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Department of Climate Change, Energy, the Environment and Water

Carbon Leakage Review

Final Report

February 2025

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Acknowledgement of Country

Our department recognises the First Peoples of this nation and their ongoing connection to culture and country. We acknowledge Aboriginal and Torres Strait Islander Peoples as the Traditional Owners, Custodians and Lore Keepers of the world's oldest living culture and pay respects to their Elders past, and present.

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Letter of Transmittal

Dear Minister Bowen,

Thank you for entrusting me to lead Australia's Carbon Leakage Review, together with the team at DCCEEW led by Ms Edwina Johnson.

The Review conducted original analysis and undertook in-depth consultation with a wide range of stakeholders in Australia and overseas, on the basis of two public consultation papers. The Review has created new insights and the process has helped create shared understanding in government, business, civil society and internationally. The findings and recommendations are geared to inform government decisions, and as a resource for policy in coming years.

The Review found that while carbon leakage is adequately addressed under the Safeguard Mechanism in the short to medium term, additional measures may be required and desirable over time, for specific commodities at high exposure to carbon leakage risk in domestic markets. Having investigated a range of policy options, the review concluded that a border carbon adjustment would be the most suitable option in these cases. We recommend phased implementation of border carbon adjustments for imports of a select group of commodities, following a further consultative process of design.

I take this opportunity to highlight some opportunities that relate to the Review's findings and recommendations.

Border carbon adjustments for selected commodities can *enhance the durability of industrial decarbonisation policies including the Safeguard Mechanism, and help strengthen future emissions reductions*. The notion of well-designed border carbon adjustment is supported by relevant industry and other stakeholders. It would remove the policy basis for trade-exposed baseline adjustments for the relevant industry sectors.

Border carbon adjustments can *support the emergence of green commodity production in Australia,* harnessing this country's opportunities to be a major contributor to global industrial decarbonisation through exports. Border carbon adjustments allow low- and zero-emissions production to reap benefits in domestic markets. If other countries implement border adjustments that reflect domestic climate policy in a properly designed way, this will help create markets for green commodity exports including from Australia.

Australia should continue to be an overt champion of an open, rules-based trading system. Australia has the opportunity to *demonstrate how border carbon adjustments can efficiently create a level playing field for traded heavy industry commodities*. Australia can help create the building blocks of an internationally interoperable system, including by supporting technical work at the OECD and other plurilateral and multilateral bodies. Australia would do well to support developing country trade partners in our region in implementation of a border carbon adjustment and in their industrial decarbonisation efforts.

It has been a privilege to undertake this important work for you, and professionally rewarding to work with the team at the department and the Australian Public Service more widely.

Frank Jotzo

February 2025

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Executive Summary

This Final Report from Australia's Carbon Leakage Review (the Review) details the Review's findings and advice to Government on: potential future carbon leakage risks (including materiality of such risk for individual commodities); different possible policy approaches to address leakage risks; and feasibility and potential impacts of border carbon adjustments.

It incorporates feedback from two consultation processes including stakeholder submissions in November-December 2023 and November-December 2024, and targeted international consultation including in trade partner countries.

The Review's work was guided by the following principles.

First, the overall goal is a policy framework that promotes economically efficient low and zero emissions industrial production as a contribution to climate change objectives. A durable market-based system to incentivise investments in low and zero emissions industries is important to this.

Consequently, the Review focused on carbon leakage solely in terms of shifts in industrial production due to differences in climate change policy between countries. Other objectives such as supply chain security and regional economic prosperity remain important, and are the domain of other policy spheres and initiatives.

The Review focused on durable policy approaches, recognising that carbon leakage risk may change over time.

Second, the Review placed emphasis on the global transition to a low or zero emissions industry sector and Australia's opportunity to become a major producer and exporter of clean energy and industrial commodities in a net zero world economy. Policy frameworks that provide market premiums for low emissions products, including for traded goods, can contribute to this goal.

In this context, addressing carbon leakage means helping create the preconditions for investment in new low emissions industrial structures in the most suitable locations, rather than shielding existing high emissions processes from change.

Third, the Review placed importance on the international rules-based trading system and on maintaining open and liberal trade relationships, especially in the region. Australia's economic prosperity has been enhanced by open trade, and strong trade relations will be vital to achieve net zero emissions in Australia and globally.

In this regard, the Review sought to identify ways in which possible future measures to address carbon leakage, including a border carbon adjustment, can respect international trade rules and obligations, facilitate trade that is consistent with climate change policy objectives, and be collaboratively implemented with Australia's trade partners. The Review also sought to identify opportunities to support progress in multilateral and plurilateral forums.

The Review focused on assessing carbon leakage risk and the suitability of policies in the Australian context. Consistent with its terms of reference and the views of stakeholders from consultation, the

Review also explored and considered in some detail the key issues relating to policy design and implementation of a possible carbon border adjustment, particularly related to feasibility. However, detailed design would need to be considered and consulted on should government decide to pursue a border carbon adjustment. The principles and criteria set out by the Review provide a point of reference for any future policy adjustments.

Leakage under existing policies

2.1 Safeguard Mechanism settings

Findings

Current Safeguard Mechanism settings are effective at mitigating carbon leakage risk in the short- to medium-term. But settings for some sectors may need to be augmented with additional measures over time. Reduced baseline decline rates for Trade Exposed Baseline Adjusted (TEBA) facilities constrain the contribution of Safeguard Mechanism sectors to Australia's overall emissions reduction efforts.

The Safeguard Mechanism provides incentives for Australian industrial producers to reduce the emissions intensity of production. It covers around 220 of Australia's largest industrial facilities, which together account for around 30% of annual national emissions.

The Safeguard Mechanism includes several elements to mitigate risks of carbon leakage, including the ability to emit up to the production adjusted baseline, access to lower baseline reductions if facilities qualify as TEBA facilities, a cost containment measure and access to funding under the Powering the Regions Fund.

These settings are likely to be sufficient to prevent carbon leakage risk over the short- to medium-term. However, over time, default baseline declines could see risks of leakage become more significant for some sectors. Meanwhile, reduced baseline decline rates under TEBA arrangements constrain sectors' contribution to Australia's overall emissions reduction effort.

Consequently, additional measures for some sectors may be needed over time.

2.2 Public investment

Findings

Public investment to help reduce emissions intensity can help address the risk of carbon leakage in specific cases and is particularly relevant for export-oriented industries. A range of such programs exist in Australia.

While fulfilling a range of functions, public investment would not be sufficient as a systematic and fiscally sustainable standalone solution for commodities with high carbon leakage risk.

Well-designed public investment can help the emergence of low and zero emissions export industries. They can also help reduce emissions intensity of production in industries that compete with imports.

In feedback received from consultation, stakeholders highlighted three specific roles for well-calibrated public investment to support industry's transition to net zero and mitigate carbon leakage risks. These are accelerating innovation, supporting low emissions production and enabling infrastructure for decarbonisation. Stakeholders also identified Australia's fiscal limitations as a mid-sized economy and the need for finite public funds to be effectively targeted and efficiently delivered.

The Future Made in Australia National Interest Framework outlines the government's approach to unlocking private investment at scale in industries that are in the public interest. This includes a Net Zero Transformation Stream which will identify sectors that have a sustained comparative advantage in a net zero global economy, and where public investment is needed for the sector to make a significant contribution to emissions reduction at an efficient cost. It also includes an Economic Resilience and Security Stream for sectors where some level of domestic capability is necessary or efficient to deliver adequate economic resilience and security, and the private sector would not invest in this capability in the absence of public investment.

Several of the programs announced in the 2024-25 Budget as part of Future Made in Australia, and previously announced programs such as the Powering the Regions Fund, include public investment targeted at sectors at risk of carbon leakage. These programs will help selected Australian industrial facilities reduce emissions intensity of domestic production, and thereby can make contributions to alleviating carbon leakage risk, in particular for green export-oriented industries.

However, public investment does not address differences in climate policy stringency across countries, which is the root cause of carbon leakage, in a systematic way. This reduces the capacity for public investment programs to address carbon leakage risks comprehensively or in a predictable way. Public investment also has greater fiscal implications than regulatory policy approaches.

In the design of public investment programs, it is important to ensure they provide the long-term certainty required for investment decisions and can be removed or phased out when their support is no longer needed.

The Review sees public investment as having a beneficial role as part of a portfolio of potential options to address leakage, particularly for green export industries. However, it may not be sufficient as a sustainable standalone solution for commodities with high carbon leakage risk.

The Review recognises that relevant public investment is an active area of policy implementation and development, however additional public investment programs specifically to address carbon leakage concerns may not be warranted.

2.6 Findings of leakage by commodity

Findings

The following commodities are found to be subject to potentially material carbon leakage risk over time and may warrant additional policies to be introduced: cement, clinker and lime; hydrogen, ammonia and derivatives; steel and iron; and glass.

Further, potential carbon leakage risks for aluminium and alumina, refined petroleum, and pulp and paper, are recommended for particular consideration as part of the 2026-27 Safeguard Mechanism

Review on the suitability of arrangements for emissions-intensive trade-exposed activities for all commodities.

The Review assessed leakage risks in 2030 for all 75 trade-exposed commodities under the Safeguard Mechanism across 42 commodity groups.

Leakage risk for trade-exposed commodities under the Safeguard Mechanism was assessed using a range of indicators, as well as bespoke econometric analysis for each commodity to quantify trade leakage risk and a proxy for investment leakage risk for broad industry categories. This was combined with commodity-specific qualitative analysis including stakeholder input.

This analysis, presented in **Chapter 2** with further details in the Annex, shows that the risk of carbon leakage is likely to evolve for some specific commodities. The degree and source of that risk varies.

Clinker, cement and lime are commodities where the Review finds a combination of high risks across multiple indicators and high estimates of trade and investment leakage, which aligns with information shared by industry. Hydrogen, ammonia and derivatives, steel and iron, and glass exhibit moderate to high risks on multiple indicators, and trade and investment leakage findings that are material or close to it. These commodities will need additional policy measures over time to address leakage.

Alumina, aluminium, refined petroleum, and pulp and paper form a second group which are not considered at risk based on current analysis, but where risks have the potential to become material. This group is characterised by mixed evidence in relation to leakage risk indicators and analysis of trade and investment leakage.

Border Carbon Adjustment

Findings

A border carbon adjustment applied to imports could be an appropriate policy measure for selected Safeguard-covered commodities with high carbon leakage risk from imports. It could provide a robust underpinning of the Safeguard Mechanism for commodities where carbon leakage risk is material, and efficiently support industrial decarbonisation and the emergence of low emissions industries.

Implementation could be phased and could involve the removal of TEBA provisions for facilities producing commodities once a border carbon adjustment is fully implemented.

A border carbon adjustment that provides rebates for exports would be inconsistent with Australia's emissions reduction targets and could raise considerable international trade law concerns. For these reasons a border carbon adjustment for exports is unlikely to be appropriate for Australia or achieve the relevant policy objectives. Well-designed border carbon adjustments in other countries would provide market premiums to Australian low emissions export commodities.

A border carbon adjustment would need to mirror domestic emissions policy settings for imports to provide a level playing field and be designed to minimise administrative burdens. It would need to be consistent with Australia's longstanding support of an open, rules-based trading system and its international trade law obligations. Australia could advance relevant work with plurilateral initiatives and support trade partner countries with implementation.

A border carbon adjustment mechanism could be used to equalise the effective carbon reduction efforts between Australia and foreign jurisdictions. By doing so, it can address carbon leakage while strengthening incentives to decarbonise production and invest in low emissions facilities in existing industries, as well as supporting the emergence of new low emissions industries.

Many stakeholders have argued in favour of a border carbon adjustment. The Review has closely considered suitability and feasibility of a border carbon adjustment and finds that it could be an appropriate measure for selected commodities, subject to considerations set out below.

The Review has found that a border carbon adjustment that applies a rebate on export is not suitable for Australia. Rebating emissions obligations to exports would effectively exempt production for export from emissions reductions obligations, running counter to overall policy objectives towards net zero and increasing the required emissions reductions elsewhere in the economy. Further, a border carbon adjustment for exports could raise considerable international trade law concerns.

The Review has found that some export-oriented sectors are subject to carbon leakage risk. In some cases, public investments to help Australian facilities decarbonise their production will help competitiveness of exports in international markets, for example by bridging the production cost gap between low emissions and conventional production or reducing exposure to carbon liabilities in markets where emissions of imports are priced. For example, the $4 billion Hydrogen Headstart program will provide production incentives on a competitive basis to close the gap between production cost and sale price, to encourage early large-scale production of renewable hydrogen and derivatives, including ammonia for export.

Longer term, export sectors stand to benefit from increased climate ambition worldwide, including carbon pricing matched with border carbon adjustments in other countries. In this respect, Australia has opportunities to amplify multilateral and plurilateral engagement to encourage premiums for low emissions goods to emerge in other markets.

A border carbon adjustment for selected commodities imported to Australia could be designed to provide a level playing field regarding emissions reduction policy, and to facilitate trade of low emissions commodities. Perspectives from Australia’s trade partners and lessons from international experience would be important in the detailed design of a border carbon adjustment.

In this report, unless otherwise stated, the term ‘border carbon adjustment’ refers to an import-based border carbon adjustment mechanism.

3.4 Sectoral application

Findings

Implementation of a border carbon adjustment would most suitably start with commodities at relatively high risk of carbon leakage and for which implementation is likely to be simplest. Cement and clinker would be suitable candidates in this regard.

Based on current analysis, lime, hydrogen, ammonia and derivatives, steel and iron, as well as glass are also candidates for a border carbon adjustment. However, they possess attributes such as partial Safeguard coverage and complex supply chains, which would likely require more time to investigate and resolve before a border carbon adjustment could be implemented.

Should a border carbon adjustment be pursued, coverage of commodities could be expanded over time where the suitability criteria are met, as reliable emissions monitoring is expanded and domestic and international experience with border carbon adjustments grows. Further stakeholder consultation would need to be undertaken before the addition of other commodities.

The Review's consideration of the suitability of a border carbon adjustment has been informed by a commodity-by-commodity analysis, with regard to:

- the extent of carbon leakage risk facing the sector without additional policies
- the practical feasibility of a border carbon adjustment for the sector, accounting for sector-specific considerations (e.g. simplicity or complexity of calculating embedded emissions, traceability of commodities through supply chains, etc.)
- the share of domestic production subject to Safeguard obligations
- other existing policies that may affect carbon leakage risk assessment or the suitability of a border carbon adjustment.

Using the criteria above, the Review's assessment is that cement and clinker would be suitable for a border carbon adjustment, with earlier implementation being a feasible prospect. Clinker, an energy and emissions intensive key ingredient in cement, has a high ratio of carbon costs to product price and imports are readily substitutable for domestic production. Supply chains are not complex, which facilitates monitoring and reporting of emissions intensity of imports. The assessment is similar for cement.

For both cement and clinker production, a border carbon adjustment may enhance prospects for investment in future low emissions production capacity located wherever cost structures are most competitive. In some circumstances, it could encourage substitution to lower emissions alternatives.

The Review finds that lime, hydrogen, ammonia and derivatives, steel and iron, as well as glass, are also candidates for a border carbon adjustment. However, implementation would suitably be at a later time than for clinker and cement for the following reasons:

- Australia's lime and glass production are only partially covered under the Safeguard Mechanism. Where domestic policy coverage is not near-universal, application of a border carbon adjustment faces additional complexity. Further investigation would be required on whether and how a border carbon adjustment could apply given the current Safeguard Mechanism coverage threshold.

- Hydrogen, ammonia and derivatives, and steel and iron, carry material carbon leakage risks, including with regard to investment in low or zero emissions production capacity. A border carbon adjustment for this group of products could help create durable preconditions for the emergence of green industries in Australia, such as for low and zero emissions iron, hydrogen and ammonia. However, these products feature more complexity with respect to production methods, supply chains, and product diversity. Some products are also only partially covered by the Safeguard Mechanism. There may be merit in exploring earlier piloting of a border carbon adjustment for some types of steel (such as reinforcement bar) where suitable to do so, before expanding to the broader steel and iron group.

3.5 Design considerations

Findings

A border carbon adjustment would need to mirror key provisions of the Safeguard Mechanism. Should a border carbon adjustment be pursued, a border carbon liability could be applied to emissions in exceedance of the Safeguard Mechanism baselines and to the extent that the assessed effective carbon price paid in the originating country is lower than the Australian benchmark price. This assessment would be based on explicit emissions prices only.

The basis for emissions assessment should be the same as the Safeguard Mechanism, covering only scope 1 emissions and all relevant greenhouse gases.

Further consideration would be needed before a border carbon adjustment is applied to a commodity with less than 100% Safeguard Mechanism coverage of domestic production.

A border carbon adjustment for a particular sector would remove the policy basis for TEBA provisions for that sector. Consequently, TEBA provisions for a commodity should be removed once a border carbon adjustment is fully implemented for that commodity.

A border carbon adjustment may generate revenue. Stakeholders have suggested that in addition to offsetting the costs of implementation of the policy, funds could also be provided to programs to support implementation and industrial decarbonisation objectives in trade partner developing countries or in Australia. The Review sees particular benefit in supporting programs in developing trade partner countries in the region.

Should the government decide to pursue a border carbon adjustment, detailed design and implementation would need to be considered and consulted on. Consultation would need to encompass both domestic and international stakeholders, including trading partner countries.

The key principle underpinning an appropriately designed border carbon adjustment is to mirror domestic policy settings for imported goods. This means that any design decisions should be referrable to the Safeguard Mechanism’s design.

As such, the scope of emissions captured by a border carbon adjustment should be scope 1 only, as grid connected electricity generators do not have emissions reduction obligations under the Safeguard Mechanism.

Compliance

Should a border carbon adjustment be pursued, border carbon adjustment liabilities should be defined to be comparable to the obligations on domestic producers.

To achieve this design objective, carbon adjustment liabilities should apply only to emissions that exceed the relevant Safeguard Mechanism baseline at the time of import. Any imports which have an emissions intensity below that baseline should not carry a border carbon adjustment liability. Under this design, importers, like domestic producers, would have to pay for or offset any emissions in exceedance of the baseline.

Similarly, any carbon costs already incurred in the country of production should be deducted from the liability. This means if a producer has paid a carbon cost in the originating country which is higher than the calculated carbon cost applied by the border carbon adjustment, they would not face a liability. This assessment of overseas carbon costs should be based on explicit emissions prices only (after accounting for any free allocations). Other emissions reduction policies, to the extent that they are effective at reducing the emissions intensity of goods, would be accounted for by reducing the total emissions subject to a border carbon adjustment liability.

Revenue

A border carbon adjustment would result in revenue collected by government if it partially or fully adopts a fee model instead of, or as well as an Australian Carbon Credit Unit (ACCU) surrender model. The amount of revenue is difficult to predict. However, it is likely that the amount of border revenue will be small relative to the overall value of imported products.

If there is border carbon adjustment revenue, it is relevant that the costs of implementing the program need to be funded. Additional funding could go to support other policy priorities, including decarbonisation programs.

Some stakeholders have raised that in conjunction with the introduction of a border carbon adjustment, funding could be directed towards helping to build capacity in developing trade partner countries for emissions monitoring, verification and reporting, or to support industrial decarbonisation. Other stakeholders also raised the option of increasing funding to support domestic industry to decarbonise.

The Review considers that supporting programs in developing trade partner countries in Australia's region may offer benefits, such as in enhancing understanding and acceptance of border carbon adjustments. Amounts are expected to be small in comparison to existing public investment measures to support domestic decarbonisation and emergence of green industries.

Safeguard TEBA arrangements

Under the Safeguard Mechanism, trade-exposed baseline adjusted (TEBA) arrangements reduce baseline decline rates under the Safeguard Mechanism where there is a significant impact on revenue (EBIT for manufacturing facilities). A border carbon adjustment for a particular sector would ensure that imports would receive equivalent policy treatment as domestic production. For import competing sectors, as the underlying challenge of carbon leakage would be fully addressed, it would be logical to remove TEBA for those commodities once a carbon border adjustment is fully implemented for that commodity.

TEBA is only available for facilities that meet a threshold impact of carbon costs. A border carbon adjustment reduces cost disadvantage to domestic Safeguard producers relative to imports that may arise from differences in climate change policy and facilitates pass-through of carbon costs in product markets. This would significantly decrease TEBA eligibility across facilities. If facilities have a higher cost base because they remain more carbon intensive than their competitors, then supporting such a facility would need to be for reasons other than differential climate policy.

Retaining or phasing out TEBA with a border carbon adjustment would create complexity in determining the relevant border carbon adjustment liability. Given the intention to equalise costs across domestic production and imports, any TEBA allocation would need to be reflected in the liability calculation. This calculation would be particularly complex if different facilities producing a commodity received different adjustments under TEBA.

The retention of TEBA with a border carbon adjustment could raise international trade law concerns, particularly regarding the principle of non-discrimination.

Administrative considerations

Findings

Should a border carbon adjustment be pursued, frameworks relating to reporting and verification of emissions should minimise administrative burden, including through streamlined reporting processes that maintain confidentiality for producers; effective yet efficient emissions verification; and suitable emissions intensity default values.

These frameworks should align with existing and future international standards when possible, including supporting the development of frameworks for emissions monitoring and industrial decarbonisation for Australia's trade partners.

Submissions to the Review's consultation papers and subsequent consultations emphasised that a border carbon adjustment should have as low an administrative burden as possible and not act as a barrier to trade. This includes simplified and digitised procedures which can support trade and enable interoperability with emerging environment and climate trade standards and verification schemes, such as the Guarantee of Origin and its equivalents overseas.

In international consultations in the region, the importance of pragmatic, low-cost procedures for emissions monitoring, reporting and verification for any border carbon adjustment was consistently highlighted. International consultations also emphasised the importance of preserving confidentiality of proprietary production data.

While specific design and implementation decisions relating to a border carbon adjustment mechanism would occur after a government decision on whether to implement a border carbon adjustment, the Review has considered key issues relating to administration as part of its overall feasibility assessment.

A confidential, efficient and effective framework for reporting and verifying emissions will be an important first step in the implementation of any border carbon adjustment.

Given the differences in emissions accounting systems internationally, it would also be important to establish suitable emissions intensity default values. Emissions default values should prioritise accuracy while still maintaining incentives to report actual emissions values. Interoperability with other countries' existing and future standards will also be an important consideration. This would support development of common frameworks for emissions monitoring and industrial decarbonisation policies with Australia's trade and strategic partners, bilaterally and multilaterally.

In principle, importers could acquit the liability by paying a fee or surrendering ACCUs. It would also be theoretically possible to provide importers the choice of a fee or surrendering ACCUs. Consultation feedback indicated broad support among stakeholders for the fee option.

Modelling a border carbon adjustment for Australia

Findings

The Review used a variety of analytical tools to assess the potential impacts of border carbon adjustments on prices and output.

None of this analysis found material impacts on the macroeconomy.

Computable General Equilibrium (CGE) modelling of a potential border carbon adjustment on cement, clinker, lime, steel, ammonia and ammonia derivatives shows no material impact on aggregate economic activity and negligible changes to imports and exports when compared to current policy settings.

Input-Output analysis indicates that the impact of a border carbon adjustment on downstream activity, such as construction, would be very limited.

The Review's analysis suggests that the maximum price impacts on final goods that incorporate commodities that may be subject to a border carbon adjustment, such as wind farms, house construction and crops like wheat, would be vanishingly small as a share of product prices.

Indicative modelling of a border carbon adjustment was undertaken using an integrated modelling framework that combines sectoral, domestic and global models. Modelling presents an economic assessment of potential policies designed to address carbon leakage. The modelling focused on a border carbon adjustment in combination with current settings under the Safeguard Mechanism, and a comparison with the option to remove TEBA for sectors covered by a border carbon adjustment. This modelling complements the economic analysis of a border carbon adjustment (see **Section 3.3**).

Modelling has focused on cement, clinker, lime, steel, ammonia and ammonia derivatives to demonstrate the possible economic effects of a border carbon adjustment on multiple sectors. The Review's assessment is that these sectors may be suitable for consideration for a border carbon adjustment (see **Section 3.4**). One set of scenarios applies a border carbon adjustment on cement, clinker and lime only, and a second set of scenarios applies the adjustment to all sectors.

Climate policy modelling is highly complex. There are many data sources and assumptions that are used throughout this process. This modelling is illustrative of possible scenarios that could emerge, but each scenario represents only one possible outcome. Therefore, the economic outcomes of these scenarios should not be viewed as predictions or forecasts, but as an illustrative description of a possible future outcome given a potential carbon leakage policy.

The estimated price impacts on final goods such as wind farms, house construction and crops like wheat that incorporate commodities that may be subject to a border carbon adjustment are found to be vanishingly small as a share of product prices.

Mandatory emissions product standards

Findings

While mandatory emissions product standards can be suitable for other policy objectives, they are not likely to be an effective policy intervention to address carbon leakage risk.

Mandatory product standards can fulfil a range of objectives, including to facilitate a shift towards low-emissions products and production technologies. A mandatory emissions product standard could in principle be used as a way to address leakage concerns, by precluding the sale of products that exceed some threshold emissions intensity.

Mandatory emissions product standards could be designed to restrict entry of products into the Australian market above some standard. They would carry similar emissions verification requirements and compliance costs as a border carbon adjustment, but without the flexibility that a border carbon adjustment mechanism could offer, and without affecting carbon leakage risks for products that meet a minimum standard. It could risk detrimental supply chain problems if there was insufficient supply of a commodity below the product standard to meet demand.

As a tool to address carbon leakage risk, submissions to the Review's consultation processes expressed concern about, and only very limited support for, mandatory emissions product standards for commodities covered by the Safeguard Mechanism. In particular, submissions expressed concern that a mandatory emissions product standard would be a blunt tool to address carbon leakage, with risks of unintended and detrimental consequences.

While mandatory emissions product standards can be effective interventions to achieve other climate objectives, the Review has not identified any instances in which they would be an effective policy instrument to address carbon leakage risk.

Multilateral and plurilateral initiatives

Findings

Given Australia's strong stake in the international rules-based system, policy responses to address carbon leakage risks should advance and support the international system.

Enhanced global climate action would reduce carbon leakage, but divergences in ambition and policy approaches will persist in the medium-term.

An internationally agreed solution to address carbon leakage risk developed through multilateral and plurilateral initiatives would be ideal, but is uncertain and would take time to develop. Possible long-term international solutions will not replace the near- and medium-term need for domestic policy action.

Multilateral and plurilateral initiatives could support the implementation of border carbon adjustments through the adoption or development of interoperable standards and approaches, for example, the development of agreed default emissions intensities or standards to measure embedded emissions.

Australia’s active engagement in relevant multilateral and plurilateral initiatives would support the development of best practice policy to address carbon leakage. Enhanced engagement is an opportunity for Australia to contribute positively to international policy development.

An Australian policy response to address carbon leakage risk should support and advance Australia’s broader interests in the international system. Australia is an active participant in existing international discussions on carbon leakage.

Enhanced global climate action would be the most desirable way to reduce the risk of carbon leakage from a climate and trade perspective. But divergence in ambition and approaches will persist for some time.

A multilateral or plurilateral solution to address carbon leakage would be ideal, for example an internationally agreed approach for border carbon adjustments. Whilst some international initiatives focused on carbon leakage are prospective, consensus or broad-based agreement on any international solution will take time to develop and will not replace the need for domestic policy action in the short- to medium-term.

Multilateral and plurilateral initiatives could play a more immediate role to support the implementation of border carbon adjustments by contributing to the development of commonly accepted and interoperable approaches. An Australian border carbon adjustment framework could draw on such internationally agreed approaches where and when they arise. For example, efforts underway internationally could support the development of common emissions accounting standards or agreed default emissions intensities that could contribute to more harmonious approaches to border carbon adjustments.

There is value in deepening collaboration with like-minded trade and climate partners. Existing initiatives focused on carbon leakage are at an early stage. Australia’s participation could contribute to positive international policy innovation in a manner that supports the international system and the development of interoperable policy approaches. This could occur in initiatives like the Climate Club, the OECD’s Inclusive Forum on Carbon Mitigation Approaches, at the UNFCCC, WTO and ISO, or in regional or other groupings.

Recommendations

Based on the findings, the Review recommends:

1. A border carbon adjustment be introduced for a select group of commodities that are of particular risk of carbon leakage from imports, adopting the following approach:
    a. A border carbon adjustment be introduced for cement and clinker.
    b. A border carbon adjustment be considered for: lime; hydrogen, ammonia and derivatives; steel and iron; and glass, subject to further assessment.
    c. A border carbon adjustment that provides rebates for exports not be pursued, for consistency with Australia's emissions reduction targets and to avoid international trade law concerns.
2. Should the government decide to pursue a border carbon adjustment, it should be designed consistently with Australia's international trade law obligations and:
    a. The border carbon adjustment should mirror domestic emissions policy settings for imports to provide a level playing field.
    b. The liability should be assessed based on scope 1 emissions above benchmarks set in line with Safeguard Mechanism baselines and differences between the effective carbon price paid in the originating country and an Australian benchmark price. This assessment should be based on explicit emissions prices only.
    c. TEBA provisions for a commodity should be removed once a border carbon adjustment is fully implemented for that commodity.
    d. Compliance requirements of the border carbon adjustment, including emissions measurement, reporting and verification requirements should be designed to minimise administrative burden.
    e. The design and implementation stage should include consultation with domestic and international stakeholders, including trading partner countries.
    f. In conjunction with the potential revenue, options should be pursued to help build capacity in trade partner developing countries for emissions monitoring, reporting and verification.
3. That the Government continue to actively engage in multilateral and plurilateral initiatives that could support the implementation of border carbon adjustments, for example through the development of interoperable standards and approaches to default emissions intensities or measurement of embedded emissions.

