AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

Market-imposed Environmental Disclosures – Final Report

Assessing the potential impacts and mitigations of market-imposed environmental disclosures for Australian red meat processors

Contents

1.0 Executive Summary

The red meat industry is at the forefront of global scrutiny on environmental performance. While there are no regulated requirements for reporting environmental performance in international markets at present, moves are being made to develop these reporting frameworks.

For the processing sector to prepare for future obligations, this project was commissioned by AMPC to gain an understanding of the likely disclosures the industry may need to comply with. The project also looked at the likely impact of market-imposed environmental disclosures on the red meat industry, the level of preparedness to respond and a review of reporting capacity in existing industry platforms such as Meat Messaging.

This investigation identified three regulatory frameworks that pose the greatest risk to the Australian red meat industry, namely the Carbon Border Adjustment Mechanism (CBAM), Product Environmental Footprint (PEF), and EU Deforestation Regulation (EUDR). All three frameworks are initiatives of the European Union, often viewed as the global leader in developing market-imposed disclosure requirements. Despite the EU not being a significant export market for Australian red meat, systems developed in the EU are likely to become precedents for trade in other markets and mirrored in other major export destinations, such as Japan, the USA, China, and South Korea.

The CBAM is a tool that can be used to put a fair price on carbon emitted during the production of carbon-intensive goods entering the EU while encouraging cleaner production in non-EU nations. It imposes additional costs and regulatory compliance burdens on industry for the disclosure of carbon footprints. The transition period commencing 1 Oct 2023 requires EU companies importing CBAM-listed commodities (cement, iron and steel, aluminium, electricity, and fertilisers) to report their relevant carbon permit equivalents. However, the requirements to purchase permits (and thus pay taxes) only begin on 1 Jan 2026.

PEF is the EU's recommended life cycle assessment (LCA) based method, establishing a common way to quantify and measure environmental impacts and performance of products using reliable, verifiable and comparable information. It aims to compare exports from various countries with EU domestic production and other competing export nations, essentially developing into a non-tariff trade barrier. It exposes industry to other environmental indicators performance comparison other than climate change and greenhouse gas (GHG) emissions, such as land use, water scarcity, acidification, eutrophication, toxicity, etc. The transition period commenced in 2019 and was scheduled to end in 2024, although timelines in PEF have undergone multiple extensions.

EUDR is a rule aimed at avoiding the purchase, use, and consumption of any product that contributes to deforestation and forest degradation in the EU and globally, especially activities

associated with agricultural expansion. Beef is one of the seven key products relevant to this regulation. It poses a barrier risk of precluding access into a premium market. The transition period runs from June 2023 to June 2025, likely expanding to include a wider product range and other ecological environments such as savannahs and wetlands.

The expected impacts include barriers to market access, the burden of compulsory compliance, competitive price pressure, and the cost of practice change. Currently, none of these initiatives has an immediate impact on the red meat industry. The first phase of CBAM (Oct 2023–Dec 2025) does not cover red meat products, PEF faces strong objections from agricultural lobby groups and is now voluntary rather than mandatory until further notice. Noting this, it is expected to be adopted by at least some European countries (France being a leading country) and exporters should review requirements in the countries they export to. Over time, it will also gain traction as a voluntary reporting mechanism for corporate companies in Europe and is therefore considered influential in the voluntary action space.

The first phase of EUDR (June 2023–June 2025) excludes land currently used for agricultural purposes, including rearing livestock. This was a key finding of the study, indicating immediate conflict with grazing land management is not part of the regulation. However, there is likely to be a significant impact in compliance burden through the due diligence obligations, and future risk as the scheme is adapted over time and potentially broadens its remit.

The study concluded that industry has approximately 1–2 years before these changes in regulation parameters, the direct impact shifts to industry preparation for compliance requirements and the development of data systems to allow accurate and seamless reporting to demonstrate environmental performance credentials. These efforts can concurrently prepare industry to meet disclosure expectations from commercial clients and consumers and will be a sensible strategy to pursue.

There are two aspects of readiness in responding to changing disclosure regulations:

   I.   the ability to assess, measure, and calculate environmental impacts based on scientifically robust methods, and

  II.   the ability to effectively store and convey those performance data to trade partners.

The Meat Messaging platform is the most widely used system for Australian red meat exports to convey information for compliance and support traceability validation of products. It can attach consignment information at the trade unit level, usually to the carton. Designed for efficient destination port approvals and the reduction of import rejection, it is used for all export destinations. This project found that the Meat Messaging platform is sufficient to convey this information.

The study also identified gaps in the industries' readiness for meeting requirements:

III.   For CBAM, background datasets that support scope 3 assessment in red meat production are scarce and will most likely be required, though exact methods remain unclear.

IV.   For PEF, there is no current capability to report through the red meat supply chain, and there are technical problems with implementing the science behind this system in Australia: in effect, European systems are being imposed on an Australian context, and for regionally specific environmental impacts, this is not appropriate and leads to incorrect reporting of impacts.

V.   For EUDR, the due diligence and reporting requirements are challenging: it is not clear how meat companies would verify zero deforestation claims with the level of traceability in the industry and the available satellite imagery systems to analyse the 10% canopy cover and 5m height forest definition (Appendix 5).

Our investigation revealed several strategies for mitigating the impacts of these market-imposed regulations. A common method or tool can be developed for meat processors to facilitate scope 3 emissions reporting and reporting of other environmental impacts from their suppliers. Next, the reporting system must be harmonised, and flexible to deliver results suited to each international framework. Collaborative efforts along the supply chain and across various industry players are essential to ensure that costs and expectations around emissions reductions and removals are manageable for each stakeholder. Political engagement in Europe is necessary to allow industry to constructively critique these regulatory initiatives. Ensuring that the required resources and funding are allocated to industry to address these compliance requirements is crucial.

While market-imposed environmental disclosures are often perceived as a threat, there could also be 'first mover' advantages that will improve Australia's competitiveness and cement its ongoing reputation for being a market leader in traceability and responsibility in production. AMPC has taken an important step in leading the industry towards a course of preparatory action. It will benefit from continuous partnerships with other industry peak bodies to assist the Australian red meat industry in maintaining its competitive advantage in the global trade arena by developing the systems to respond proactively to new market requirements.

Mitigating risks and harnessing opportunities can largely be achieved through the same process. This report recommends the following further steps and initiatives:

1.   The fast-moving nature of this area means that information in this report will be dated quickly. We recommend extending this project to maintain a watching brief, inform industry via communications and enable establishment of a working group to meet bi-annually between interested industry members to keep abreast of new requirements and opportunities and to identify collaboration opportunities.

2. Our review of EU legislation regarding deforestation concluded that agricultural land was exempt, resulting in relatively low short-term impacts. This conclusion should be reviewed frequently to check for emerging risks from this issue.

