctioning** leads to highest levels of carbon leakage, which is also reflected in the most significant reduction of output in all CBAM sectors at approximately -4 % in aggregate by 2030. By effectively capturing some of this carbon leakage, all CBAM options lead to higher output levels relative to the MIX-full auctioning. As evidenced in Figure 10 most CBAM options fare roughly the same by leading to increases in output compared to the MIX-full auctioning, with **option 4** having the strongest effect keeping output at baseline levels.

Figure 10: Impact on output in all CBAM sectors - EU 27 in 2030 (in levels -billion EUR- and as % change from baseline)



Source: JRC-GEM-E3 model

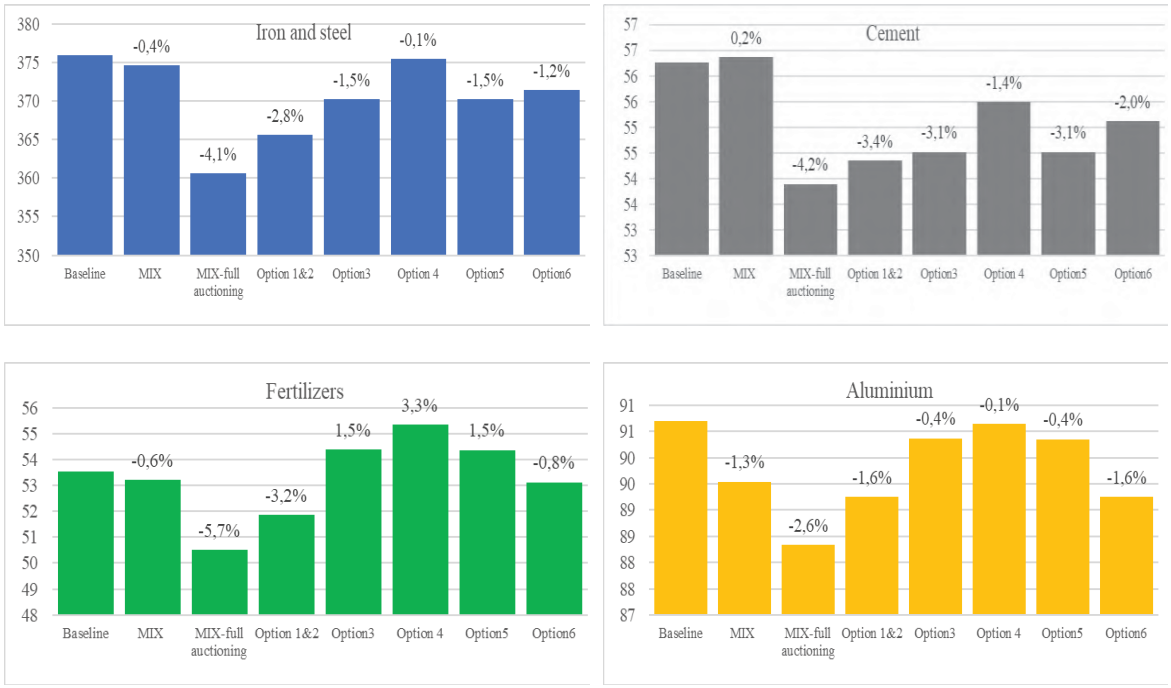
The effect is observed across CBAM sectors as indicated in

Figure 11, which also shows changes in levels -billion EUR- and as percentage change from baseline. Again the MIX-full auctioning by eliminating free allocation results in highest output losses, with all CBAM options resulting to a rebounding of output relative to that.

The CBAM options, notably **option 4**, stand well against output losses, as well as at higher carbon prices, as projected for 2030 in these scenarios. In contrast, the MIX-full auctioning would see increasing output losses with increasing carbon prices. This is of particular relevance for the period after 2030, which will see a continued increasing tightening of the ETS cap and probably a continued increase in carbon price.

The MIX results in the least amount of output losses relative to all CBAM options, which is largely due to the switch to full auctioning assumed under the CBAM. Higher levels of output therefore come at the cost of forgone revenues, due to the continuation of free allocation and higher CO2 eq. emissions in partner countries relative to the CBAM. It is worth noting that, in the case of fertilisers, all options based on actual emissions result in the increase of output levels relative to the baseline (and possibly in a corresponding greater capture of carbon leakage).

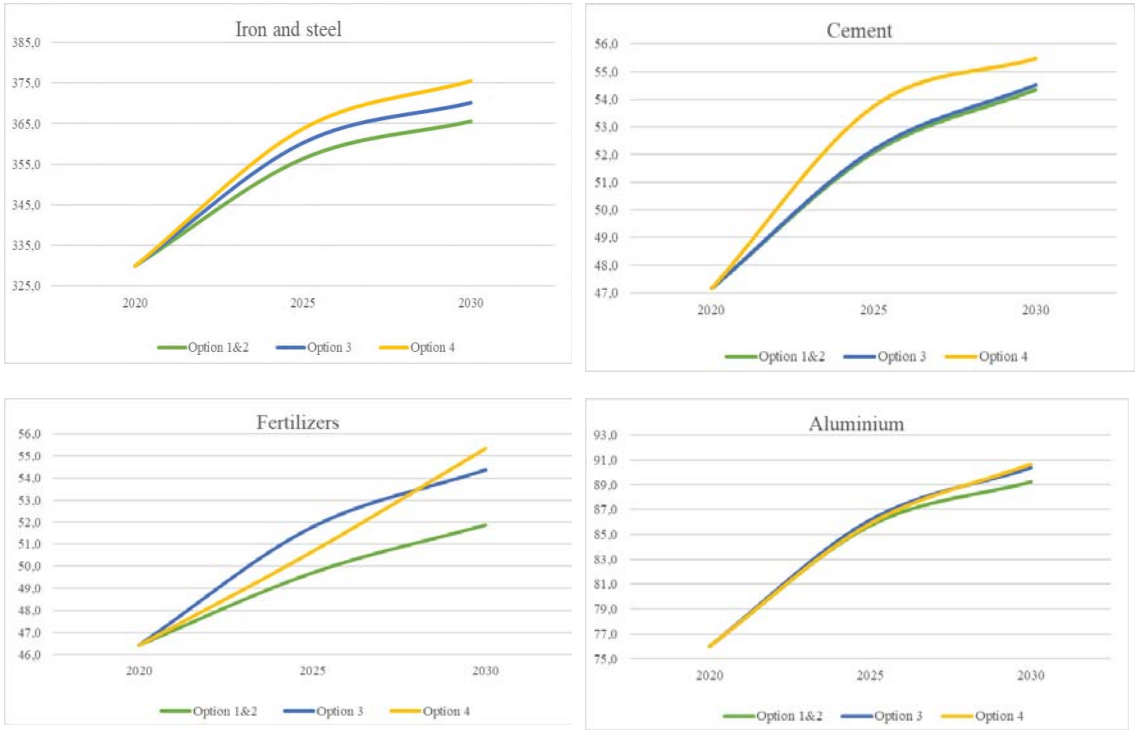
Figure 11: Output in all CBAM sectors in the MIX, MIX-full auctioning and under alternative CBAM options (in levels -billion EUR- and as % change from baseline) - EU 27 in 2030



Source: JRC-GEM-E3 model

Figure 12 illustrates the effects on output by year for options 1, 2, 3 and 4. The figure highlights how the gradual phase out of allowances (and respective phase in of CBAM) under option 4 after 2025 relative to option 3 results in higher levels in 2030. The impact of the phase in – phase out on output is more pronounced for iron and steel, cement, and fertilisers, while it appears weaker for aluminium. By comparison, options 1 and 2 - by adopting an immediate phase out as option 3 but applying a CBAM based on EU average emissions - result in lower output relative to the options based on actual emissions (options 3 and 4).

Figure 12: Output effects in all CBAM sectors for options 1, 2, 3 and 4 (in billion EUR) - EU 27