1 Introduction

This report outlines the Review's findings on carbon leakage risks and advice on additional policy options to address identified leakage risk. It also discusses the feasibility of these policy options.

The report has been informed by analysis and modelling undertaken as part of the Review, and by stakeholder feedback on the Review's consultation papers.

1.1 Carbon leakage in the context of the net zero transition

Australia has a legislated national target of reducing emissions by 43% below 2005 levels by 2030 and to net zero by 2050. A range of policies have already been introduced to achieve this, including Rewiring the Nation, the Capacity Investment Scheme, the National Reconstruction Fund, Hydrogen Headstart and the reformed Safeguard Mechanism. To establish pathways for Australia's transition to net zero, the government is also developing a Net Zero Plan and an emissions reduction target for 2035, both of which will be underpinned by six sectoral emissions reduction plans.[1]

The transition will also present opportunities and challenges for individual countries. Australia has an ambition to become a renewable energy superpower.[2] By harnessing our potential comparative advantages (including low-cost firmed renewable energy, abundant land, and critical mineral and resource endowments), Australia could become a significant future exporter of low emissions energy and commodities. This would deliver significant economic benefits while supporting the global transition to net zero.

Industry has a central role in driving Australia's transition to net zero and realising our potential as a renewable energy superpower. Climate policies will also play a vital role in:

- providing the right incentives for industry to transition to low and zero emissions production, especially through investment
- creating market premiums for low emission commodities
- supporting international trade of clean, energy-intensive commodities.

Climate change ambition is increasing globally. As of June 2024, over 100 countries had made net zero commitments.[3] They include countries that are destinations for 97% of Australia's exports.[4] The majority of countries have emissions targets for 2030 in place and are expected to communicate strengthened ambition for 2035. In aggregate, a gap remains between stated ambition and the effect of climate policies, however the prevalence and effectiveness of climate change policies has been rising.[5] As part of a multitude of policy approaches, carbon pricing is on the rise. As of April 2024,

[1] DCCEEW, Net Zero webpage, available here.
[2] Annual Climate Change Statement, November 2024, available here.
[3] UN Net Zero Coalition, available here.
[4] DCCEEW, Annual Climate Change Statement 2023, November 2024, available here.
[5] Intergovernmental Panel on Climate Change 2023: Synthesis Report for the 6th Assessment Report, available here.

24% of global greenhouse gas emissions were covered by a price signal, through 75 different emissions trading schemes or carbon taxes.[6]

At the same time, differences remain in the ambition, effectiveness and coverage of climate policies, including between Australia's policies and those of trading partners. Such differences create a risk of carbon leakage, which in turn can hamper the effectiveness and efficiency of policy aimed at providing incentives to decarbonise industries producing tradable goods.

As a trading nation, Australia's international partnerships will be essential to our transition. Our economic prosperity will be underscored by maintaining a free, fair, open and rules-based international trading system. Internationally compatible approaches to emissions measurement and policy will be fundamental to a robust green international trading system.

The Review was particularly cognisant of the need to carefully identify the conditions under which carbon leakage policies should apply to particular industries. As carbon leakage risks change over time, the need for a policy response to carbon leakage risk may materialise in the future. However, carbon leakage policies now and in future should be implemented only where a material leakage risk is identified and where such policies will both support climate policy objectives and be compatible with rules-based trade principles.

The Review focused on durable policy settings, including establishing the criteria for any future policy action in a manner that can preserve Australia's climate and trade policy objectives.

1.2 What is carbon leakage?

Carbon leakage refers to shifts in the production of emissions-intensive trade-exposed commodities from countries with more ambitious emissions reduction policies to those with weaker (or no) emissions reduction policies, due only to differences in policy stringency across countries.

Following this definition, changes in production that occur due to other factors, such as differences in production costs or differences in emissions intensity under equal climate policy treatment, are not carbon leakage.

Carbon leakage can occur via two channels:[7]

- *Trade channel:* domestic climate policies can lead to increased domestic production costs, creating a cost advantage for traded products from jurisdictions with no or less stringent climate policies.
- *Investment channel:* current or expected future policy differences can lead new investments to shift towards countries with less stringent policies.

Carbon leakage could hinder the achievement of global net zero emissions. A high amount of carbon leakage over time would see emissions reduction in a country with more stringent climate policies being offset or exceeded by emissions increases overseas due to shifts in production. It could also

[6] World Bank, State and Trends of Carbon Pricing 2024, available here.

[7] This is consistent with the framework others have taken. This Review did not explicitly assess an energy channel for Carbon Leakage, such as described in the World Bank's ETS Handbook, available here.

undermine the economic, social and political foundations needed for sustained, effective and ambitious climate policy.

Emissions reductions policies that apply to traded, emissions intensive commodities are typically accompanied by dedicated measures to prevent or minimise leakage.

Policies to address leakage risk give firms greater confidence to invest in low and zero emissions technologies and can pave the way for stronger domestic emissions reductions and investment in clean production capacity.

1.3 About the Review

The Review originated from the reforms to Australia's Safeguard Mechanism, which came into effect on 1 July 2023. During the reform process, stakeholder feedback was received on additional policies to address carbon leakage risks over the long-term. As part of the final reform package for the Safeguard Mechanism, the government announced measures to address leakage and a commitment to undertake the Review.[8]

The Terms of Reference for the Review are included at **Appendix A**.

The Review's scope included an assessment of carbon leakage risks, policy options to address carbon leakage, and the feasibility of different policy options including a potential Australian border carbon adjustment (BCA) mechanism, particularly for steel and cement.[9]

The Review was undertaken by the Department of Climate Change, Energy, the Environment and Water (the Department) and led by Professor Frank Jotzo. Members of the Review team are listed at **Appendix B**.

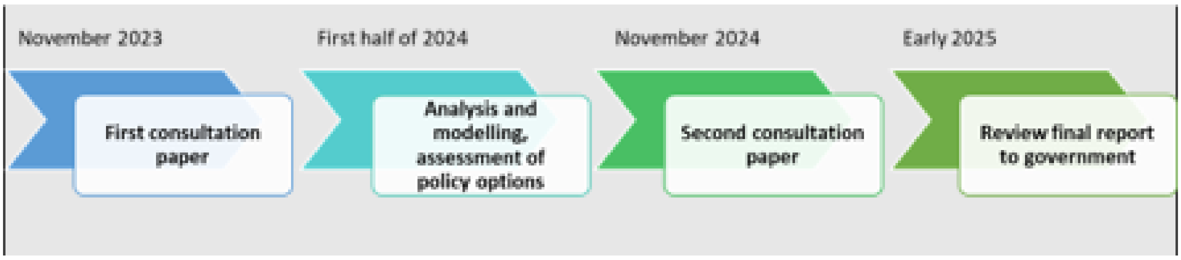

Figure 1: Timeline for the Review.

[8] Media release, March 2023, available here.
[9] Information on the Review is available here.

1.4 Engagement

The Review consulted with a range of stakeholders including industry and international trade partners, as well as NGOs and think tanks, research experts, and the broader community.

In response to the first consultation paper released in November 2023, the Review received 77 submissions from businesses, industry associations, academics, unions and private individuals.[10] Feedback was also received in meetings with stakeholders and in a webinar.

In response to the second consultation paper released in November 2024, the Review received 65 submissions from businesses, industry association, academic, unions, international businesses and industry associations and fellow government organisations. Some of the submissions are public, others confidential.

The Review also hosted a number of industry roundtables for commodities specifically mentioned in the Review's findings, roundtables for peak groups and research organisations, and a public webinar. Feedback was also received in meetings with stakeholders.

The Review engaged with international partners, including government, industry, and other groups. The Review directly engaged with stakeholders in Canada, China, the European Union, India, Indonesia, Japan, South Korea, Malaysia, New Zealand, Thailand, the United Kingdom, the United States and Vietnam. The Review also engaged with international organisations including the World Trade Organization (WTO), the Organisation for Economic Co-operation and Development (OECD) and the International Energy Agency (IEA).

[10] Public submissions have been published on the Consultation Hub, available here.

2 Leakage under existing policies

2.1 The Safeguard Mechanism

Findings

Current Safeguard Mechanism settings are effective at mitigating carbon leakage risk in the short- to medium-term. But settings for some sectors may need to be augmented with additional measures over time. Reduced baseline decline rates for Trade Exposed Baseline Adjusted (TEBA) facilities constrain the contribution of Safeguard Mechanism sectors to Australia's overall emissions reduction efforts.

The Safeguard Mechanism provides incentives for Australian industrial producers to reduce the emissions intensity of their production over time. It covers around 220 of Australia's largest industrial facilities, accounting for around 30% of annual national emissions.

The Safeguard Mechanism sets annual limits, or baselines, on emissions from each facility. Baselines are set on a production-adjusted basis, meaning they vary as production volumes rise or fall. From 1 July 2023, baselines decline on a trajectory consistent with Australia's 2030 emission reduction target and net zero by 2050 target. Baselines will generally decline by 4.9% per year between 2023-24 and 2029-30.

Safeguard facilities automatically receive Safeguard Mechanism Credits (SMCs) when their emissions are below their baseline. SMCs can be sold to other Safeguard facilities to meet Safeguard obligations or held for future use.

Facilities are required to keep emissions to their baselines or to cover excess emissions through the surrender of SMCs or Australian Carbon Credit Units (ACCUs). Emissions up to the baseline do not attract any compliance costs.

The Safeguard Mechanism includes several elements to mitigate risks of carbon leakage.

- Facilities can emit up to their baseline level. This is equivalent to the role that free allowances play under emissions trading schemes. The production-adjusted nature of baselines flexibly allows for changes in production and emissions.
- Facilities that are trade-exposed and experience particular cost impacts – also referred to as TEBA facilities – can have their baseline decline rates reduced, from the default 4.9% down to a minimum of 2% for non-manufacturing sectors or 1% for manufacturing sectors.
- A cost-containment measure enables eligible facilities to purchase ACCUs from the government. This provides certainty to facilities on maximum compliance costs.
- Federal funding to assist Safeguard facilities to reduce their emissions. This includes various funding streams under the Powering the Regions Fund, including the Safeguard Transformation Stream ($600 million) and Critical Inputs to Clean Energy Industry Stream ($400 million).

A key question for the Review was whether these policy settings will be sufficient to prevent or minimise leakage risk over the long-term, and whether and what form of additional or alternative policy approaches may be required for specific commodities. The Review undertook extensive analysis and consultation on these questions, as detailed below.

Stakeholder feedback indicated that existing settings may be sufficient to prevent carbon leakage risk over the short-term, but as baselines decline and compliance costs rise, leakage risks may become more significant and existing settings may not be sufficient to address them.

> *BlueScope welcomes the Paper's preliminary finding that current SGM settings are effective at mitigating carbon leakage risks for steel in the short term. The 'Trade Exposed Baseline Adjusted' (TEBA) regime is the most important and effective measure to limit short to medium term carbon leakage risk, but will need to be supported by additional longer-term measures.*
> – **BlueScope submission to November 2024 consultation**
>
> *Our industry members agree with the consultations findings that current Safeguard Mechanism (SGM) settings, Trade Exposed Baseline Adjusted (TEBA), mitigate carbon leakage for steel in the short term – however this will need to be monitored closely in the future for the need for additional measures. Our members are concerned leakage risks are expected to rise in the future and combined with specific TEBA baselines decline and a rise in business compliance costs, longer term support measures will be required.* – **Australian Steel Institute submission to November 2024 consultation** *Whilst these settings may be sufficient for most sectors, further measures are immediately required for the cement and lime sectors until a border carbon adjustment measure is legislated and introduced to address carbon leakage (both domestically and internationally).*
> – **Cement Industry Federation submission to November 2024 consultation**
>
> *An ideal carbon leakage policy achieves lower emissions in Australia and preserves the economic viability of exposed industries by ensuring they remain competitive in a global market … It is unlikely that the Safeguard Mechanism alone could address Australia's carbon leakage concerns and still maintain the allocated emissions budget to the mechanism.*
> – **Fortescue submission to November 2023 consultation**

Additionally, maintaining TEBA arrangements could constrain the contribution of Safeguard Mechanism sectors to Australia's future emissions reduction efforts. As shown in Figure 2, the estimated baseline allocation for TEBA facilities, as a share of the overall emissions budget for the Safeguard Mechanism, is anticipated to increase each year.

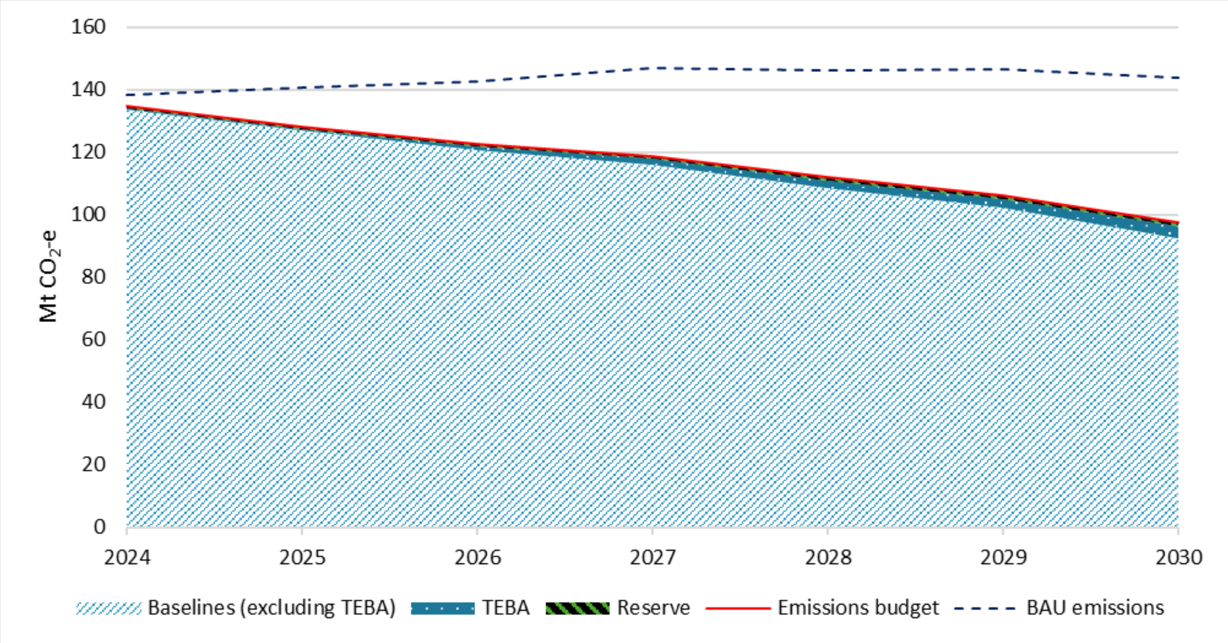

Figure 2: Aggregate estimated emissions baselines, TEBA allocations, and the reserve in the Safeguard emissions budget, according to projections underlying *Australia's emissions projections 2024*.[11]

For these reasons, there was benefit in considering additional policy measures for the medium- to longer-term.

2.2 Public investment

Findings

Public investment to help reduce emissions intensity can help address the risk of carbon leakage in specific cases and is particularly relevant for export-oriented industries. A range of such programs exist in Australia.

While fulfilling a range of functions, public investment would not be sufficient as a systematic and fiscally sustainable standalone solution for commodities with high carbon leakage risk.

The government's Future Made in Australia National Interest Framework outlines the government's approach to unlocking private investment at scale in industries that are in the public interest. This includes a Net Zero Transformation Stream which will identify sectors that have a sustained comparative advantage in a net zero global economy, and where public investment is needed for the sector to make a significant contribution to emissions reduction at an efficient cost. It also includes an Economic Resilience and Security Stream for sectors where some level of domestic capability is

[11] Safeguard Mechanism baseline data includes estimated onsite abatement and estimates of TEBA allocations, consistent with Australia's emissions projections 2024.

necessary or efficient to deliver adequate economic resilience and security, and the private sector would not invest in this capability in the absence of public investment.[12]

Several of the programs announced in the 2024-25 Budget as part of Future Made in Australia, and previously announced programs such as the Powering the Regions Fund, include public investment targeted at sectors at risk of carbon leakage. These programs will help reduce emissions intensity of domestic production, and thereby can make contributions to alleviating carbon leakage risk, in particular for green export-oriented industries prioritised under Future Made in Australia including renewable hydrogen and derivatives, green metals, low carbon liquid fuels and critical minerals.[13]

Roles of government investment in supporting the net zero transition include:

- *Accelerating innovation and cost reductions of low emissions technologies:* Public investment helps address market failures that would otherwise prevent sufficient investment in research and development, piloting and early commercial deployment of nascent low emission technologies. It helps defray and derisk the high capital costs for pilots and early-stage deployments, which in turn drive technologies along their learning curves and brings costs down.

- *Supporting low emissions production:* Public investment can help bring forward low emissions production whilst green premiums exist, and markets do not price negative externalities from emissions. In these cases, public investment in the form of production or tax credits, such as those announced under Future Made in Australia, can help bridge the green premium gap that would otherwise discourage private investment in low emissions production. This support would be time-limited and phased down as green premium gaps reduce.

- *Shared infrastructure for decarbonisation:* Shared infrastructure often has public good characteristics. Public investment in shared infrastructure can support decarbonisation, for example investment in local electricity transmission (such as microgrids and sharing between off-grid facilities), hydrogen hub infrastructure, or carbon dioxide transport and storage infrastructure.

Feedback from stakeholders reinforced these roles for public investment and provided specific examples. Stakeholders also identified Australia's fiscal limitations as a mid-sized economy and need for finite public funds to be effectively targeted and efficiently delivered.

Some stakeholders also noted potential synergies between public investment and other policies such as a border carbon adjustment. For example, pass through of carbon costs enabled by a border carbon adjustment supports growth of new low emissions industries, while reducing the need for financial support by government.

> *While The Superpower Institute agrees that public investment is not a systematic solution to carbon leakage, we note the important role that public investment plays in addressing market failures related to externalities (carbon emissions), innovation spillovers, and provision of*

[12] Speech, 11 April 2024, available here.
[13] Future Made in Australia - National Interest Framework, Treasury, May 2024, available here.

> *essential shared infrastructure.* – **The Superpower Institute submission to November 2024 consultation**
>
> *Targeted public investment through these programs is an important step in reducing the long-term carbon exposure, de-risk investment decisions and accelerate technology cost reductions through deployment and learning.* – **Australian Chamber of Commerce and Industry submission to November 2024 consultation**

Well-designed public investment can help the emergence of zero emissions export industries. They can also help reduce emissions intensity of production in industries that compete with imports. This can help reduce exposure to carbon leakage risk. However, public investment does not address differences in climate policy stringency across countries, which is the root cause of carbon leakage, in a systematic way. This reduces the capacity for public investment programs to address carbon leakage risks comprehensively or in a predictable way. Public investment also has greater fiscal implications than regulatory policy approaches.

To fully address carbon leakage risks, public investment programs would need to cover a multitude of investments in many facilities. It would require continuous monitoring and assessment of exposure. Even so, government programs would not be able to identify and cover every instance of carbon leakage risk and the investment response would inevitably be uneven.

In the design of public investment programs, it is important to ensure they provide the long-term certainty required for investment decisions, but can also be removed when their support is no longer needed or the benefits of public investments no longer outweigh the costs including shifting risk from private investors to the public.

As such, public investment can have beneficial role as part of a portfolio of potential options to address leakage, particularly to support emerging low and zero emissions export industries. However, public investment programs may not be sufficient as a sustainable solution for commodities with high carbon leakage risk. Many stakeholders expressed similar views in their submissions.

2.3 Assessing carbon leakage risks

The Review assessed leakage risks for all 75 trade-exposed commodities under the Safeguard Mechanism Rule.[14] To streamline the analysis, these commodities were grouped into 42 commodity categories.[15] Some trade-exposed commodities are not yet produced and traded at commercial scale in Australia and so a leakage indicator was not able to be assessed due to insufficient data. These commodities include liquid and gaseous hydrogen, primary iron, lithium hydroxide, rare earth oxides, phosphoric acid, renewable aviation kerosene and renewable diesel.

Following the release of the second consultation paper, the assessment of carbon leakage risks was revised for this final report. The revised analysis incorporates updated production data, estimates of baselines in 2030, and improvements to the calculation methodology. A detailed description of the changes since the second consultation paper is included in the Annex. The analysis represents a point in time estimate of leakage risks and is dependent on several market-based factors, including unit prices, production and trade ratios, and ACCU prices.

A watching brief on leakage risk levels and the appropriateness of policy settings would be warranted beyond this Review. The 2026-27 Safeguard Mechanism Review provides one such opportunity to reassess leakage risks for all commodities, with particular consideration for selected commodities identified later in this report.

Imports and exports of these commodities were worth A$456 billion in 2023, making up 47% of the value of total Australian trade in all goods in that year.

Table 1 below shows value of trade for goods covered by a Safeguard production variable grouped into categories. This identifies whether a category is associated with a high value of trade and the value of trade in exports and imports.

Table 1: Australian trade of Safeguard Mechanism-covered goods in 2023[16]

Category	2023 Import value ($m AUD)	2023 Export value ($m AUD)	Import share of total trade (%)
Steel: Crude steel	49	59	46
Steel: Long steel products	1,313	107	92
Steel: Flat steel products	410	311	57
Steel: Treated steel flat products	641	448	59
Cement production: Cement	205	4	98
Cement production: Clinker	364	0	100
Cement production: Lime	89	0	100

[14] Trade-exposed commodities are those listed in Schedule 2 of the *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015*, available here.

[15] For example, iron ore pellets, coke oven coke and lime (integrated iron and steel manufacturing) production variables are regarded as part of the steel commodity group and were not analysed separately.

[16] Data sourced from UN Comtrade.

Category	2023 Import value ($m AUD)	2023 Export value ($m AUD)	Import share of total trade (%)
Chemicals: Ammonia	134	168	44
Chemicals: Ammonium nitrate	175	26	87
Chemicals: Ammonium phosphate	894	252	78
Chemicals: Urea	1,844	3	100
Chemicals: Sodium cyanide	5	4	55
Aluminium production: Alumina	46	8,298	1
Aluminium production: Aluminium	214	5,167	4
Aluminium production: Bauxite	2	1,681	0
Glass: Flat glass	731	26	97
Glass: Glass containers	166	35	83
Pulp and paper	1,027	868	54
Polyethylene	707	0	100
Energy: LNG	1	74,572	0
Energy: Refined petroleum	54,899	4,219	93
Energy: Coal	354	102,012	0
Energy: Crude oil	8,274	11,564	42
Energy: Ethane and LPG	359	2,137	14
Iron ore	190	135,985	0
Basic non-ferrous metal	107	1,041	9
Nickel products	2	471	0
Magnesia	13	-	100
Manganese ore	22	1	98
Ferro-manganese	12	0	100
Silicomanganese	6	-	100
Lithium ore	18	19,083	0
Synthetic rutile	119	675	15
Titanium dioxide	3	1	68
Other metal ore	725	12,301	6
Silicon	62	159	28
Ethanol and dried distillers grain	87	709	11
Emerging industry: Lithium hydroxide	9	43	17
Emerging industry: Phosphoric acid	22	0	99
Emerging industry: Rare earth oxides	N/A	N/A	N/A
Emerging industry: Renewable diesel	N/A	N/A	N/A
Emerging industry: Renewable aviation kerosene	N/A	N/A	N/A

Leakage risks and estimates were assessed using 6 key indicators:

- ***Carbon costs as a share of commodity prices***: Carbon costs were estimated based on emission reduction obligations under the Safeguard Mechanism in 2030 (consistent with Australia's current Nationally Determined Contribution). This obligation reflects the reduction of emissions intensities from 2022 baseline levels to levels corresponding to 2030 baselines (with estimated effects of TEBA settings factored in).[17] This is multiplied by the projected ACCU price in 2030 (consistent with Australia's emissions projections), which serves as a proxy for the marginal cost of abatement, including onsite abatement where used.[18] Prices of commodities are drawn from multiple sources, and in most cases inferred from data on trade volumes and values between 2019 and 2023 inclusive. The unit prices of these commodities can vary significantly, accordingly results of computations are presented as ranges rather than point estimates. Carbon costs as a share of commodity prices is given by the equation below (see the Annex for further details).

$$\frac{(Average\ Emissions\ Intensity_{2022}\ -\ Baseline\ Emissions\ Intensity_{2030}\ ) \times\ ACCU\ price_{2030}}{Commodity\ Price\ per\ unit\ (e.g. tonne)} \times 100\%$$

- ***Imports/exports relative to Safeguard production***: This assessed the extent to which trade matters for Australian commodities and whether trade exposure exists mainly in domestic or export markets. The indicator is a ratio calculated as the volume of imports or exports divided by the volume of Safeguard Mechanism-covered domestic production in 2022.[19] The ratios are presented as ranges because some underlying Safeguard data is confidential.

$$\frac{Exports\ \text{OR}\ Imports}{Safeguard\ Production}$$

- ***Sensitivity of imports/exports to price changes***: Trade-price elasticities were estimated for each commodity to understand the sensitivity of imports and exports to price changes. They give a broad indication of how susceptible commodities may be to trade leakage. For example, an elasticity of -0.5 implies a 1% increase in price has been, on average, associated with a 0.5% reduction in imports or exports. These estimates are derived from econometric analysis of Australian Bureau of Statistics (ABS) data. See Annex for further details including a discussion of confidence interval and robustness checks.

- ***Share of production covered by the Safeguard Mechanism***: The proportion of domestic production covered by the Safeguard Mechanism varies across commodities. As production data

[17] Default (industry average) emissions intensity values are used as a proxy for emissions intensity levels in 2022, noting that onsite electricity generation has a separate default emissions intensity in the Safeguard Mechanism Rule. Electricity generation emissions are therefore excluded from the analysis. Baseline emissions intensities in 2030 for each good are calculated by averaging 'baseline components' for each facility and production variable corresponding to that good. Further details are described in the Annex.

[18] In the case of onsite abatement, this reflects an economically rational assumption that onsite abatement is undertaken when abatement costs are equal to or cheaper than the cost of ACCUs. In practice, there may be other reasons why firms choose to undertake onsite abatement in preference to purchasing ACCUs. The equation does not take into account any likely reductions in emissions intensity due to onsite abatement that is greater than the reduction in baselines between 2022 and 2030.

[19] The import and export values were typically for the year 2022. Where that year appeared to be an outlier due to COVID-19, Ukraine war impacts, or other market volatility, a more appropriate value such as an average from 2019 to 2023 was used instead.

is not available for some commodities, Safeguard-covered emissions as a percentage of total emissions from all National Greenhouse and Energy Reporting Scheme (NGER) facilities producing that commodity were calculated as a proxy for this. The ratio indicates what share of production is potentially subject to leakage risk. It is also a factor in assessment of feasibility of carbon leakage policy instruments.

$$\frac{\textit{Emissions from Safeguard facilities producing a commodity}}{\textit{Emissions from all NGER facilities producing a commodity}} \times 100\%$$

- ***Changes in Safeguard production:*** This indicator provides an estimate of trade leakage, drawing on elements of the three risk indicators described above. Changes in Safeguard production were estimated based on the equation below, which links the percentage change of prices to quantities via an econometrically estimated elasticity. Import or export changes were assumed to proportionally change (increase or reduce) domestic production, and rounded to the nearest per cent given the range of plausible values for key parameters discussed above. Further details on the assessment approach are provided **Section 2.4**.

$$Elasticity_{trade,price} \times \%\,Change\ in\ price \times \frac{Imports\ OR\ Exports_{(e.g.,tonnes),t}}{Safeguard\ production_t} \times 100\%$$

- ***Emissions to industry group profits ratio***: This indicator provides insight into investment leakage risk on the assumption that inability to pass carbon costs through to customers, or deeper cuts to profit margins, could lead to investment moving offshore to jurisdictions where carbon costs are low or zero. Facility-level carbon emissions were integrated with firm-level data on profits from the ABS. This analysis and its results are discussed further in **Section 2.5**.

$$Ratio\ (emissions\ intensity) = \frac{Emissions_{firm,t}}{Profits_{firm,t}}$$

2.4 Assessing trade leakage risk

Building on the leakage risk indicators, the Review illustratively estimated the potential shifts in Safeguard-covered production due to differences in carbon costs as they might be observed in 2030 for each commodity. This approach generated approximate order of magnitude estimates of potential leakage in trade. They are not intended to be forecasts or projections of leakage.

The approach considered two production entities - a representative Australian producer and a representative foreign producer - as proxies for domestic and overseas producers in the aggregate. It is recognised that this approach may under or overestimate trade leakage, compared to a fuller approach that captures multiple domestic and foreign producers with a broad range of emissions intensities and cost profiles.

Trade leakage was estimated for each commodity, based on a scenario of maximum carbon cost differences between Australian and foreign producers. Under this scenario, it was assumed that foreign producers face no carbon price, and therefore no carbon costs, in 2030.

Carbon costs for Australian producers were based on emission reduction obligations under the Safeguard Mechanism. This obligation was calculated based on the difference between emissions intensity levels in 2022 and estimated baselines in 2030 (with estimated TEBA effects factored in). This was then multiplied by the projected ACCU price in 2030 (consistent with Australia's emissions projections) to estimate a carbon cost.[20]

Emissions intensities of Australian and foreign commodities were assumed to be equal, and no declines in emissions intensity were assumed between 2022 and 2030.[21]

Where the Safeguard Mechanism covers more than one commodity along a supply chain, there is potential for carbon costs for input commodities to affect carbon costs for intermediate or final commodities. Carbon costs of input commodities (e.g. ammonia, crude steel, bauxite and lime) were taken into account in estimating carbon costs for ammonia derivatives, long and flat steel, and alumina and aluminium.[22]

As shown in the relevant equation in **Section 2.3**, estimates of trade leakage were then calculated by linking changes in relative prices of Australian and foreign commodities to changes in volumes of imports or exports (and thus production) using econometrically estimated trade-price elasticities.