3. Develop methods and mechanisms for reporting scope 3 impacts in a standardised and compliant way will deliver value by enabling consistency across the sector. This should be pursued as an 'industry good' activity.

4. Harmonising key reporting requirements and exploring 'whole of industry' approaches to compliance to overcome producer/processor hurdles is recommended. This may best be done using a pilot-based approach. Standardised requirements and clarity across the sector will be key to having a harmonised and transferrable approach between businesses, in much the same way as standard carcase specifications ensure fairness and uniformity in the trade between processors and producers.

5. Our review concluded that the Meat Messaging system could carry further specification data around environmental disclosures. Depending on the verification level needed in third-party markets, this may vary from a 'certification' verified in Australia to providing some primary data with actual shipments of beef. There is no imminent need for verification with beef shipments from regulatory systems. However, trialling this system for customer-led trade would provide interesting insights and help the industry be responsive to regulatory needs, should they emerge.

2.0 Introduction

The red meat industry is at the forefront of global scrutiny on environmental performance. There are emerging regulatory forces and potential cross-border taxes that could be extended to emission-intensive products such as beef and lamb in the future. There is also growing pressure from customers to report environmental impacts and demonstrate improvements over time. This report will focus primarily on the emerging regulatory environment for red meat in international trade, the capacity of the Australian industry to comply with new regulations and the impacts on the competitiveness of the Australian red meat industry in export markets.

In leading the world on environmental regulation, the European Union (EU) has announced three new regulatory barriers that are a potential risk to Australian red meat trade relating to environmental impacts of traded products:

i)   the European Carbon Border Adjustment Mechanism (CBAM) on traded commodities is a proposal that, while having scant detail, is another clear risk to trade for high emission intensity products such as red meat, and the transition period for the regulation begins in October 2023;

ii) the Product Environmental Footprint (PEF) system is a comparative and trade-relevant system that will assess impacts from Australian exports and compare these to EU domestic production and other major competitors for beef and lamb. The transition period for the regulation begins in 2019 and was scheduled to end in 2024 (though timeframes have regularly been extended in this program);

iii) the EU Deforestation Regulation (EUDR) aims to prevent companies from placing products into the EU market that are linked to deforestation. The EUDR especially calls out beef as one of 7 key products to which this regulation relates. The transition period for the introduction of the regulation begins in June 2023.

The risk with the CBAM is that this may impose additional costs, regulatory compliance burden, and market disadvantage upon Australian red meat processors to meet requirements for the disclosure of environmental footprints. Risk areas with PEF include exposure to climate change (GHG emissions including direct land use change that occurred in 2001-2021), land use, water scarcity, and acidification impacts. EUDR poses a risk as a trade barrier to preclude market access into a premium market for the red meat industry. Consideration of international market requirements for environmental information should be within the scope of future industry work. It should also be reviewed to maximise alignment between industry reporting frameworks such as the Australian Beef Sustainability Framework (ABSF) and the Australian Sheep Sustainability Framework (ASSF).

AMPC is proactively seeking to understand what the expected nature and format for this market-imposed disclosure will be, the timeframes and impacts, whether other markets may follow (e.g.

North America, Japan, South Korea, China), and what meat processors can do now to mitigate any potential risks or unfavourable impacts.

Currently, no exporting processors have had to disclose their product environmental footprint, and voluntary environmental disclosure has rarely (if ever) been conducted by processors. Carbon border adjustment and related mechanisms are currently only implemented in California, applying exclusively to the Californian power market, and do not currently impact the red meat industry. Deforestation has been conventionally targeted towards tropical rainforests, usually associated with agricultural production in South America and Southeast Asia, with less focus on rangeland management in regions such as Australia. However, with recent dramatic shifts in global governmental rhetoric and policy proposals, consideration is being given to implementing similar arrangements in countries such as Japan, the USA, China, and South Korea – all markets of great significance to Australia's red meat processors and exporters.

Currently, the proposed European CBAM, also known as the carbon border tax (CBT), is an import levy on imports of electricity, cement, aluminium, fertiliser, iron and steel products most likely to be covered by the exporter and passed back through supply chains to producers.

While market barriers and regulations will likely require compulsory compliance within years, there is a rapidly increasing need to report environmental disclosures to customers. Because of the overlap in requirements, it is sensible to consider the potential needs of both regulation and customers. However, this project focused on the specific impacts of regulated frameworks; thus, the lens here is how these market-based regulation changes may influence the impacts on red meat processors across the need to report environmental disclosures.

This report summarises the emerging market-imposed environmental disclosure requirements that have been legislated and identifies three clear directions the Australian meat supply chain can pursue to align their organisations with the likely requirements of the most relevant environmental disclosure reporting systems. *Appendix 2 – Description of Environmental Disclosures* provides tabulated examples of the many frameworks for environmental disclosure that red meat processors may encounter.

3.0 Project Objectives

The project objectives were outlined as follows:

3.1 Assessment of the timing and impacts of proposed product environmental footprint regulations and carbon adjustment mechanisms to determine how Australian red meat exporters would be positioned to respond.

3.2 Considerations of the disadvantages faced by Australian red meat exporters to meet these regulatory (and associated commercial) requirements, as well as comparative advantages that may occur against competitor suppliers.

3.3 Analysis of mitigating steps that the meat processing sector and individual enterprises could take to reduce the impact of introducing border adjustment or environmental disclosure requirements.

3.4 Assessment of the potential for existing platforms (e.g., Meat Messaging) to facilitate the transfer of environmental disclosures to meet customer and regulatory requirements.

While the project scope and objectives are focused on regulatory, market-imposed impacts, the project also considered other commercial drivers for increased environmental disclosures, such as customer-based and finance sector-based requirements for a broader context.

4.0 Project Methodology

The project reviewed the emerging market-based frameworks that would require compulsory compliance and reporting against environmental criteria for the red meat industry. A broad desktop literature review focused on emerging market regulation and consideration for articles, publications and information on voluntary commercial frameworks used in customer and finance-led disclosure changes. Investigations of identified mechanisms were also investigated through communication with government and industry officials, from which further detail and clarification on regulation criteria and methodology were sought.

This project also conducted a desktop review of available reporting platforms. It consulted with AUS-MEAT and the developer of the Meat Messaging system, Des Bowler, to assess the applicability of the Meat Messaging platform to facilitate the transfer of environmental disclosure information.

Insights were shared with industry members through the project, including via presentation at the industry conference in 2022 and stakeholder meetings with the industry in December 2022, to present industry findings on regulated and voluntary frameworks and obtain feedback on current understanding and concerns across the sector.

Further, one-on-one red meat processing industry consultation meetings were conducted to understand the perspectives and challenges on environmental disclosure currently faced by meat processors and exporters. Consultation meetings were held across a representative group of industry organisations, which covered all species and diverse geographies, accounting for a large

proportion of the total industry annual throughput. The template of the questionnaire used in the industry consultation meetings can be found in *Appendix 3 - Questionnaire*.