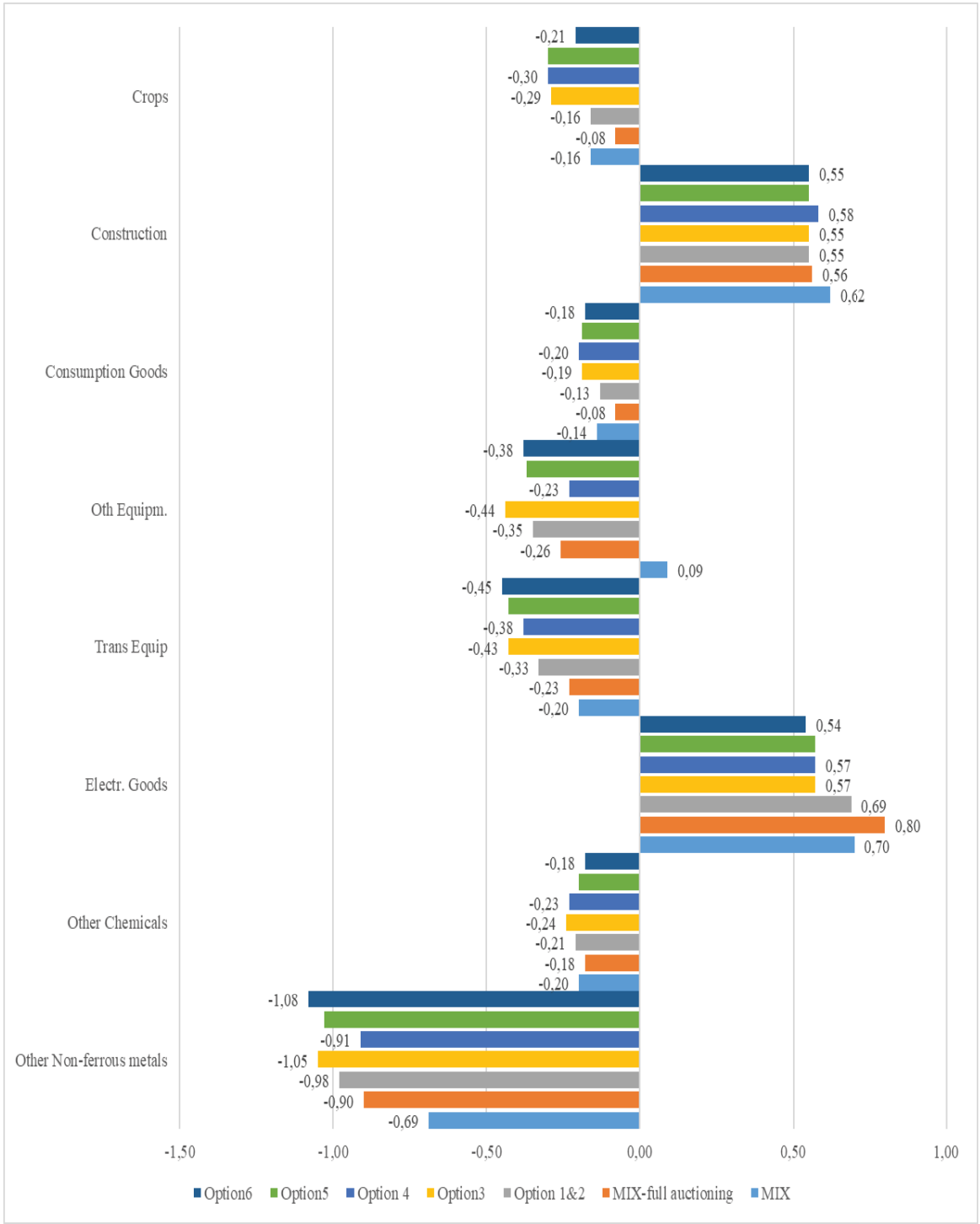


Source: JRC-GEM-E3 model

Turning to downstream industries, the response of different sectors is again largely dependent on the assumptions related to the increased ambition as depicted in the MIX scenario. It is these assumptions that drive the increase in output in the construction and electrical goods sectors, reflecting the shift to energy efficiency in buildings and electrification of the economy that accompanies the higher ambition to 2030.

Depending on the share of inputs used, downstream users are typically slightly worse off under the CBAM as they face higher input prices. Extending the CBAM to downstream sectors (in **option 5** for embodied raw products) appears to have a relatively small impact on production further down the supply chain. For example, the negative output effects downstream are found to be lower, albeit slightly, under **option 5** than those observed under **options 3 and 4** in the case of other chemicals, other non-ferrous metals and other equipment. Compared to options 1 and 2, the move to actual emissions (options 3-5) has a noticeably stronger negative impact on output downstream. This is indeed observed for crops, which under the actual emissions options would source more expensive imported fertilisers, as well as transport and other equipment which would possibly source more expensive imported iron and steel.

Figure 13: Output in downstream industries - 2030 (% change from baseline[75]) - EU 27



Source: JRC-GEM-E3 model

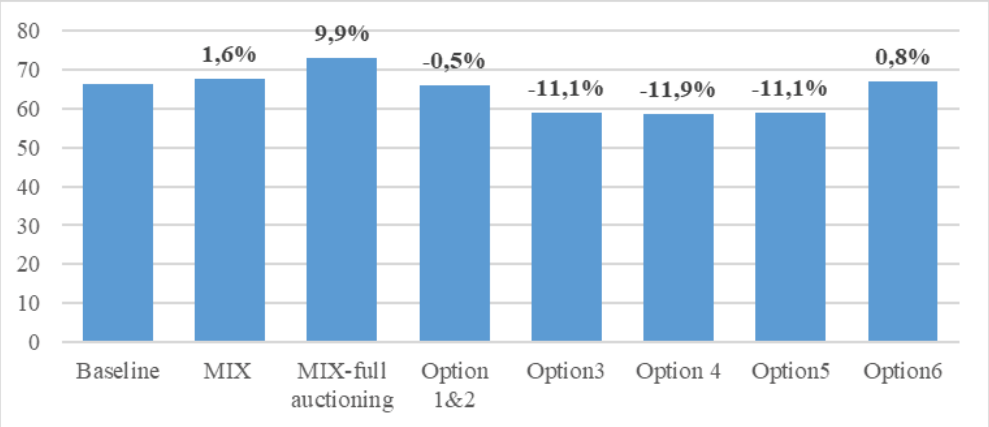
[75] *Crops* includes Paddy rice, Wheat, Cereal grains, Vegetables, fruit, nuts, Oil seeds, Sugar cane, sugar beet, Plant-based fibres; *Consumption* goods include beverages and tobacco products, food products, meat and meat products, vegetable oils and fats, dairy products, processed rice, sugar, textiles, wearing apparel and leather products; *Transport equipment* includes motor vehicles and parts, and transport equipment nec *Electrical goods* includes electronic equipment and electrical equipment; *Other chemicals* includes chemicals other than fertilisers, pharmaceuticals and rubber.

6.4.3 Trade impacts

The impact of the CBAM on trade flows is analysed both from the view of the EU and with regards to our main trade partners. Figure 14 illustrates changes in EU imports in the CBAM sectors under the different scenarios both in levels -billion EUR- and as % change from baseline. Consistent with the previous discussion, EU imports for all CBAM sectors increase in the MIX-full auctioning, reflecting the import side of carbon leakage. By effectively reducing this leakage, all CBAM options (except option 6) lead to import levels lower than to those even of the baseline (which has less overall climate ambition).

Overall, the resulting reduction in imports is approximately 11.1 % in 2030 for **options 3 and 5**, and slightly stronger for **option 4** at 11.9 %. The exceptions are **options 1, 2 and 6**, which result in import levels closer to those in the baseline[76]. To complement these findings, our analysis has also estimated what the CBAM obligation would represent in proportion of the value of imports (for more details see Annex 10). With higher carbon prices, the MIX-full auctioning would see even larger increasing imports. In contrast, notably **option 4**, as well as **options 3 and 5** would see higher reductions of imports compared to baseline with higher carbon prices. The principal driver of this effect is the difference in actual emissions, which is much higher in partner countries than the EU average. These results, as emphasised earlier, do not account for the possibility of resource shuffling. As indicated in Annex 10, in the event that the risk of resource shuffling materialises, the reduction in imports induced by the CBAM could be substantially limited.

Figure 14: EU 27 imports for all CBAM sectors in 2030 (in levels -billion EUR- and as % change from baseline)



Source: JRC-GEM-E3 model

Effects by specific CBAM sector are broadly similar. Cement and fertilisers appear to experience the highest impacts in the MIX-full auctioning, but impacts from different options are equivalent to other sectors. Impacts on downstream industries are quite limited, with changes in imports estimated at less than 2.06 % relative to the baseline.

[76] It should be noted that in the modelling the application of the CBAM reduces exports to the EU relative to the counterfactual but is not linked to potential changes in production processes in trade partners, which in turn could result in lower emissions and thereby a rebounding of exports, especially in options that would allow for individual treatment.

Table 11: EU 27 imports by sector in 2030 (% change from baseline)

		MIX	MIX-full auctioning	Options 1 and 2	Option 3	Option 4	Option 5	Option 6
Sectors covered by CBAM	Iron and Steel	1.45	11.01	-0.86	-11.05	-11.98	-11.05	0.21
	Cement	3.39	45.88	3.74	-10.71	-15.12	-10.69	0.89
	Fertiliser	1.20	14.33	0.19	-23.70	-26.41	-23.66	0.64
	Aluminium	2.07	3.64	-0.54	-5.12	-4.41	-5.06	1.81
Downstream sectors	Other non-ferrous metals	1.00	0.62	0.87	1.19	1.29	1.11	1.02
	Other chemicals	-0.03	-0.19	-0.11	0.02	0.07	-0.19	-0.14
	Electrical goods	0.89	0.78	0.86	0.95	0.97	0.90	0.97
	Transport Equipment	-0.09	-0.05	0.05	0.14	0.09	0.05	0.16
	Other Equipment	0.19	1.21	1.66	2.06	1.40	1.29	1.73
	Consumption goods	-0.19	-0.34	-0.26	-0.18	-0.13	-0.22	-0.20
	Construction	0.39	0.65	0.69	0.74	0.60	0.44	0.67
	Crops	-0.79	-0.88	-0.82	-0.69	-0.65	-0.67	-0.78

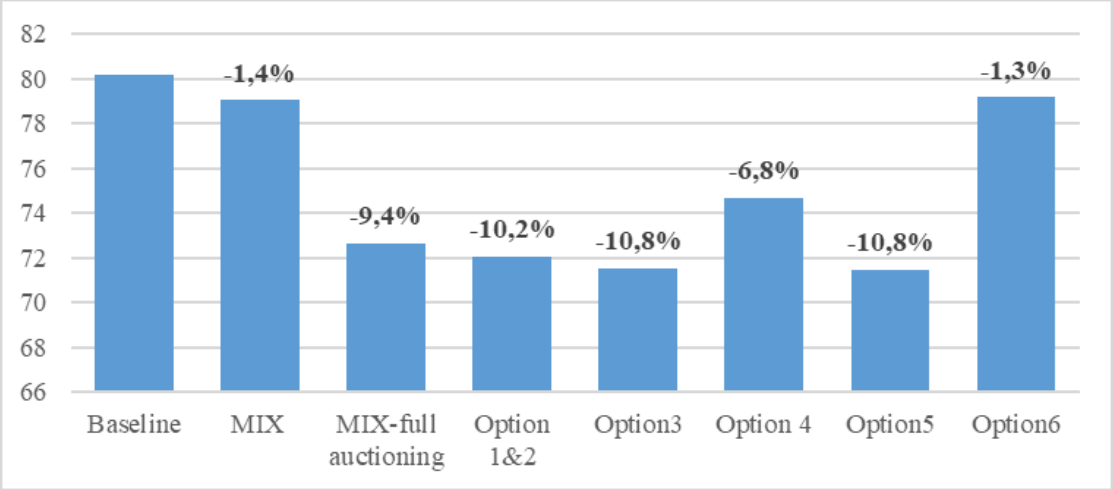
Source: JRC-GEM-E3 model

The CBAM results in a reduction of EU exports as compared to the MIX scenario. This effect appears to be primarily driven by the loss of free allocation, as evident by the impacts under the MIX-full auctioning scenario.