The volume of emissions that would relocate from Australia to overseas due to trade leakage was also illustratively estimated, using stylised assumptions.

Leakage through commodities that are downstream of Safeguard boundaries (downstream leakage) was raised as a potential issue for some sectors. Quantitative analysis focused on commodities directly covered by the Safeguard Mechanism, where trade leakage risks are expected to be more significant. The Review has however assessed at a macroeconomic level the downstream impacts from a border carbon adjustment. This suggests that downstream trade leakage risk is present in principle but very limited in materiality. See **Appendix C** for further details.

2.4.1 Results of trade leakage risk assessment

Results for leakage risk indicators and trade leakage estimates are presented numerically in Table 2 for import-competing commodities in domestic markets, and Table 3 for commodities competing in export markets. To support interpretation, they are also presented graphically in Figures 3, 4 and 5. Results for investment leakage risks based on the ratio of emissions to industry group profits are presented separately in **Section 2.5**.

These results and charts provide insights into general patterns of trade leakage risk, as well as specific commodities that are potentially more vulnerable to leakage based on different indicators.

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[20] This approach to estimating carbon costs is the same as the approach taken for the 'carbon costs as a share of commodity prices' indicator.

[21] Availability of consistent and reliable emissions intensity data for foreign production is limited or not available for many commodities. Where data was available, differences in emissions intensities between Australian and foreign commodities appeared to have modest impacts on leakage estimates, compared to other factors. As such, the simplifying assumption of equal emissions intensities for Australian and foreign commodities was considered appropriate and sufficient in the context of an approach that seeks to generate illustrative insights rather than accurate forecasts. This assumption also means leakage estimates generated were solely due to differences in climate policy stringency across jurisdictions and exclusive of other non-leakage factors such as differences in emissions intensities.

[22] Lime (imported from other producers) was taken into account as an input to alumina production in addition to bauxite, which is also reflected in aluminium. Lime was not included as an input to steel as these facilities produce lime onsite which is accounted for in the production variable.

In domestic markets, commodities are concentrated in the ranges of 0-5% for estimated carbon costs as a share of price, and 0-0.2 for imports relative to Safeguard production (Figure 3a). Commodities with estimated risk levels that exceed these ranges include ammonium phosphate, polyethylene, long steel, flat steel, clinker, lime, treated flat steel, pulp and paper, flat glass, glass containers, and refined petroleum. Among these, clinker and lime stand out as commodities with particular material risk levels on the basis of both indicators.

In export markets, risk levels are also concentrated in terms of carbon costs as a share of price, with most commodities between 0-5% (Figure 3b). However, risk levels are more dispersed in relation to export trade leakage exposure, including a significant group of commodities where exports relative to Safeguard production are over 0.6.

Significant proportions of imported and exported commodities appear sensitive to price changes (Figure 4). Around 46% of imported commodities have trade-price elasticities with an absolute value greater than 1, while in export markets, the proportion is around 35%.

Figure 5 summarises the estimated level of trade leakage for all commodities in domestic and export markets, which takes into consideration risk levels for the indicators in Figures 3 and 4. Trade leakage due to imports is highest for clinker, and lime with declines in Safeguard production of over 5%. Estimated trade leakage risk is less pronounced for commodities in export markets, with only crude and treated flat steel products reaching similar levels.

Section 2.6 brings together the results summarised here, together with analysis of investment leakage and qualitative considerations from stakeholders and other sources, to provide findings on the adequacy of existing policies in addressing leakage risks for each commodity.

The maximum illustratively estimated emissions shift associated with the total shifts in production from Australian to foreign producers under the scenario in Tables 2 and 3 is to be 1.5 million tonnes CO_2-e per year, equivalent to 0.3% of Australia's total emissions in 2023.[23]

[23] Australia's total emissions in 2023 was 465 Mt CO_2-e. Data from Australia's emissions projections 2023, available here.

Table 2: Carbon leakage risk and estimates (trade leakage) – domestic market

Commodities	Indicative 2030 carbon cost as % of price	Imports relative to Safeguard production[24]	Sensitivity of imports to price changes[25]	% of emissions covered by Safeguard	Illustrative estimate of reduction in Safeguard production[26]
Steel: Crude steel	1-3%	0-0.2	-3.9	100%	0%
Steel: Long steel products	1-3%	0.4-0.6	-0.6	94%	1%
Steel: Flat steel products	3-5%	0-0.2	-0.5	100%	0%
Steel: Treated steel flat products	3-5%	0.2-0.4	N/A	59%	N/A
Cement production: Cement	5-10%	0-0.2	-2.5	100%	3%
Cement production: Clinker	10-20%	0.8-1.0	-0.8	100%	14%
Cement production: Lime	5-10%	0.2-0.4	-3.0	74%	7%
Chemicals: Ammonia	3-5%	0-0.2	-3.5	100%	0%
Chemicals: Ammonium nitrate	1-3%	0-0.2	-1.0	100%	0%
Chemicals: Ammonium phosphate	1-3%	1.4-1.6	-0.3	100%	1%
Chemicals: Urea	N/A[27]	1.2-1.4	-1.7	100%	N/A
Chemicals: Sodium cyanide	0-1%	0-0.2	-5.2	92%	0%
Aluminium production: Alumina	1-3%	0-0.2	-0.6	100%	0%
Aluminium production: Aluminium	1-3%	0-0.2	-4.5	100%	0%
Aluminium production: Bauxite	0-1%	0-0.2	-2.8	75%	0%
Glass: Flat glass	1-3%	0.6-0.8	-1.3	100%	3%
Glass: Glass containers	0-1%	0.4-0.6	-8.5	44%	4%
Pulp and paper	0-1%	0.4-0.6	-0.8	52%	0%
Polyethylene	0-1%	0.4-0.6	-0.5	100%	0%
Energy: LNG	0-1%	0-0.2	-0.3	96%	0%
Energy: Refined petroleum	0-1%	3.2-3.4	-0.3	97%	0%
Energy: Coal	0-1%	0-0.2	-1.1	95%	0%
Energy: Crude oil	0-1%	0-0.2	-0.6	96%	0%
Energy: Ethane and LPG	0-1%	0-0.2	-4.4	98%	0%
Iron ore	0-1%	0-0.2	N/A	93%	N/A
Basic non-ferrous metal	0-1%	0-0.2	N/A	90%	N/A
Nickel products	0-1%	0-0.2	N/A	100%	N/A
Magnesia	3-5%	0-0.2	-2.2	100%	1%
Manganese ore	0-1%	0-0.2	-1.5	73%	0%
Ferro-manganese	1-3%	0-0.2	-0.2	100%	0%
Silicomanganese	1-3%	0-0.2	N/A	100%	N/A
Lithium ore	0-1%	0-0.2	-0.5	53%	0%
Synthetic rutile	0-1%	0-0.2	-0.2	100%	0%
Titanium dioxide	0-1%	0-0.2	-1.2	100%	0%
Other metal ore	0-1%	0-0.2	-0.4	70%	0%

[24] Import and production data are in volumetric units and presented as ranges to ensure confidentiality of underlying data.

[25] Import elasticity. N/A indicates when a useable trade sensitivity estimate could not be obtained.

[26] Reduction in production of goods covered by the Safeguard Mechanism due to 2030 carbon cost substitution effects with imports, expressed as a percentage of Safeguard-covered production. Rounded to the nearest per cent given the range of plausible values for key input parameters.

[27] See Section 2.6 for detailed assessment of the carbon leakage risk for urea production.

Commodities	Indicative 2030 carbon cost as % of price	Imports relative to Safeguard production[24]	Sensitivity of imports to price changes[25]	% of emissions covered by Safeguard	Illustrative estimate of reduction in Safeguard production[26]
Silicon	1-3%	0-0.2	-0.7	100%	0%
Ethanol and dried distillers grain	0-1%	0-0.2	-1.4	100%	0%
Emerging industry: Lithium hydroxide	0-1%	N/A	N/A	N/A	N/A
Emerging industry: Phosphoric acid	0-1%	N/A	N/A	N/A	N/A
Emerging industry: Rare earth oxides	0-1%	N/A	N/A	N/A	N/A
Emerging industry: Renewable diesel	1-3%	N/A	N/A	N/A	N/A
Emerging industry: Renewable aviation kerosene	0-1%	N/A	N/A	N/A	N/A

Table 3: Carbon leakage risk and estimates (trade leakage) – export markets

Commodities	Indicative 2030 carbon cost as % of price	Exports relative to Safeguard production [28]	Sensitivity of exports to price changes[29]	% of emissions covered by Safeguard	Illustrative estimate of reduction in Safeguard production [30]
Steel: Crude steel	1-3%	0-0.2	-3.6	100%	0%
Steel: Long steel products	1-3%	0-0.2	-0.4	94%	0%
Steel: Flat steel products	3-5%	0-0.2	-0.4	100%	0%
Steel: Treated steel flat products	3-5%	0.4-0.6	-3.4	59%	6%
Cement production: Cement	5-10%	0-0.2	-0.6	100%	0%
Cement production: Clinker	10-20%	0-0.2	N/A	100%	N/A
Cement production: Lime	5-10%	0-0.2	-2.6	74%	0%
Chemicals: Ammonia	3-5%	0-0.2	-3.4	100%	1%
Chemicals: Ammonium nitrate	1-3%	0-0.2	-11.0	100%	0%
Chemicals: Ammonium phosphate	1-3%	0.4-0.6	N/A	100%	N/A
Chemicals: Urea	N/A[31]	0-0.2	-1.1	100%	N/A
Chemicals: Sodium cyanide	0-1%	0-0.2	N/A	92%	N/A
Aluminium production: Alumina	1-3%	0.8-1.0	-0.3	100%	1%
Aluminium production: Aluminium	1-3%	0.8-1.0	N/A	100%	N/A
Aluminium production: Bauxite	0-1%	0.4-0.6	-0.8	75%	0%
Glass: Flat glass	1-3%	0-0.2	N/A	100%	N/A
Glass: Glass containers	0-1%	0-0.2	-1.6	44%	0%
Pulp and paper	0-1%	1.0-1.2	-1.5	52%	1%
Polyethylene	0-1%	0-0.2	-1.4	100%	0%
Energy: LNG	0-1%	0.4-0.6	-0.6	96%	0%
Energy: Refined petroleum	0-1%	0.2-0.4	-1.0	97%	0%
Energy: Coal	0-1%	0.6-0.8	N/A	95%	N/A
Energy: Crude oil	0-1%	0-0.2	N/A	96%	N/A
Energy: Ethane and LPG	0-1%	0.4-0.6	-0.8	98%	0%
Iron ore	0-1%	0.8-1.0	N/A	93%	N/A
Basic non-ferrous metal	0-1%	0.4-0.6	N/A	90%	N/A
Nickel products	0-1%	0-0.2	N/A	100%	N/A
Magnesia	3-5%	NA	N/A	100%	N/A
Manganese ore	0-1%	0-0.2	N/A	73%	N/A
Ferro-manganese	1-3%	0-0.2	0.0	100%	0%
Silicomanganese	1-3%	NA	N/A	100%	N/A
Lithium ore	0-1%	0.2-0.4	-1.2	53%	0%
Synthetic rutile	0-1%	0.2-0.4	-1.2	100%	0%

[28] Export and production data are in volumetric units. Results are presented as ranges because some underlying Safeguard data is confidential and given the range of plausible values for key parameters. For some commodities marked with an asterisk, the ratio may exceed 1.0 for various reasons, including because Safeguard production is less than total domestic production for some commodities.

[29] Export elasticity. N/A indicates when a useable trade sensitivity estimate could not be obtained.

[30] Reduction in exports of goods covered by the Safeguard Mechanism due to 2030 carbon cost substitution effects for exports, expressed as a percentage of Safeguard-covered production. Rounded to the nearest per cent. N/A indicates when a meaningful estimate could not be produced.

[31] See Section 2.6 for detailed assessment of the carbon leakage risk for urea production.

Commodities	Indicative 2030 carbon cost as % of price	Exports relative to Safeguard production [28]	Sensitivity of exports to price changes[29]	% of emissions covered by Safeguard	Illustrative estimate of reduction in Safeguard production [30]
Titanium dioxide	0-1%	0-0.2	N/A	100%	N/A
Other metal ore	0-1%	0-0.2	N/A	70%	N/A
Silicon	1-3%	0.8-1.0	-0.2	100%	0%
Ethanol and dried distillers grain	0-1%	0.2-0.4	-0.6	100%	0%
Emerging industry: Lithium hydroxide	0-1%	N/A	N/A	N/A	N/A
Emerging industry: Phosphoric acid	0-1%	N/A	N/A	N/A	N/A
Emerging industry: Rare earth oxides	0-1%	N/A	N/A	N/A	N/A
Emerging industry: Renewable diesel	1-3%	N/A	N/A	N/A	N/A
Emerging industry: Renewable aviation kerosene	0-1%	N/A	N/A	N/A	N/A

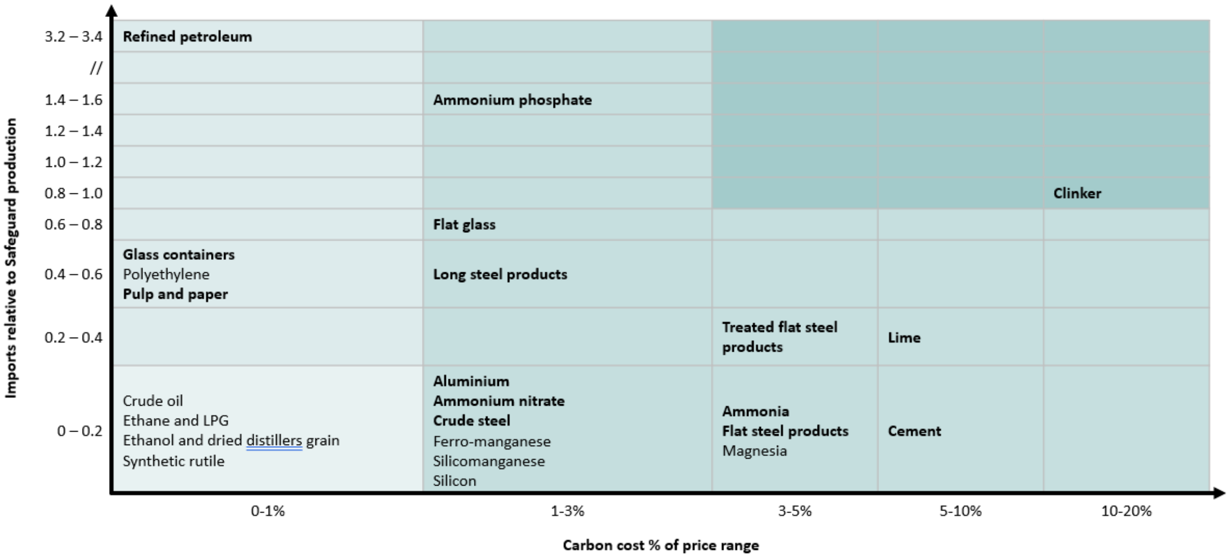

Figure 3(a): 'Carbon cost as per cent of price' compared to 'Imports relative to Safeguard production'.[32]

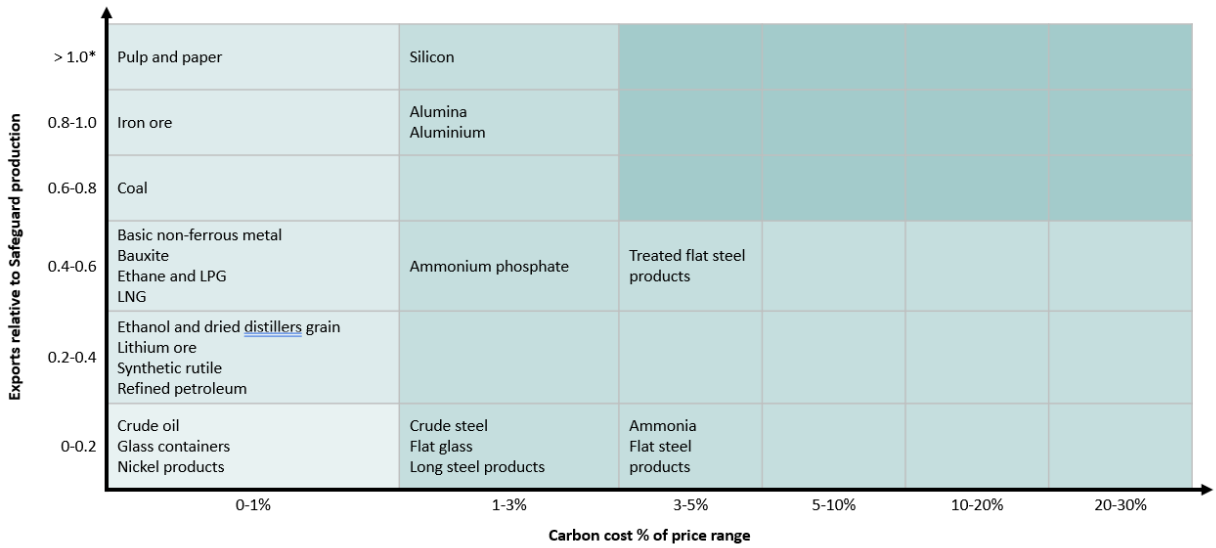

Figure 3(b): 'Carbon cost as per cent of price' compared to 'Exports relative to Safeguard production'.[33]

[32] Commodities with imports relative to Safeguard production below 0.02 are excluded.

[33] Commodities with exports relative to Safeguard production below 0.02 are excluded, as are emerging industry production due to lack of clear trade-to-production ratios. For some commodities, exports relative to Safeguard production may exceed 1.0 for various reasons, including because Safeguard production is less than total domestic production for some commodities.

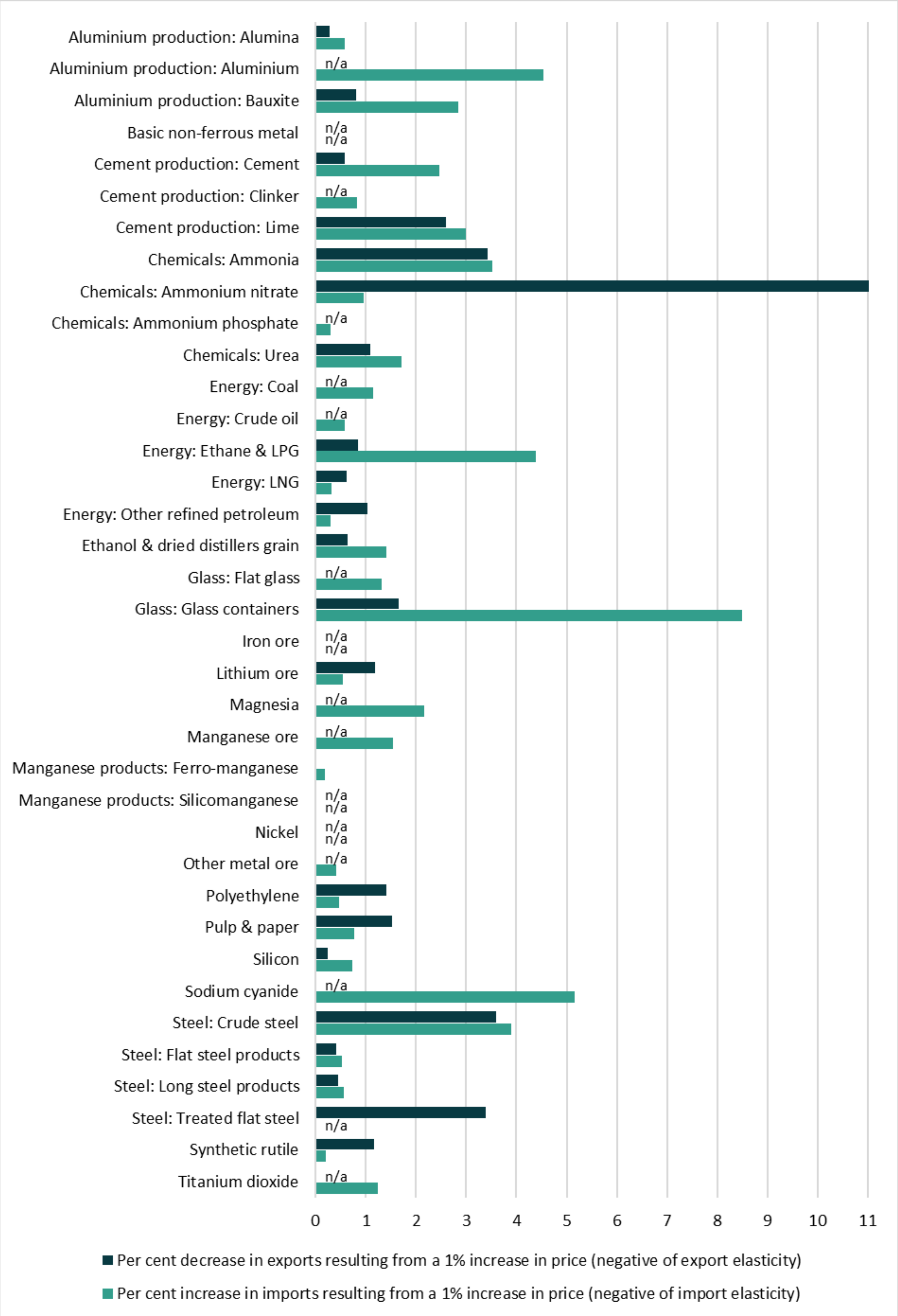

Figure 4: Trade elasticity illustrating the sensitivity of imports and exports to price changes.[34]

[34] Note emerging industries are not shown as trade elasticity are not available.

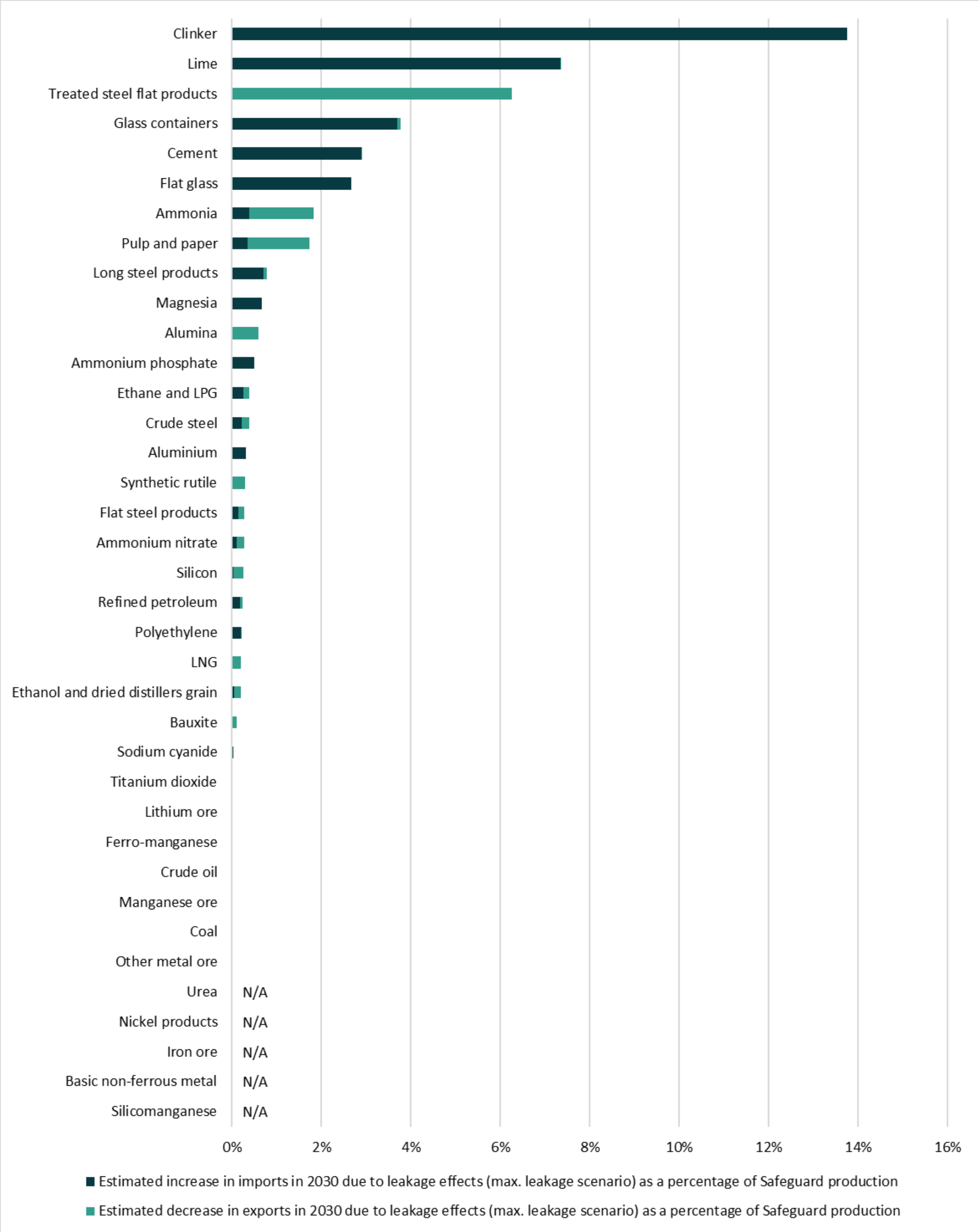

Figure 5: Estimated change in production as a percentage of Safeguard-covered production.

2.5 Assessing investment leakage risk

Differences in emissions reduction policies can give rise to carbon leakage risks in investment. Changes in investment decisions also occur for reasons other than differences in climate policy. Investment decisions are influenced by features including costs of capital and labour, access to skilled labour and operational costs. In addition, investment also often turns on more intangible issues like market conditions, company strategies and business sentiment.[35] In considering investment leakage risk, the Review relied on stakeholder engagement complemented by an assessment of investment leakage risk based on average emissions-to-profits ratios for industry groupings.

Stakeholders identified carbon leakage risk in the investment channel as important.

> *In considering the definition of carbon leakage, all parts of the Australian aluminium industry are highly exposed to both trade and investment leakage.* - **Australian Aluminium Council submission to November 2023 consultation**
>
> *… it is crucial that the significant risk of investment leakage associated with uneven international climate policies is considered alongside the direct carbon leakage risks.* **- Boral submission to November 2023 consultation**
>
> *ASFI is supportive of the attention the Review has paid not only to trade-based carbon leakage risk, but also investment-based carbon leakage risk. Measures that encourage further investment in Australia will be critical to ensure that Australia captures the benefits of the transition to net zero. BCAs may be one piece of the puzzle to build confidence in Australian industry among investors and the wider community.* **– Australian Sustainable Finance Institute submission to November 2024 consultation**

The emissions-to-profits ratio is a typical measure of emissions intensity used in emissions-intensive trade-exposed metrics, such as those of the OECD, IMF, the European Union (EU) and others.[36] This measure of exposure to leakage is usually given as ratio of carbon costs (emissions, prices) to profits (for example gross value added). Industries or firms with a smaller profit margin and large emissions are identified by the metric as having a potential carbon leakage risk. We characterise this as investment leakage risk as it sheds light on the relative attractiveness of the industry for new investment based on its capacity to pass carbon costs through to consumers without loss of profit margin, as well as the potential profits available within an industry or firm for reinvestment in additional production or abatement to earn future revenue.

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[35] Centre for Policy Development, 2023, Green Gold: A strategy to kickstart Australia's renewable industry future, available here.

[36] Fournier Gabela, J. G. and Freund, F., 2023, Potential carbon leakage risk: a cross-sector cross-country assessment in the OECD area, *Climatic Change*, available here.

In contrast to the trade leakage estimate, the investment leakage indicator brings a focus on the emission intensity of profit rather than of production. This identifies activities with lower carbon costs as share of the final unit price but higher carbon cost as a share of profits (i.e. after production costs).

The Review’s analysis used firm-level information developed through the integration of NGER Scheme data and Business Longitudinal Analysis Data Environment (BLADE) economic activity datasets provided by the ABS.

Figure 6 below represents an average by industry grouping based on firms with emissions above 100,000 tonnes CO_2-e. This data covers 5 years of financial reporting by firms from 2017-18 to 2021-22. It is based on aggregated firm emissions. Emissions are presented as a share of the firms’ profits. An average is taken, as in any given year, profits can shift due to forces beyond the firm’s control, such as variations in commodity prices, input costs or interest rates.

The presentation of results of the Review's analysis is constrained by ABS rules that require data aggregation to prevent possible release of identifying data. The data are presented in industry groupings to ensure that each data point presented in Figure 5 includes information for a minimum of 10 firms that represent industries with similar averages and represent logical groupings of industry sectors.

The industry grouping most subject to potential investment leakage according to Figure 6 is the ‘Glass, Cement, Lime, and Pulp and Paper Manufacturing’ industry group, followed by ‘Petroleum Refining, Grain Mill Product, and Chemicals and Fertilisers Manufacturing’.