Findings from the industry consultations were used to guide the focus of the research and recommendations of this report, as well as informing the development of scenario case studies aimed at demonstrating the industry's capability in the case of future compliance. These scenarios used available industry information, which was analysed to examine the potential impacts of emerging environmental disclosure measures.

5.0 Project Outcomes

The outcomes of the investigation phase of the project, from which potential imposed mechanisms were identified, are further discussed in this chapter.

5.1 Market-imposed Frameworks for Environmental Disclosures

Market-imposed environmental disclosures relate to the compulsory compliance to and reporting against specific environmental credentials such as carbon footprint (greenhouse gas emissions), water use, biodiversity impact or deforestation imposed by an export market or destination. Key environmental disclosures are greenhouse gas (GHG) emissions (Scope 3 emissions), water and waste management, and deforestation-free status.

As global trade evolves to meet accelerating consumer consciousness about climate change and responsible sourcing, environmental disclosures are being imposed on red meat exporters through customer or finance/investor requirements. Evidence from industry consultation indicates these non-regulated drivers are likely to gain momentum faster than market-imposed environmental disclosures, potentially becoming a greater force for change than cross-border regulation. Market-based systems were only investigated briefly for context, and future work should fully review these requirements and compare them with Australian assessment frameworks to ensure reporting in Australia is also fit-for-purpose for international markets.

5.1.1 The EU – Leading Market-imposed Environmental Disclosures

The EU is the leading market in developing market-imposed disclosure requirements. Three separate initiatives have been announced under the aspirations of the EU Green Deal: i) the Carbon Border Adjustment Mechanism, ii) the Product Environmental Footprint, and iii) the Deforestation Regulation.

Based on volume, the EU is not considered a market of major significance to Australian red meat. Negotiations for a free trade agreement, known as the A-EU FTA, commenced in 2018 and remain ongoing, with the 15th round having stalled on the improvement of Australian agricultural product market access in June 2023 (Financial Review, 2023; MLA, 2023), however expanding import regulations designed to meet the goals of the EU Green Deal by progressing carbon neutrality of the region by 2050 pose new threats to growing trade with the region.

While the EU may be a relatively small volume market, the systems developed there are not exclusively focused on red meat. They are far-reaching in the economy, and because of the significance of the EU in global trade, systems developed in the EU may become embedded in global trade, becoming global precedents; this triggers the need for red meat processors and exporters to examine these policies closely.

5.1.2   The EU Green Deal

By way of background to understand the rolling emergence of multiple systems for environmental disclosure reporting by countries exporting to the EU, it is helpful to be aware of the EU Green Deal (EU-ASEAN Strategic Partnership 2022, 2022).

Set forth by the European Parliament in January 2020, the EU Green Deal is a set of proposals and policy initiatives to roadmap the EU as a continent toward climate neutrality by 2050. The key pillars of the Green Deal framework are set out in Figure 1. Advances in transport, agricultural systems, ecosystems, and biodiversity are all required, as well as efforts to reuse and recycle. In lockstep, the EU passed the European Climate Law in 2021, which legislated that greenhouse gas emissions should be 55% lower in 2030 than in 1990. To reach this target, the Fit for 55 package (July 2021) of proposed legislation details how the EU intends to reach this target and includes potential carbon tariffs for imports that don't cut their greenhouse gas emissions at the same rate (Valatsas, 2019), including the EU CBAM policy.

Figure 1. The European Union Green Deal 11 pillar framework (Source: EU-ASEAN)

The overarching aim of the European Green Deal is to reach net-zero greenhouse gas emissions within the EU. As such, one of the first policies announced concerning imports was the development of a carbon border adjustment mechanism, followed by an approach to universally scoring all products according to their carbon footprint and other environmental impacts (the PEF system). Most recently, the EU announced the introduction of the EU Deforestation Regulation for products connected to deforestation and forest degradation. These emerging policies were explored in detail in this project.

5.2   Regulated Frameworks for Environmental Disclosures

The EU is now the global leader in the development and potential application of systems that may impose environmental requirements on imported goods. Prime examples are the PEF method and the CBAM (Table 1). The CBAM has generated more global political interest because of its

potential implications for international trade. Other countries that might consider a CBAM include the UK (to maintain seamless trade flows), Canada and the United States (Brauch et al., 2021).

Table 1. Summary of announced regulatory environmental reporting frameworks under development in the European Union

	Carbon border adjustment mechanism	Environmental Footprint method of the European Commission	EU Deforestation regulation
Acronym	CBAM	PEF	EUDR
Link	Link	Link	Link
Administered by	European Union	European Union	European Union
Purpose	To avoid carbon leakage through products made outside the EU while internal efforts are made to reduce emissions	To provide a common method for conveying green credentials within the single market	To prevent the conversion of primary forest to non-forest
Audience/target	Importers of goods that do not have carbon certificates corresponding to the price that would have been in the EU	Products (and organisations) in the European single market	High-risk products in the European market
Products only?	Yes. Initially to cover cement, iron and steel, aluminium, fertilisers, and electricity	Products and organisations	Yes. Initially to cover cocoa, coffee, soy, palm oil, wood, rubber, and cattle, as well as derived products
Emission scopes considered	Scope 1 emissions only (initially)	Scopes 1, 2 and 3	Not applicable
Voluntary or compulsory?	Compulsory	Unknown - may be country-specific	Compulsory for high-risk products – cattle, soya, palm-oil, paper & wood, cocoa, coffee, and rubber. May cover more products in the future
Targets	No target	Not applicable	Not applicable
Timeframe	Reporting to take place 2023 - 2025, and full operation in 2026	Timeline unknown (most recently scheduled for 2023). Implementation has been delayed multiple times because of the complexity of the system.	Begins in June 2023 with large companies needing to comply by Dec 2024, and all others complying by Jun 2025.
Deforestation reporting	LULUCF emissions must be included in the GHG inventory of EU members, so this emission source will likely be considered, but explicit reporting is unclear	Climate change - land use and land use change to be reported separately	Clearing of primary forest greater than 5m in height and with a canopy cover greater than 10% over an area greater than 0.5 Ha since 31 Dec 2020. Urban and agricultural land is currently excluded.
Non-carbon indicators	None	16 total indicators. Non-carbon indicators include energy, water, eutrophication, land, toxicity	Deforestation aims to reduce carbon and biodiversity loss
Underpinning method or standard	EU Emission Trading Scheme, specific emission accounting requirements unclear.	PEF method	EU forest definitions

5.2.1 EU Carbon Border Adjustment Mechanism (CBAM)

The high carbon price in the EU on the back of shifting domestic climate ambition creates the potential for carbon leakage, a process whereby producers of products retreat to jurisdictions with less rigorous rules on carbon emissions, allowing an unfair advantage against producers in the EU. In a mechanism to bring equality to carbon responsibility and prevent such carbon leakage, the EU plans to exact a Carbon Border Adjustment Mechanism (CBAM), with final legislation passing in May 2023.