Figure 15 illustrates these changes both in levels -billion EUR- and as percentage change from baseline. A CBAM on imports only, under **options 1, 2, 3, 4** and **5,** appears to weaken the export performance of the CBAM sectors slightly more than the MIX-full auctioning in 2030. This can be explained by the fact that the introduction of the CBAM would raise domestic prices for CBAM sectors, thereby weakening slightly more export competitiveness. The magnitude of the effect varies, nevertheless, depending on the extent of free allocation it remains still by 2030. In particular, **option 4**, where free allowances are up to 50 % in 2030, results in a weaker reduction in export for the CBAM sectors. **Option 6,** which addresses the export side, results in very limited impacts on exports. In case of higher carbon prices, as projected for 2030 in these scenarios, both the MIX-full auctioning and CBAM options would see further negative impacts on exports, though they would remain mostly limited for option 6.

Respondents to the public consultation did emphasise that the introduction of the CBAM might have repercussions on the EU's competitiveness, especially with regard to EU's exports. The argument highlighted by a number of respondents was that the cost-competitiveness of EU businesses could drop on international markets due to higher European product prices.

Figure 15: EU 27 exports for all CBAM sectors in 2030 (in levels -billion EUR- and as % change from baseline)



Source: JRC-GEM-E3 model

Impacts on main trade partners would differ depending on the importance of respective CBAM sectors in bilateral trade with the EU. Section 2 of Annex 10 lists the main exporting countries to the EU per CBAM sector.

Overall, based on a simple descriptive analysis of current trade flows, the countries that would potentially be most exposed to the CBAM include Russia, Ukraine, Turkey, followed by certain Eastern European partners (Belarus and Albania) and North African partners (Egypt, Algeria and Morocco). Exports from these countries feature among the top in most of the shortlisted sectors considered for analysis under a CBAM.

In the case of aluminium, the top 10 exporting countries which collectively account for about 85 % of the overall imports into the EU are Norway (19 %), Russia (17 %), United Arab Emirates (8 %), China (7 %), Iceland (7 %), Mozambique (7 %), the UK (6 %), Switzerland (5 %), Turkey (5 %) and Bahrain (3 %). With respect to fertilisers, about 85 % of imports are accounted for by 5 countries, namely Russia (32 %), Egypt (21 %), Algeria (20 %), Trinidad and Tobago (7 %) and Ukraine (5 %).

Lastly, for cement the primary exporter is Turkey, which accounts for 35 % of the sector's total imports. Along with Ukraine (13 %), Belarus (10 %), Colombia (7 %), Algeria (6 %), Morocco (5 %), Albania (4 %), Norway (3 %) and Tunisia (3 %), they account for about 80 % of the total imports.

Figure 16 illustrates the results of the modelling regarding the impacts of the CBAM on imports by trade partner or regional group in 2030. Similar to the aggregate picture presented above, the MIX-full auctioning leads to an increase in carbon leakage and a corresponding increase in imports in the CBAM sectors. Imports from Rest of Europe, Russia, UK and China see the strongest increase in the MIX-full auctioning.

The introduction of a CBAM brings imports back to baseline levels for options 1,2 and 6, whereas for options based on actual emissions, imports in the CBAM sectors decline relative to baseline levels. For these options (options 3, 4 and 5) the overall decline in imports relative to the baseline reaches -11 % by 2030, and is more pronounced for imports from Russia (-35 %), Africa (-28 %), India (-25 %), and China (-11 %). As indicated earlier, these import reductions could be substantially limited in the event of resource shuffling.

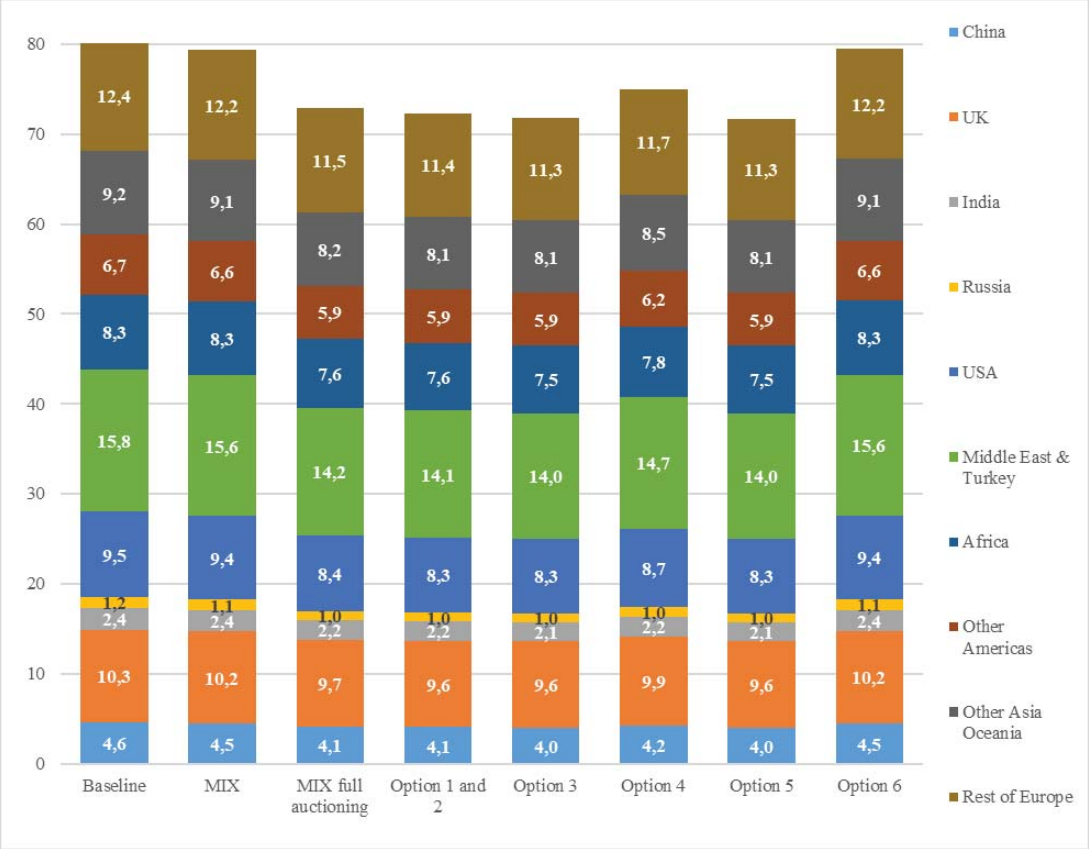
Figure 16: Value of imports into the EU-27 in all CBAM sectors in 2030 (in billion EUR) [77]

Source: JRC-GEM-E3 model

Figure 17 illustrates the impact of a CBAM on EU export by trade partner or regional group in 2030. Overall, the CBAM has limited effects on exports relative to the MIX-full auctioning. Both the scale and regional structure of exports are broadly the same under **options 1 to 5** and the MIX-full auctioning, with **option 4** resulting in slightly higher export levels overall, as also indicated earlier. **Option 6,** which addresses the export side, also result in exports closer to baseline levels.

Figure 17: Value of exports from the EU-27 in all CBAM sectors in 2030 (in billion EUR)

[77] Rest of Europe includes EFTA countries, Western Balkans, Ukraine, Moldova and Belarus.



Source: JRC-GEM-E3 model

6.4.4 Impacts from a CBAM on electricity

The impacts from the application of the CBAM on imports of electricity are presented in detail in Annex 8.

Overall, the CBAM is found to have positive effects on total carbon emissions reductions (in the EU and its neighbours), although there are differences in the impacts of the two considered options. Both options contribute to mitigating the risks of carbon leakage by discouraging in the mid-term horizon the build-up of carbon-intensive power generation sources in the vicinity of EU borders, which might replace EU-based generators exposed to increasing carbon costs. The option based on the carbon emission factor displays superior effectiveness in preventing carbon leakage due to a greater amount of carbon-intensive imports, and hence generation, avoided. This option could however be subject to a greater risk of resource shuffling, which could limit its impacts. The energy mix within the EU will not change significantly due to the application of a CBAM on electricity.