Within industry groupings, the absolute mean deviation (plus or minus from the industry average presented by the bar graph) is illustrative of individual firm deviations from the average. Deviation from the average is highly variable, particularly in the manufacturing sectors represented. The absolute mean deviation is largest in the ‘Petroleum Refining, Grain Mill Product Manufacturing, and Chemicals and Fertilisers’ industry grouping, followed by the ‘Glass, Cement, Lime, and Pulp and Paper Manufacturing’ industry group.

The results indicate that industries with high emissions and smaller profit margins are more at risk of investment leakage compared with industries with smaller emissions and higher profit margins.

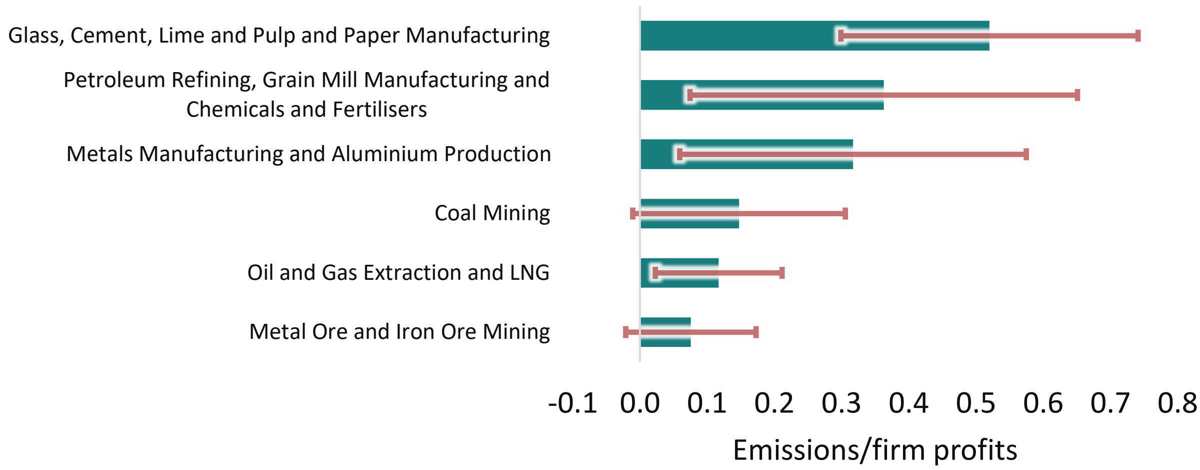

Figure 6: Measure of investment leakage risk estimated as the ratio of Safeguard Mechanism-covered facility emissions to profits.[37]

2.6 Findings of leakage by commodity

Findings

The following commodities are found to be subject to potentially material carbon leakage risk over time and may warrant additional policies to be introduced: cement, clinker and lime; hydrogen, ammonia and derivatives; steel and iron; and glass.

Further, potential carbon leakage risks for aluminium and alumina, refined petroleum, and pulp and paper, are recommended for particular consideration as part of the 2026-27 Safeguard Mechanism Review on the suitability of arrangements for emissions-intensive trade-exposed activities for all commodities.

Table 4 integrates and summarises key findings from the preceding assessments in 3 areas: emissions intensity and trade-related risk indicators[38] (see **Section 2.4**); estimates and analysis of trade and investment leakage risk[39] (see **Sections 2.4 and 2.5**); and stakeholder feedback and other relevant considerations (see commodity-level discussions in this section).

For each of these areas, a judgment on the overall level of leakage risk under existing policies is presented, drawing on quantitative analysis of trade and investment leakage as well as qualitative information from stakeholder feedback and other sources. Red indicates areas where risks are considered material overall, and therefore a pronounced need to consider additional policies. Orange indicates areas where risks are, on balance, approaching levels that could be considered material.

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[37] Based on integrated NGER scheme emissions data and ABS BLADE economic activity data. Data is industry group average for 2017-18 to 2021-22. The 'Metals Manufacturing and Aluminium Production' includes alumina production, aluminium smelting, bauxite mining, basic ferrous and non-ferrous metal manufacturing, iron and steel manufacturing, and other metals such as lead, copper, silver and zinc smelting and refining.

[38] These indicators are: (1) indicative 2030 carbon costs as a percentage of price; (2) imports/exports relative to Safeguard production; and (3) sensitivity of imports/exports to price changes.

[39] The indicator for trade leakage risk is the illustrative estimated reductions in Safeguard Mechanism production in 2030. The investment leakage risk indicator is the ratio of firms' emissions-to-profits.

Green indicates areas where risks of leakage are considered low or where the evidence is mixed, and therefore less or no need to consider additional policies.

A summary of the underlying sectoral analysis and findings for each commodity group is also provided after this table.

Table 4: Summary of leakage assessment findings

Additional leakage policies warranted

Commodities	**Emissions intensity and trade-related leakage risk factors**	**Assessed trade and investment leakage risk**	**Other factors, including from stakeholder feedback**
Clinker	High risk levels evident for both carbon costs as a share of product price and import exposure. (Red)	Trade leakage estimate is the highest of all commodities. Profit analysis also suggests clinker is among the sectors most vulnerable to investment leakage. (Red)	Industry stakeholders noted high levels of risks of leakage in absence of longer-term solutions such as a border carbon adjustment. (Red)
Cement	High levels of risk for multiple indicators, including carbon costs as a share of product price and import sensitivity to price changes. (Red)	Estimates of trade leakage risks are material. Investment leakage analysis suggests cement is among the highest risk sectors. (Red)	Industry stakeholders noted high risks of leakage in absence of longer-term solutions such as a border carbon adjustment. (Red)
Lime	Lime displays high risk levels on all risk factors. (Red)	Trade leakage estimates are high. Investment leakage analysis suggests lime is among the sectors most at risk of investment leakage. (Red)	Industry stakeholders noted risks of leakage in absence of a longer-term solution such as a border carbon adjustment. Uneven coverage of lime production by Safeguard creates domestic leakage risks. (Red)
Hydrogen, ammonia and derivatives	Risks of leakage are material or close to material overall for import-facing ammonia and derivatives production, and approach material levels for ammonia in export markets. (Orange)	Profit analysis places ammonia and derivatives in the industry group ranked second most at risk of investment leakage. (Orange)	Industry stakeholders noted risks of leakage in absence of longer-term solutions such as a border carbon adjustment. This includes risks of investment leakage for emerging low emissions production, including low emissions hydrogen and ammonia. Renewable hydrogen and derivatives are a strategic priority under Future Made in Australia. (Red)
Steel and iron	Overall, risks of leakage are approaching material levels for all types of steel in import markets. In export markets, risks levels are material for treated flat steel and approaching material levels	Trade leakage risks are generally modest for most commodities but could reach material levels for treated flat steel in export markets. Steel is in the sectoral group ranked third most at risk of investment	Industry stakeholders noted risks of leakage in absence of longer-term solutions such as a border carbon adjustment. This includes risks of investment leakage for emerging low emissions production, including green iron.

	for crude and flat steel. (Orange)	leakage, based on profit analysis. (Orange)	They also stressed the need for careful design due to complexities of the sector. Green metals are a strategic priority under Future Made in Australia. (Red)
Glass	Risks of leakage are material for import-facing flat and container glass. (Red)	Estimated trade leakage is moderate for both types of glass in domestic markets. However, based on profit analysis, glass is in the industry group most at risk of investment leakage. (Orange)	Industry stakeholders noted the risks of investment leakage, in absence of longer-term solutions such as a border carbon adjustment. Uneven coverage of the sector by Safeguard also creates domestic leakage risks. (Red)

Give particular consideration of the need for additional policies in 2026-27 Safeguard Review

Commodities	Emissions intensity and trade-related leakage risk factors	Assessed trade and investment leakage risk	Other factors, including from stakeholder feedback
Alumina and aluminium	Risk levels across risk factors are mixed. For both commodities, carbon costs as a share of product prices are modest, but export exposure is high. (Green)	Trade leakage risk in export markets is low for alumina and could not be estimated for aluminium due to uncertain price sensitivity. Based on profit analysis, alumina and aluminium are in the sectoral group ranked third most at risk of investment leakage. (Orange)	Industry stakeholders noted existing TEBA measures are yet to be tested, and highlighted other policy options that matter for competitiveness. Green metals are a strategic priority for support for Future Made in Australia. (Orange)
Refined petroleum	Risk levels appear modest in domestic markets. Carbon costs form a relatively small share of product price. (Green)	Estimates of trade leakage risk are low. Based on profit analysis, refined petroleum is in the industry group with the second highest risk of investment leakage. (Orange)	Addressing leakage could support a transition to low emissions fuel production. Any additional policies must consider interactions with existing fuel security policies. (Orange)
Pulp and Paper	Overall, carbon leakage risk levels are material in export markets and approach material levels in domestic markets. (Orange)	Estimated trade leakage risk is low. Based on profit analysis, pulp and paper is in the industry group most at risk of investment leakage. (Orange)	Industry stakeholders pointed to the merits of additional policies to mitigate leakage, and also noted other policy areas that affect production. (Green)

Retain existing policies at this stage

All other commodities	In general, most other commodities exhibit modest levels of leakage risk factors, and/or low estimates of trade leakage risk. Profit analysis suggests resource sector commodities face much lower risks of investment leakage compared to commodities in manufacturing sectors. The suitability of arrangements for emissions-intensive trade-exposed activities will be reviewed for all commodities as part of the 2026-27 Safeguard Mechanism review. (Green)

2.6.1 CEMENT AND CLINKER

In 2020-21, Australia produced around 10 million tonnes of cement and 5 million tonnes of clinker.[40] With regard to cement, a major portion of Australia's cement production is produced using domestically manufactured clinker. It is this portion that is covered by the Safeguard Mechanism and relevant to carbon leakage considerations.[41]

Domestic producers primarily compete with imports from Southeast and East Asia. Imports relative to Safeguard production are currently between 0.8-1.0 for clinker and 0-0.2 for cement. Cement imports appear price sensitive (elasticity of -2.5). Clinker imports are presented as less sensitive (elasticity of -0.8). This is likely to be an underestimate, based on industry feedback and because estimates are based on the time period before the COVID pandemic. Exports of cement and clinker are negligible.

Clinker and cement production are emissions intensive. Average Australian emissions intensities are 0.71 tonnes CO_2-e/tonne of cement and 0.84 tonnes CO_2-e/tonne of clinker.[42] Around 60% of total emissions (scope 1 and 2) from integrated clinker and cement production are process emissions from the conversion of limestone and other inputs into clinker, while 30% is from use of kiln fuels.[43]

Emissions are high relative to the value of commodities. Carbon costs in 2030 are estimated to be between 5-10% and 10-20% of cement and clinker prices respectively. Reliable data on emissions intensity of foreign produced commodities is limited but suggests clinker imports may be more emissions intensive than domestic clinker.

Decarbonisation of cement production is possible through efficiency improvements, clinker substitution in cement production and alternative kiln fuels. Carbon capture, utilisation and storage (CCUS) will be key to achieving step change reductions in process emissions, but most domestic stakeholders do not see this being commercially viable in the near term. Overall decarbonisation will also involve some product substitution towards alternatives to concrete.

Estimates of potential leakage for cement and clinker were found to be amongst the highest for all commodities, with reduced Safeguard production of up to 14% for clinker and 3% for cement, in a maximum carbon cost difference scenario.

Engagement with industry also highlighted risks of investment leakage, due to investor concerns in the absence of stronger measures to address leakage. The risks, if unaddressed, could deter investment in onsite abatement. Analysis of profits finds cement to be among the sectors most at risk of investment leakage (see **Section 2.5**).

Given these results, there is a clear basis for considering further policies to mitigate leakage for cement and clinker production, given the more pronounced nature of the leakage risks for cement and clinker.

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[40] See Cement Industry Federation data here.
[41] All Australian clinker production is covered by the Safeguard Mechanism.
[42] Based on default emissions intensity values for these commodities under the Safeguard Mechanism.
[43] See Cement Industry Federation.

2.6.2 LIME

Australia produced 1.5 million tonnes of lime in 2021-22, around three quarters of which was covered by the Safeguard Mechanism.[44] Imports are equivalent to between 0.2-0.4 of Safeguard production, with Southeast Asia being the main source of imports. Lime imports are very sensitive to price changes (elasticity of -3). Australia exports negligible volumes of lime.

Lime production is emissions intensive. Average lime emissions intensity in Australia is 1.13 tonnes CO_2-e/tonne.[45] The Review found little data on foreign lime emissions intensities, but in general, emissions intensity ranges from 1.02-1.33 tonnes CO_2-e/tonne depending on kiln and fuel types.[46] The sources and shares of emissions from each source are very similar to clinker, with process emissions from calcination of limestone into lime and kiln fuels being the main sources. Options to decarbonise rely mainly on alternative kiln fuels and CCUS. Emissions are high relative to the value of lime, with 2030 carbon costs estimated at between 5-10% of price.

Under a maximum carbon cost difference scenario, estimated declines in Safeguard production due to carbon costs are around 7%.

Industry observations about the risks of investment leakage for cement and clinker were also applicable to lime. These views were shared by domestic producers within and outside of the Safeguard Mechanism. Analysis of profits finds lime to be among the sectors most vulnerable to investment leakage (see **Section 2.5**).

Given these results, there is a basis for considering further policies to mitigate leakage for lime production, given the more pronounced nature of the leakage risks for lime.

2.6.3 HYDROGEN, AMMONIA AND DERIVATIVES

Ammonia and key derivatives – ammonium nitrate, ammonium phosphate, urea and sodium cyanide – are used to produce fertilisers, explosives and in other industrial applications.

Australia produces around 1.8 million tonnes of ammonia and 1.9 million tonnes of ammonium nitrate.[47] Urea was produced up until the end of 2022 but is not currently produced domestically. However, a new 2.3 million tonne/year facility in the Pilbara is due to commence in 2027.[48]

Australia has potential comparative advantages in the production of low emissions hydrogen and derivatives such as ammonia in a net zero world, due to the potential for cost-competitive renewable energy resources. The government has identified renewable hydrogen as an initial priority sector under its Future Made in Australia agenda and set a production target of at least 15 million tonnes by 2050 under the National Hydrogen Strategy 2024.[49, 50]

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44 Presentation, 2023, Cement Industry Federation, available here.
45 Based on the default emissions intensity value under the Safeguard Mechanism.
46 Resources for the Future, 2022, Greenhouse Gas Index for Products in 39 Industrial Sectors, available here.
47 Some of this ammonia is used as inputs for other commodities, such as ammonium nitrate. Australian Industry Energy Transition Initiative, 2023, Pathways to industrial decarbonisation, available here.
48 Construction of Perdaman Chemicals and Fertilisers' urea plant begins, 2023, available here.
49 Future Made in Australia - National Interest Framework, Treasury, May 2024, available here.
50 Australia's National Hydrogen Strategy 2024, available here.

Under the IEA's net zero by 2050 scenario, global demand for hydrogen is expected to grow four-fold to around 420 million tonnes per annum, and with global demand for green ammonia expected to grow from US$0.3b to around US$60b in 2030s.[51,52] Several of Australia's trading partners such as Japan, South Korea and the European Union have set 2030 targets for the import and use of low emissions hydrogen.[53] Major global players are already locking in offtake agreements for their production of low emissions ammonia products.[54] Ammonia could be used as a carrier of renewable hydrogen, or in industrial applications in markets willing to pay a market premium in the near term, either due to industry decarbonisation commitments or the presence of carbon border adjustments or similar policies. Zero and low emissions ammonia is also a prospective transport fuel for international shipping of the green commodities to be traded internationally. This suggests the emergence of a premium on low emissions products in some markets, especially where policies foster the use of low emissions commodities.

In domestic markets, urea and ammonium phosphate appear most exposed to import competition (imports equivalent to 1.2-1.4 and 1.4-1.6 times the volume of production under Safeguard respectively) while ammonia (0-0.2), ammonium nitrate (0-0.2) and sodium cyanide (0-0.2) appear less exposed.[55] Sodium cyanide, ammonia, urea and ammonium nitrate imports are sensitive to price changes (elasticities of -5.2, -3.5, -1.7 and -1.0 respectively) but other derivatives appear less so.

Ammonia (0-0.2) and ammonium phosphate (0.4-0.6) are relatively more trade-exposed in export markets than ammonium nitrate (0-0.2), sodium cyanide (0-0.2) and urea (0-0.2).[56] Exports of ammonium nitrate, ammonia and urea all appear sensitive to price changes (elasticities of -11, -3.4 and -1.1 respectively).

Conventional production of ammonia is emissions-intensive, due to process emissions from the use of gas feedstock to produce hydrogen, and fossil fuels to produce heat. Derivative products use ammonia as a feedstock and generate additional process and thermal emissions in their production.

Carbon costs in 2030 as a share of prices is estimated to be between 3-5% for ammonia, 1-3% for ammonium nitrate and ammonium phosphate, and between 0-1% for sodium cyanide. Urea has the attributes of a commodity at risk of carbon leakage, being emissions-intensive, trade exposed, and trade sensitive. Carbon costs have less impact on prices than costs for other inputs such as gas.[57]

There are various pathways to decarbonise ammonia supply chains. They include renewable hydrogen to replace the steam methane reforming step in ammonia production, and electrification of heat processes.[58] Low emissions ammonia production could reduce emissions intensity from the current global average of 2.4 tonnes CO_2-e/tonne to 0.2 tonnes CO_2-e/tonne. At some Australian

[51] Spherical Insights, data available here
[52] Australia's National Hydrogen Strategy 2024, available here.
[53] Future Made in Australia - National Interest Framework, Treasury, May 2024, available here.
[54] Yara International media release, available here
[55] Imports relative to Safeguard production for urea is based on production data prior to the closure of the sole domestic urea producer at the end of 2022.
[56] Exports relative to Safeguard production for urea may increase in future as new urea production capacity comes online.
[57] International Energy Agency, Ammonia Technology Roadmap, available here.
[58] Australian Industry Energy Transition Initiative, 2023, Pathways to industrial decarbonisation, available here.

ammonium nitrate facilities, tertiary catalysts are being installed that can reduce onsite emissions by nearly half.[59]

In domestic markets, under a maximum carbon cost difference scenario, potential declines in Safeguard production are modest at below 1% across all commodities. Leakage risks in export markets are similarly low, ranging from 0-1% across all commodities.

Industry consultations indicate ammonia and derivatives are seen as vulnerable to leakage in domestic and export markets through trade and investment channels. The Review's analysis of profits finds conventional ammonia and derivatives are among the group of industries with the second highest level of investment leakage risk (see **Section 2.5**). Stakeholders noted that production has high fixed operating costs, requiring facilities to operate at full capacity. Even small leakage results could therefore have material impacts on facilities.

Leakage risks for hydrogen could not be assessed by the Review as Australian production at scale is still emerging. However, in the context of Australia's efforts to establish new low emissions hydrogen and ammonia industries, carbon leakage risks for ammonia and derivatives could undermine both current investment in, as well as future demand for, hydrogen production.

Additionally, emerging Australian production of zero and low emissions hydrogen and derivatives could in principle also be undermined by imports of conventionally produced equivalents, particularly where there is a significant different in production costs. In the case of hydrogen, the likelihood of this risk occurring would be higher if the costs of producing and shipping (fossil fuel-based) hydrogen to Australia, which are currently relatively high, were to fall to parity with the cost of domestic low emissions hydrogen production.[60]

Overall, for this commodity group, industry did not see existing policies as sufficient to address leakage in these products, both in the short term with respect to investment leakage, as well as in the longer term with respect to trade leakage. With regard to hydrogen, industry stakeholders emphasised that the absence of further policy measures could increase investment uncertainty, including for green hydrogen projects currently under development.

Many also viewed a border carbon adjustment as a valuable tool that could support investment in a transition to low emissions production in Australia.

Given these results, there is a basis for considering further policies to mitigate leakage for hydrogen, ammonia and derivatives production.

2.6.4 STEEL AND IRON

Australia produced 5.4 million tonnes of steel in 2023.[61] Domestic facilities produce different types of steel: primary flat steel, primary treated flat steel, primary crude, and primary and secondary long

[59] Orica Media release, available here.
[60] The IEA estimates 2030 production cost for Australian renewable hydrogen to be USD 3 per kilogram. By comparison, 2030 production costs for unabated gas-based hydrogen are estimated to be around USD 2.50, with shipping of liquified hydrogen adding a further USD 1.70-3.70 per kilogram. IEA Global Hydrogen Review 2023, available here.
[61] Includes secondary and primary steel, data available from World Steel here.

steel.[62] Australia is seen as having comparative advantages in the production of green iron, and potentially steel, in a net zero world, due to the potential to produce cost-competitive renewable hydrogen. Green metals have been identified as a sector aligned with the Net Zero Transformation Stream of the National Interest Framework under the Government's Future Made in Australia agenda. Demand for green steel has begun to emerge and is expected to grow over time, driven by the global transition to net zero.[63]

Australian steel faces competition from imports and exports. In 2022-23, around a third of domestic consumption was met through imports, while a quarter of domestic steel was exported.[64] Between 2018 and 2022, East Asian countries were the key source of imports for flat and long steel, while imports of crude steel came from a variety of countries in the Middle East, Central and South Asia.[65] Countries in East Asia and North America were the main suppliers in Australia's top export markets. Imports appear highly sensitive to price changes for crude steel (elasticity of -3.9) but less sensitive for flat and long steel (-0.5 and -0.6). For exports, trade sensitivities are similarly high for crude and treated flat steel (-3.6 and -3.4) and lower for flat and long steel (-0.4).

Emissions intensities of Australian primary steel are currently around 2.07 tonnes CO_2-e/tonne for flat steel and 2.17 tonnes CO_2-e/tonne for (primary) long steel.[66] Most steel emissions from the primary route are scope 1 emissions from the conversion of iron ore into iron (process emissions) and fuel combustion for heat. Emissions are material relative to value for most types of steel, with 2030 carbon costs estimated to be 3-5% for flat and treated flat steel, 1-3% of prices for crude steel and primary long steel, and 0-1% for secondary long steel.[67]

For primary steel production, the most prospective decarbonisation pathway involves replacing the current blast furnace and basic oxygen furnace process with a renewable hydrogen-based direct reduced iron and electric arc furnace process, or variants of this. This could reduce scope 1 emissions by up to 90% but is not yet commercially viable and in the early stages of deployment globally.[68]

In domestic markets, potential leakage appears to be modest, with declines in Safeguard production for Australian steel of 1% for primary long steel and less than 1% for crude, flat and secondary long steel types based on 2030 carbon costs under a maximum carbon cost difference scenario. Against exports, estimated declines in Safeguard production under the same scenario were material for treated flat steel (6%), and below 1% for crude, flat and long steel.

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[62] Primary steel generally refers to steel made from iron ore (as opposed to scrap). Under the Safeguard Mechanism, the production variable for crude steel (steel in its first solid state upon leaving a furnace) is described as 'primary steel'. To avoid confusion, this paper uses 'primary steel' to mean steel made from iron ore, and 'crude steel' for the primary steel Safeguard production variable.

[63] BloombergNEF, available here.

[64] Resources and Energy Quarterly, December 2023, available here.

[65] In ABS data, the country sources of steel imports are not disclosed for a significant portion of overall imports. The Review used UN Comtrade data (including data on foreign steel exports to Australia) to help address this data gap.

[66] Based on default emissions intensity values for these commodities under the Safeguard Mechanism.

[67] In addition to the estimated carbon cost for all long steel presented in Tables 2 and 3, carbon costs were also separately estimated for primary and secondary long steel.

[68] Depending on whether natural gas or renewable hydrogen is used for DRI. BCG, 2022, available here.

However, industry views leakage as a risk in the medium-term as Safeguard baselines decline. Analysis of profits finds steel to be among a group of industries with material levels of investment leakage risk (see **Section 2.5**).

Leakage risks for iron could not be assessed independent of steel as Australia has not historically produced iron for sale outside of integrated steel production. However, any carbon leakage risks for steel could also undermine current investment in, as well as future demand for, anticipated green iron production. In principle, any emerging production of low emissions iron could also face carbon leakage risks from imports of conventional fossil fuel-based iron, such as hot briquetted iron (which is already a globally traded commodity).

Consultation feedback affirmed that a border carbon adjustment could support investment in decarbonising existing steel production, as well as in establishing new low emissions production in Australia. Industry also emphasised the need to ensure any border carbon adjustment included iron, to incentivise decarbonisation across the whole value chain. Demand for green iron and steel is expected to grow, including in markets willing to pay a green premium in the near term, either due to industry decarbonisation commitments or the presence of carbon border adjustments or similar policies.

Indirect leakage through downstream commodities was also highlighted as a concern, given imports are estimated to make up half of Australia's true total steel consumption.[69] Finally, it was also noted that facilities needed to operate at or close to capacity to cover high fixed costs. Overall, these considerations suggest that even small amounts of leakage could have material impacts on facility viability. Estimates could also be understated as they do not account for downstream leakage.

Given these results, there is a basis for considering further policies to mitigate leakage for steel and iron production.

2.6.5 GLASS

Facilities covered under the Safeguard Mechanism produce flat glass and glass containers.

Both types of glass are exposed to imports, which are equivalent to 0.6-0.8 times the volume of Safeguard production for flat glass and 0.4-0.6 times for glass containers.

Imports appear price sensitive, with elasticities of -1.3 for flat glass and -8.5 for glass containers. Exports of glass containers are also price sensitive (-1.6). Carbon costs in 2030 are estimated at 1-3% compared to price for flat glass and 0-1% for glass containers.[70]

Under a maximum carbon cost difference scenario and based on 2030 carbon costs, production is estimated to decline by 3% for flat glass and 4% for glass containers due to import competition. On the export side, production is estimated to decline by less than 1% for glass containers under the same scenario.

[69] Based on industry submissions.
[70] These estimates use illustrative price assumptions for flat glass drawn from different sources.

Industry consultation suggests leakage risks are a concern. This could discourage investment in existing and new production, including for decarbonisation. The Review's analysis of profits also finds glass to be among the group of sectors most vulnerable to investment leakage risk.

Given these results, there is a basis for considering further policies to mitigate leakage for glass production.

2.6.6 ALUMINA AND ALUMINIUM

Australia produces around 20 million tonnes of alumina and 1.5 million tonnes of aluminium per year.[71] Alumina refineries and aluminium smelters under the Safeguard Mechanism cover all domestic production. Australia has potential comparative advantages in the production of zero and low emissions alumina and potentially aluminium in a net zero world, due to its bauxite resources, established production base and the potential for low cost, firmed renewable energy. Aluminium is important for the net zero transition, is in demand from strategic international partners, and leverages Australia's geological resource endowments. It forms part of the green metals priority area identified as aligned with the Future Made in Australia National Interest Framework and listed on the government's Strategic Materials List.[72] Similar to steel, demand for low emissions aluminium is expected to grow as the world transitions to net zero, and green premiums, while nascent, are beginning to emerge.[73]

Alumina and aluminium are trade-exposed in export markets. Exports relative to Safeguard production are between 0.8-1.0 for both alumina and aluminium. Imports relative to Safeguard production are small for both commodities, though Australia does import significant amounts of processed aluminium products that are downstream of current Safeguard boundaries. In export markets, Australia competes with alumina producers from Asia and aluminium producers from North America, Asia, the Middle East and Russia. Alumina exports are modestly price sensitive (elasticity of -0.3). An elasticity estimate for aluminium has not been established.

Average Australian alumina emissions (scope 1) is 0.5 tonnes CO_2-e/tonne.[74] Decarbonisation of alumina production relies on early-stage technologies to switch from use of gas or coal to electrification or renewable hydrogen, and access to low cost, firmed renewable electricity. Average Australian aluminium emissions (scope 1) is 1.9 tonnes CO_2-e/tonne, below the global average of around 2.4 tonnes CO_2-e/tonne.[75] Scope 1 emissions can be reduced by replacing carbon anodes with emerging inert anode technology. 2030 carbon costs are estimated at between 1-3% of prices for both commodities.

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[71] See Australian Aluminium Council.

[72] The Strategic Materials List identifies minerals where Australia has geological potential for resources, that are important for the economy and national security, and that are in demand by strategic international partners. Minerals on this list have supply chains that are currently not vulnerable enough to be included on the Critical Minerals List, available here.

[73] Fastmarkets, available here.

[74] Based on the default emissions intensity value under the Safeguard Mechanism.

[75] Australian value based on the default emissions intensity under the Safeguard Mechanism. Global value based on data for perfluorocarbon and process emissions is from the International Aluminium Institute, available here.

Based on 2030 carbon constraints, under a maximum carbon cost difference scenario, production is estimated to decline by less than 1% for alumina. An estimate for aluminium is not available, due to uncertainty regarding its trade sensitivity.

Industry consultation confirmed that leakage risks are mainly related to exports and noted potential for indirect leakage risk for downstream aluminium products from import competition. It was also noted that leakage impacts affecting the viability of one part of the supply chain could also affect other parts, due to vertical integration. The Review's analysis of profits finds the aluminium sector to be among a group of sectors facing material risks of investment leakage.

Industry considered it too soon to judge the effectiveness of current policy in addressing leakage but noted that public investment and other policies beyond the Safeguard Mechanism were likely to be more suitable than a border carbon adjustment for export leakage. As green markets that allow consumers to preference green products mature, demand for low emissions alumina and aluminium is set to rise.

While not at risk over the short-term, further monitoring of risk levels is required, and it is proposed that the carbon leakage risk of alumina and aluminium is particularly considered in the 2026-27 review of Safeguard Mechanism settings.

2.6.7 REFINED PETROLEUM

Assessing leakage risks for this commodity is complex due to various factors. Refined petroleum, as defined under the Safeguard Mechanism, combines over 17 different refinery products, each with their own price structures and market dynamics. There are also a range of existing government measures to support fuel production and ensure fuel security, which interact with the emissions intensity and production of refineries. For this analysis, the production variable was disaggregated into two groups of commodities: ethane and LPG; and (other) refined petroleum products.