Over the remaining months of 2023, the EU CBAM will focus on imports of steel, aluminium, cement, fertiliser, and electricity, aligning with priority areas for reduction (Figure 2) in phases. The first phase, from 2023 to 2025, **will exclude agricultural products**. However, the second phase, beginning in January 2026, will start to bring on new categories of products under the EU carbon ambit.

CBAM will function by requiring importers to buy CBAM certificates for goods imported into the EU if production is not covered by a carbon scheme in the country of production. For importers required to purchase certificates, the price of these certificates is linked to the price of weekly allowances under the EU Emissions Trading System (ETS) (Trading Economics, 2023). The ETS is the world's largest carbon-pricing system. It functions as a cap-and-trade scheme where a limit (the cap) is placed on emitting specified pollutants over a geographic area, and companies trade rights for such emissions within that area, known as permits. Initially, the sectors subject to CBAM are cement, iron and steel, aluminium, electricity, and fertilisers, as these represent the highest sectors contributing to EU carbon emissions and are also the sectors most prone to carbon leakage (European Parliament, 2023). As of 1 Oct 2023, companies importing CBAM-listed commodities will be required to report their relevant carbon permit equivalents, however, they are not required to purchase permits (and thus pay taxes) until phase 2, beginning 1 Jan 2026.
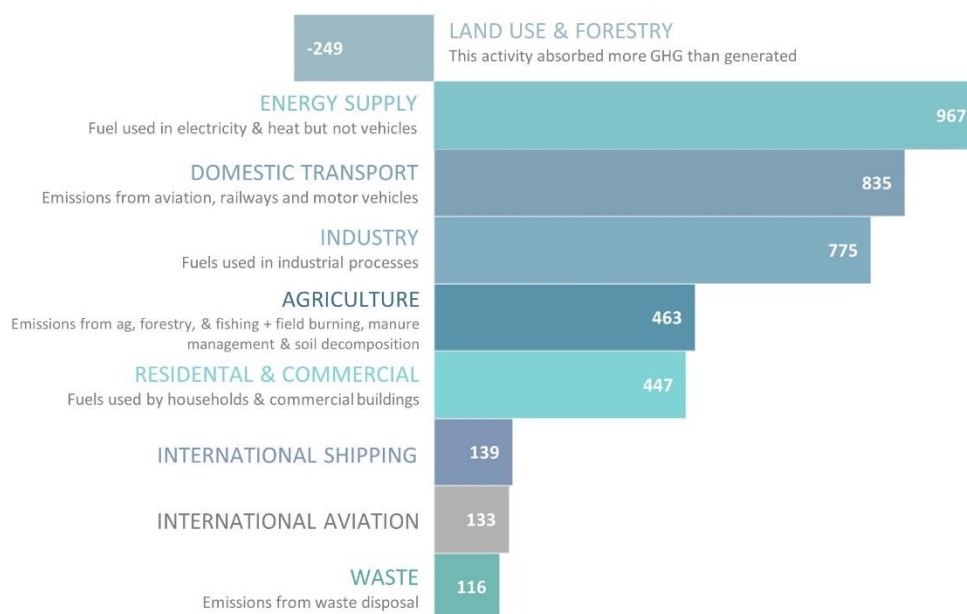
Figure 2. EU emissions by sector, 2019 (millions of tonnes of CO_2-e) (Source: EEA)

As per the initial proposal released in 2021, the EU CBAM aims to tax imported goods based on their emissions intensity. While exact details are still forthcoming, these broad principles were outlined in the 2021 proposal:

1. **Direct Emissions:** For certain goods, the CBAM calculation will primarily consider direct emissions that occur during the production process. This would include emissions from the combustion of fossil fuels and emissions from chemical reactions in the production process.

2. **Indirect Emissions:** For electricity and certain other products, indirect emissions from the generation of electricity consumed in the production process will also be considered.

3. **Default and Actual Values:** The EU plans to set default values for the emissions intensity of goods from different countries and sectors, based on average emissions levels. However, companies will be able to use actual values instead, if they can provide verified emissions data that meet EU requirements.

4. **ETS Compatibility:** The CBAM is designed to complement the EU's Emissions Trading System (ETS). The carbon price for imports under the CBAM would be linked to the price of allowances issued each week. This means that if a tonne of carbon costs 90 euros under the ETS, importers would need to buy CBAM permits for 90 euros for every tonne of carbon in their imported goods where they are not already covered by an emission scheme in the country of production (Figure 3).

5. **Emissions Data Reporting:** Under the proposal, companies importing goods subject to the CBAM would be required to report emissions data and buy CBAM certificates on an annual basis as required. This data would be verified by independent auditors.

Carbon emission weekly allowances are sourced from the EU-ETS and are allocated first by considering EU directives for the maximum amount of greenhouse gases that can be emitted. Allowances are then traded via auction on an open market system. As shown in Figure 3, the price of EU Carbon Permits has been rising significantly as the CBAM comes closer to taking effect. During CBAM Phase 1, sectors subject to the mechanism are required to report their carbon emissions but are not yet required to purchase permits to offset any emissions. Phase 2 initial commodities subject to CBAM will begin paying carbon adjustment tax through the purchase of permits and new commodities, such as agricultural products, and will be brought into the CBAM ambit.

Figure 3. EU Carbon Permits trading value last 5 years and current price as of 18 July 2023 (Source: Trading Economics)

It's important to note that the CBAM is a complex and innovative policy proposal that raises several challenges in terms of measurement, verification, and implementation. As the EU further develops and refines this mechanism over Phase 1, details of how carbon emissions are measured may be adjusted to address practical and policy challenges. Further, if agricultural and food products are brought in under the CBAM regulation, potentially in early 2026, clarification on the measurement and calculation methods and reporting platforms will need to occur.

5.2.2 EU Product Environmental Footprint (PEF)

The PEF scheme was developed by the European Union (EU) to provide a uniform system for reporting the environmental impacts of a product or organisation to eliminate the confusion caused by the proliferation of environmental labels and systems for describing products' environmental impacts. The scheme is led by the European Commission (EC) and is currently in a 'transition period' that began in 2018 and will extend until PEF is legislated in the EU. The scheme's overarching goals are to achieve replicable, comparable, and verifiable results and to underpin consistent communications about the environmental credentials of products or organisations. These are laudable aims. PEF follows the Life Cycle Assessment (LCA) approach of assessing all environmental impacts from a product or service, from raw material acquisition through to end-of-life. This whole supply chain approach is what makes it most significant for trade partners. The system includes an assessment of 16 environmental impact categories, which are 'normalised' and 'weighted' to develop a single score that is suggestive of the environmental performance of the product. The final score is highly sensitive to the normalisation and weighting approach.