6.4.5 Feedback from the Open Public Consultation

Regarding the expected economic impacts from the introduction of a CBAM, consulted stakeholders somewhat agree that the CBAM would: i) encourage the consumption of less carbon intensive products; ii) have a positive impact on innovation in the EU and elsewhere, through the promotion of clean technologies; iii) have a positive impact on the competitiveness of EU industry in the sectors concerned; and iv) have a positive impact on investment in the EU. They also agree, however, that it would lead to increased costs for EU businesses in downstream sectors.

These findings are, to some extent, confirmed when looking at responses by groups of stakeholders, with a few exceptions. Companies and business associations do not agree nor disagree on potential positive impacts on the competitiveness of the sectors concerned; they do agree, however, that the CBAM would impinge on EU exporters in the relevant sectors. This concern is shared also by public authorities responding to the consultation. Only citizens and civil society organisations somewhat agree on expected positive impacts on investment in the EU. Interestingly, business organisations somewhat disagree that the CBAM would result in the relocation or replacement of activities from third countries into the EU; by contrast, citizens somewhat disagree that the mechanism would lead to a relocation of downstream sectors from the EU to third countries.

When estimating the economic impacts stemming from each of the policy options for a CBAM, it is apparent from the Open Public Consultation that no policy option leads to significantly better economic impacts. A slightly larger share of respondents tend to agree that: a tax at the consumption level may be costly for EU businesses in downstream sectors; and the obligation to purchase allowances from a specific pool outside the ETS dedicated to imports may generate a negative impact on EU exporters.

6.5 Social Impacts

6.5.1 Impacts on employment

Overall the impact of a CBAM on employment is limited. The JRC-GEM-E3 model assumed imperfect labour markets with unemployment allowed to adjust following the policy scenarios.

Both the overall and sectoral employment effects across all CBAM options mirror the impacts on output and investment. Changes in employment are largely driven by the presence (or not) of free allocation. The **MIX,** by retaining free allocation, results in a slight increase in employment in the CBAM sectors largely driven by cement. The complete removal of free allocation in the absence of a border measure (MIX-full auctioning) leads to the highest employment losses. In this case, the high levels of carbon leakage and the associated depression of sectoral output, in the CBAM sectors, reduces employment by -3.76 % relative to the baseline. Depending on the strength of different CBAM options in capturing the carbon leakage generated in the MIX-full auctioning, negative effects on employment are mitigated. **Option 4** results in a slight increase in employment in the CBAM sectors. As regards downstream sectors impact on employment appears to be minimal. Impacts are comparable to the MIX-full auctioning across all industries for all CBAM options. This would imply that the cost pressures generated by the CBAM on downstream industries (e.g. in vehicle manufacturing as reflected in transport equipment below) are not strong enough to generate significant output and employment losses down the value chain.

Table 12: Employment - EU 27 in 2030 (% change relative to the baseline)

	MIX	MIX full auctioning	Option 1/2	Option 3	Option 4	Option 5	Option 6
Sectors covered by a CBAM							
Iron and Steel	0.06	-3.92	-2.55	-1.30	0.22	-1.29	-0.50
Cement	1.40	-3.53	-2.75	-2.45	-0.48	-2.45	-0.87
Fertiliser	-0.10	-7.29	-4.92	-0.31	2.59	-0.32	-0.32
Aluminium	-0.46	-1.72	-0.63	0.62	0.89	0.61	-0.80
CBAM sectors	0.22	-3.76	-2.48	-1.20	0.32	-1.19	-0.60

Downstream sectors							
Other Non-ferrous metals	-0.34	-0.41	-0.46	-0.52	-0.43	-0.50	-0.58
Other Chemicals	-0.12	-0.09	-0.12	-0.15	-0.14	-0.11	-0.10
Electrical Goods	0.87	1.02	0.91	0.77	0.76	0.76	0.72
Transport Equipment	0.00	0.09	-0.01	-0.13	-0.11	-0.13	-0.17
Other Equipment	0.23	-0.03	-0.11	-0.20	-0.03	-0.14	-0.14
Consumption Goods	0.05	0.23	0.19	0.13	0.07	0.12	0.11
Construction	0.05	0.23	0.19	0.13	0.07	0.12	0.11
Crops	-0.20	-0.11	-0.17	-0.32	-0.07	-0.33	-0.44
Economy wide	0.04	0.04	0.05	0.04	0.05	0.04	0.05

Source: JRC-GEM-E3 model

6.5.2 Distributional impacts

The application of the CBAM on material industrial products is likely to have limited impact on consumer prices because the measure is targeted at products upstream in the value chain, and affects goods for final consumption only indirectly. The results from the JRC-GEM-E3 model suggest that prices across most household consumption categories increase only slightly across all options when compared to the MIX-full auctioning. The highest increases are observed in fuels and power[78] and under **option 4**. When compared to the MIX with free allocation, price changes for certain energy-related consumption categories decline slightly under the CBAM, following the changes in the carbon price reported in

[78] This is because CO_2 prices are higher than in the MIX-full auctioning, and transport and buildings are assumed to be included in the EU ETS in the MIX scenario.

Table 9. At the same time, more resource intensive products, such as household appliances, vehicles (due to steel and aluminium) and to a lesser extent food (due to fertilisers), experience small increases prices reflecting the increase in resource prices as a consequence of full auction and the border measure CBAM. Nevertheless, the estimated effects on final prices are particularly small to have a material impact on final consumers.

This is reported in the table below.

Table 13: Impact on selected consumer prices - EU 27 in 2030 (% relative to the MIX and the MIX-full auctioning)

	Food beverages & tobacco	Housing and water charges	Fuels and power	Household equipment and operation	Heating and cooking appliances	Purchase of vehicles	Operation of personal transport equipment	Transport services	Misc. goods and services
Relative to MIX									
MIX full auctioning	-0.01	-0.07	-0.36	-0.02	0.07	0.04	-0.24	-0.13	-0.08
Option 1/2	0.01	-0.07	-0.30	-0.01	0.10	0.06	-0.20	-0.11	-0.07
Option 3	0.03	-0.06	-0.25	0.01	0.12	0.09	-0.16	-0.09	-0.06
Option 4	0.03	-0.03	-0.09	0.01	0.07	0.06	-0.06	-0.04	-0.03
Option 5	0.04	-0.06	-0.24	0.02	0.13	0.10	-0.16	-0.09	-0.06
Option 6	0.03	-0.06	-0.11	0.01	0.12	0.10	-0.07	-0.05	-0.06
Relative to the MIX full auctioning									
Option 1/2	0.02	0.01	0.06	0.01	0.02	0.02	0.04	0.02	0.01
Option 3	0.04	0.01	0.11	0.03	0.04	0.05	0.07	0.03	0.02
Option 4	0.04	0.05	0.27	0.03	0.00	0.02	0.17	0.09	0.05
Option 5	0.04	0.02	0.12	0.03	0.05	0.06	0.08	0.03	0.02
Option 6	0.04	0.02	0.25	0.03	0.05	0.06	0.16	0.07	0.02

Source: JRC-GEM-E3 model

These limited price changes, in turn, would imply fairly low distributional impacts from the introduction of the measure.

Distributional impacts were analysed with the use of the Euromod micro simulation model, by effectively linking it with the JRC-GEM-E3 model (see Annex 4 for details). In this sense, the distributional analysis at micro level was able to account for the economy-wide impact of the carbon adjustment measure under consideration, capturing the effects of the policy option not only through its direct impact on the tax burden, but also through its broader implications on consumer prices and household incomes. The analysis of distributional impacts focused **on options 1, 2, 4** and **6**, relative to the MIX full auctioning scenario. Exploring other options was deemed not to provide significant value added to the analysis.

The results indicate that a CBAM is regressive, albeit the overall impact is very small. That is because the expected changes in prices and incomes (as estimated by the JRC-GEM-E3 model) are very small, and so is their impact on household adjusted disposable income. For example, for the lowest income group (1st decile) the impact on disposable income ranges from -0.11 % (Lithuania, scenario 6) to 0.07 % (Lithuania, scenario 1/2). Beyond the lowest income group, the largest negative impact across all countries and scenarios is observed in Greece and Romania, in their second decile, in scenario 6 (of about -0.06 %), while the largest positive impact is observed in Belgium (scenario 1/2, 9th decile: 0.24 %). Detailed results by option are provided in Annex 10.

Options 1 and 2 have the lowest estimated impact on poorer household incomes, while **options 4** and **6** display a larger impact. In these latter scenarios, the worst affected households are those in the first decile who experience a decrease in adjusted disposable income between -0.15-0.21 % (option 4, in Lithuania, Slovakia and Romania) and of 0.1 % (option 6, in Lithuania, Romania, Germany and Greece). On the other hand, in option 1/2 the largest fall in adjusted disposable income for households in the first decile is about a fifth of it (i.e. about -0.015 % in Denmark, Finland, France and Slovenia).

Distributional impacts vary across countries. This is due to the different impact that the same reform produces on prices of each good category and on incomes in each country. Country disparities are also explained by the different consumption patterns across the income distribution and the income structure of households. A detailed discussion of distributional impacts by Member State is provided in Annex 10.