Refineries covered under the Safeguard Mechanism account for all domestic production. The sector is highly exposed to import competition, with 80% of the domestic market served by imports, mainly from East Asian countries.[76] Energy intensive refining forms a relatively small share of product prices, with carbon costs in 2030 estimated to range from 0-1% of prices. Import sensitivity to prices was estimated as significant for ethane and LPG (-4.4) but modest for other refined petroleum products (-0.3). Under a maximum carbon cost difference scenario, estimated declines in production are below 1% for these commodities.

Exports of refined petroleum relative to Safeguard production are between 0.2-0.4, with exports sensitive to price changes (elasticity of -1). Overall, trade leakage is estimated to be below 1%.

Industry feedback highlighted the need for early steps to address investment leakage risks arising from policy uncertainty, which reduce capacity to invest in existing refinery assets or new low emissions fuel production. However, industry also recognised that existing policies to support or regulate refinery operations could have complex interactions with potential leakage policies. Analysis of profits finds petroleum refining to be among a group of sectors with the second highest level of investment leakage risk (see **Section 2.5**). Existing policies were considered insufficient to mitigate

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[76] Based on industry submissions.

leakage risks in the longer run. A border carbon adjustment was seen as potentially useful if designed appropriately.

Industry also emphasised the need to consider a holistic set of policy measures to help refineries pivot to the production of low emission fuels (e.g., renewable diesel and sustainable aviation fuels), and noted that the broader emissions reduction impact of this would far outweigh the direct impact of decarbonising production facilities. Low carbon liquid fuels is a priority area under the Future Made in Australia agenda. The government has committed $18.5 million over four years from 2024-25 to develop a certification scheme for low-carbon liquid fuels for the transport sector, including sustainable aviation fuels and renewable diesel, by expanding the Guarantee of Origin scheme.

While not at risk over the short-term, further monitoring of risk levels is required and it is proposed that the carbon leakage risk of refined petroleum is particularly considered in the 2026-27 review of Safeguard Mechanism settings.

2.6.8 PULP AND PAPER

Facilities covered under the Safeguard Mechanism produce pulp, packaging paper, tissue paper and newsprint.[77] The sector is highly trade-exposed. Imports are equivalent to 0.4-0.6 times the amount of Safeguard production for all commodity types. Exports relative to Safeguard production are between 1.0-1.2. Exports are more sensitive to price changes (elasticity of -1.5) compared to imports (-0.8).[78]

Decarbonisation for pulp production relies on alternatives to heating fuels, either by electrifying heating processes or switching to lower emission fuels. Industry feedback suggests this could be difficult in regional locations where enabling infrastructure is lacking.

Carbon costs in 2030 are estimated to between 0-1% of prices. Under a maximum carbon cost difference scenario, Safeguard production is estimated to decline by less than 1% for import leakage and 1% for export leakage. The Review's analysis of profits finds pulp and paper to be among a group of industries most susceptible to investment leakage (see **Section 2.5**).

Industry affirmed the emissions-intensive and trade-exposed nature of paper production and noted potential risks of leakage in absence of additional policies to address them, such as a border carbon adjustment. They also noted other non-leakage policies (e.g. forestry policies affecting access to timber inputs) as significant influences on production decisions.

Based on some risk indicators approaching material levels and potentially high susceptibility to investment leakage risks (see **Section 2.5**), the Review proposes that the carbon leakage risk of pulp and paper be particularly considered in the 2026-27 review of Safeguard Mechanism settings.

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[77] There is currently no domestic production of printing and writing paper.

[78] It is recognised that in a scenario of import dependency Australia's price elasticity of demand is likely to be inelastic.

2.6.9 MAGNESIA

Magnesia is used in a wide variety of industrial applications, including fertilisers, steel production and electric vehicle (EV) batteries, and is included on the government's Critical Minerals List.[79]

Imports are equal to 0-0.2 times the volume of Safeguard production and are price sensitive (elasticity of -2.2). Australia appears to export some magnesia, but limited data is available on export volumes. China is the largest producer of magnesia, accounting for two thirds of global production in 2023.[80]

Magnesia production is emissions-intensive. Around 70% of emissions are process emissions from calcination of magnesite and 25% is from the use of fuels for calcination. Decarbonisation relies on CCUS for process emissions and electrification of the calcination process, but neither are considered viable in the near term. 2030 carbon costs are estimated to be between 3-5% of price. Safeguard production is estimated to decline by 1% due to import competition.

The Review has found that existing policies currently appear sufficient to address leakage risks.

[79] The Critical Minerals List identifies minerals where Australia has geological potential for resources, that are essential for the economy and national security, that are in demand from strategic international partners, and are vulnerable to supply chain disruption, available here.

[80] S&P Global, 2023, Magnesium Oxide and Other Magnesium Chemicals, available here.

2.6.10 POLYETHYLENE

Ethane and other petroleum products are used as feedstocks to produce ethylene, which is then further processed into polyethylene. Polyethylene can be made into a wide range of plastic products. Future production levels are uncertain based on recent industry announcements.

Polyethylene is trade-exposed in domestic markets, with imports equivalent to 0.4-0.6 times the volume of domestic production. Exports are negligible. Imports are modestly price sensitive (elasticity of -0.5). Carbon costs in 2030 are estimated to be between 0-1% of prices. Under a maximum carbon cost difference scenario, Safeguard production is estimated to decline by less than 1% based on 2030 carbon constraints.

The Review notes that other supply chain factors beyond the Safeguard Mechanism may have a significant influence on future production decisions. In relation to rising energy prices, the government has implemented several measures as part of the Energy Price Relief Plan, including a temporary wholesale gas price cap which has been superseded by the Gas Market Code. The Gas Market Code is designed to facilitate a well-functioning domestic wholesale gas market with adequate gas supply at reasonable prices and on reasonable terms.

Based on the analysis, the Review is not proposing additional policies for plastics at this time.

2.6.11 LNG

Domestic gas production in 2022-23 was around 164 billion cubic metres, with around 68% of this exported as LNG (82 million tonnes). Australia was among the top 3 global exporters of LNG in 2023.[81]

Around 80% of Australia's LNG is supplied under long-term contracts, and exports are moderately sensitive to price changes (elasticity of -0.6).[82] Carbon costs in 2030 are estimated to be between 0-1% of prices and resulting declines in Safeguard production from export leakage under a maximum carbon cost difference scenario are estimated to be less than 1%. Analysis of profits finds LNG to be among the groups of industries with relatively lower risks of investment leakage (see **Section 2.5**).

While Australia's gas industry has been significantly export-focused to date, the Future Gas Strategy identified that there is potential to use LNG import terminals in the future.[83]

Based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.12 ETHANOL AND DRIED DISTILLERS GRAIN[84]

Leakage risks primarily arise from trade exposure in export markets, given exports relative to Safeguard production are between 0.2-0.4. Exports are moderately sensitive to price changes

[81] Resources and Energy Quarterly, March 2024, available here.
[82] Ibid.
[83] Future Gas Strategy, 2024, available here.
[84] Production variables covered include wheat protein products (dried gluten), direct wheat starch and wheat based dried distillers grain.

(elasticity of -0.6). Imports are equivalent to 0-0.2 times the volume of Safeguard production and sensitive to price changes (elasticity of -1.4).

Carbon costs in 2030 are estimated to be between 0-1% of prices. The estimated declines in Safeguard production under the maximum carbon cost difference scenario are less than 1% from import exposure and export exposure. Analysis of profits suggests grain product manufacturing is among a group of sectors that is second most susceptible to investment leakage.

Based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.13 MANGANESE ORE

Manganese ore is processed into various manganese products. Over 90% of manganese is used in steel as an alloying agent, but there are growing uses in batteries and EVs.[85] Manganese is included on the Critical Minerals List, based on its use in technologies of economic and security importance, Australia's resource potential, demand from strategic international partners, and vulnerability to supply chain disruption.

Carbon costs in 2030 are estimated to be between 0-1% of prices. Australia appears to export manganese ore, but data on export volumes is limited. Estimates of export sensitivity to prices has not been established, and therefore production leakage could not be estimated. Imports are small, equivalent to 0-0.2 times the volume of production, but are sensitive to prices (elasticity of -1.5). Estimated Safeguard production leakage due to import competition is less than 1%.

Based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.14 SILICON

Silicon is used in a variety of applications, including manufacture of products important for the net zero transition such as aluminium, silicon chips and solar panels. Silicon is listed on the Critical Minerals List, reflecting its importance to strategic technologies, Australia's geological resources, demand from strategic partners and vulnerability to supply chain disruption. The 2024-25 Budget included funding to study solar PV value chain opportunities from developing a green polysilicon industry in Australia.[86]

Leakage risks are mainly relevant in export markets, with exports relative to Safeguard production of between 0.8-1.0. Carbon costs are estimated at between 1-3% of prices. Exports are not sensitive to price changes (elasticity of -0.2) and production is estimated to decline by less than 1% from export competition.

In domestic markets, imports are equivalent to 0-0.2 times the volume of production and are moderately sensitive to price changes (elasticity of -0.7). Overall, under a maximum carbon cost difference scenario, estimated decline in production based on 2030 carbon costs is less than 1%.

[85] See Manganese Ore, Geoscience Australia, available here.
[86] Budget Measures Budget Paper No.2, The Commonwealth of Australia, May 2024, available here.

On balance, based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.15 BAUXITE

Globally, Australia is a major producer of bauxite, and was the second largest exporter in 2023.[87]

Exports relative to Safeguard production are between 0.4-0.6 and the remainder is domestically refined into alumina. Exports are somewhat sensitive to price changes (elasticity of -0.8). Bauxite production is less emissions-intensive relative to other parts of the aluminium value chain, and 2030 carbon costs are estimated to be between 0-1% of prices. Under a maximum carbon cost difference scenario, production is estimated to decline by less than 1%.

Industry stakeholders have noted that the vertically integrated nature of the aluminium sector means any leakage risks affecting alumina refineries could also impact the bauxite facilities that supply them.

On balance, based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.16 SYNTHETIC RUTILE AND TITANIUM DIOXIDE

Synthetic rutile is produced by upgrading mineral ilmenite in a kiln and is a feedstock for titanium dioxide production. Titanium dioxide is used in the manufacture of paint and other products and is listed on the Critical Minerals List. Minerals are included in this list based on their importance to technologies of economic and security significance, Australia's resource potential, demand from strategic international partners and vulnerability to supply chain disruptions.

Exports of synthetic rutile relative to production are between 0.2-0.4, and exports are sensitive to price changes (elasticity of -1.2). Exports of titanium dioxide are negligible.

Imports of synthetic rutile are equivalent to 0-0.2 times the volume of production but price sensitivity is low (-0.2). Imports of titanium dioxide are negligible.

Coal use as a reductant and for heating accounts for the bulk of emissions in synthetic rutile production. Clean hydrogen could replace the use of coal but is not expected to be viable in the near-term, which could result in increased leakage risks over time. Carbon costs in 2030 are estimated to be between 0-1% of the value of these commodities. Under a maximum carbon cost difference scenario, declines in production for all commodities are estimated to be less than 1%.

Based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.17 FERRO AND SILICOMANGANESE ALLOY

Ferro and silicomanganese are used as an alloying element in steel. Ferro and silicomanganese imports are equivalent to 0-0.2 times the volume of Safeguard production. Trade sensitivity for

[87] Resources and Energy Quarterly, March 2024, available here.

ferromanganese is low for imports (-0.2) and exports (-0.01). Trade sensitivity for silicomanganese could not be estimated.

Australian production appears to have relatively low emissions intensity, as electric arc furnaces powered by hydroelectricity are used for smelting.[88] Carbon costs in 2030 are estimated to be modest at 1-3% of prices. Trade leakage is estimated to be less than 1% due to import competition and less than 1% in export markets for ferromanganese. Leakage is not estimated for silicomanganese as trade sensitivities could not be established.

On balance, based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.18 LITHIUM HYDROXIDE AND LITHIUM ORE

Lithium hydroxide is used in the production of lithium ion batteries. It is produced by refining spodumene, a lithium mineral, into lithium hydroxide. Australia was the world's largest producer of spodumene in 2021, supplying over 50% of global demand.[89] Lithium is listed on the government's Critical Minerals List, and it is estimated that Australia could represent 15% of global lithium hydroxide production by 2029.[90] The government has identified critical minerals processing as aligned with the Economic Resilience and Security Stream of the National Interest Framework under its Future Made in Australia agenda.[91]

The first domestic production of lithium hydroxide recently commenced, primarily for export.[92] Given this, leakage risks are not quantitatively assessed for lithium hydroxide at this time.

Lithium ore exports are sensitive to prices (elasticity of -1.2).[93] Carbon costs in 2030 are estimated to be between 0-1%, reflecting the high prices for lithium ore. As such, under the maximum carbon cost difference scenario, declines in production are estimated to be less than 1%.

Based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.19 COAL

Australia is the world's largest exporter of metallurgical coal and second largest exporter of thermal coal. Nearly all metallurgical coal production is exported, while around 75-80% of thermal coal production is exported.[94]

Estimates of export sensitivity to prices are uncertain, and therefore trade leakage has not been estimated**.** Carbon costs in 2030 as a share of price are estimated to be low, at between 0-1% of price. Analysis of profits finds coal mining to be at lower risk of investment leakage relative to other industries, particularly manufacturing (see **Section 2.5**).

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[88] Media release, 2021, available here.
[89] World Economic Forum.
[90] Resources and Energy Quarterly, March 2024, available here.
[91] Future Made in Australia - National Interest Framework, Treasury, May 2024, available here.
[92] Tianqi Lithium Energy Australia.
[93] Elasticity was estimated based on spodumene, as historical data for lithium hydroxide was unavailable.
[94] Resources and Energy Quarterly, March 2024, available here.

Based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.20 OTHER METAL ORES[95]

This covers the mining and onsite processing of ores that contain one or more metals that are not already covered by other Safeguard production variables.[96]

Trade-exposure appears low, with imports and exports both equivalent to 0-0.2 times the volume of production. The sensitivity of imports to price changes was estimated to be -0.4, but a sensitivity for exports could not be estimated. Carbon costs in 2030 are estimated to be low, at between 0-1% of prices. Under a maximum carbon cost difference scenario, estimated declines in production from import competition are negligible. Export-related leakage has not been estimated as trade sensitivity could not be established**.** Analysis of profits suggests metal ores are in the group of industries with the lowest level of investment leakage risk (see **Section 2.5**).

There is some uncertainty regarding this analysis, as the broadly defined nature of this commodity under the Safeguard Mechanism means that the types and volumes of relevant metal ores produced can vary from year to year. Based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.21 CRUDE OIL

Australia produced 291,000 barrels a day of crude oil in 2022-23. Crude oil and condensates are trade-exposed in domestic and export markets. Around 98% of production was exported, and imports were equivalent to almost 60% of production in 2022-23.[97] Imports of crude oil are somewhat sensitive to price changes (elasticity of -0.6), but a price sensitivity could not be established for exports. The export ratio of 0-0.2 reflects multiple production variables including extraction, processing and stabilisation.

The carbon cost as a share of price is estimated to be between 0-1%. Estimated trade leakage is below 1% and is considered small in the context of other factors driving production. For example, crude oil and condensate production in Australia is estimated to have fallen by 10% in 2023 due to oil fields in the Carnarvon Basin approaching their end of life.[98] Analysis of profits suggests oil and gas sectors are at lower risks of investment leakage compared to other sectors, particularly manufacturing industries.

Based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.22 IRON ORE

Australia is the world's largest producer and exporter of iron ore.[99] Iron ore is primarily export-exposed. Virtually all production is exported, though estimates of export trade sensitivity have not been established.

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[95] This relates to the run-of-mine metal ores production variable under the Safeguard Rule 2015.
[96] Safeguard Mechanism: prescribed production variables and default emissions intensities, available here.
[97] Resources and Energy Quarterly, March 2024, available here.
[98] Ibid.
[99] Ibid.

Carbon costs in 2030 are estimated to be between 0-1% of prices, but trade leakage is not estimated given uncertainty over the trade sensitivity. Analysis of profits finds that iron ore is among the group of sectors least at risk of investment leakage, out of all industries assessed (see **Section 2.5**).

Based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.23 NICKEL[100]

Nickel is used in the production of stainless steel, and increasingly in EV batteries and other clean energy technologies. It is included on the Critical Minerals List based on its use in technologies of economic and security importance, Australia's geological resources and vulnerability to supply chain disruptions. Analysis focuses on refined nickel products rather than nickel ore which is covered by the run-of-mine metal ores Safeguard Mechanism production variable.

Australia has been a major global producer of nickel and was the third largest exporter in 2022.[101] Exports of refined nickel products relative to Safeguard production are between 0-0.2, but an estimate of export sensitivity has not yet been established.

Carbon costs are estimated to be between 0-1% of prices. Declines in production have not been estimated due to uncertainty about the trade-price sensitivity. Excess international nickel supply and lower prices are more significant risks for Australian production.[102] Analysis of profits finds nickel to be in the group of industries with the lowest level of investment leakage risk compared to other industries, particularly manufacturing.

Based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

2.6.24 BASIC NON-FERROUS METALS

This category includes lead bullion and refined lead, zinc in fume and copper anode. These commodities are primarily export-competing, with exports relative to Safeguard production between 0.4-0.6. Imports relative to Safeguard production are between 0-0.2. Australia was the largest exporter of zinc and fourth largest exporter of copper in 2022.[103] Copper and zinc are included in the Strategic Materials List, on the basis of their importance to technologies critical to the net zero transition, Australia's resource potential, and demand from strategic international partners.

Export sensitivity to price changes could not be estimated. Carbon costs in 2030 are estimated to be between 0-1% of prices. Production declines from export leakage could not be established due to uncertainty about trade-price sensitivity. Based on profit analysis, basic non-ferrous metals were among the group of industries with the third highest level of investment leakage risk (see **Section 2.5**).

[100] PVs covered include primary nickel from nickel bearing inputs, primary nickel from imported intermediate nickel products, and intermediate nickel from nickel bearing inputs.
[101] Resources and Energy Quarterly, March 2024, available here.
[102] Ibid.
[103] Ibid.

Industry feedback highlighted several factors beyond climate policy that are important for competitiveness, including: fiscal settings; permitting processes; enabling infrastructure; a strong supporting services sector; and a skilled workforce.

On balance, based on the Review's analysis, existing policies currently appear adequate to address leakage risks.

3 Border carbon adjustment

3.1 Principles and objectives

Findings

A border carbon adjustment applied to imports could be an appropriate policy measure for selected Safeguard-covered commodities with high carbon leakage risk from imports. It could provide a robust underpinning of the Safeguard Mechanism for commodities where carbon leakage risk is material, and efficiently support industrial decarbonisation and the emergence of low emissions industries.

Implementation could be phased and could involve the removal of TEBA provisions for facilities producing commodities once a border carbon adjustment is fully implemented.

A border carbon adjustment that provides rebates for exports would be inconsistent with Australia's emissions reduction targets and could raise considerable international trade law concerns. For these reasons a border carbon adjustment for exports is unlikely to be appropriate for Australia or achieve the relevant policy objectives. Well-designed border carbon adjustments in other countries would provide market premiums to Australian low emissions export commodities.

A border carbon adjustment would need to mirror domestic emissions policy settings to imports to provide a level playing field and be designed to minimise administrative burdens. It would need to be consistent with Australia's longstanding support of an open, rules-based trading system and its international trade law obligations. Australia could advance relevant work with plurilateral initiatives and support trade partner countries with implementation.

A border carbon adjustment mechanism could be used to equalise the effective carbon reduction efforts between Australia and foreign jurisdictions.

The policy objective of a border carbon adjustment is to achieve climate policy parity between domestically and internationally produced goods, thereby avoiding carbon leakage while providing full incentives to decarbonise production practices and invest in low emissions facilities. A border carbon adjustment allows pass through of carbon costs which allows low and zero emissions products to achieve a market price premium. It also alleviates the need to support domestic emissions-intensive producers to compete with producers that do not face carbon costs.

Should government decide to pursue a border carbon adjustment, the design of an Australian border carbon adjustment should take into account Australia's obligations under international trade law. Any measure would need to reflect the key trade law principle of non-discrimination by ensuring that any obligations arising from a border carbon adjustment treated imported and locally produced commodities equally and ensured equal treatment between Australia's trade partners. These requirements are actively considered in the treatment of specific issues through the Review.

Where suitable, a border carbon adjustment is a policy option that could be a long-term solution to carbon leakage. The adjustment recognises both actual emissions intensity and costs already paid on embedded emissions, and thereby automatically adapts to changes over time in domestic and trading partners' climate policy.

Border carbon adjustments can also support the emergence of new low emissions industries and could in principle apply even when production of a Safeguard-covered low emissions commodity is only emerging. Stakeholder feedback highlighted that, in this context, a border carbon adjustment could be particularly relevant to addressing investment leakage risks.

A border carbon adjustment is usually conceptualised, and typically designed, to be based on the difference in explicit carbon costs between jurisdictions. The principle of equal treatment of domestic producers and imports implies mirroring of domestic policy settings to imports, as far as practicable.

In the Australian context of the Safeguard Mechanism, this would mean that only imports that are higher emissions intensity than the relevant Australian baseline and that face a lower effective carbon cost would be liable for a border carbon adjustment (see **Section 3.5.2** and the Appendix).

While the initial basis for a border carbon adjustment would be the Safeguard Mechanism, in principle it could also include any future emission reduction policies involving explicit carbon costs, whether at national or subnational levels.

A border carbon adjustment can enable increased domestic climate ambition with reduced fiscal outlay by providing a level playing field for domestic industry relative to overseas producers.

The implementation of a border carbon adjustment would be complex, and it would be appropriate to phase its application to different commodities. The feasibility of a border carbon adjustment depends on factors including reliable international emissions reporting, compliance and administrative arrangements, and consistency with international trade rules and obligations.

The Review has also considered key issues and lessons from international experience relating to policy design and implementation of possible carbon border adjustment, particularly related to feasibility. Detailed design would need to be considered and consulted on, should government decide to pursue a border carbon adjustment.

Stakeholders from trade-exposed industrial sectors by and large supported an Australian border carbon adjustment.

> *A CBAM would be a significant reform and require careful design, international collaboration and domestic policy evolution. … it could be a major and increasingly important element of an effective Australian climate policy suite.* – **Ai Group submission to November 2024 consultation**
>
> *Australia's economy potentially sits on the verge of benefitting highly from the next generation green iron production, followed by low carbon steel manufacturing in time, if a*

number of key enablers allow it to do so. A strong and effective CBAM policy will be one such important enabler. **– Australian Steel Institute submission to November 2024 consultation**

The Australian Government should introduce calibrated measures to prevent carbon leakage, while maintaining the incentive for Australian industry to reduce its emissions. Among the options, border carbon adjustments look to be the most effective. **– The Grattan Institute submission to November 2024 consultation**

Urgent implementation of a border carbon adjustment for clinker, cement and lime will be critical to mitigate the accelerating carbon leakage our sector is facing. The certainty of a level playing field will provide the confidence necessary for our industry to deploy the significant capital investment associated with implementing decarbonisation technologies. – **Cement Industry Federation submission to November 2024 consultation**

We consider that a well-designed import BCA could broaden and deepen Australia's climate policy suite, by supporting greater mitigation outcomes through the Safeguard Mechanism than would be possible if carbon leakage risks are not addressed. Alongside the Safeguard Mechanism and Guarantee of Origin, a BCA would also help to support Australia's economic opportunity as a major producer and exporter of clean energy and industrial commodities. **– Carbon Market Institute submission to November 2024 consultation**

Some stakeholders expressed concern about an Australian border carbon adjustment, including the potential for broader trade consequences and the cost impact on downstream users. The Review has carefully considered these concerns and addresses them throughout this chapter.

ACCI contends the CBAM, as outlined in the consultation paper, will be extremely difficult to integrate with the SM and is unlikely to be effective in addressing the carbon leakage. **– Australian Chamber of Commerce and Industry submission to November 2024 consultation**

Box 1 - International examples of border carbon adjustments

The EU was the first jurisdiction to implement a border carbon adjustment. Implementation commenced in 2023 with a transitional phase requiring only reporting, until 2026 when charges will be levied. The EU CBAM will initially cover aluminium, cement, electricity, fertilisers, hydrogen, iron and steel. It will cover scope 1 and for certain sectors scope 2 emissions (with the aim of consistent with the coverage of the EU Emissions Trading Scheme (ETS)). In line with requirements in the EU CBAM regulation, the European Commission is reviewing various elements of the CBAM before the end of the transitional phase, and has stated that it is considering ways to simplify administrative requirements. In February 2025 the EU Commission announced some proposed changes to EU CBAM legislation as part of its Clean Industrial Deal roadmap. Reflecting that less than 20 per cent of the companies in scope are responsible for more than 95 per cent of the emissions in the products, the changes would introduce a new threshold based on cumulative mass per importer per year, that would be set to ensure 99 per cent of emissions remain in scope. The changes also enable importers to use default carbon prices when providing information on carbon prices paid in third countries.

The UK Government has committed to introducing a border carbon adjustment starting in 2027, covering aluminium, cement, fertiliser, hydrogen, iron and steel. It will cover scope 1, scope 2 and select precursor product emissions, consistent with the UK ETS.[104]

The Canadian Government has consulted on the introduction of a border carbon adjustment.[105] In April 2024, the US announced it would establish a White House Climate, Trade and Industrial Competitiveness Taskforce to, among other things, develop policies to effectively address carbon leakage.[106] The US announcement follows introduction of legislative proposals in Congress that could facilitate the introduction of a border carbon adjustment in the future. Other countries are at the early stages of their own carbon leakage reviews.

3.2 Export border carbon adjustment

A border carbon adjustment could in theory apply to both imports and exports. Neither the EU nor UK include exports in their border carbon adjustment policies at this time, although future reviews are expected to examine the issue.[107]

Stakeholder views on the appropriateness of an export border carbon adjustment were mixed, and there remains interest among Australian industry in continuing to engage with this issue. Some stakeholders have argued strongly in favour of export border carbon adjustments, others against.

The Review has identified potential carbon leakage risk could emerge over time in some export sectors. The export leakage risk is assessed to be most material in relation to steel, ammonia, alumina and aluminium.

An export border carbon adjustment would provide a rebate for carbon costs for goods that are exported. It could be calculated based on the actual domestic carbon costs incurred during production or against another benchmark such as international best practice. An export border carbon adjustment would increase domestic producers’ competitiveness in overseas markets.

However, fully rebating carbon costs incurred under the Safeguard Mechanism for exports would effectively exempt production that is exported from emissions reduction obligations. This would be counter to national emissions reductions and net zero objectives. A partial rebate based on the emissions up to international best practice would continue some incentive for investment in decarbonisation in export-facing industries but would still reduce incentives for action compared to current arrangements.

In either approach an export border carbon adjustment would tend to result in less emissions reductions in export-oriented industries, and likely increases in emissions under a full rebate. It

[104] UK Government, Consultation on the introduction of a UK CBAM, 30 October 2024, available here.
[105] Government of Canada, Exploring Border Carbon Adjustments for Canada, 2021, available here.
[106] US Government, 16 April 2024, available here.
[107] GMK, 20 November 2024 available here.

would consequently increase the emissions reduction requirement on other sectors of the economy, including industries that predominantly supply the domestic market.

Australian industrial production under the Safeguard Mechanism is predominantly export oriented, so the effects of an export border carbon adjustment could be large. Emissions from facilities in sectors that export at least 20% of their production comprised approximately 73% of Safeguard emissions in 2021-22. By contrast, in sectors where a border carbon adjustment is recommended for consideration, the estimated emissions in imports are much larger than those in exports from Australia.

The Review found that estimated average annual emissions in Safeguard covered trade to be around 67 Mt CO_2-e and 17 Mt CO_2-e in exports and imports respectively (see Annex Table 7 for details). For commodities where a border carbon adjustment is recommended for consideration, estimated combined average annual emissions are around 2 Mt CO_2-e and 6 Mt CO_2-e for exports and import respectively.

Importantly, an export border carbon adjustment would likely raise considerable international trade law concerns and risks. These risks need to be considered in the context of Australia's international treaty obligations and ongoing commitment to the rules-based multilateral trading system. Given legal uncertainties, export border carbon adjustment measures could be particularly vulnerable to legal challenge by trading partners.[108]

Given the challenges facing an export border carbon adjustment, the Review has considered what policy options would be appropriate for sectors facing export leakage risk. Some of these sectors are included in Future Made in Australia announcements (see **Section 2.2**). It has not been possible to specifically assess the impact that these programs may have on carbon leakage risks. However, as also raised by some stakeholders, public investment has the ability to reduce carbon leakage risk by supporting investment in low and zero emissions options.

Over time, export sectors will benefit most from a faster global energy transition and the further growth of markets that provide a premium for low emissions goods. This premium could be achieved through other countries implementing carbon pricing complemented by border carbon adjustments. Australian exports of low emissions commodities can also benefit from other countries' policy approaches, such as mandatory product standards for imports (e.g. emissions standards for hydrogen and hydrogen derived products) and a more general shift to production systems which make low emissions production the norm.

Australia has opportunities to amplify engagement with multilateral and plurilateral forums to facilitate growth in markets which offer a premium for low emission goods (see **Chapter 5**).

An export border carbon adjustment which rebates Safeguard Mechanism costs could pose fundamental challenges for Australia's climate objectives and would raise considerable international trade law concerns. Consequently, the Review assesses export border carbon adjustment as unsuitable for Australia.