The detail within the final policy that drives the implementation of PEF is uncertain and is to be decided by the European Parliament soon. However, the program has been progressing for the past 10 years and is already enshrined in some EU policy instruments. Some countries, such as France, have also indicated that they will expedite the use of the system once it is available. They have progressed this by adopting a similar system in regulation already. Therefore, PEF will likely be implemented in some form, either as a voluntary system or, more dramatically, as a mandated policy that enforces labelling on all traded products in the EU.

The PEF program is expected to be the first major market-based government-regulated system for reporting the environmental impacts of products, making it globally significant. The EU has stated its intent to lead worldwide mitigation of environmental impacts. As they are currently doing the 'heavy lifting' in this space, other countries may choose to adopt EU policies and procedures instead of repeating the investment in their jurisdictions. Considering this, it is prudent to understand the system and its likely impacts on Australian products and to engage with the developers.

Labelling based on PEF will be used for complex decisions including, but not limited to, daily consumer choices, procurement management, trade negotiations and others. The scheme is expected to be adopted by at least some European countries (France being a leading country) and exporters should review requirements in the countries they export to. Over time, it will also gain traction as a voluntary reporting mechanism for corporate companies in Europe and is therefore considered influential in the voluntary action space.

As the guidelines establish the scope of a PEF and must cover all impact categories from cradle to at least port (and by extension to retail shelf or all-of-life), the cost of conducting a PEF study is largely determined by the inventory data requirements, which are established by the data quality requirement. An overarching method guidance document governs the system and has separate PEF Category Rules (PEFCRs) for different sectors that outline the exact approach to assessment, for example, textiles or beef. There is a range of PEFCRs for products of relevance to red meat (leather, pet food, dairy, and feed for food-producing animals), and one independent CR guideline for red meat (not an official PEFCR) developed by the European Livestock and Meat Trading Union (UECBV). All the PEFCRs expired in 2020 or 2021, but they serve as points of reference for data requirements necessary for compliance with the PEF scheme. Further details on PEF compliance and cost implications can be found in Appendix 4 – PEF Requirements and Cost of Compliance.

The PEF scheme may represent an opportunity, risk, or both to red meat. The key risk of PEF is that there will be a bias against Australian products because of a negative 'sustainability score', which could lead to a disadvantage compared to competitors if retailers or consumers choose against products with higher scores. If the method does not properly reflect or interpret environmental impacts in Australia, it could result in unfair comparisons and incorrect product-label guidance to consumers. Ultimately, PEF could unintentionally develop into a significant non-tariff trade barrier, further widening the trade deficit between Australia and Europe. Furthermore, there is a clear risk that PEF becomes a precedent for trade in other markets because it will effectively become embedded as the first system in global trade.

Taking a different view, the key opportunity in this scheme would be that Australia could comply with this sophisticated system and demonstrate improved environmental management. At the same time, other international regions may find this difficult. The EU is typically a premium market, which may open opportunities for higher volumes of high-value trade.

5.2.2.1 The Green Claims Directive

Proposed in March 2022 and adopted in March 2023, the European Commission's proposal for the Green Claims Directive aims to protect consumers from greenwashing. Designed to prevent companies from making misleading claims about the environmental merits of products and services, the Green Claims Directive also looks to help consumers make informed environmental choices (European Commission, 2023). In an unexpected development, the EC decided against directing companies to substantiate their claims using the PEF system and instead stated that environmental claims should "rely on recognised scientific evidence and state-of-the-art technical knowledge".

5.2.3   EU Deforestation Regulation (EUDR)

Under the Protecting Nature pillar of the EU Green Deal (Figure 1), the EU has enacted the EU Deforestation Regulation (EUDR), legislation aimed at protecting the world's forests. This policy initiative is designed to ensure that products placed in the EU market do not contribute to deforestation or forest degradation. Under this Regulation, companies must demonstrate that their products, especially those linked to key deforestation risk industries, are not directly or indirectly associated with deforestation or forest degradation.

The EUDR was launched in June 2023, and during its initial phase, it will focus on seven specific commodities: soy, cattle, palm oil, coffee, paper and wood products, cocoa, and rubber. The EUDR will also focus on imported products containing these specified products as components or ingredients (e.g. leather, cosmetics, confectionary, etc.). The Regulation will require any company importing or exporting these commodities or related products to prove the products were produced on deforestation and degradation-free land. All companies are included, whether EU-based or not, and it will relate to illegal and legal forms of forest degradation and/or clearing.

A product is defined as deforestation-free when the product itself, its ingredients or its derivatives were not produced on land that has undergone deforestation or forest degradation. The Regulation applies to land after the cut-off date of 31 December 2020 to minimise disruption to international supply chains (KPMG, 2023).

After EU Member States' adoption, each Member State's respective authorities are responsible for enforcing the Regulation. To support the Regulation's adoption, an online system is planned to be set up to facilitate the exchange of information on products placed on the EU market.

It should be noted that previous anecdotal evidence, including that gathered by the Meat Messaging platform for red meat exports to the EU, demonstrates that the EU is not known for its strict policing of its regulations. Thus, the capacity for managing the implementation of this Regulation, at least in the short term, remains an issue for some scepticism. Nonetheless, indications dictate that it would be unlikely for the EC to change the parameters of this Regulation until at least the phase-in period has been completed (June 2025), giving industry significant time to prepare or, better still, further influence bipartisan policy for the recognition of local jurisdiction laws, where they adequately exist and are effective in governing the management of vegetation to the same intent as the EU Green Deal, yet protect the national interest, both economically and environmentally.

For more information on the EUDR and its implications for red meat processors in Australia, please refer to Appendix 5 – Public Communications Article.

5.3   Voluntary Frameworks for Environmental Disclosures

5.3.1   Organisation and Customer-led Frameworks

Key customer-led environmental disclosure reporting frameworks are summarised in Appendix 2 – Description of Environmental Disclosures. The target audience for these frameworks is companies. These systems are voluntary and are being implemented now. Some have strict requirements that the industry should be aware of, such as a public commitment to end deforestation by 2025 (SBTi FLAG in Appendix 2 – Description of Environmental Disclosures.)

5.3.1.1   Science-Based Targets Initiative (SBTi)

The Science-Based Targets Initiative (SBTi) is a global body enabling businesses to set ambitious emissions reduction targets that align with the latest climate science, including the Paris Agreement goals. The initiative is a collaboration between CDP, the United Nations Global Compact, the World Resources Institute (WRI) and the World Wide Fund for Nature (WWF). The SBTi *Net-Zero Standard* was launched ahead of COP26 and provided the first corporate net-zero target-setting framework.

For companies setting science-based targets, there are three methods available:

1.   Carbon budget.
2.   Emissions scenario.
3.   Allocation approach (convergence or contraction).

For companies setting targets to reduce emissions to align with the scenario of limiting global warming to well below 2 degrees Celsius, the minimum reduction required is 2.5% in annual linear terms. This percentage is calculated by measuring baseline and target-year emissions and determining the difference (SBTi, 2020).