6.5.3 Feedback from the Open Public Consultation

On average, stakeholders participating in the consultation somewhat agree that the CBAM would have both positive and negative social impacts. On the one hand, respondents tend to agree that the mechanism would avoid job losses in the EU, which would otherwise stem from the substitution of EU production with production from third countries with lower climate ambition. On the other hand, they tend to agree that the CBAM may: i) increase the price of consumer products, including those related to basic needs (depending on the sectors covered); ii) lead to job losses in downstream sectors (by increasing the cost of their inputs); and iii) generate potential negative effects on the living standards of the poorer segments of the population.

The overall results are confirmed across all groups of stakeholders and regions, with a few exceptions. Business organisations are more sceptical about the contribution of the CBAM to avoiding job losses in the EU. By contrast, civil society organisations and citizens neither agree nor disagree when it comes to negative impacts on jobs in downstream sectors. When looking at the breakdown by geographical area, respondents based in bordering countries show the highest level of agreement when it comes to negative social impacts of the CBAM. Respondents from EEA countries, Switzerland and the UK neither agree nor disagree on the expected negative impact on jobs in downstream sectors.

Finally, when assessing the social impacts stemming from each of the policy options under analysis, no policy option leads to significantly better social outcomes. A slightly larger share of respondents tends to agree, however, that the obligation to purchase allowances from a specific pool outside the ETS dedicated to imports (options 2, 3, 4, 5 in the Impact Assessment) may lead to job losses in downstream sectors and generate negative effects on the living standards of the poorer segments of the population.

6.6 Administrative Impacts

In order to estimate the compliance costs for economic operators and determine the drivers behind enforcement costs for authorities, data from cost assessment of existing mechanisms is used. Cost elements are estimated based on similar elements in instruments such as the EU ETS, national emissions trading systems, existing excise duties or import taxes as well as the Clean Development Mechanism[79] (CDM) as an international instrument that monitors emissions from international installations and projects. However, the CBAM will target imports of products and their embedded emissions. Therefore, costs from existing mechanisms of monitoring installations' emissions are generally doubled to create an estimation for the production of multiple products in one installation.

[79] See: https://cdm.unfccc.int/index.html

Generally speaking, compliance costs are assumed to arise for importers located in the EU that would have to pay the CBAM obligation. This could be done either based on a default value or by providing verified information about actual emissions. While the monitoring of these actual emissions would take place outside the EU, the responsibility – and thus costs – of providing the information regarding this monitoring to authorities lies with the importers. More detailed data and analysis for this section can be found in Annex 6.

6.6.1 Administrative burden for businesses

The **baseline** scenario would not change anything compared to the current situation as no new obligations are introduced.

Design **options 1 to 5** rely on an adjustment of carbon price at the border using the payment options of an import tax or CBAM certificates. For these border instruments, the cost elements are the following:

- First and most importantly, the quantification of the emissions value that forms the basis of the calculation of the carbon price for design options that allow claiming of actual emissions. This includes:
  - monitoring the quantity of imported products;
  - tracking the place of origin;
  - monitoring the embedded GHG emissions of products stemming from the production process;
  - verification of the monitored emissions.
- Cost related to the documentation of the process, including the submission of information to the CBAM registry.
- Costs related to making the payment.
- Costs related to the preparation for controls by the authorities.

The documentation and reporting of the quantities and emissions will also represent a cost for businesses.

On the other hand, **option 6** proposes to implement a CBAM with an excise duty system. For this option, the cost elements differ and comprise the following steps:

- Again, the first important cost element is the quantification of the emissions value and the related excise duty amount. As the excise duty option fully relies on default values, this involves:
  - monitoring the weight of basic materials, including imported and domestically produced goods;
  - accounting of the movement of the basic material along the value chain including manufacturing businesses.
- Costs related to the administration of the processes, such as trading licenses or requests for specific uses of the material.
- Costs related to the documentation of materials and goods.
- Costs related to the payment.
- Costs related to the verification of information by the authorities.

With respect to **option 1**, the first set of cost elements related to the quantification of emissions, monitoring the quantity of imported products and their origin does not cause substantial added burden to businesses. When emissions are declared at default value, monitoring the emissions from the production process is not necessary and therefore also

cause limited costs. However, if importers decide to claim the use the actual emissions from the production process, the monitoring creates additional costs for the business, estimated to be between EUR 9.8 million and EUR 13.2 million in aggregate[80].

For options 2, 3, 4 and 5, as the cost assessment for an implementation using CBAM certificates follows very similar requirements and thus also cost elements, the considerations largely overlap with the one made above. For options 2 and 3, this cost would amount to between EUR 9.8 million and EUR 14.3 million.

Administrative effort for **option 4** is similar to **option 3**. However, there are additional administrative costs for continuing to determine the level of free allocation that producers should receive. Therefore, the combined administrative effort is higher than for options 3, and would result in a cost increase for businesses.

For option 5, and as this option also relies on actual emissions, the total costs are similar to option 3, although the broader coverage of the value chain adds more relevant installations, importers and import transactions. This increases the compliance costs for importers compared to similar designs only targeting basic materials (and basic material products).

Under **option 6,** default values have to be determined both for materials and manufactured goods. Administrative effort is relatively low for producers of materials in the EU, since the excise duty relies on default values for basic materials, which means producers do not have to demonstrate the carbon intensity of their production. However, they will have to report production volumes to the competent authorities. Manufacturers along the value chain would have some additional effort, since the use of duty suspension arrangements would require them to report the weight of basic materials upon the sale of their products, as well as submit periodic returns to the relevant national authorities[81]. However, where increased administrative costs outweigh the carbon costs of materials in products, manufacturers would also have the option to pay the excise duty rather than register under the duty suspension regime.

Administrative costs for international firms are relatively low, since importers would be charged according to the weight of the material imported, without having to demonstrate the carbon intensity of the production process. For the same reason, no verification efforts for the carbon intensity of imported goods are needed for EU authorities. Compliance risks are also low due to the absence of a need for extraterritorial verification. For option 6, the estimated yearly total is between EUR 14.7 million and EUR 28.7 million (detailed calculation in Annex 6).

In all options, a CBAM would result in relatively higher compliance costs for Small and Medium-sized Enterprises ('SMEs') compared to large enterprises. Indeed, while the available data does not allow for a quantitative assessment of impacts of a CBAM specifically on SMEs, the literature suggests that there is a significant difference between large and smaller companies when it comes to administrative burden of tax or customs measures, or for MRV of carbon emissions (see Annex 6).

[80] Calculated based on the estimates and the number of cases.

[81] Ismer, R., Haussner, M., Neuhoff, K., & Acworth, W., 'Inclusion of Consumption into Emissions Trading Systems: Legal Design and Practical Administration', 2016. http://climatestrategies.org/wp-content/uploads/2016/05/CS-Administration-of-IoC-02052016-formatted3.pdf

6.6.2 Administrative impact for authorities

Authorities face comparable cost elements to the businesses, with the difference that costs arise from assessing information and controlling the reports from economic operators. Therefore, the options that have been found to be more costly for businesses above, in general also create higher costs for authorities.

An overarching cost element is to have the necessary IT technology in place. Collected data at the time of import by customs authorities needs to be shared with the authorities in charge of assessing declared actual emissions and connecting the imported products to CBAM certificates either already surrendered at that point or to be. A central CBAM Authority or national authorities tasked with the CBAM will, in the design options involving surrender of CBAM certificates, be assigned the task of selling these certificates and conducting monitoring and verification of importers surrendering sufficient CBAM certificates to cover for embedded emissions in imported materials. In the case of a centralised system, the establishment of a central CBAM Authority would not mean establishing a new agency, but the necessary tasks could be dealt with by an existing body. For a decentralised CBAM, a limited number of functions would still need to be carried out at central level, for example the supervision of national customs and climate authorities, or the publication of CBAM certificate prices. The interaction between the central CBAM Authority and national authorities, as well as how the collection of necessary data for the operation of a well-functioning CBAM could be shared between this body and other authorities, primarily national custom authorities, is a matter to be closely evaluated during the finalization of the CBAM proposal. This also relates to the way the CBAM revenue will be collected as an EU-own resource. The same also applies to the option of implementation as an excise duty as this would also require an interface between Member States and the Commission, including the customs organisations.

According to experience collected through the management of tax administration, this can represent a major share of the costs. Across the options assessed below, the need for additional IT systems varies slightly depending on their complexity and need for collaboration, but additional infrastructure would in all cases be necessary to process the data and share it between customs and CBAM authorities. Similarly to some existing requirements on imported goods, such as ozone-depleting substances or F-gases, the CBAM could also be part of the recently launched Single Window Environment for Customs which facilitates automatic assessment and sharing of import-related data. Including the CBAM obligation in this environment would reduce costs for IT systems and also for the processing of the documents. However, the process of setting this up would require time and result in some limitations in the implementation. For example, a centralised assessment of monitoring data would be necessary. A decentralised approach involving Member States' existing structures would not be supported by this environment, as discussions with Commission experts have shown.