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[108] World Trade Institute, The EU Proposal for a CBAM: An analysis under WTO and Climate Change Law, 2022, available here.

Submissions to the second consultation paper expressed different views on whether an export border carbon adjustment was suitable for Australia. Some producers expressed concern that export sectors would require a rebate to avoid competitive disadvantage while others acknowledged the climate and trade policy challenges with implementing an export border carbon adjustment.

> *The Council welcomes the recognition in the Paper that a border carbon adjustment (BCA) is not appropriate for export oriented industries such as bauxite, alumina and aluminium in Australia.* **– The Australian Aluminium Council submission to November 2024 consultation**
>
> *The Paper concludes that an export rebate would not be an appropriate part of a BoCA because it would remove the incentive to transition and would violate international trade law. While we recognise that these concerns are widely held and have led the European Union to opt not to include an export adjustment in its CBAM, we do not share these views. An export rebate need be no less legal and no less compatible with abatement incentives than current Safeguard baselines.* **– Ai Group submission to the November 2024 consultation**
>
> *A rebate for exports is critical to a well-designed BCA for Australia, because it ensures that domestic producers who are subject to the SGM will not be competitively disadvantaged when exporting products to jurisdictions that do not impose a carbon cost on their domestic producers.* **– BlueScope submission to November 2024 consultation**
>
> *An export border carbon adjustment is not appropriate due to incompatibility with Australia's emissions reduction targets and, likely, international trade law obligations. The finding that 'well-designed border carbon adjustments in other countries would provide market premiums to Australian low emissions export commodities' is correct.* **– The Superpower Institute submission to November 2024 consultation**

For the remainder of this paper the term 'border carbon adjustment' will be used to refer only to an import-based border carbon adjustment mechanism.

3.3 Economic effects of a border carbon adjustment

A border carbon adjustment, properly designed and implemented, provides equivalent policy treatment for embedded emissions for production within the implementing country and imports.

As a result, the risk of carbon leakage – including relocation, investment leakage, and loss of market share purely because of policy differences – is fully addressed. A border carbon adjustment can mean greater confidence for investment in low or zero emissions production, including both improvements to existing facilities and new investments. This is because the risk of being undercut by high emissions imports that do not face emissions costs is removed.

The objective of a border carbon adjustment should be to create a level playing field between domestic and foreign producers, rather than shielding existing high emissions processes from change. Overseas producers may be able to produce specific commodities at equal or lower emissions intensity more cheaply or be able to compete successfully on the basis of lower production costs that outweigh carbon costs on higher emissions. Although it is not the primary purpose, a border carbon adjustment would create incentives for producers in other countries to monitor emissions of production and potentially to invest in low emissions facilities to enhance export competitiveness.

If a border carbon adjustment is implemented, it reduces the need to allocate a particular share of emissions allowances to limit the exposure to carbon leakage risk. In the context of Australia's Safeguard Mechanism, a border carbon adjustment would in principle allow removal of TEBA provisions and more rapid baseline reduction rates in the future would also be possible.

Carbon cost pass through

A border carbon adjustment allows companies to reflect the costs of complying with emissions constraints in their product prices, which is not possible when domestic companies compete in tradable commodity markets with imports that are not subject to climate policy measures. This carbon cost pass through allows producers of clean products to obtain a market premium for their products. Low emissions production benefits from product price uplift while paying lower or no carbon costs, which supports investment in decarbonisation.

Relative prices will change. Low emissions commodities will tend to become cheaper relative to high emissions commodities, creating incentives for downstream industries and end users to substitute towards lower emissions options. In construction, for example, this will tend to result in greater use of low emissions alternatives and greater material efficiency in the use of high emissions products.

The same effect applies to exports if other countries introduce border carbon adjustments, which would facilitate a market premium for low emissions products in that country. This improves competitiveness of low emissions production in exporting countries including Australia.

The effects of a border carbon adjustment mechanism would be largely confined to the specific industrial sectors where it would be implemented, and even in those sectors the effects would generally be gradual and limited. The low level of projected carbon costs relative to finished product prices for most of the products reviewed in **Chapter 2** indicates this. In the long-term, impacts on market prices are limited by the production costs of low or zero emissions processes and alternatives. Likewise, substitution effects away from the commodity towards other activity is expected to be small. In either time horizon, effects on the economy overall would be small, while serving the broader national policy objectives of net zero emissions and investment in zero emissions industries.

These economic effects are illustrated quantitatively in modelling, using an integrated modelling framework combining sectoral, domestic and global models (see **Appendix C**). The modelling shows the introduction of border carbon adjustments for selected commodities will have: no material impact on Australia's macroeconomy; minor changes in trade flows; and some changes in the source countries of specific exports to Australia, which are minor relative to overall trade.

Resource shuffling

Border carbon adjustments create incentives for imports to be sourced from lower emissions facilities. Where this results in the shifting of trade patterns, with pre-existing cleaner production directed towards jurisdictions that have a border carbon adjustment in place, and no change in overseas investment or operation towards cleaner production, this is termed 'resource shuffling'. Resource shuffling is likely to be greater in easily substitutable commodities or production pathways and for commodities where there are relatively large differences in emissions intensity of production between different facilities in exporting countries. Resource shuffling may occur both between facilities within an exporting country, or between exporting countries.

It would be challenging to estimate the likely extent of resource shuffling that might occur in exports to Australia as a result of a border carbon adjustment, because of lack of comprehensive and reliable data for facility-specific emissions intensities overseas, and lack of data about opportunity for and costs of redirecting imported commodities in specific supply chains.

Resource shuffling would be expected to be less pronounced over time as baselines in the Safeguard Mechanism decline and to the extent that emissions policy ambition rises in exporting countries.

Box 2 - Resource shuffling example

There are two facilities producing a commodity overseas. One facility was built recently and has integrated technology to reduce energy loss and emissions. It produces the commodity at an emissions intensity of 0.75 tonnes CO_2-e/tonne. The second facility is older and produces the commodity at an emissions intensity of 0.90 tonnes CO_2-e/tonne. Both facilities export the commodity to Australia.

Australia introduces a border carbon adjustment that references the average emissions intensity baseline of Australian commodity producers (0.80 tonnes CO_2-e/tonne). In response, only the new, modern facility exports to Australia.

Over time, emissions intensity baselines under the Safeguard Mechanism for the commodity reduce to 0.6 tonnes CO_2-e/tonne. All things being equal, the new facility is likely to continue to send more commodity from than the higher emissions facility but, in the absence of further investment in emission reduction technology, would face a border carbon adjustment liability.

3.4 Sectoral application

Findings

Implementation of a border carbon adjustment would most suitably start with commodities at relatively high risk of carbon leakage and for which implementation is likely to be simplest. Cement and clinker would be suitable candidates in this regard.

Based on current analysis, lime, hydrogen, ammonia and derivatives, steel and iron, as well as glass are also candidates for a border carbon adjustment. However, they possess attributes such as partial Safeguard coverage and complex supply chains, which would require more time to investigate and resolve before a border carbon adjustment could be implemented.

Should a border carbon adjustment be pursued, coverage of commodities could be expanded over time where the suitability criteria are met, as reliable emissions monitoring is expanded and domestic and international experience with border carbon adjustments grows. Further stakeholder consultation would need to be undertaken before the addition of other commodities.

The Review's consideration of the suitability of a border carbon adjustment was informed by a commodity-by-commodity analysis, with regard to:

- the extent of carbon leakage risk facing the sector without additional policies
- the practical feasibility of a border carbon adjustment for the sector, accounting for sector-specific considerations (e.g. simplicity or complexity of calculating embedded emissions, traceability of commodities through supply chains, etc.)
- the share of domestic production subject to Safeguard obligations
- other existing policies that may affect carbon leakage risk assessment or the suitability of a border carbon adjustment.

Stakeholders acknowledged that implementation would be more readily feasible and could proceed more quickly for commodities with simpler supply chains and manufacturing processes and full Safeguard coverage, such as cement and clinker.

The Review assessed the commodities that analysis showed as subject to carbon leakage risk in **Chapter 2**. **Section 3.4.1** also includes a commodity-by-commodity discussion relating to commodity complexity, domestic Safeguard coverage and other key domestic considerations (see also Table 5).

The identification of commodities suitable for a potential border carbon adjustment in this chapter is based on a point in time estimate of leakage risks, which depends directly on assumptions about several market-based factors, such as future unit prices, production and trade ratios, and ACCU prices. Changes to these assumptions, and deviations of future values from the assumptions made here, will result in changes to the analysis presented in this report and could change assessments about leakage risks.

As with the analysis in this report, the Review considers that future carbon leakage risk assessments would need to rely on careful and balanced judgement, informed by assessment of quantitative, qualitative and contextual information, rather than a mechanical approach based on quantitative materiality thresholds.

A watching brief on leakage risk levels and the appropriateness of policy settings would be warranted beyond this Review.

3.4.1 Commodities recommended for border carbon adjustment consideration

Cement, clinker, and lime

Estimates of potential trade leakage due to imports for cement, clinker and lime were found to be amongst the highest for all commodities, and these sectors may be subject to high risk of investment leakage (see **Chapter 2**).

These commodities and their production methods are relatively homogenous and supply chains are typically shorter and less complex than for other goods that are assessed as being of material carbon leakage risk.

Existing emissions accounting frameworks, such as the one within the Environmental Product Declaration system, may help facilitate emission measurement and verification for the purposes of a border carbon adjustment.

One potential complexity relates to the variation in emissions intensities that arises from different types of cement and the blending of supplementary cementitious materials into cement. Further consideration may need to be given to how this could be appropriately reflected in the design of any border carbon adjustment for cement to ensure a level playing field for both domestic and imported products.

A border carbon adjustment for cement, clinker and lime would address carbon leakage risk for the long-term and could potentially help facilitate private investments in lower emissions production facilities in Australia.

Traceability of goods may present an issue in limited circumstances as these commodities are relatively homogenous. Further development of international climate accounting systems in response to international carbon leakage measures would minimise this issue.

A particular complexity exists for domestic lime production, as the Safeguard Mechanism covers only around three quarters of total Australian production. Further investigation would be required of whether and how a border carbon adjustment could apply given the Safeguard Mechanism threshold. Implementing a border carbon adjustment mechanism for lime may therefore require more time than for clinker and cement, which are fully covered by the Safeguard Mechanism (see **Section 3.4.2**). Stakeholder feedback on the option of lowering the Safeguard threshold for lime was mixed, with views both for and against.

Consequently, it would be feasible to implement a border carbon adjustment for cement and clinker earlier than for other commodities. Some stakeholders indicated a preference to see a border carbon adjustment come into effect by as early as 2025, while others suggested a timeframe coinciding with the 2026-27 Safeguard Mechanism review could be appropriate.

A period of time will be required to establish a border carbon adjustment, should the government decide to pursue one. It would be a new and complex policy instrument, requiring careful detailed policy design work, the establishment of new legislation, institutional arrangements and IT systems, preceded by detailed design work and consultations with stakeholders in industry and internationally.

Hydrogen, ammonia and derivatives

Ammonia and related products were overall assessed as having moderate leakage risk through the trade channel. Investment leakage risk however may be pronounced with regard to emerging low and zero emissions production routes that will compete with traditional high emissions production.

As discussed in **Chapter 2**, hydrogen is considered at risk of leakage alongside ammonia and derivatives. While the future prospect of domestic hydrogen competing with imported hydrogen depends on future developments in the relative costs between producing and shipping (conventional) hydrogen to Australia and domestic low emissions production, industry feedback emphasised that a border carbon adjustment for hydrogen would be important for investment certainty, including for projects currently in development. It would also enhance coherence with other government policies to establish low emissions hydrogen and ammonia industries in Australia, particularly the National Hydrogen Strategy and Future Made in Australia.

Hydrogen, ammonia and derivatives are individually relatively homogenous products, although the overall supply chain exhibits some complexity. For example, stakeholders noted that it is common for ammonia derivatives to be manufactured in one country and then undergo further value-adding in other countries, before being exported to Australia for blending into fertiliser products. Ammonia and its downstream products can be produced from low or zero emissions hydrogen, and ammonia as an energy carrier is a transportation pathway for renewable hydrogen. Australia's renewable energy export strategy is in significant part predicated on production of renewable hydrogen, with production of ammonia and related products a key use for renewable hydrogen.

A border carbon adjustment for the hydrogen and ammonia group of products could help create durable preconditions for the emergence of a renewable hydrogen and ammonia industry in Australia, by creating a market premium for low emissions products and applying an equivalent emissions liability on imports of emissions intensive product. Supply chain complexities among ammonia derivatives, and the fact that some ammonia derivatives are only partially covered by the Safeguard Mechanism, may require more time to investigate and resolve before a border carbon adjustment could be implemented.

A considerable amount of work is being undertaken on international standards and verification schemes for hydrogen and ammonia.

The government is working through the IEA and the International Partnership for Hydrogen and Fuel Cells in the Economy on developing a mutual recognition framework for hydrogen as part of the COP28 Declaration of Intent. This work is intended to identify core design elements for hydrogen certification schemes.

This would be complementary to support for renewable hydrogen and derivatives renewable hydrogen through the Future Made in Australia policy, aimed to support the growth a new renewable hydrogen and ammonia market segment, alongside the decarbonisation of conventional ammonia.

Steel and iron

In domestic markets, estimates for potential trade leakage for steel appeared to be modest while export leakage risk appeared more material, especially for crude and treated flat steel. Industry viewed investment leakage as a material risk in the medium-term as Safeguard baselines decline.

As noted in **Chapter 2**, iron is considered at risk of leakage alongside steel. In principle, emerging low emissions iron production could be at risk of leakage from imports of conventional iron, such as hot briquetted iron which is globally traded. Carbon leakage risks for steel could also have the potential to undermine investment in, and demand for, low emissions iron production. Industry feedback highlighted the importance of any border carbon adjustment for steel including precursors such as iron, to ensure low emissions production is incentivised along the entire steel value chain.

There are several international emissions accounting standards and verification schemes being developed.[109] Further development of international standards and verification schemes for emissions measurement would be beneficial for any border carbon adjustment for steel.

Industry stakeholders also highlighted the risk of indirect leakage through downstream commodities, given imports are estimated to make up half of Australia's true total steel consumption. Indirect leakage risks for simpler steel intensive products, for example, fabricated and finished steel products such as roof and wall cladding, fencing and structural frames and the feasibility of including such products in a border carbon adjustment would need further investigation. There is an in-principle difficulty in deciding where on the value chain to stop coverage, which is an inescapable challenge for any border carbon adjustment.

Views also differed among stakeholders on how quickly carbon leakage risk may materialise and when a response may be warranted.

Steel and iron are characterised by complex and varied production structures, involving low and high emissions production processes, and trade and substitutability of intermediate products. Australia both exports and imports steel. Accounting for embedded emissions in imports would likely pose particular challenges. These complexities have been highlighted by industry stakeholders with several submissions urging caution on introducing a border carbon adjustment without careful consideration of how to navigate such complexities.

> *A CBAM for steel needs to be carefully designed and introduced cautiously. Any CBAM involves many complex and untested design choices. The choices for steel are particularly complex because steelmaking uses a large variety of processes that create a wide range of products. The risk of doing irreversible damage is very high – a poorly designed CBAM would make iron and steelmaking in Australia unviable.* - **BlueScope submission to November 2023 consultation**

Based on industry consultations, stakeholders had mixed views on the feasibility and speed of implementing a border carbon adjustment for steel. In the Review's assessment, based on the complexities described above, a border carbon adjustment for steel and iron could not proceed as quickly as for other commodities such as clinker and cement.

Some industry stakeholders suggested implementing a border carbon adjustment sooner for some specific types of steel that are relatively homogenous and exhibit fewer complexities, such as reinforcement bar. Should the government decide to pursue a border carbon adjustment, the Review sees merit in exploring this possibility.

Introduction of a border carbon adjustment on a specific steel product that has suitable characteristics could provide an opportunity to undertake earlier piloting of a border carbon

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[109] For example, the World Steel Association has developed a methodology for calculating the emissions intensity of steel using common definitions and boundaries, available here.

adjustment for some types of steel where suitable to do so, before expanding to the broader steel and iron group.

Glass

In domestic markets, potential import leakage risk appeared to be modest for glass containers and flat glass. Analysis also showed that investment leakage is a high risk for glass manufacturers.

Industry consultation suggested leakage risks are a concern, including with regard to investment in low emissions facilities.

A border carbon adjustment may be appropriate for glass production, subject to Safeguard coverage issues being resolved.

Coverage by the Safeguard Mechanism comprises one facility each for flat and container glass, representing all flat glass and less than half of all glass container production. The partial coverage of the glass container industry may present a barrier to implementing a border carbon adjustment quickly, and would need to be carefully considered (see **Section 3.4.2)**. In Table 5 below, the green is intended to indicate factors that contribute to higher feasibility with early implementation of a BCA and orange is intended to indicate factors that contribute to lower feasibility with early implementation of a BCA.

Table 5: Feasibility Assessment for border carbon adjustment

Candidate for BCA, with early implementation likely to be feasible

Commodities	Commodity specific considerations	Domestic Safeguard coverage	Other domestic considerations	International considerations
Clinker	Relatively homogenous. (Green)	100% (Green)	None. (Green)	Relatively good emissions data and proxies. Supply chains are generally not complex, although traceability may be an issue. (Orange)
Cement	Relatively homogenous. (Green)	100% (Green)	None. (Green)	Relatively good emissions data and proxies. Supply chains are generally not complex, although traceability may be an issue. (Orange)

Candidate for BCA, with more feasibility issues to investigate and resolve before a BCA could be implemented

Commodities	Commodity specific considerations	Domestic Safeguard coverage	Other domestic considerations	International considerations
Lime	Relatively homogenous. (Green)	74% (Orange)	None. (Green)	Relatively good emissions data and proxies. Supply chains are generally not complex,

Commodities	Commodity specific considerations	Domestic Safeguard coverage	Other domestic considerations	International considerations
				although traceability may be an issue. (Orange)
Hydrogen, ammonia and derivatives	Individual commodities are relatively homogenous, although the overall supply chain exhibits some complexity. (Green)	92% for sodium cyanide 100% for all other commodities. (Orange)	Possible interactions with government investment programs. (Orange)	International standards and verification schemes being developed. Traceability an issue, but there are synergies with GO work. (Orange)
Steel and iron	Primary and secondary production methods that entail different emissions intensities. Multiple types of steel products. (Orange)	100% for crude and flat steel 94% for long steel 59% for treated flat steel. (Orange)	Potential for downstream leakage risk through a diverse range of products. (Orange)	International standards being developed. Traceability an issue, possibly exacerbated by complexity of supply chains. (Orange)
Glass	Some complexity in product differentiation, although relatively homogenous production processes. (Orange)	100% for flat glass 44% for container glass. (Orange)	Relatively small volume of production may make alternative policy interventions more proportionate. (Orange)	Limited work towards international standards. (Orange)

3.4.2 Safeguard Mechanism thresholds

The Safeguard Mechanism applies to facilities that emit more than 100,000 tonnes CO_2-e in a year.

To align with the international trade law principle of non-discrimination between domestic products and imports, the Safeguard Mechanism’s coverage of domestic production needs to be carefully considered when assessing what imports could be covered by a border carbon adjustment. Particular consideration would be needed for commodities where the Safeguard Mechanism coverage does not cover all domestic production, such as glass and lime.

The Review’s calculation of domestic production coverage for import-exposed commodities is set out in Table 2.

One design option for these commodities would be to consider reducing the Safeguard Mechanism threshold for domestic coverage from the existing annual threshold of scope 1 emissions of 100,000 tonnes CO_2-e to a level that covers all production for commodities with a border carbon adjustment. There would be separate implications of any reduction in the Safeguard Mechanism threshold which would need to be carefully considered. Stakeholder feedback on this option was mixed, with views both for and against lowering the threshold in these circumstances.

Another design option would be to require importers to certify that imported products had come from a facility emitting more than 100,000 tonnes CO_2-e a year. There are challenges with implementing such a requirement, such as independent verification in location, international trade law considerations, and the risk that it would cause resource shuffling and changes to business arrangements solely for the purpose of meeting these requirements, without associated emissions reductions.

3.5 Design considerations

Findings

A border carbon adjustment would need to mirror key provisions of the Safeguard Mechanism. Should a border carbon adjustment be pursued, a border carbon liability could be applied to emissions in exceedance of the Safeguard Mechanism baselines and to the extent that the assessed effective carbon price paid in the originating country is lower than the Australian benchmark price. This assessment would be based on explicit emissions prices only.

The basis for emissions assessment should be the same as the Safeguard Mechanism, covering only scope 1 emissions and all relevant greenhouse gases.

Further consideration would be needed before a border carbon adjustment is applied to a commodity with less than 100% Safeguard Mechanism coverage of domestic production.

A border carbon adjustment for a particular sector would remove the policy basis for TEBA provisions for that sector. Consequently, TEBA provisions for a commodity should be removed once a border carbon adjustment is fully implemented for that commodity.

A border carbon adjustment may generate revenue. Stakeholders have suggested that in addition to offsetting the costs of implementation of the policy, funds could also be provided to programs to support implementation and industrial decarbonisation objectives in trade partner developing countries or in Australia. The Review sees particular benefit in supporting programs in developing countries in the region.

Should the government decide to pursue a border carbon adjustment, detailed design and implementation would need to be considered and consulted on. Consultation would need to encompass both domestic stakeholders and trading partner countries.

The key principle of a border carbon adjustment is to mirror domestic policy settings for imported goods. As such, the provisions of the Safeguard Mechanism would be the starting point for designing the core elements of a border carbon adjustment, including emissions covered and calculating a liability.

Engagement with domestic stakeholders and international partners has affirmed the importance of the compliance of any measure with international law, particularly WTO trade rules. International partners encouraged Australia to consider a design, if it pursued a border carbon adjustment, that was non-discriminatory, had low transaction and compliance costs, and supported an open and fair trading system.

Several specific issues were raised, including the importance of protecting confidentiality of trade secrets for importers, ensuring small and medium enterprises could comply and ensuring that any measure was applied fairly to domestic and foreign producers. These issues and other ideas raised by partners have been carefully considered in developing this Final Report and should be further considered and consulted on, should the government decide to pursue a border carbon adjustment.

> *Based on our experience, we acknowledge the potential for carbon border adjustments to reduce carbon leakage, however full regional coordination would be needed for a carbon border adjustment mechanism (CBAM) to be effective, particularly given the role that Australia plays in the regional supply chain and price sensitivity of customers for some Australian exports, including alumina and aluminium.* - **Rio Tinto submission to November 2023 consultation**

3.5.1 Emissions scope

To align with the Safeguard Mechanism, a border carbon adjustment would apply to imports based on the scope 1 emissions from the manufacture of products, for all greenhouse gas emissions covered by the Safeguard Mechanism. Scope 2 and 3 emissions would not be included as these emissions are not covered by the Safeguard Mechanism.[110] In comparison, both the EU CBAM and proposed UK CBAM include scope 2 emissions where the electricity sector is covered by their respective emissions trading schemes.

Transport emissions from shipping commodities to Australia would not be included. Transport emissions outside of site boundaries are not included under the Safeguard Mechanism. In addition, international transport emissions are difficult to account for and attribute to specific products shipped. Work is being undertaken by the International Maritime Organisation on a multilateral approach to levying greenhouse gas emissions from international shipping.[111]

During consultations, some stakeholders suggested excluding scope 1 emissions from onsite electricity generation, which are included in Safeguard Mechanism coverage. Others suggested including scope 3 emissions from transport, which are excluded from the Safeguard Mechanism. The Review considers it essential for any border carbon adjustment to mirror Safeguard settings, to ensure non-discrimination between domestic and imported commodities.

The boundary of commodity emissions covered by a border carbon adjustment should reflect Safeguard Mechanism coverage, including the commodity itself as well as any inputs also covered by the Safeguard Mechanism. For example, a border carbon adjustment for cement or ammonium nitrate should include emissions from clinker and ammonia production respectively.

3.5.2 Calculating the border carbon adjustment

Should government decide to pursue a border carbon adjustment, to mirror the Safeguard Mechanism, an Australian border carbon adjustment should only apply a liability on emissions above

[110] Other policies focus on reducing emissions in the electricity sector including the Powering Australia plan, but these do not impose a liability on domestic producers and therefore could not be included in calculating a border carbon adjustment liability.
[111] International Maritime Organisation, Strategy on Reduction of GHG Emissions from Ships, 2023, available [here](#).

the applicable Safeguard Mechanism production variable baseline, and deducting any carbon costs already incurred in the producing jurisdiction.[112]

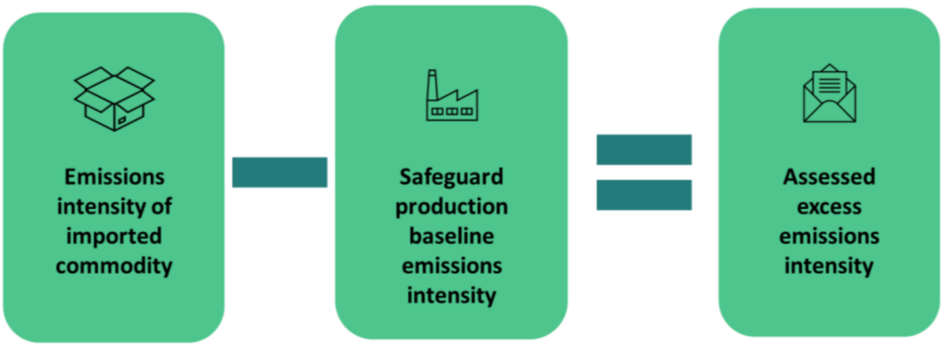
Safeguard Mechanism baselines effectively provide a portion of 'free allocation' of the right to emit to covered facilities, which would be mirrored on imports.

The Safeguard Mechanism baseline emission intensity per commodity (production variable) is set out in the Safeguard Mechanism Rules.[113] Baselines are currently transitioning from facility-specific emissions intensity baselines to industry average defaults by 2030.

Baselines for the border carbon adjustment would have to account for the different domestic baseline arrangements, including any adjustments if TEBA was phased out rather than removed immediately, and different arrangements for any new entrants.

Calculation of a border carbon liability that approximates Safeguard Mechanism provisions can be described as comprising the following three steps.

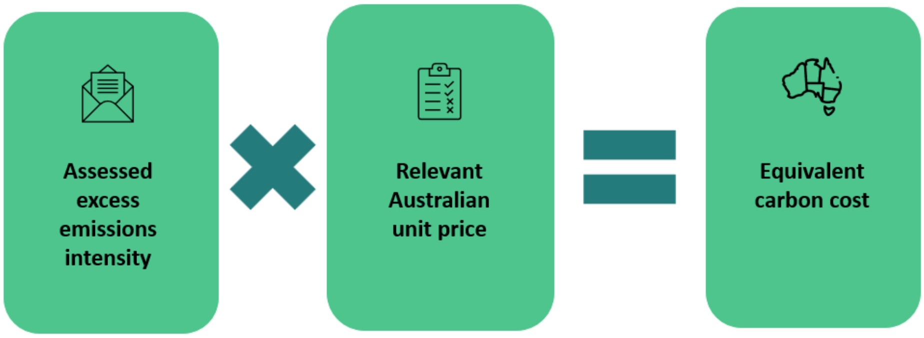
Step 1: Assess whether and by how much the imported commodity's emissions intensity exceeds the relevant Safeguard baseline ('Assessed excess emissions intensity').



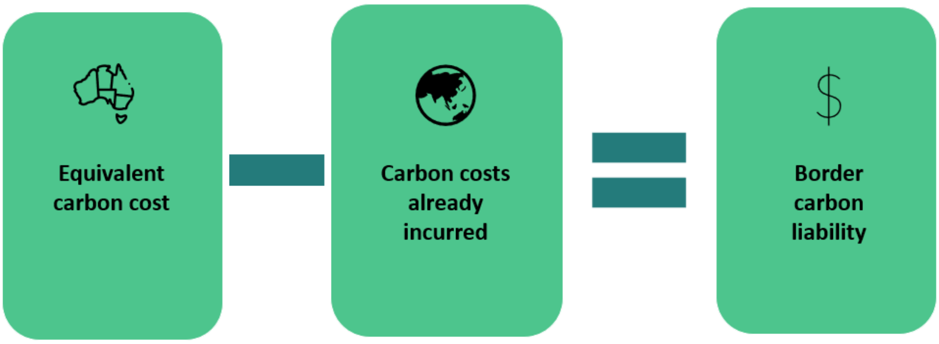
Step 2: Determine the 'equivalent carbon cost' that applies per tonne of imported products. This is the assessed excess emissions intensity multiplied by the relevant Australian unit price (credit price).

[112] This may differ from other border carbon adjustments, as it reflects Australia's specific Safeguard Mechanism settings. If an overseas climate policy provides no right to emit up to a baseline, then a liability would accrue for domestic producers at any emission intensity, which would mean a border carbon adjustment would apply regardless of emission intensity. This is the case under the EU CBAM.

[113] *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015,* available here.



Step 3: Any carbon costs incurred in the producing jurisdiction or in transit to Australia are then deducted, to result in the border carbon liability.



A liability arises only if there is a positive assessed excess emissions intensity, and if the carbon cost already incurred is lower than the equivalent emissions obligation.