The SBTi advises that a company should set a scope 3 target if scope 3 emissions contribute to at least 40% of total scope 1, 2 and 3 emissions profile, which is relevant to meat processors as most of the company emission profile will likely be scope 3.

5.3.1.2   SBTi Forest, Land and Agriculture (FLAG)

The SBTi FLAG guidance provides the world's first standard method for companies in land-intensive sectors to set science-based targets. The FLAG guidance was launched in September 2022 and requires companies with land-intensive activities in their value chain, including food production, forest and paper products, and companies in any other SBTi-designated sector that has FLAG-related emissions that total more than 20% of overall emissions across scopes 1, 2

and 3, to set FLAG science-based targets. These companies must calculate/estimate their FLAG emissions in their direct operations and supply chain in line with the GHG Protocol's Land Sector and Removals Guidance (SBTi, 2023).

All companies will need to account for FLAG-related emissions when setting a science-based target. Companies are required to either set a separate FLAG target or include these emissions in their non-FLAG target. The added complexity to companies reporting FLAG SBTi targets is that they need to collect data on emissions from land use (LU) and land use change (LUC), which is challenging for companies where these fall under scope 3 emissions, such as meat processors.

5.3.1.3 Global Reporting Initiative (GRI)

The GRI is an international independent standards organisation that helps businesses, governments, and other organisations understand and communicate their impacts on relevant issues, such as climate change, human rights, and corruption.

Established in the late 1990s, the GRI provides the world's most widely used standards for sustainability reporting – the GRI Standards (Global Reporting Initiative, 2021). These standards are designed to help organisations transparently and effectively report on their sustainability impacts in a standardised way and can be compared across organisations and sectors.

In terms of environmental sustainability, the GRI Standards cover a range of topics, including:

1. **Emissions**: This includes direct and indirect greenhouse gas emissions, reductions in emissions, and other emissions-related data.

2. **Effluents and Waste**: This includes data on waste and water discharges and managing these outputs.

3. **Environmental Compliance**: This involves disclosure of any violations of environmental laws and regulations.

4. **Water and Energy Use**: This covers the organisation's consumption of water and energy and the efficiency of that use.

5. **Biodiversity**: This involves reporting on the impacts of operations on biodiversity in protected areas and areas of high biodiversity value.

6. **Supplier Environmental Assessment**: This involves reporting on the environmental impacts within an organisation's supply chain.

By using the GRI Standards, organisations can provide a comprehensive picture of their environmental footprint, setting a baseline for improvement and allowing stakeholders like

investors, employees, customers, and regulators to make informed decisions. It's important to note that while GRI helps to standardise reporting, it's up to individual organisations to implement changes and improvements to their environmental sustainability practices.

Some examples of organisations across various sectors that use GRI to report their sustainability performance include:

2. **Multinational Corporations:** e.g. Unilever, Nestle, Royal Dutch Shell, and Siemens.

3. **Small and Medium-sized Enterprises (SMEs)**: While GRI reporting is usually associated with large corporations, many SMEs use the standards. The flexibility of the GRI Standards allows SMEs to focus on the sustainability issues most relevant to their operations.

4. **Public Sector Entities:** Many public sector entities, including government departments and public utilities, use GRI standards.

5. **Non-Government Organisations (NGOs):** e.g. Oxfam and the World Wildlife Fund, also use GRI standards to report for their operations.

6. **Financial Institutions:** Banks, insurance companies, and investment funds like HSBC, Allianz, and BlackRock also use GRI reporting for sustainability reporting.

Organisations use GRI reporting because it provides a common language for organisations to report sustainability issues in a way that is understandable and comparable across different industries and countries.

5.3.1.4 Company-Specific Reporting Frameworks

Key multinational corporations may have preferred methods for suppliers to report their environmental footprint. For example, the McDonalds Corporation uses the Cool Farm Tool (link) to quantify on-farm greenhouse gas emissions from farm crop and livestock systems on a per-product basis (carbon footprint). The chief limitation of this system is its uniformity. Using IPCC (Intergovernmental Panel on Climate Change) Tier 1 and 2 factors for N_2O and livestock emissions, the ability to identify contrasts between countries (which would require Tier 3 factors) is limited. Furthermore, contrasts between Tier 1 and 2 emission factors with more specific Tier 3 factors may give false reads. For example, N_2O factors are higher than those used in the Australian national greenhouse gas inventory report – if taken at face value, this would falsely increase the apparent importance of mitigating this emission source.

Walmart provides another example. Walmart's Project Gigaton accounting methodology (link) underpins the goal of avoiding one billion metric tonnes of greenhouse gas emissions from their global value chain by 2030, using a 2015 baseline. As they acknowledge, the summation of avoided scope 3 emissions to meet this goal is a departure from the GHG Protocol Corporate

Value Chain (scope 3) standard (Appendix 1 – Customer Targets). Walmart's suppliers' self-report absolute emission reductions, avoided emissions (i.e., an emission that did not occur because a specific action was taken) and sequestration. For Walmart, these represent avoided scope 3 emissions.

5.3.2 Finance Sector Frameworks

Climate change presents a financial risk to the global economy through rising temperatures, climate-related policy, and emerging technologies. In the past decade, there has been growing concern that the physical and transition effects of climate change may contribute to changes in the value of financial assets and potentially increase financial stability concerns (Task Force on Climate-related Financial Disclosures, 2022). Environmental disclosures in the finance sector are increasingly becoming compulsory. The frameworks serve to improve and increase reporting of climate and nature-related financial information to allow companies to evaluate the climate and nature-related risks, improve capital allocation decision-making, and conduct informed strategic planning. There are currently two main finance sector frameworks: Task Force on Climate-related Financial Disclosures (TCFD) and Taskforce on Nature-related Financial Disclosures (TNFD). These disclosures are not simply about reporting impacts, such as a carbon footprint, but are also concerned with supply chain exposure to climate-related risks (e.g., sea level rise, extreme weather events, and temperature change).

5.3.2.1 Task Force on Climate-related Financial Disclosures (TCFD)

The TCFD was created in 2015 and released its final recommendations for climate-related disclosures in a 2017 report, which provided a framework for companies and other organisations to develop more effective climate-related financial disclosures through their reporting processes. Since 2021, there has been over a 50% increase in global company support of the TCFD. There has also been an increase in the percentage of companies disclosing information in line with the TCFD recommendations (Task Force on Climate-related Financial Disclosures, 2022).

As part of the TCFD's 2022 report, they reviewed over 100 peer-reviewed papers on climate-related risks and their effects on market prices of financial assets, lending rates and insurance rates. The review found that climate-related risks are increasingly being factored into price, and risks expected to materialise in the short term are more likely to be incorporated into prices when compared to risks expected to materialise in the mid to long term. The extent to which climate-related risks affect prices varies based on the type of financial asset or product and the type of risk associated with it, and it was found that transition risks were more likely to be incorporated into prices compared to physical risks. It was also found that introducing the Paris Agreement

increased the effect of transition risk pricing, but this varied over time and election cycles. The third finding was that the uncertainties around a company's future cash flow were another determining pricing factor, not just climate-related risks (Task Force on Climate-related Financial Disclosures, 2022). The countries and continents with the greatest number of companies supporting the TCFD include the United States, Canada, the United Kingdom, France, and Australia.