Under **option 1**, efforts are necessary for processing documents, administering payments and controlling the correct declaration of goods. In the case of actual emissions reported, these reports and validations would need to be assessed as well. Additional controls by customs authorities would be necessary to ensure that the right product categories are declared. A high level of carbon price may increase the risk of fraud by not declaring products that should be subject to the CBAM. Therefore, the controls at entry points to the EU on a sample of imports are necessary, and result in additional enforcement costs. An import tax with the option to present actual emission values has a higher complexity

and creates higher costs for enforcement. The processing of customs declaration would require more time, as the existence of an emissions report supporting the declared carbon content would need to be checked. The CBAM obligation would need to be paid based on the declared emissions at the time of import. Together with the necessary controls, this would complete the task of the customs authority. However, the declared actual emissions would have to be assessed by a competent climate authority. The monitoring report provided by the importer and its verification need to be assessed. As the reporting needs to be performed at product level and in non-EU countries, the costs are again assumed to be twice the amount of assessing the EU ETS reports. Based on cost estimations for the EU ETS[82], this results in costs of EUR 6 750 per installation from which products are imported. A reconciliation of payments needs to be made at the end of a compliance cycle. The administration of these additional payments by the importers or the refunding in case the actual emissions were lower creates costs that do not arise when using default values. Using the administration of EU ETS accounts as a proxy, this element is estimated at EUR 400 per importer per year. In addition to this, it is assumed that a small amount of site inspections at production sites would be carried out to verify compliance at the level of production process as well. As this is assumed to target only a sample every year, the costs are estimated at EUR 351 per installation per year.

Table 14 summarises the ongoing administration and enforcement costs for CBAM options based on an import tax. To these, the costs for setting up and maintaining the IT infrastructure need to be added.

Table 14: Yearly administration and enforcement costs for an import tax-based CBAM in EUR.

Costs / Cost element	Unit costs[83]		Overall costs	
	default factors	actual emissions	default factors	actual emissions
Processing of customs declarations	3	6	690 000	1 380 000
Assessment of monitored actual emissions	0	6 750	0	3 442 500
Administration of accounts/payments	included above	400	0	400 000
Customs controls	75	75	8 625 000	8 625 000
Site inspections	0	351	0	179 010
Total (yearly)	**78**	**7 582**	**9 31 ,000**	**14 026 510**

Sources: Amec Foster Wheeler Environment, 2016; German Parliament[84], 2020; own expertise.

[82] Amec Foster Wheeler Environment, 2016. Evaluation of EU ETS Monitoring, Reporting and Verification Administration Costs. http://publications.europa.eu/resource/cellar/f6a49ec5-c35c-11e6-a6db-01aa75ed71a1.0001.01/DOC_1

[83] Units: Processing of documents: per import transaction; assessment of monitored emissions: per third-country installation; administration of accounts: per importer; customs controls: per import transaction; site inspections: per third-country installation.

For **options 2, 3, 4 and 5,** the administration and enforcement costs are structured similarly to option 1 described above. The main difference is the greater involvement of a CBAM authority responsible for issuing and administering the surrender of the CBAM certificates. Empowering a central CBAM authority for the entire Union would minimize the relevant administrative costs associated with this task. In contrast to this, a set-up similar to the EU ETS with national competent authorities could also be conceivable. This is expected to result in higher costs because of the stronger need for collaboration and coordination of the assessment of monitoring reports, but such a decentralised approach could be easier to implement, as it would rely on existing capabilities in EU Member States.

As the CBAM based on import certificates would also be charged in relation to import, customs authorities need to process the information related to the imported product on behalf of the Union. Sufficient data to calculate the amount of necessary CBAM certificates would have to be included in the customs declaration and either certificates would be directly surrendered or added up for a final balance covering a full calendar year. In all cases, customs will always have an important role and will face costs. The option of requiring a surrender or proof of surrender of the CBAM certificates at the time of import will have a significantly higher impact on customs costs. If customs authorities only collect this information on behalf of a CBAM authority that in turn performs the yearly balance, reconciliation and ensures submission, the costs for customs authorities are lower, as those costs would be shifted to the CBAM authority. The costs would arise in both cases, either for customs authorities or for the CBAM authority, and are for this assessment assumed to be similar to each other.

For the options based on import certificates, the administration of the importers' accounts would be the main cost difference to the costs of an import tax. The costs here are estimated based on the assessment of such costs for the national implementation of the ETS in Germany[85]. Because of the higher complexity resulting from international accounts that also need to be administered, the reported costs are again doubled. As a result, EUR 400 per year and importer account are assumed for the administration of accounts and payments such as the supervision of the surrender of allowances. Additional customs controls are estimated similarly to the costs for the import tax.

The possibility to provide actual emissions as basis for the calculation of the CBAM creates higher costs compared to the use of default values. The need for emission monitoring reports to support the claimed actual emissions on which the self-declared CBAM obligation is calculated creates further complexity for the processing of customs declaration in the customs authorities. Similar to the import tax, the monitoring reports and verifications need to be assessed by a responsible authority, for example the central EU CBAM authority. The costs for this are – just as for the import tax above – estimated at EUR 6 750 per report. This cost element could increase in the case of decentralised assessment of the MRV documents. In this case, authorities on multiple Member States would have to assess the documents of an installation, unless exchange and acceptance of

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[84] German Parliament, 2020a. Entwurf eines Jahressteuergesetzes 2020. http://dipbt.bundestag.de/dip21/btd/19/228/1922850.pdf
See also: https://ec.europa.eu/taxation_customs/business/vat/modernising-vat-cross-border-ecommerce_en

[85] See: German Parliament, 2020: Entwurf eines Gesetzes zur Anpassung der Rechtsgrundlagen für die Fortentwicklung des Europäischen Emissionshandels.
https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Glaeserne_Gesetze/19._Lp/tehg_novelle/entwurf/tehg-novelle_180801_rege_bf.pdf

the decisions in other Member States is the case. In addition, the same costs as for the import tax are assumed for site visits, adding on average EUR 351 per installation.

summarises the administration and enforcement costs for CBAM options based on national ETS allowances. To these, the costs for setting up and maintaining the IT infrastructure need to be added.

Table 15: Yearly administration and enforcement costs for an import certificates-based CBAM in EUR.

Costs / Cost element	Unit costs[86]		Overall costs	
	default factors	actual emissions	default factors	actual emissions
Processing of customs declarations	6	9	1 380 000	2 070 000
Assessment of monitoring and reporting action	0	6 750	0	3 442 500
Administration of accounts/payments	400	800	400 000	800 000
Customs controls	75	75	8 500 000	8 500 000
Site inspections	0	351	0	179 010
Total (yearly)	**481**	**7 985**	**10 280 000**	**14 991 510**

Sources: Amec Foster Wheeler Environment, 2016; German Parliament, 2020; own expertise.

Furthermore, and in a similar manner than for businesses, the further depth of the value chain, as envisaged under **option 5,** adds more relevant installations, importers and import transactions. This increases the compliance costs compared to similar designs only targeting basic materials (and basic material products).

Under **option 6**, an excise duty requires different actions from authorities than the import tax and import certificates options, which complete the price adjustment at the import of the products. The administration and enforcement of an excise duty requires the issuing of authorizations and licenses, processing of reported inventories of the economic operators, as well as carrying out inspections and checks[87]. Data sources for existing excise duties are scarce and not comprehensive in their assessment of different cost

[86] Units: Processing of documents: per import transaction; assessment of monitored emissions: per third-country installation; administration of accounts: per importer; customs controls: per import transaction; site inspections: per third-country installation.

[87] Ramboll et al. 2014: Study on the measuring and reducing of administrative costs for economic operators and tax authorities and obtaining in parallel a higher level of compliance and security in imposing excise duties on tobacco products. https://op.europa.eu/en/publication-detail/-/publication/a5d22256-3d16-4c7f-bb9e-3209447e517e/language-en

elements. The central element influencing the costs for enforcement of an excise duty is the requirement for movement control within a duty suspension arrangement, as well as obtaining data from the producers and traders participating in this system. This is the case for excise duties on highly taxed products like tobacco. The high costs – not only for authorities but also for economic operators – are mentioned by the experts. As the excise duty systems to implement a CBAM is assumed not to require such real-time tracking, the costs of enforcement can be limited in this respect.

Still, the excise duties require processing data reported by businesses, maintaining the data infrastructure and monitoring compliance through controls. Important factors influencing the administration and enforcement costs are the complexity of products and the number of producers obliged to pay the excise duty. A higher number of producers increases costs for the authorities. The number of producers will be high compared to other excisable goods, because of the nature of the covered products as basic materials for many value chains.

Because of the nature of product and the similarity in set-up, consumption charges for plastic provide a good reference point for the administration and enforcement of an excise duty on carbon intensive basic materials. Currently, a plastic levy is in preparation in the United Kingdom. This provides an estimation of the overall ongoing costs. The impact assessment performed by the UK government foresees EUR 12.9 million per year for ongoing costs. This includes implementing continuous changes in the collection systems, compliance monitoring and support to customers. An EU CBAM system could thus be expected to result in higher yearly costs than this. With the available evidence base, a more precise quantification is difficult to achieve.

6.6.3 Administrative impact electricity

In view of the relatively limited number of undertakings engaged in the business of importing electricity, the total administrative costs associated with compliance are expected to be rather low.

6.6.4 Feedback from the Open Public Consultation

About 95 % of the respondents agree that the CBAM could increase administrative burdens for exporters and importers. The lion's share of respondents (430/478) indicating an increase in administrative burdens believe that the CBAM could entail burdensome verification and reporting procedures (430/478), and require a complex approach to establish the carbon content of the product (376/478); more than half of them (265/478) also believe that administrative burdens will increase due to the needed alignment with measurement standards. Similar results are recorded across all stakeholder groups and geographical areas.

Almost 93 % of respondents envisage an increase in administrative burdens borne by public administrations in the EU. More specifically, a large share of respondents indicating such an increase in administrative burdens believe that public administrations will face monitoring needs (413/460) as well as the need to adjust customs systems (328/460). Similar results are registered across all stakeholder groups and geographical areas; public authorities and stakeholders based in other non-EU countries, however, give more relevance to adjustments of customs systems than to monitoring needs to explain such an increase in administrative burdens for public administrations.