<table>
<tr><td rowspan="4">Step 1: Emissions intensity of imports</td><td colspan="3">Step 2 and 3: Foreign jurisdiction carbon cost compared to Australian equivalent carbon cost</td></tr>
<tr><td></td><td>Lower than Australia</td><td>Equal or higher than Australia</td></tr>
<tr><td>Higher than Safeguard benchmark</td><td>Liability applies</td><td>No liability</td></tr>
<tr><td>Lower than Safeguard benchmark</td><td>No liability</td><td>No liability</td></tr>
</table>

Figure 7: Illustration of when a border carbon adjustment liability applies.

This table shows when a border carbon adjustment liability applies. Liability applies when the emissions intensity of imports is higher than the Safeguard benchmark and the foreign jurisdiction carbon cost compared to the Australian equivalent carbon cost is lower than Australia. There is no liability when:

- the emissions intensity of imports is lower than the Safeguard benchmarks and the foreign jurisdiction carbon cost compared to Australian equivalent carbon cost is lower than Australia;
- the emissions intensity of imports is higher than the Safeguard benchmark and the foreign jurisdiction carbon cost compared to the Australia equivalent carbon cost is equal or higher than Australia; and
- the emissions intensity of imports is lower than the Safeguard benchmark and the foreign jurisdiction carbon cost compared to Australian equivalent carbon cost is equal or higher than Australia.

Box 3 – Examples of the potential border carbon adjustment calculation

Example 1: A commodity with an emissions intensity higher than the baseline and some carbon costs already incurred in the production jurisdiction.

A company produces a commodity with an emissions intensity of 1.1 t CO_2-e/t. They have incurred a carbon cost of $2/t CO_2-e on all scope 1 emissions associated with production, so $2.20/t of commodity.

The relevant Australian unit price at time of importation is $50/t CO_2-e and the baseline emissions intensity for the commodity is 1.0 t CO_2-e/t.

Step 1: Calculate the assessed excess emissions intensity

1.1 t CO_2-e/t – 1.0 t CO_2-e/t = 0.10 t CO_2-e/t

Step 2: Calculate the Australian equivalent carbon cost

0.10 t CO_2-e/t x \$50/t CO_2-e = \$5/t

Step 3: Calculate the border carbon adjustment liability

\$5/t - \$2.20/t = \$2.80/t

The importer incurs a border carbon adjustment liability of \$2.80 per tonne of commodity.

Example 2: A commodity with an emissions intensity higher than the Australian baseline and higher carbon costs in the production jurisdiction.

A company produces a commodity with an emissions intensity of 1.0 t CO_2-e/t of commodity. They have a domestic carbon price of \$100/t CO_2-e with 75% free allocations on a production basis, equating to an effective carbon cost of \$25/t of commodity.

The relevant Australian unit price at time of importation is \$50/t CO_2-e and the baseline emissions intensity for the commodity is 0.90 t CO_2-e/t.

Step 1: Calculate the assessed excess emissions intensity

1.0 t CO_2-e/t – 0.90 t CO_2-e /t = 0.10 t CO_2-e/t

Step 2: Calculate the Australian equivalent carbon cost

0.10 t CO_2-e/t x \$50/t CO_2-e = \$5/t

Step 3: Calculate the border carbon adjustment liability

1.0 t CO_2-e/t x \$100/t CO_2-e x 25% (free allocations) = \$25/t paid in production jurisdiction.

\$5/t - \$25/t = -\$20

Because the carbon cost already incurred exceeds the Australian equivalent carbon cost, the importer will not incur a border carbon adjustment liability.

Example 3: A commodity with a lower emissions intensity than the Australian baseline and no carbon costs already incurred in the production jurisdiction.

A company produces a commodity with an emissions intensity of 0.85 t CO_2-e/t of commodity. They have incurred no carbon costs prior to importation.

The relevant Australian unit price at time of importation is \$50/t CO_2-e and the baseline emissions intensity for the commodity is 0.90 t CO_2-e/t.

Step 1: Calculate the assessed excess emissions intensity

0.85 t CO_2-e/t – 0.90 t CO_2-e/t = -0.05 t CO_2-e/t

Because the emissions intensity of the imported commodity is less than the Australian baseline, the importer will not incur a border carbon adjustment liability.

Step 1 – Emissions intensity calculation

For the border carbon adjustment liability to be calculated, importers will need to account, report and be able to verify their emissions in a manner suitable to Australian frameworks.

In principle, Australia would be confident in emissions accounting that follows international rules and standards, uses approaches developed in the context of other countries' border carbon adjustments (e.g., reporting for the EU and UK CBAMs), and is measured in line with IPCC methodological guidelines.

Further discussion of emissions reporting, verification and the importance of default values is included in **Section 3.6** below.

Step 2 – Relevant Australian unit price

Specific provisions for determining relevant Australian unit price levels would be left for a detailed design process.

Discussion of the administrative considerations in setting a relevant Australian unit price are included in next section below.

Step 3 – Recognising carbon costs paid

Carbon costs paid in the country of production or in transit would need to be recognised and subtracted from any border carbon adjustment in Australia.

Foreign carbon costs could be assessed by a relevant authority according to established methods, including potentially any methods developed in the future under a body such as the Inclusive Forum on Carbon Mitigation Approaches.

The proposed border carbon adjustment would be based on the effective price paid.[114] This would recognise price-based instruments, such as taxes or emissions trading schemes.

It is not proposed that implicit carbon costs (encompassing non-price-based policies, rebates, subsidies, or other compensations) would be considered until such a time as there are internationally agreed methods to price non-pricing-based policies.[115]

However, under the proposed approach it would not be necessary for other jurisdictions to have in place explicit carbon pricing. If the emissions intensity of imports is lower as a result of policies that impact producers' emissions, the importer would have that lower emission intensity accounted for in Step 1.

3.5.3 Revenue from a border carbon adjustment

A border carbon adjustment may result in revenue collected by government if it partially or fully adopts a fee model instead of, or as well as an ACCU surrender model. The amount of revenue is difficult to predict because of lack of specific data on emissions intensities of imports and because a border carbon adjustment may result in importation from lower emissions facilities (see **Section 3.3**) and because future emissions credit prices and differences to effective prices paid in exporting countries are unknown.

However, it is likely that the amount of border revenue will be small relative to the overall value of imported products, just as the financial emissions obligation under the Safeguard Mechanism is small relative to the value of Australian production of these commodities.

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[114] 'Effective price paid' is defined for jurisdictions with an ETS or carbon tax as the explicit carbon price ($ per tonne of CO_2-e) faced after taking account of free allocations. In the context of the Safeguard Mechanism, the equivalent 'effective price paid' is defined as the carbon compliance costs (per tonne) which arise on emissions above Safeguard regulated baselines, i.e. from ACCU or SMC surrender. 'Effective price paid' is distinct from the term 'carbon cost' ($ per tonne of good), which is the cost arising from an effective price paid being applied to the emissions intensity of a good, i.e. the carbon costs are simply the (effective) price times the quantity of emissions.

[115] OECD, 2024, Towards more accurate, timely, and granular product-level carbon intensity metrics: a scoping note, *Inclusive Forum on Carbon Mitigation Approaches Papers,* available here. Note the EU and UK CBAM focus on explicit pricing.

With regard to any border carbon adjustment revenue, the government would need to fund the costs of implementing the program. Additional funding could go to support other policy priorities, including decarbonisation programs.

Some stakeholders have raised that in conjunction with the introduction of a border carbon adjustment, funding to build developing country capacity in emissions monitoring, verification and reporting, or to support industrial decarbonisation, could be increased. Other stakeholders also raised the option of increasing funding to support domestic industry to decarbonise.

The Review considers supporting trade partner developing countries in the region would offer distinct benefits in enhancing understanding and acceptance of border carbon adjustments amongst trading partners. The Review also notes that the magnitudes of funding required are likely to be small in comparison to existing public investment measures to support domestic decarbonisation and the emergence of low emissions industries.

3.5.4 Safeguard TEBA arrangements

Facilities covered by the Safeguard Mechanism can apply to become TEBA facilities if they meet a particular cost impact metric based on Earnings Before Interest and Taxes (for manufacturing sectors) or revenue (for non-manufacturing sectors). The facility must demonstrate the cost impact, including engaging an independent auditor, before they become eligible.

Sectors that are candidates for a border carbon adjustment are estimated to receive around 40 per cent of the projected TEBA allocations to 2030.

Because a border carbon adjustment for a particular commodity would ensure that imports would receive equivalent policy treatment as domestic production, this would remove the policy basis for TEBA for producers of that commodity. It would be logical to remove TEBA for those commodities, once a carbon border adjustment for that commodity is fully implemented. This is in line with the EU approach of phasing in the CBAM alongside the phase out of free allocations under the ETS.

Furthermore, if a border carbon adjustment is introduced, then the number of facilities that qualify for TEBA should lower significantly since a border carbon adjustment allows pass through of carbon costs.

Stakeholder feedback reflected general agreement that, as a matter of principle, a border carbon adjustment could enable the removal or phasing out of TEBA for covered commodities. Some stakeholders advocated for retaining TEBA either temporarily or permanently. Reasons include providing certainty for current or upcoming investments, as a temporary safety net until a border carbon adjustment demonstrated its effectiveness, or as a back stop to prevent leakage risks for any facility still facing particularly high costs.

If the facilities have a higher cost base because they remain more carbon intensive than their competitors, the only remaining basis for supporting such a facility would be reasons other than differential climate policy. Such a policy would therefore be best delivered through an approach outside the Safeguard Mechanism’s TEBA arrangements.

Retaining or phasing out TEBA with a border carbon adjustment would create complexity in determining the relevant border carbon adjustment liability. Given the intention to equalise costs across domestic production and imports, any TEBA allocation would need to be reflected in the liability calculation. This calculation would be particularly complex if different facilities producing a commodity received different adjustments under TEBA.

The retention of TEBA with a border carbon adjustment raises international trade law concerns, particularly regarding the principle of non-discrimination. Retaining TEBA for sectors with a border carbon adjustment would also continue the limits on emissions reduction contribution from those sectors.

The Review sees merit in removing TEBA for sectors where a border carbon adjustment is introduced. Implementation of the TEBA removal for any commodity would be appropriate following the full introduction of a border carbon adjustment for that commodity.

3.6 Administrative considerations

Findings

Should a border carbon adjustment be pursued, frameworks relating to reporting and verification of emissions should minimise administrative burden, including through: streamlined reporting processes that maintain confidentiality for producers; effective yet efficient emissions verification; and suitable emissions intensity default values.

These frameworks should align with existing and future international standards when possible, including supporting the development of frameworks for emissions monitoring and industrial decarbonisation for Australia's trade partners.

3.6.1 Emissions accounting, reporting, and verification

Reporting and verification

Should a border carbon adjustment be pursued, emissions reporting requirements would need to balance the needs of regulators to administer a border carbon adjustment and any producer confidentiality issues. Reporting directly to government may ease confidentiality concerns. The administrative burden of reporting is a key consideration, particularly for micro and small to medium-sized enterprises. Detailed design of a border carbon adjustment would need to carefully consider these matters in close consultation with both domestic stakeholders and trading partner countries. The design should minimise administrative burden as far as possible and ensure that procedures are non-discriminatory and do not constitute an obstacle to trade consistent with international trade laws and obligations.[116]

Independent verification will be required to validate production emissions. Independent verification by internationally recognised accrediting bodies could be desirable, whether via international

[116] Aisbett, E., White, L., Burkitbayeva, S., Pearce, O., McQueen, J. & Borevitz, J., 2024, Embedded Emissions Accounting Frameworks to Support Net Zero Trade, available here.

organisations such as the International Accreditation Forum, or in a network of intergovernmental arrangements.

National inventory data is produced in line with Intergovernmental Panel on Climate Change (IPCC) Guidelines. The minimum (Tier 1) standards estimate energy and process emissions through the IPCC default emissions factors. This approach is lower cost than direct measurement (Tier 3) of emissions at the facility-level.[117] For countries that do not have extensive measurement and reporting, obtaining accurate facility or process-level emissions data may be challenging for some industries or incur significant costs to producers.

> *It is important that agreements that are struck between trade partners that have carbon border adjustment policies, and those that are considering them, streamline the process for trade of emissions intensive and emissions free products. Customers must have confidence in the integrity of the product they are purchasing through the use of government programs like the Australian Guarantee of Origin product scheme. The interoperability of these schemes across jurisdictions is key to maintaining consumer confidence and accurate emissions accounting across the life cycle of a product.* – **Fortescue submission to November 2023 consultation**

Emissions intensity default values

Allowing importers to rely on appropriate default values reduces compliance and transaction costs where importers do not have accurate data, or where it is too costly to produce and verify. Default values can also assist importing businesses by providing a certain reference point for emissions intensity. A default standard that is also accepted in other contexts removes the need to comply with multiple standards further reducing compliance and transaction costs.

Default values can be developed on a by-country basis or by-production pathway basis or using global weighted averages. The EU CBAM is proposing to set both by-country and by-product default values and the proposed UK CBAM will determine by-product default values using global average embodied emissions weighted by production volumes of key UK trading partners.

Default values could be set to incentivise emissions monitoring and reporting by setting generally high default emissions intensity values for a particular product. Such an approach tends to penalise low emissions producers that are unable to meet emissions measurement requirements or face particularly high costs for emissions measurement. Alternatively, default emissions intensity values could be set to approximately reflect actual emissions, for example by setting default values based on specific production circumstances on a by-country basis. If default values tend to be very close to, or below, actual emissions, this reduces the incentive to report actual emissions. Conversely, default values that tend to be well above actual emissions intensities will tend to strongly incentivise reporting actual emissions, even if this is costly.

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[117] OECD, 2024, Towards more accurate, timely, and granular product-level carbon intensity metrics: a scoping note, *Inclusive Forum on Carbon Mitigation Approaches Papers,* available here.

Setting default values appropriately therefore means to avoid underestimating emissions intensities whilst maintaining an incentive to report emissions where reporting is not overly costly. A system that allowed reporting of actual emissions and the use of default values that approximate actual emissions intensity would be desirable.

Box 4 - Role of the OECD Inclusive Forum on Carbon Mitigation Approaches and the Climate Club

Work is underway at the OECD's Inclusive Forum on Carbon Mitigation Approaches (IFCMA) related to the calculation of sector- and product-level emissions intensities, including the move to interoperable and harmonised methodologies (see **Chapter 5**). This could lead to a commonly accepted set of default emissions intensity values, which could be used in the calculation of any border carbon adjustment charge. Such a standard would avoid the need to make specific determinations for an Australian border carbon adjustment, could reduce transaction and compliance costs, and could promote interoperability between border carbon adjustments in different countries.

Similar efforts underway in the Climate Club to investigate approaches to address carbon leakage and to build a common understanding of comparable and interoperable emissions computation standards with a focus on the cement and steel sectors could contribute to the development of international standards for the measurement of emissions intensity. Such an approach would avoid unnecessary costs associated with divergent compliance and separate verification requirements.

The IFCMA's work to build transparency and a deeper understanding of different jurisdictions' approaches to carbon pricing policy also has potential for arriving at agreed methods for assessing effective carbon pricing that applies to traded commodities produced in specific countries. Relying on an international or plurilaterally agreed assessment of the domestic policy efforts would reduce compliance costs and enhance predictability, and improve overall acceptability of border carbon adjustments.

3.6.2 Setting Australian reference unit price

If a border carbon adjustment is implemented through a fee-based system (see below), then it will be necessary to set a reference price that represents the Australian relevant unit price. This price could be drawn from recent averages of the headline ACCU price, for example using the Safeguard Mechanism's Default Prescribed Unit Price which is to be published in June of each financial year. Alternatively, a shorter-term rolling average of market prices could be applied.

Consideration could be given to acquitting obligations on an aggregate basis across shipments from facilities within the same corporate group, over some period of time (for example quarterly). This would allow shipments with emissions intensity below the baseline to offset emissions intensity obligations from shipments above baselines, within defined temporal and ownership boundaries.

Importers would not receive SMCs for emissions intensities below the Safeguard baseline. SMCs are generated within a regulated emissions limit which restricts the overall emissions of all Safeguard facilities. This ensures SMCs have integrity under the Safeguard Mechanism as a tradeable credit, facilitating abatement wherever it is most cost-effective to do so. These policy objectives and settings could not be mirrored in a border carbon adjustment.

3.6.3 Paying for border carbon adjustment liability

Paying the border carbon adjustment liability could involve either:

- paying a fee calculated by reference to the relevant Australian unit price, either at the border or reconciled later, and/or
- purchasing and surrendering ACCUs.

Payment of a fee would be administratively simpler and provide greater predictability of liabilities as the fee would be set for a defined period of time and published, providing certainty to importers.

Surrendering ACCUs would more closely reflect domestic requirements, but trading in ACCUs has legislative requirements that would have to be met by importers which would require careful consideration. It is possible that ACCUs could be wholly secured and surrendered domestically by the importer, but importers need to consider the administrative or practical burden this option may impose. The ACCU purchase option would create additional demand in the Australian credit market, raising the prices prevailing in emissions credit markets. The abatement associated with any ACCUs surrendered would contribute to the achievement of Australia's emissions reduction targets.

In principle, importers could acquit the liability by paying a fee or surrendering ACCUs. It would also be theoretically possible to provide importers the choice of either a fee or surrendering ACCUs.

Stakeholder feedback reflected concerns about the potential impact on ACCU supply if ACCUs were used to meet border carbon adjustment liabilities. Broad support was expressed for a fee model. On balance, the Review suggests that payment of a fee on imports may be the preferable option.

3.6.4 Customs administration and costs of the border carbon adjustment

A border carbon adjustment would have administrative costs to government and compliance costs to business. The level of cost would depend on design and could include:

- *Government administrative costs:* including checking and verifying declarations of emissions, calculating and collecting border carbon adjustment liability, compliance checks, record keeping and reporting.

- *Compliance costs to business:* including meeting emissions verification requirements, engaging with government to report emissions and any carbon price already paid, and training and hiring employees to comply with border carbon adjustment requirements, or the cost of engaging professional services to do so. Australian producers already face these compliance costs through NGER scheme and the Safeguard Mechanism.

Government administrative costs

Should a border carbon adjustment be pursued, the government would face both establishment and ongoing costs. Establishment costs would include personnel and ICT system costs.

The main ongoing government administrative cost would be staffing. Staffing costs would be higher during the design and implementation stage of applying a border carbon adjustment to a commodity and would then reduce during the monitoring and compliance stage. Final staffing costs would depend on design decisions and the extent to which processes can be automated and streamlined. Ongoing arrangements could be cost recovered.

Compliance costs

The costs associated with any border carbon adjustment would be directly related with the complexity of the compliance process. Any border carbon adjustment mechanism should be designed to minimise administrative burden and costs arising to businesses from processes to comply.

To ensure that compliance costs are commensurate with the value of the import, it is likely that a minimum annual threshold would be set before an importer would become liable for a border carbon adjustment liability. This would align with the proposed UK CBAM approach.[118] In February 2025, it was reported that the EU tax commissioner would consult on an approach to reduce the EU CBAM's coverage to around 20 per cent of importers currently covered, reflecting that less than 20 per cent of the companies in scope are responsible for more than 95 per cent of the emissions in CBAM products.[119] The EU CBAM has so far had a consignment threshold (CBAM goods whose value exceeds €150) but in February 2025 the EU Commission announced that it would be replaced by a new threshold based on cumulative mass per importer per year, meaning that the CBAM would apply to fewer importers.

Several stakeholders expressed the need for any border carbon adjustment mechanism to minimise compliance cost for business.

> *The design of a CBAM should aim to minimise the costs of emissions accounting and compliance, recognising the complexity of accounting for emissions across what may be complex supply chains.* – **Business Council of Australia**
>
> *While addressing any unique Australian circumstances is important, ideally Australia will apply common international approaches in order to minimise compliance costs and ease trade.* – **Ai Group submission to November 2023 consultation**
>
> *The PC has previously argued that a BCA mechanism could act more as a form of trade protection than a means of addressing carbon leakage risks … where administrative costs of complying with the mechanism raise the effective cost of imports. The PC welcomes the Review's acknowledgement of these risks, and its proposals for minimising administrative burdens, including the use of appropriate default emissions intensity values.* **– Productivity Commission submission to November 2024 consultation**

[118] UK HM Treasury, 21 March 2024, Introduction of a UK carbon border adjustment mechanism from January 2027, available here.

[119] Financial Times, 6 February 2025, Brussels to exempt most EU companies from carbon border tax.

4 Mandatory emissions product standards

Findings

While mandatory emissions product standards can be suitable for other policy objectives, they are not likely to be an effective policy intervention to address carbon leakage risk.

Mandatory emissions product standards are a form of mandatory product standards or regulations that would set an upper limit on the emissions intensity of products, including imported products, that can be sold in the Australian market. Mandatory product standards can fulfil a range of objectives, including to facilitate a shift towards low-emissions products and production technologies.

A mandatory emissions product standard could in principle be used as a way to address leakage concerns. In its simplest form, a mandatory emissions product standard would make it unlawful for products that do not meet an emissions intensity standard to be sold in Australia. This would include imposing a fine or other legal penalties for goods that exceed the standard and are still sold in Australia.

A mandatory emissions product standard could have similar administrative processes, design decisions, and administrative and compliance costs as a border carbon adjustment. This includes an assessment of emissions intensity of production in originating countries, a reporting and verification system, and a system for checking and applying the standard at the border. These would all carry additional costs to government and business as a border carbon adjustment as outlined in the preceding **Chapter 3**.

The same international trade law principles that must be considered in relation to a border carbon adjustment are also relevant to a mandatory emissions product standard, especially non-discrimination. A mandatory emissions product standard that restricted the sale of non-compliant imports would also need to prevent non-compliant domestically produced commodities from being sold in the local market.

As such, a mandatory emissions product standard would have to be set by reference a new domestic policy to prevent the sale of goods that exceed the relevant standard.

This would be a new regulation in addition to the Safeguard Mechanism and would create additional complexity and reduce flexibility.

For domestic producers, the Safeguard Mechanism is designed to be flexible and provide facilities lowest cost options to reduce their emissions over time.

A border carbon adjustment would mirror that flexibility to the treatment of imports. Compared to a mandatory product standard, a well-designed border carbon adjustment could provide a higher degree of flexibility and would not carry the risk of goods becoming ineligible for entry into the Australian market at a future point in time.

For a mandatory emissions product standard to be suitable to address carbon leakage risk, there would need to be a situation where particular high emissions intensity production methods or practices would undercut production that is subject to carbon obligations, and where suitable thresholds for product standards can be reliably identified. Consideration and consultation through the course of the Review has not identified such an instance.

There was little support for, and considerable concern about, mandatory emissions product standards expressed by business stakeholders in submissions and other consultations. The primary concern was that mandatory emissions product standards would be a blunt tool with a high possibility of unintended and detrimental consequences.

For example, there are several cement product standards that set a minimum percentage of clinker in accordance with the performance standard required for its application. A mandatory emissions product standard relating to cement would have to account for each of these standards or risk making it unlawful to import cement that meets a particular performance standard.

Some stakeholders were also concerned about the impact of a mandatory emissions product standard on downstream users and broader economic outcomes due to the risk of preventing import of critical commodities.

> *The CIF remains of the view that emissions product standards are not the appropriate mechanism to mitigate carbon leakage – particularly for clinker and cement where Scope 1 emissions can be measured and tracked directly. They are blunt mechanisms that are insensitive to varying amounts of embedded carbon, meaning that there is little incentive to exceed the minimum requirements of the standard, which could stifle innovation.* – **Cement Industry Federation submission to November 2024 consultation**
>
> *[E]missions product standards are a much blunter instrument because they create a binary threshold for what products can be sold and do not provide incentives to reduce emissions further below the standard, especially for hard to abate sectors such as iron and steel. If product standards impacted Australian manufactured product, these industries might well immediately cease to be viable, and Australia would lose sovereign capacity.* – **BlueScope submission to November 2023 consultation**
>
> *Product emission standards are unlikely to adequately address the risk of carbon leakage, given the significant risk of non-conformance and spurious conformance claims.* – **Chemistry Australia submission to November 2024 consultation**

Some stakeholders were supportive of the possibility of emission product standards that would follow future international standards, several of which are being negotiated or discussed in multilateral forums. In the steel industry, international standards for evaluating emissions intensity already exist or are under development, such as ISO 14404 and ISO 20915. There are also a range of industry standards widely used internationally, including the Worldsteel Benchmarking Systems. However, these measurement standards do not specify normative thresholds or target levels for emissions intensities.[120] There have also been collaborative, industry-led initiatives to set product and site-level decarbonisation standards such as ResponsibleSteel. None of these standards have been formally adopted as part of any multilateral forums.

The suitability of future international standards as a tool to address carbon leakage would depend on the standard itself and its application to Australia's specific carbon leakage risks.

Product standards, including emissions product standards, can be effective policy tools where an established maximum emissions intensity can be efficiently determined and legislated. For example, the *Product Emissions Standards Act 2017* (PESA) sets emissions standards for outdoor power equipment and marine engines. The PESA standard can be satisfied using certification from established standards in the EU, United States and Canada. These standards are established, well-understood in the market and already widely used by manufacturers.

More generally and beyond the objective of curbing carbon leakage risk, product standards, both mandatory and voluntary, may have roles to play as part of overall future industrial decarbonisation strategies and to help Australia's net zero objectives. A number of submissions expressed support for the creation of voluntary standards that estimate and declare the emissions intensity of different materials and commodities for the purposes of meeting possible future mandated government procurement guidelines, or green 'star' labelling. Others noted that emissions standards could also serve important roles as part of green procurement policies.

Such standards could help build demand and foster the emergence of market premiums for low emissions intensity commodities in Australian markets. However, they would not directly address carbon leakage concerns.

[120] International Energy Agency, International Renewable Energy Agency and UN Climate Change High-Level Champions, 2022, *The Breakthrough Agenda Report 2022: Accelerating Sector Transitions Through Stronger International Collaboration*, available here.

5 Multilateral and plurilateral initiatives

Findings

Given Australia's strong stake in the international rules-based system, policy responses to address carbon leakage risks should advance and support the international system.

Enhanced global climate action would reduce carbon leakage, but divergences in ambition and policy approaches will persist in the medium-term.

An internationally agreed solution to address carbon leakage risk developed through multilateral and plurilateral initiatives would be ideal, but is uncertain and would take time to develop. Possible long-term international solutions will not replace the near- and medium-term need for domestic policy action.

Multilateral and plurilateral initiatives could support the implementation of border carbon adjustments through the adoption or development of interoperable standards and approaches, for example development of agreed default emissions intensities or standards to measure embedded emissions.

Australia's active engagement relevant multilateral and plurilateral initiatives would support the development of best practice policy to address carbon leakage. Enhanced engagement is an opportunity for Australia to contribute positively to international policy development.

The Review assessed the role of multilateral and plurilateral initiatives to both address carbon leakage and to support the implementation of policy approaches to reduce leakage risk in an internationally cohesive and effective manner.

Australia is an active participant in international discussions and initiatives that are considering carbon leakage, including the Inclusive Forum on Carbon Mitigation Approaches and the Climate Club (see **Box 5**).

Active engagement in relevant multilateral and plurilateral initiatives will support the development of policy responses to carbon leakage in a way that advances Australia's interests in the rules-based system and can help develop international policy innovations. Discussions on these issues are underway in a variety of bodies, including the UNFCCC, the WTO, the OECD, ISO and the G7 Climate Club.

Box 5 - Australia's engagement in multilateral and plurilateral initiatives

Australia is an active participant in initiatives focused on carbon leakage. Australia participates in the Climate Club[121] and the Organisation for Economic Co-operation and Development's Inclusive Forum on Carbon Mitigation Approaches[122]. Australia is also a member of the Coalition of Trade Ministers for Climate[123] and is actively involved in discussions on the nexus of trade and climate, including carbon leakage at the WTO through the Committee on Trade and Environment and the Trade and Environmental Sustainability Structured Discussions.[124] In each of these bodies, Australia advocates for greater transparency and enhanced cooperation on carbon leakage.

Australia is a proponent of the international rules-based system, including the global climate and trade regimes. International cooperation underpinned by this system is critical for a peaceful, stable and prosperous world. This system has been a foundation of Australia's economic and social development. The international rules-based system has a crucial role to play with the challenge of climate change sharpening and as international trade patterns become more complex.

5.1 Enhanced global climate ambition

International cooperation is essential to encourage the ambitious cooperative responses needed to address climate change. Such action has an important role to support industrial decarbonisation by, for example, assisting the spread of advanced decarbonisation technology, enabling access to finance and promoting harmonised regulatory approaches, and enabling coordinated and effective policy responses.

Enhanced and converging global climate action would reduce the risk of carbon leakage. This would be the most desirable outcome from a climate and trade perspective. Ongoing encouragement for enhanced ambition, including as part of Australia's existing climate diplomacy, could help to address carbon leakage in the longer-term. In the short- to medium-term, divergence of climate ambition will persist and domestic policy approaches will continue to differ given differing national circumstances, preferences and objectives. Carbon leakage risks will remain whilst this divergence continues.

5.2 International solutions developed through multilateral and plurilateral initiatives

Internationally agreed solutions developed through multilateral and plurilateral initiatives to address carbon leakage risks would be ideal. For example, international standards and approaches for border carbon adjustments. These types of solutions could support policy effectiveness and efficiency, minimise transaction costs, balance different national perspectives and reduce tensions between different jurisdictions based on different perspectives of unilateral measures.

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[121] See information on the Climate Club here.

[122] See information on IFCMA in Box 4 and here.

[123] See information on the Committee on Trade and Environment and the Trade and Environmental Sustainability Structured Discussions here.

[124] Australia is actively involved in discussions on these issues at the WTO's Committee on Trade and Environment and the Trade and Environmental Sustainability Structured Discussions.