5.3.2.2 Task Force on Nature-related Financial Disclosures (TNFD)

The TNFD framework is another financial disclosure framework currently in beta phase development, with a disclosure approach and guidance aligned with the TCFD. It is currently in the final draft stage with the intention of release in September 2023. The TNFD builds on the TCFD by encouraging companies to produce integrated climate-nature disclosures and to develop appropriate risk management processes (Taskforce on Nature-related Financial Disclosures, 2023b).

The Beta version of the framework was released in March 2023 and outlines the six general requirements for company disclosure statements under the TNFD framework (Taskforce on Nature-related Financial Disclosures, 2023a). These include;

1. **The approach to materiality**: An organisation should describe the materiality processes used, with reference to external standards where appropriate.

2. **The scope of disclosures made**: The organisation should describe the scope of current nature-related disclosures.

3. **Links between nature-related dependencies and impacts, and risks and opportunities (referred to collectively in the TNFD framework as nature-related issues):** Identification of nature-related <u>risks</u> and <u>opportunities</u> should be based on an assessment of <u>dependencies</u> and <u>impacts</u> on nature.

4. **The location specificity of nature-related issues:** Consideration of the specific location of an organisation's interface with nature.

5. **Integration with other sustainability-related disclosures:** Nature-related disclosures should be integrated with other business and sustainability-related disclosures whenever possible.

6. **Stakeholder engagement:** The issues discussed, and concerns raised during engagement with affected stakeholders should be taken into consideration when preparing the content of the TNFD-recommended disclosures.

The TNFD has determined three core global metrics for impacts and dependencies and two core global metrics for risk and opportunity reporting. The TNFD strongly encourages organisations to

report all core metrics relevant to their business model, sector, biome, and priority locations on a 'comply or explain' basis.

Core Global Metrics: Impacts and Dependencies:

Land/freshwater/ocean use change

- Extent of land/freshwater/ocean use change, by type of ecosystem and business activity.
- Extent of land/freshwater/ocean use change, by type of ecosystem and business activity, for prioritised ecosystems.

Pollution/pollution removal

- Total pollutants released to soil, split by type.
- Volume of water discharged and concentrations of key pollutants in the wastewater discharged by type.
- Total amount of hazardous waste generated by type.
- Total non-GHG air pollutants by type.

Resource use/replenishment

- Total water withdrawal and consumption from areas of water stress.
- Quantity of high-risk natural commodities sourced from land/ocean/freshwater, split into types.
- Quantity and share of natural commodities sourced from priority ecosystems, split into types.

Core Global Metrics: Risk and Opportunities:

Nature-related risks

- Proportion and total annual revenue exposed to: (1) physical risks and (2) transition risks.
- Proportion and value of assets exposed to nature-related: (1) physical risks and (2) transition risks.
- Proportion and value of assets/total annual revenue exposed to risks by risk rating.
- Proportion and total annual revenue/value of assets with substantial dependence on ecosystem services or with a high impact on nature.
- Nature-related opportunities
- Value of capital allocated to nature-related opportunities, by type of opportunity, with reference to a jurisdictional green taxonomy.

As part of the TNFD disclosure recommendations, they acknowledge that nature-related dependencies, impacts, risks, and opportunities occur upstream and downstream from an

organisation's direct operations, and thus the organisation's disclosures should reflect this. The TNFD recognises that there are practical challenges in tracing nature-related issues up and down complex supply chains. It recommends that organisations report their upstream, downstream, and financed dependencies, impacts, risks, and opportunities to the greatest extent possible. This could mean that proxy data is used instead of location-specific data for reporting purposes, however, organisations are encouraged to improve the detail and coverage of the reporting over time, supported by improvements in measurement, data and analytics methods and technologies. The TNFD continues to assess how upstream and downstream financed considerations can be incorporated into the framework before publication of complete recommendations in September 2023 (Taskforce on Nature-related Financial Disclosures, 2023b).

Further information on finance sector frameworks can be found in Appendix 2 – Description of Environmental Disclosures.

5.3.3   Underlying Methodologies

A review of the environmental disclosure systems considered here identified that, despite their diversity, there were a limited number of underlying methodologies upon which they were based. Many systems cited the Greenhouse Gas (GHG) Protocol as the underpinning method or standard. Accordingly, the GHG Protocol claims to be the most widely used set of greenhouse gas accounting standards and warrants particular attention. Within supply chain reporting, Life Cycle Assessment (LCA) is the dominant methodology underpinning product carbon footprinting, water footprinting and a wide range of other environmental impact assessment methods potentially reported for a product.

5.3.3.1 Greenhouse Gas (GHG) Protocol

The GHG Protocol is a multi-stakeholder partnership of businesses, non-governmental organisations, governments, and others convened by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The GHG Protocol was established to develop and promote the use of industry-accepted best practices for GHG accounting. Multiple global standardised frameworks have been developed to measure and manage GHG emissions from private and public sector operations, value chains and mitigation actions.

To accurately account for emissions generated by an organisation, the organisational boundaries need to be defined. To determine the boundary, the scopes of emissions need to be defined. In emission accounting, there are direct and indirect emissions, which are broken down into three scopes (Greenhouse Gas Protocol, 2014):

- **Direct sources:** Owned and controlled by the reporting company. All direct sources are classified as scope 1.
- **Indirect sources:** Owned or controlled by another company, but a portion of whose emissions are a consequence of the reporting company's activities. Indirect sources are either scope 2 or 3. Scope 2 emissions stem from generating electricity, heat, or steam that the reporting company purchases, while scope 3 emissions are all other indirect emissions.

The GHG Protocol Agricultural Guidance outlines the requirements in the corporate standard for emissions accounting.

- The GHG accounting and reporting should be based on the principles of relevance, completeness, transparency, and accuracy.
- The organisational boundary should be established using a single consolidation approach.
- Scopes 1 and 2 should be accounted for and reported on separately, at a minimum.
- The base period for accounting shall be the earliest point in time for which verifiable data are available on scope 1 and 2 emissions. Multi-year baseline periods are recommended for many agricultural companies to remove seasonal effects and variation.

For specific information on GHG emissions reporting, please see the published Guidance document (Greenhouse Gas Protocol, 2014).

To summarise these many frameworks and systems, there are effectively two types of GHG quantification frameworks that underpin many systems. These are business frameworks and product frameworks (Figure 4). Further, some frameworks establish methods for reporting emission reduction and emission removals at the business and project levels. These are further discussed in Section 6.5.