Although the majority of respondents (336/480) confirm that the CBAM is expected to generate relatively higher administrative burdens for small and medium-sized enterprises (SMEs), almost one third of respondents (144/480) do not agree with this conclusion. When looking at the breakdown by stakeholder cluster, the majority of companies (225/268) and public authorities (11/14) believe that SMEs will face higher administrative burdens; by contrast, slightly more than half of the respondents representing civil society organisations (33/57) and less than half of citizens (67/141) expect higher costs for SMEs. Results similar to those recorded in the entire sample are consistent in all geographical areas, except for bordering countries, where the vast majority of respondents indicate a stronger increase in administrative burdens for SMEs.

6.7 Revenue Generation Impacts

All options where free allocation is fully removed (1, 2, 3, and 5) as well as option 6 generate additional revenues, above EUR 14 billion per year in 2030. Option 5 provides the highest revenue. Option 4, which is based on partial phase out of free allocation, results in lower revenues in 2030 by comparison, at EUR 9.1 billion per year. Beyond 2030 and as free allocation is phased out and the CBAM is phased in, revenue should continue to increase in the EU and at the border for this option, eventually reaching the same levels as option 3.

Three main elements impact the revenue.

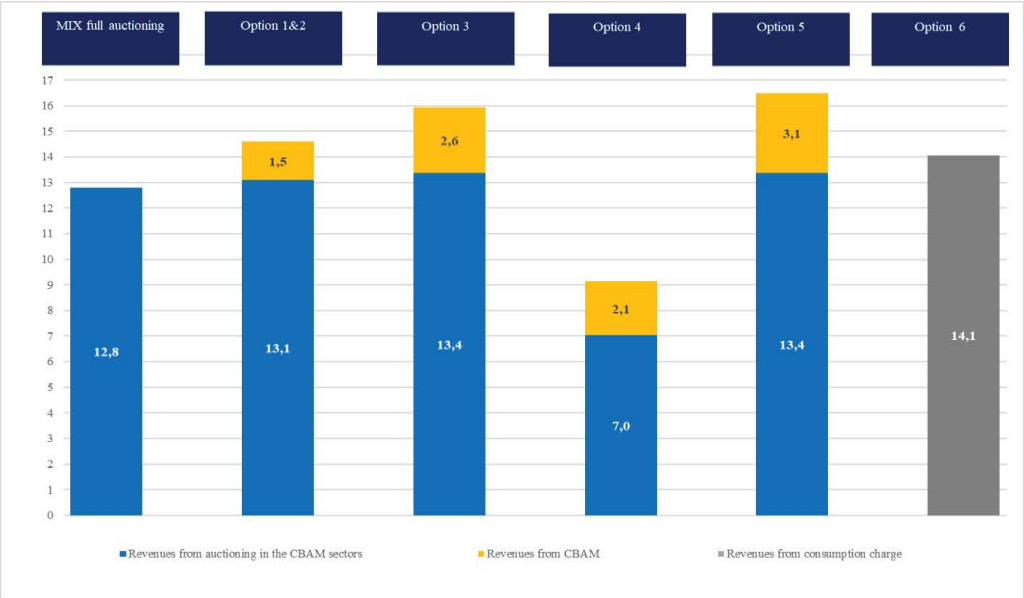
The first is the switch from free allocation to full auctioning. This explains why option 4, where this effect is phased in after 2025 over 10 years, produces less revenue in 2030.

The second is the revenue collected at the border; this revenue in all options is significantly lower than the revenue collected from auctioning in the EU ETS (at most the CBAM revenue is less than one fifth of the EU ETS revenue in option 3). This reflects the proportion between production in the EU and imports in the CBAM sectors. Extending the CBAM down the supply chain, as envisaged under option 5, increases the revenue generated at the border, which remains however limited compared to the revenue generated by the termination of free allocations in all scenarios.

Overall, total revenues will depend on effective level of carbon prices. The CBAM can have a limited effect on the demand for ETS allowances from industrial sectors and hence on the carbon prices. This has an effect on ETS revenues not only in CBAM sectors but in the whole ETS. This effect, however is not very significant.

Revenue impacts are presented below for 2030. In the longer term, the potential evolution of revenues would depend on the future level of the carbon price and the embedded emissions in the imported CBAM products. Whilst the carbon price may continue to rise in the future, the emissions embedded in the CBAM products from the EU's trade partners may decline as a consequence of the application of the CBAM, the latter expected to encourage the adoption of zero or low emission technologies in other countries. This may result in lower revenue levels for all options in the longer term.

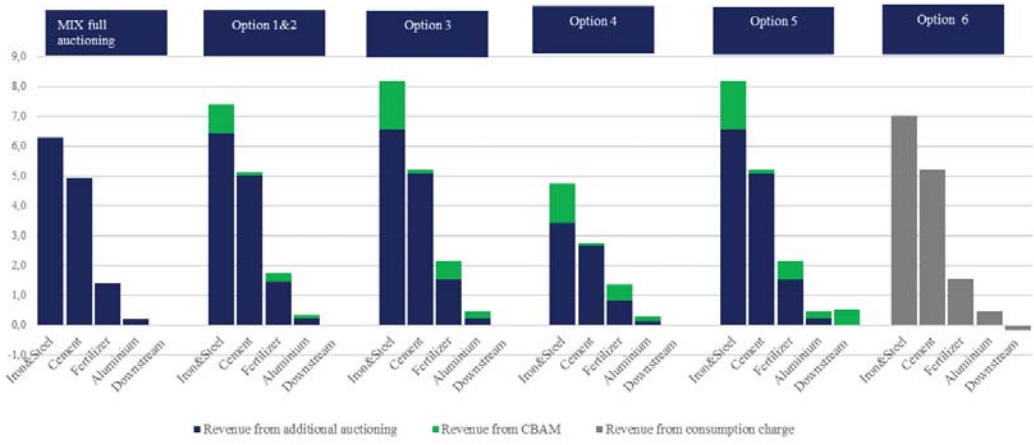
Figure 18: Revenues from the CBAM in 2030- Auctioning in the CBAM sectors plus border measure (in billion EUR)



Source: JRC-GEM-E3 model

In terms of sectoral structure, revenues largely reflect the scale of emissions in respective sectors, as well as their trade intensity. Therefore iron and steel, which is the highest emitter among the CBAM sectors and is also characterized by high import penetration, results in highest revenues both from the border measure and from additional auctioning. By contrast, cement, which is the second strongest emitter, has a much lower import penetration than iron. Resulting revenues are therefore lower and mostly arising from additional auctioning. Fertilisers come third in emissions and their relative stronger import penetration result in higher revenues from the border measure. Finally, aluminium, which is the last in strength of emissions also comes last in revenue impacts.

Figure 19: Revenues from the CBAM by sector in 2030 - Auctioning plus border measure (in billion EUR)



Source: JRC-GEM-E3 model

7 HOW DO THE OPTIONS COMPARE?

The policy options are compared against the criteria of effectiveness, efficiency, coherence and proportionality in Table 16 below. The cost/benefit part assesses the overall performance of each option against all criteria in the medium to long term.

With respect to the effectiveness of the CBAM in meeting its environmental objectives and supporting reduction of emissions, all the policy options show a positive impact. On providing protection against carbon leakage, while **option 4 followed by options 3 and 5** also bring about a strong positive impact, **options 1, 2 and 6** would be less effective. All policy options are designed in a way that respects the EU's international commitments. With regards to incentivising third country producers to move towards cleaner production processes, all policy options bring about positive results. On that criteria, the options allowing for the possibility to demonstrate actual emissions are particularly effective, with **option 4 followed by options 3 and 5** also showing strong positive results. All options are coherent with the EU ETS.

Assessing the efficiency of the options, all options have slightly better economic impacts than the MIX-full auctioning. As regards social impacts, the effects of the CBAM on employment as well as its distributional impacts are generally quite limited. In addition, effects on consumer prices are very small and distributed in a progressive manner. Furthermore, all options will increase administrative costs for both businesses as well as the EU and Member States administrations. Lastly, all options comply with the principles of subsidiarity and proportionality.

Table 16: How do the options compare

Effectiveness, efficiency and coherence	Option 0 (a): MIX	Option 0 (b): MIX full auctioning	Option 1: Import Carbon Tax	Option 2: Import certificates at average EU emissions	Option 3: Import certificates based on actual emissions	Option 4: Import certificates with parallel continuation of free allowances for a transitional period	Option 5: Import certificates on basic materials also as part of components and finished products	Option 6: Excise duty
	Effectiveness							
Supporting reduction of GHG emissions (by supporting investments on low carbon technologies)								
Carbon leakage prevention								
Respect international commitments								
Incentivising third country producers								
	Coherence							
Consistency with EU ETS								
	Efficiency							
Economic Impacts								
Social Impacts								
Budgetary impacts								
Administrative costs								
	Subsidiarity/proportionality							
	Overall assessment							
Cost/benefit								

Strong positive impact | Limited positive impact | Limited negative impact | Negative impact

8 PREFERRED OPTION

When proposing its updated 2030 greenhouse gas emissions reduction target of at least 55 %[88], the European Commission also described the actions across all sectors of the economy that would complement national efforts to achieve the increased ambition. A number of impact assessments have been prepared to support the envisaged revisions of key legislative instruments.