Efforts underway in existing bodies, for example at ISO, the WTO, the OECD and the Climate Club are building some momentum towards these goals. Sectoral or narrower plurilateral cooperative efforts could also lead to effective and efficient solutions and are inherently less complex than initiatives with a wider sectoral scope or broader participation. An example of these types of agreements is the Global Arrangement on Sustainable Steel and Aluminium, currently under negotiation between the US and the EU.

The initiatives focused on carbon leakage are at an early stage. This presents an opportunity for Australia to contribute to positive international policy innovation in a manner that supports the international system and can encourage the benefits of harmonious policy responses.

As more countries adopt or strengthen climate policies covering industrial production, including through market instruments, carbon leakage policy is likely to become a more prominent feature of multilateral and plurilateral discussions.

Building consensus or broad-based agreement on international solutions to address carbon leakage will take time. Whilst some of these initiatives underway are prospective for future cooperation, in the short to medium-term they will not replace the need for domestic action to address carbon leakage risk.

5.3 Multilateral and plurilateral cooperation to support domestic policy implementation

Multilateral and plurilateral initiatives could play a more immediate role by contributing to the development of commonly accepted and interoperable policy approaches that could support effective and efficient implementation of domestic policies, particularly border carbon adjustments.

Multilateral and plurilateral initiatives, such as the Climate Club and the OECD's Inclusive Forum on Carbon Mitigation Approaches, are advancing several streams of work that could contribute practically to the implementation of interoperable and more harmonised border carbon adjustments. In particular, efforts towards common emissions accounting standards, agreed default emissions intensities and to independently assess the effect or equivalence of different carbon pricing policies could contribute significantly to better border carbon adjustment policies.

Discussions underway at the WTO (at the Committee on Trade and Environment and under the working group on trade-related climate measures of the Trade and Environmental Sustainability Structured Discussions) have focused on the need for greater interoperability and coherence of measures, including on emissions measurement and verification.

International and domestic work on an Australian sustainable finance taxonomy may be relevant for domestic carbon leakage policies. For example, the work has explored potential emissions intensity thresholds and accounting frameworks to help investors identify economic activities that could be considered 'green'.[125] This has drawn on international work on similar taxonomies in other countries, to promote alignment and interoperability. It may be relevant to consider the need for alignment

[125] Australian Sustainable Finance Institute, October 2024, Australian Sustainable Finance Taxonomy: Second Public Consultation Paper, available here.

between emissions accounting frameworks used by the taxonomy and any potential Australian BCA in future.

The Review has indicated how a border carbon adjustment in Australia's context could rely on such tools. Generally speaking, any Australian border carbon adjustment would rely on internationally agreed standards and guidelines, where relevant and appropriate.

Using multilaterally and plurilaterally developed tools or assessments by plurilateral initiatives to support implementation of a border carbon adjustment can reduce international policy divergence and fragmentation, minimise transaction costs, create business certainty, enhance policy effectiveness and contribute to the development of best practice.

Given Australia's interests in this carbon leakage policy, there could be value in deepening collaboration with like-minded trade and climate partners. The Climate Club and the OECD's Inclusive Forum on Carbon Mitigation Approaches represent some of the most advanced discussions and are suitable forums where collaboration could occur. This work could also be advanced in other multilateral architectures, such as the WTO and the UNFCCC, or regional groupings such as the Asia Pacific Economic Cooperation forum or the Indo-Pacific Economic Framework, or through small groups or under bilateral dialogues, such as the Australia-United States Climate, Critical Minerals and Clean Energy Transformation Compact. The work could also take place in new bodies. For example, there could be utility in creating a new initiative of like-minded countries focused on developing common and interoperable approaches to measure and reduce embedded emissions in traded commodities.

Acronyms

Acronym	Full name or phrase
ABS	Australian Bureau of Statistics
ACCU	Australian Carbon Credit Unit
ARENA	Australian Renewable Energy Agency
BCA	Border carbon adjustment
BLADE	(ABS) Business Longitudinal Analysis Data Environment
CBAM	Carbon border adjustment mechanism
COP	(UNFCCC) Conference of Parties
CCUS	Carbon capture, utilisation and storage
CGE	Computational General Equilibrium
CPI	Consumer price index
DFAT	Department of Foreign Affairs and Trade
ETS	Emissions trading scheme
EU	European Union
EV	Electric vehicle
GDP	Gross domestic product
GTAP	Global Trade Analysis Project database
IEA	International Energy Agency
IFCMA	Inclusive Forum on Carbon Mitigation Approaches
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
LNG	Liquified natural gas
NGER	National Greenhouse and Energy Reporting Scheme
NGO	Non-government organisation
OECD	Organisation for Economic Co-operation and Development
PESA	Product Emissions Standards Act 2017
SMC	Safeguard Mechanism Credits
TEBA	Trade Exposed Baseline Adjusted
UNFCCC	United Nations Framework Convention on Climate Change
WTO	World Trade Organization

Appendix A: Terms of Reference

Preamble

The Australian Government has increased Australia's emission reduction ambitions, legislated targets of 43 per cent below 2005 levels by 2030 and net zero by 2050, and has recently reformed the Safeguard Mechanism in line with these targets.

Many other countries are also stepping up efforts to tackle climate change. But the level of ambition differs between jurisdictions. This creates the potential for production to shift from countries with more ambitious emissions reduction policies to those with lower (or no) emission reduction policies, and potentially resulting in increased global emissions. Where such shifts in production occur solely because of different policy settings, they are termed 'carbon leakage'. Carbon leakage undermines national and international climate action and may require a policy response where carbon leakage risk is significant.

In May 2023, the Australian Government completed landmark reforms to significantly strengthen the Safeguard Mechanism. Under the reforms, legislated limits on emissions for Safeguard facilities — known as baselines—decline from 1 July 2023, on a trajectory consistent with Australia's emissions reduction targets. The reforms will reduce over 200 million tonnes of greenhouse gas emissions by 2030, while improving incentives and confidence for facilities to invest in decarbonising their operations.

The reform package included elements to support industry competitiveness in a decarbonising global economy and to mitigate the risk of carbon leakage. This includes access to reduced annual baseline decline rates for trade-exposed facilities that experience particular scheme impacts and $1 billion in funding for trade-exposed Safeguard facilities through the Powering the Regions Fund.

The Government has agreed to a Review of additional policy options to address carbon leakage, including considering the feasibility of an Australian Carbon Border Adjustment Mechanism (CBAM), particularly in relation to steel and cement (including clinker and lime).

The Review will be led by an eminent Australian expert who will be responsible for the strategic direction of the Review, and its key deliverables, including a final Review report outlining findings, conclusions and recommendations. The Lead Reviewer will be supported by a team within the Department of Climate Change, Energy, the Environment and Water, with representation from other Australian Government agencies.

The Review will consult extensively with two rounds of public consultation, including calls for written submissions. Key stakeholders include industry, peak business groups, experts and researchers, Commonwealth and State and Territory government agencies, international trading partners, relevant international bodies and the broader community.

The final Review report will be provided to the Government by 30 September 2024. Detailed design of any agreed policy options would take place after the Review and could be taken into account in the Government's Net Zero 2050 plan.

Terms of Reference

1. **Assessment of carbon leakage risks**
    a. Assessment of the extent of carbon leakage risks due to differences in emissions reduction policies between Australia and key trading partners, currently and into the future.
    b. Identification of key products and sectors affected by carbon leakage risk, the likelihood and consequence of any significant risks, with particular focus on, but not limited to, steel and cement.

2. **Policy options to address carbon leakage**
    a. Review of current and potential measures to address carbon leakage, in partnership with business, including:
        i. existing measures under the Safeguard Mechanism;
        ii. an Australian CBAM;
        iii. emissions product standards;
        iv. targeted public investment in firms' decarbonisation;
        v. multilateral or plurilateral initiatives.
    b. Analysis of potential measures, should they be found necessary, with regard to: implications for industry competitiveness, emission reductions, adaptability for changes in other domestic policy settings, broader economic productivity and resilience, administration costs, legal requirements and Australia's international trade commitments, including World Trade Organization (WTO) rules.
    c. Draw on the lessons from other countries' approaches to assessing and addressing carbon leakage risk, such as the EU's CBAM and the UK's Review of carbon leakage risks, including their assessment of product standards.

3. **Feasibility of policy options to address carbon leakage, including an Australian CBAM**

Assessment of the feasibility of policy options to address carbon leakage, with consideration of:

a. Principles underpinning policy options to address carbon leakage and implications for policy design, including for an Australian border carbon adjustment.
b. Potential scope of policy options to address to carbon leakage, including for an Australian border carbon adjustment: the coverage of products and sectors, the emissions scope, and the direction of trade (i.e. whether and how the adjustment falls on imports and/or exports).
c. Impacts of policy options to address carbon leakage, including an Australian border carbon adjustment, on firms' (decarbonisation) investment decisions, emission reductions, and other economic impacts, such as on Australia's relative attractiveness for foreign direct investment for net zero aligned projects.
d. How border carbon adjustments under an Australian CBAM could work, including issues relating to measurement of emissions embedded in traded goods, carbon costs incurred in origin countries, setting of the adjustment, obligations on importers/exporters, adaptability to changes in policy context over time, as well as the legislative and administrative requirements for establishment and operationalisation.
e. The implications of policies to address carbon leakage, including an Australian CBAM, for wider trade strategy and priorities, including legal consistency with and implications for international trade obligations, including the WTO, and inter-operability with carbon leakage measures taken by others, such as the EU CBAM.
f. Interests of Australia's trading partners, including those of developing countries in our region, and how an Australian CBAM or other policy measures could best support reductions in global and regional emissions intensities.

Appendix B: Review secretariat

The Review was led by Professor Frank Jotzo and undertaken by the Department of Climate Change, Energy, the Environment and Water, with inputs from the Department of the Treasury, the Department of Foreign Affairs and Trade and the Australian Bureau of Statistics.

Members of the Secretariat were:

- Edwina Johnson, Branch Head
- Joel Rathus, Director
- Cassie Benfell, Assistant Director
- Ximena Elliott, Assistant Director
- Samual Hardwick, Data Analyst
- Petrea Harrison, Graduate
- Liam Hedge, Assistant Director
- Holly Jones, Senior Policy Officer
- Warin Nitipaisalkul, Assistant Director
- Sarah Perry, Assistant Director
- Rhys Pogonoski, Assistant Director (Department of Foreign Affairs and Trade secondee)
- Ben Wee, Data Analyst
- Alex Wilson, Senior Policy Officer
- Peter Wood, Acting Director

Appendix C: Modelling a border carbon adjustment for Australia

Findings

The Review used a variety of analytical tools to assess the potential impacts of border carbon adjustments on prices and output.

None of this analysis found material impacts on the macroeconomy.

Computable General Equilibrium (CGE) modelling of a potential border carbon adjustment on cement, clinker, lime, steel, ammonia and ammonia derivatives shows no material impact on aggregate economic activity and negligible changes to imports and exports when compared to current policy settings.

Input-Output analysis indicates that the impact of a border carbon adjustment on downstream activity, such as construction, would be very limited.

The Review's analysis suggests that the maximum price impacts on final goods that incorporate commodities that may be subject to a border carbon adjustment, such as wind farms, house construction and crops like wheat, would be vanishingly small as a share of product prices.

Indicative modelling of a border carbon adjustment was undertaken using an integrated modelling framework that combines sectoral, domestic and global models. Modelling presents an economic assessment of potential policies designed to address carbon leakage. The modelling is focused on a border carbon adjustment in combination with current settings under the Safeguard Mechanism, and a comparison with the option to remove TEBA for sectors covered by a border carbon adjustment. This modelling complements the economic analysis of a border carbon adjustment (see **Section 3.3**).

Modelling has focused on cement, clinker, lime, steel, ammonia and ammonia derivatives to demonstrate the possible economic effects of a border carbon adjustment on multiple sectors. The Review's assessment is that these sectors may be suitable for consideration of a border carbon adjustment (see **Section 3.4**). One set of scenarios applies a border carbon adjustment on cement, clinker and lime only, and a second set of scenarios applies the adjustment to all sectors.

Climate policy modelling is highly complex. There are many data sources and assumptions that are used throughout this process. This modelling is illustrative of possible scenarios that could emerge, but each scenario represents only one possible outcome. Therefore, the economic outcomes of these scenarios should not be viewed as predictions or forecasts, but as an illustrative description of a possible future outcome given a potential carbon leakage policy.

Details of the modelling approach and scenarios are contained within the Annex.

5.4 Potential border carbon adjustment scenario options

Two policy options for introducing a potential border carbon adjustment within Australia were explored to examine how they may address carbon leakage risk in the Australian economy.

Scenario one modelled the introduction of a border carbon adjustment for imports of steel, cement, clinker, lime, and ammonia including derivatives, with current Safeguard Mechanism arrangements. This option had a minimal impact on the Australian economy.

Scenario two modelled the option of introducing a border carbon adjustment for imports of steel, cement, clinker, lime, and ammonia including derivatives, in combination with removing TEBA for these sectors. Total Safeguard emissions reductions were held constant to ensure comparability of economic effects.

5.4.1 Modelling the border carbon adjustment liability

The modelling used a stylised representation of how a border carbon adjustment would be implemented. While in practice any border carbon adjustment would be based on facility-level emissions intensity for different producers of goods imported to Australia, the CGE modelling was undertaken at an industry level. This necessarily assumed that there is a representative Safeguard firm in an industry and that its behaviour is identical to that of the rest of the industry. In many industries, Safeguard firms do represent the bulk (or all) of the economic activity.

As discussed in **Section 3.3**, facility-level emissions intensity data is not available for most trading partners. The global CGE model, GTEM, uses industry-level data for each country from the Global Trade Analysis Project (GTAP) database. This database does not have capability to represent intra-country variation or variation at a facility level. Emissions intensity was represented using GTAP data for each trading partner at the country-level, where available for each sector. Differences between trading partners were illustrated through different assumptions about the effective carbon price applied.

An effective carbon price for Australia was calculated by scaling the projected future ACCU price by the proportion of emissions reductions under the Safeguard Mechanism. This scaling was also applied to international trading partners to account for the effective discount from baselines.[126] These scenarios do not represent forecasts, but are instead illustrative model estimates based on a specific set of assumptions. As such, they are intended to help support an understanding of various potential carbon border adjustment scenarios.

[126] International carbon prices are taken from the World Bank Carbon Pricing Database and discounted by the coverage of national emissions reported by the World Bank.

5.5 Potential macroeconomic impacts

The modelled scenarios explored in the Review provide several insights into the potential impact of different options and approaches to implementing a potential border carbon adjustment for selected sectors.

The modelling shows no impact on aggregate economic activity and negligible changes to imports and exports when compared to current policy settings (Table 6). The small increase in Australia's net CO_2-e emissions is due to production remaining in Australia.

Table 6: Summary of potential macroeconomic impacts in 2030 (% deviation from current policy)

Variable	Scenario 1 – combined sectors	Scenario 2 – combined sectors	Scenario 1 – cement only	Scenario 2 – cement only
Real GDP	~	-0.002%	~	~
Real exports	-0.003%	0.007%	~	0.001%
Real imports	-0.004%	~	~	0.002%
CO_2-e net emissions	0.001%	0.006%	~	0.001%

Note: ~ The value is smaller than $\pm$0.001% and is considered to be zero

The absence of meaningful aggregate economic effects is explained by several factors:

- The cement, steel and ammonia sectors make up a small proportion of Australia's economic output (total gross value add is less than 1% of GDP in 2021-22[127]). Only a small proportion of Australia's overall imports are covered by a border carbon adjustment for these sectors in these scenarios (slightly more than 3% of total import value[128]).
- The border carbon adjustment liabilities are expected to be small because some imported goods are subject to emissions reductions requirements in the source country.
- The border carbon adjustment would be reduced to account for the effective price on carbon paid overseas.

The longer-run macroeconomic impact of a border carbon adjustment will depend on future changes in difference in carbon prices between Australia and its trading partners. However, the impact is expected to remain limited given the relatively small share of the sectors potentially covered in total Australian production and imports. Further, any liabilities created from a border carbon adjustment are likely to shrink as more countries strengthen their climate policies.

5.6 Potential industry impacts

Introducing a border carbon adjustment without any adjustments to TEBA is expected to increase output by a very small amount relative to current policy settings, as it redistributes demand towards

[127] Based on the gross value add sum of Basic chemical manufacturing, Cement, lime and ready-mixed concrete manufacturing, and Iron and steel manufacturing industries in the 2021-22 ABS input output table 2.

[128] Based on the sum of Basic chemical manufacturing, Cement, lime and ready-mixed concrete manufacturing, and Iron and steel manufacturing industries total value of competing imports in the 2021-22 ABS input output table 3.

domestic producers. With TEBA removal (scenario two) the results indicate a small reduction in output reflecting the greater emissions reduction efforts by these sectors in response. This is balanced by small increases in output by other sectors throughout the economy.

Downstream sectors using covered imports as inputs to production may see a small increase in input costs, as the border carbon adjustment raises the price of imported goods, and consequently a moderate contraction in output.

Table 7: Production output in 2030, by industry (% deviation from current policy)

Variable	Scenario 1 – combined sectors	Scenario 2 – combined sectors	Scenario 1 – cement only	Scenario 2 – cement only
Iron and steel	0.029%	-0.578%	-0.001%	0.014%
Basic chemicals	0.056%	0.034%	~	0.009%
Petrol	~	~	~	0.002%
Manufacturing	-0.004%	-0.022%	~	-0.003%
Cement and lime	0.021%	-0.177%	0.022%	-0.209%
Basic non-ferrous metals	-0.002%	0.072%	~	0.010%
Construction	~	-0.016%	~	-0.005%
Crops and livestock	-0.002%	-0.009%	~	-0.002%
Combined other sectors	~	-0.004%	~	~

Note: ~ means the value is smaller than ±0.001% and is considered to be zero.

Overall, the impact of a border carbon adjustment on Australian commodity import volumes is broadly consistent across scenarios (with the exception of steel) and is associated with both the size of the adjustment liability rate and its carbon reduction ambition relative to other countries. The effects of the border carbon adjustment are largest for cement, clinker and lime. The size of the effect is similar in both scenarios. Comparison of the cement-only and combined sectors scenarios illustrates some very minor cross-commodity impacts.

Table 8: Industry import volumes in 2030, by commodity (% deviation from current policy)

Variable	Scenario 1 – combined sectors	Scenario 2 – combined sectors	Scenario 1 – cement only	Scenario 2 – cement only
Iron and steel	-0.106%	0.106%	~	-0.017%
Basic chemicals	-0.155%	-0.170%	~	-0.004%
Petrol	~	-0.004%	~	0.001%
Manufacturing	0.003%	0.009%	~	0.003%
Cement and lime	-0.458%	0.005%	-0.462%	0.140%
Basic non-ferrous metals	~	-0.031%	~	-0.004%
Construction	0.004%	0.014%	~	0.019%
Crops and livestock	0.001%	-0.008%	~	0.002%
Combined other sectors	0.001%	-0.002%	~	0.003%

Note: ~ means the value is smaller than ±0.001% and is considered to be zero.

5.7 Potential effects on Australia's trade partners

The estimated macroeconomic effect of a border carbon adjustment on Australia's trading partners is negligible.

The modelling indicates that trade flows shift for covered commodities to some extent between countries. The aggregate impact on trade is negligible in the cement-only scenario, with only very minor effects in the combined sector scenario. The modelling indicates no measurable impact on overall economic activity in trading partners. Small changes in trade with Australia are reflected in reallocation of production and trade.

Table 9: Real import volumes in 2030, aggregated by region (% deviation from current policy)

Regional average	Scenario 1 – combined sectors	Scenario 2 – combined sectors	Scenario 1 – cement only	Scenario 2 – cement only
North East Asia	0.021%	0.019%	0.001%	0.004%
Rest of the World	-0.021%	-0.011%	~	0.003%
South and Southeast Asia	-0.024%	-0.022%	-0.006%	-0.009%

Note: ~ means the value is smaller than $\pm$0.001% and is considered to be zero.

5.8 Impacts of a border carbon adjustment on downstream industry and final commodity prices

Should any border carbon adjustment mechanism be pursued, impacts on downstream commodities or final goods that contain substantial amounts of intermediate inputs would need to be considered. Stakeholders have raised concerns that these final goods are also at risk of carbon leakage, if they are not also covered by a border carbon adjustment based on production variables. This would only occur if the primary commodity was covered by a border carbon adjustment, thus facilitating carbon cost pass through to products in Australia.

For example, in the steel sector the Safeguard Mechanism specifies production variables such as flat and long steel, but does not include production variables for further processed commodities such as pipes, mesh and fabricated sheet steel. If there was a border carbon adjustment on steel, then fabricators that make these commodities domestically would face increased costs due to cost pass through but would not receive the benefit of a border carbon adjustment unless imports of similar manufactured goods (such as pipes, etc. in this example) were also covered.

A decision whether to implement a border carbon adjustment to downstream and processed products would require further analysis, as well as analysis about compatibility with WTO rules.

5.8.1 Potential downstream impact assessment – at industry level

Downstream impacts on other sectors can be considered through Input-Output model assessment, which provides information on the contribution of the imported goods to the existing economy, as well as linkages between sectors. The model can be used to identify sectors that could be the most exposed to price uplift because of a border carbon adjustment on imports of cement, steel and ammonia and therefore would most likely adjust pricing in response.

Figure 8 shows the percentage of production that is associated with imports of Safeguard commodities, including the contribution of cement, steel and ammonia. The production processes for each sector also take in a variety of inputs sourced from other industry sectors (that is, the indirect contribution of imports to economic activity), in addition to direct imports of covered goods. This captures flow on effects of price effects from intermediary products as well as direct imports.

Imports of cement, steel and ammonia constituted 2.7% of total goods imported in 2021-22 (up from 1.9% in 2020-21).[129] These imports were associated (directly and indirectly) with 0.18% of GDP, equivalent to A$4.2 billion in value added.

Figure 8 shows that for the construction services industry, imports of steel, cement and ammonia through both direct and indirect channels accounted for 1.26% of the sector's industry value added, equivalent to A$1.1 billion in 2021-22.

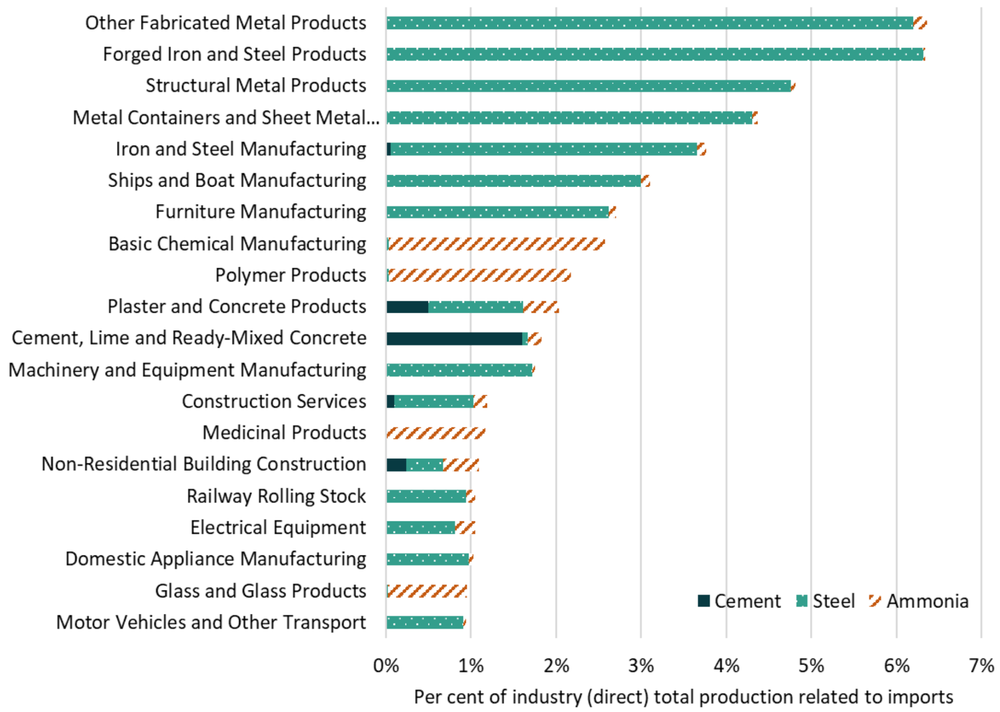

Figure 8: Contribution of imports of cement, steel and ammonia as a percentage of total industry production value for FY2021-22.[130]

[129] This increase was predominantly driven by steel imports, which accounted for 1.8% industry imports in 2021-22, up from 1.2% in 2020-21. Data from DFAT Input Output Model.

[130] Data from DFAT Input-Output model.

Box 6 - Potential downstream impact assessment – by example goods

A border carbon adjustment allows carbon costs to be reflected in product prices, because both domestic producers and imports are covered by carbon liabilities. Without it, domestic producers are constrained in their ability to reflect their carbon costs in product prices.[131]

This price uplift on competing imports is what provides a market premium to low emissions producers and can make production of low emissions goods commercially viable even if production costs were higher. It could also encourage substitution in demand to alternative products that are low or zero emissions in production and thus experience lower or no price uplift.

For example, a carbon border adjustment on cement and precursor products would tend to result in somewhat higher cement and concrete prices, as high emissions products would reflect their carbon costs in market prices. This would provide market opportunities for low emissions cement and concrete, and make it more attractive to use alternative materials.

The effect on product prices is noted in several submissions received in response to the Review's consultation processes, both with regard to the housing sector[132] and to infrastructure projects including in energy supply.[133]

However, the magnitude of potential price impacts is small, and is likely to be readily absorbed in the economy and in overall cost structures of specifically impacted sectors.[134]

Table 10 shows the price uplift enabled by a potential border carbon adjustment for cement, steel and ammonia-based fertilisers based on the sectoral analysis in Chapter 2, and assuming full carbon cost pass through to consumers. While these are the carbon costs per commodity, the contribution to final cost of goods is therefore significantly smaller (as shown in Table 11).

Table 10: Price uplift potential for selected commodities if covered by a potential border carbon adjustment in 2030

Commodity	Indicative 2030 carbon cost as % of price [135]
Concrete	1-3%
Flat steel	3-5%
Ammonium nitrate fertiliser	1-3%

The materiality of price uplift on downstream sectors was assessed using typical prices for housing, wheat (fertiliser), and wind farm construction. These estimates indicate a theoretical price impact of below 0.5% in 2030 (see Table 11). These examples assume full cost pass through from the producers to the final goods. They also do not factor in a shift to lower emissions production practices, such as cement using a higher share of supplementary cementitious materials. They also assume no

[131] Further discussion relating to price impacts is included in the Annex.

[132] See submission from the Australian Chamber of Commerce and Industry.

[133] See submissions from the Chamber of Minerals and Energy of Western Australia and BlueScope.

[134] See Mission Impossible Partnership.

[135] Price at 2030 assumes emissions intensity of products are constant. Carbon cost estimates assume a 2030 ACCU price consistent with Australia's emissions projections and no carbon costs in the base price. Commodity prices are based on indicative consumer prices.

substitution from Safeguard-covered commodities to lower emissions alternatives – for example, increased use of wood in housing construction.

In the case of fertiliser, the illustrative estimated carbon cost pass through for wheat as an example of a fertiliser-intensive downstream product amounts to 0.3-0.5 per cent of wheat prices by 2030 (see Table 11).[136] This is due to an estimated 3-5 per cent increase in the price of ammonia which is passed through to an estimated 1-3 per cent increase in the price of ammonium nitrate fertiliser (see Table 2). The impact on downstream products depends on the fertiliser requirements, with broad acre crops such as wheat having high fertiliser requirements and relatively low prices per tonne of product.[137] For example, for citrus crops, which have higher prices and lower fertiliser requirements, the estimated carbon cost passed through is less than 0.01%.[138]

Actual direct price impacts are likely lower that those estimated due to the simplified assumptions used in the analysis. These include using indicative consumer prices for downstream commodities and the 2030 ACCU price based on Australia's emissions projections.

Table 11: Example price uplift for downstream commodities based on covered inputs

Commodity	Estimated covered inputs	Indicative 2030 carbon cost as % of price[139]
Residential house (floor area 230 m²)[140]	42 m³ concrete 2.5 tonnes steel	0.05-0.1% of an average $473,000 construction price
Wind farm construction (110 MW)[141]	20,900 m³ concrete 13,200 tonnes steel	0.1-0.3% of an indicative $215 million 100 MW wind farm price
Wheat (tonne)[142]	0.116 tonnes ammonium nitrate fertiliser	0.3-0.5% of an average $435 tonne of wheat

[136] Average nitrogen requirement of 40 kg per tonne yield, more information available on the Agriculture Victoria website.
[137] Broadacre crops including wheat, barley, maize, oats and sorghum have high nitrogen-based fertiliser use. Sourced from ABS.
[138] Assumes $2000 per tonne price for navel oranges, reported here, and fertiliser application rates for 50 tonnes of navel oranges / hectare crop yield, sourced from WA Department of Primary Industries and Regional Development, available here.
[139] Price at 2030 assumes emissions intensity of products are constant. Carbon cost estimates assume a 2030 ACCU price consistent with Australia's emissions projections and no carbon costs in the base price.
[140] Average house area in 2021-22. Sourced from ABS.
[141] Capital cost for a recent 110MW onshore wind project. Sourced from Clean Energy Council.
[142] Assumes wheat price of $435 tonne for 2024-25. Sourced from ABARES. Average nitrogen requirement of 40 kg per tonne yield, more information available on the Agriculture Victoria website.