Against this background, this impact assessment has analysed the various options through which the introduction of a Carbon Border Adjustment Mechanism could effectively and efficiently contribute to the delivery of the updated target as part of a wider 'Fit for 55' policy package.

8.1. Methodological approach

Drawing conclusions about preferred options from this analysis requires tackling two methodological issues.

First, as is often the case in impact assessment analysis, ranking options may not be straightforward as it may not be possible to compare options through a single metric and no option may clearly dominate the others across relevant criteria. Ranking then requires an implicit weighting of the different criteria that can only be justifiably established at the political level. In such cases, an impact assessment should wean out as many inferior options as possible while transparently provide the information required for political decision- making. This is what this report does for the introduction of the CBAM, based on the objectives of the measure and intervention logic.

Secondly, the 'Fit for 55 Package' involves a high number of interlinked initiatives underpinned by individual impact assessments. Therefore, there is a need to ensure coherence between the preferred options of various impact assessments.

8.2. Policy interactions

Given the complex interdependence across policy tools and the interplay with the previous methodological issue outlined above, no simultaneous determination of a preferred policy package is thus possible. A sequential approach was therefore necessary.

First, the common economic assessment[8990] underpinning the 'Communication on Stepping up Europe's 2030 climate ambition' looked at the feasibility of achieving a higher climate target and provided insights into the efforts that individual sectors would have to make. It could not, however, discuss precise sectoral ambitions or detailed policy tools. Rather, it looked at a range of possible pathways/scenarios to explore the delivery of the increased climate ambition. It noted particular benefits in deploying a broad mix of policy instruments, including strengthened carbon pricing, increased regulatory policy ambition and the identification of the investments to step up the climate action.

An update of the pathway/scenario focusing on a combination of extended use of carbon pricing and medium intensification of regulatory measures in all sectors of the economy,

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[88] Communication on Stepping up Europe's 2030 climate ambition - Com(2020)562.

[89] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020SC0176

[90] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020SC0331

while also reflecting the COVID-19 pandemic and the National Energy and Climate Plans, confirmed these findings.

Taking this pathway and the Communication on Stepping up Europe's 2030 climate ambition as central reference, individual impact assessments for all 'Fit for 55' initiatives were then developed with a view to provide the required evidence base for the final step of detailing an effective, efficient and coherent 'Fit for 55 Package'.

At the aggregate level, these impact assessments provide considerable reassurances about the policy indications adopted by the Commission in the Communication on Stepping up Europe's 2030 climate ambition. This concerns notably a stronger and more comprehensive role of carbon pricing, energy efficiency and renewable energy policies, and the instruments supporting sustainable mobility and transport. These would be complemented by a Carbon Border Adjustment Mechanism and phasing out of free allowances. This approach would allow reducing, in a responsible manner, the risk of carbon leakage. It would also preserve the full scope of the Effort Sharing Regulation for achieving the increased climate target.

Various elements of the analyses also suggest that parts of the revenues of a strengthened and extended EU ETS should be used to counter any undesirable distributional impacts such a package would entail (between and within Member States). While the best way to do this is still to be determined, this would seem a superior alternative to foregoing the relevant measures altogether or simply disregarding the uneven nature of their distributional impacts. Under both these alternatives, the eventual success of any package proposed would be at risk.

8.3. Preferred policy option

Preliminarily assuming the analysis above as the framework for the aggregate 'Fit for 55 Package', the specific analysis carried out in this impact assessment comes to the main following conclusions and would suggest **policy option 4**: a Carbon Border Adjustment Mechanism on selected sectors in the form of import certificates based on actual emissions with parallel continuation of free EU ETS allowances for a transitional period as the preferred option. A primary basis on actual emissions ensures a fair and equal treatment of all imports as well as ensures a close correlation to the main features of the EU ETS. The CBAM system will, however, need to be complemented by a possibility to base calculations on a set default values to be used in situations when sufficient emission data will not be available. This option will need be designed to fully respect the EU's international commitments, in particular WTO rules, and therefore it will be necessary to ensure that the phase in of the CBAM and phase out of the free allowances do not, at any point in time over the transitional period, afford double protection to EU producers.

As regards electricity, the preferred option is to apply a CBAM based on the carbon emission factor (**option b**), and in particular the variant based on the carbon emission factor of the electricity mix of the respective exporting country. Overall, option b is efficient in reducing carbon leakage while keeping administrative costs low as discussed in Annex 8.

This choice of options would best meet the objectives of the intervention and would introduce a proportionate mechanism to address climate change by reducing GHG

emissions in the EU and avoiding that these emissions are replaced by emissions outside the EU. In addition, the gradual phase out of EU ETS allowances would allow for businesses and authorities to carry out a prudent and predictable transition.

Policy option 4 ensures a high level of effectiveness for the CBAM. The introduction of import certificates based on actual emissions would provide stronger incentives to third country producers to move towards cleaner production processes, and thereby provide a stronger protection than all other options against the risk of carbon leakage, while respecting the EU's international commitments, among which WTO rules.

In terms of coherence with other EU policy goals, option 4 would be consistent with the EU ETS, ensure a level-playing field on carbon pricing and participate to the achievement of the EU's increased climate ambitions.

The assessment in section 6 highlights that option 4 performs well from an economic and social standpoint, with limited negative effects foreseen, and a better performance compared to the MIX-full auctioning.

8.4. Ensuring coherence in the finalisation of the package

The final step of the sequential approach outlined above for the coherent design of the 'Fit for 55' proposals will be carried out on the basis of the analysis of this and the other impact assessment reports. The choices left open for policy-makers will be taken, measures fine-tuned and calibrated, and overall coherence ensured. Until that stage, all indications of preferred measures are to be considered preliminary as preserving overall effectiveness, efficiency and coherence may require adjustments as the final package takes shape.

In particular, the policy choices made with regards to the revision of the EU ETS and the Effort Sharing Regulation may affect the design of the CBAM. The compatibility of the mechanism with the EU ETS needs to be safeguarded For instance, decisions on the strengthening of the existing EU ETS, through the increased stringency of the cap and the possible revision of the EU ETS benchmarks for free allocation may require adjusting the design of the CBAM, to guarantee the even-handedness between EU and third country producers. Similarly, the possible extension of the EU ETS to road transport and buildings or all fossil fuel combustion may have consequences on the approach retained for the CBAM, in particular on the scope of emissions covered. Finally, the different initiatives of the 'Fit for 55 Package' should ensure a coherent policy framework to address the risks of carbon leakage.

A comprehensive analysis will therefore be carried out to ensure consistency with all the relevant initiatives under the 'Fit for 55 Package'. To that end, a complementary document to the full set of individual impact assessments, looking at the effectiveness, efficiency and coherence of the final package, will accompany the 'Fit for 55' proposals.

8.5. Timing considerations

The objective to have the CBAM introduced at the latest by 2023, as agreed between the European Council, the European Parliament and the Commission on 17 December 2020, is indeed an ambitious one considering the length of the legislative procedure and the

time required to set up the necessary administrative functions for its effective implementation.

In view of the time necessary for the legislators to adopt the Regulation and the Implementing and Delegated Acts it may become necessary to consider a transitional period whereby the measure could be introduced on a simplified basis before implementing a full-fledged CBAM.

Such a stepwise approach would allow for swift implementation, but would involve simplifications involving implementation options that are not optimal form outset. Such simplifications could include the use of default values, which would allow determining the CBAM obligation based on the volume of product imported according to an average of emissions in the EU. Other simplifications could involve the administrative set-up, which for the transitional period may need to rely more to Member States authorities and less at central level.

9 HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

The Commission will ensure that arrangements are in place to monitor and evaluate the functioning of the CBAM and evaluate it against the main policy objectives. Given that the CBAM is one of the policy proposals under the 'Fit for 55 Package', monitoring and evaluation could be carried out in alignment with the other policies of the package.

The administration system should be evaluated after the first year of operation to identify any issues and potential improvements. In addition, when more data is available, the Commission will also review the scope of the CBAM to examine the possibility of extending it to cover emissions of additional sectors and further down the value chain. For this, it is necessary to monitor the effect of the CBAM on the shortlisted sectors.

Table 17 provides the objectives, progress indicators and data sources/measurement tools which would be used to inform against these indicators. The monitoring indicators are expected to be collected on a yearly basis. For evaluation purposes, annual statistics will be computed and compared between successive years.

Table 17: Monitoring and evaluation indicators

Objectives	Indicators	Measurement tools/data sources
Reduce GHG emissions	– Level of emissions in the EU – Level of emissions globally	– Emission statistics – Sector statistics
Incentivise cleaner production processes in third countries	– Evolution of actual emissions for CBAM sectors in third countries	– Level of emissions demonstrated by third country producers subject to the CBAM
Prevent carbon leakage	– As indicators of GHG emissions above – Level of emissions in the EU relative to level of emissions globally – Trade flows in CBAM sectors – Trade flows downstream	– Emission statistics – Trade statistics – Sector statistics
Ensure consistency with EU policies	– Import certificates price in line with the price in the EU ETS	– Statistics from EU ETS and CBAM authorities
Limit administrative burden	– Timely treatment of CBAM enforcement (e.g. possible reconciliation procedure) – Frequency of updating EU ETS pricing – Checks of actual level of emissions by exporter	– Feedback from industry and public authorities responsible for CBAM implementation – Number of staff necessary for CBAM administration