5.3.3.2 Life Cycle Assessment (LCA)

The LCA method underpins most global reporting systems for assessing the environmental impacts of products. LCA has been defined through ISO standards 14040, 14044, 14067 (carbon footprinting) and 14046 (water footprinting). It is the underpinning methodology for Environmental Product Declarations (EPDs) and the EU PEF system. Essentially, LCA is a tool that takes an inventory of the full life cycle of a product (from raw material acquisition to final disposal) and accounts for every point of environmental impact along the supply chain. It is principally focused on the environmental impacts of products or, more correctly, the function these products provide to the economy. LCA is comprehensive, assessing "direct" impacts from one part of a supply chain and "indirect" impacts that occur upstream or downstream. In GHG Protocol language, it is

inclusive of scope 1, 2 and 3 impacts. LCA typically does not differentiate emissions by scope. Perhaps the dominant strength of LCA is the multi-impact nature of assessment. While climate change is a high priority, TNFD broadens this focus to other relevant impacts on nature. LCA is well suited to assessing water, eutrophication (nutrient enrichment) and a range of impacts on human and ecosystem health from toxic chemicals and emissions.

Figure 4 shows the relationship between the different accounting systems for GHG and their relationship to the Australian Government's carbon programs.
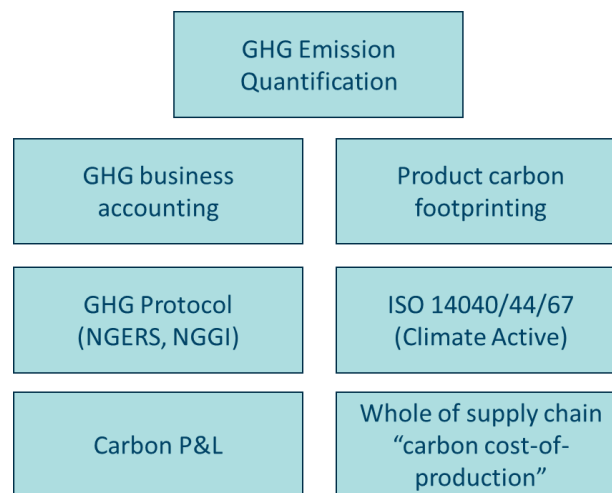
GHG Emission Quantification	
GHG business accounting	Product carbon footprinting
GHG Protocol (NGERS, NGGI)	ISO 14040/44/67 (Climate Active)
Carbon P&L	Whole of supply chain "carbon cost-of-production"

Figure 4. GHG reporting frameworks showing business and product frameworks

6.0 Discussion

6.1 Considerations for Red Meat Industry Impact

6.1.1 Timing Considerations of Environmental Disclosures

CBAM represents a pivotal shift in international climate policy. By putting a price on carbon at its borders, the EU is effectively extending the reach of its climate policies beyond its jurisdictions. Criticised by some globally as trade tariffs cloaked in ESG designed to weaken the competitive advantage of developing countries, the introduction of the EU CBAM already has knock-on effects in one of Australia's most significant red meat markets, the US. Citing the potential impacts of the EU CBAM on US product manufacturers, as well as domestic policy benefits, there is discussion in US Congress led by US Senator Bill Cassidy of a forthcoming Foreign Pollution Free Bill to be a US equivalent to the EU CBAM (Bill Cassidy MD United States Senator for Louisiana, 2023). These discussions are evolving as of the timing of this report and seem to be focused on domestic carbon emissions management and industrial products such as fuel, chemicals, cement, steel, aluminium and plastics (Cohen, 2023) rather than food imports. However, further details will become available in the coming months and should be closely observed by the red meat industry as the US policy looks to be returning from a path of free-trade to protectionism and mercantilism (Younis, 2021).

Australia is now actively debating the role and requirement for a CBAM to protect import-exposed sectors required by Australian law to reduce emissions from imports that are not required to meet such rigorous standards. This debate is ongoing.

As CBAM in Europe comes into effect, more detail will need to be worked out (Figure 5). Its controversy as a potential protectionist policy for international trade has increased the risk that it is at odds with World Trade Organisation (WTO) rules, however, it's compatibility with WTO rules is a complex legal issue that could lead to disputes.
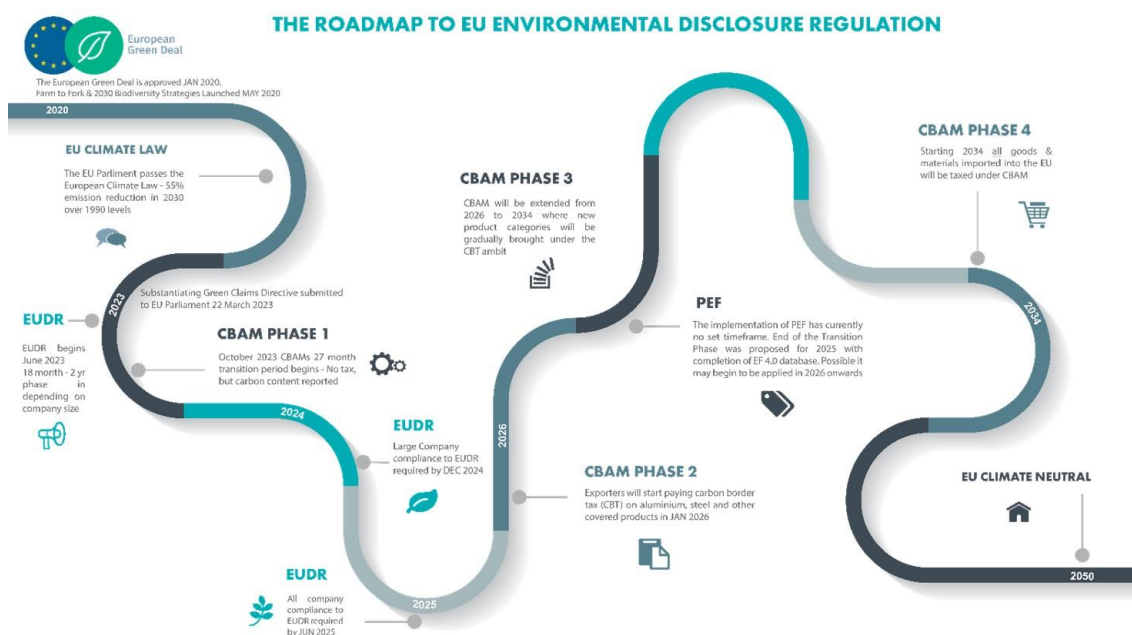
Figure 5. The roadmap to EU environmental disclosure regulation (Source: European Green Deal)

As demonstrated by Figure 2, agriculture is the next largest sector for emissions after those already included. Thus, it would be reasonable to conclude that red meat exports may be drawn into the CBAM framework from early 2026. Further supporting this is the recent EU meeting to include agriculture domestically under the polluter-pays policy framework of the EU Green Deal. As recently as June 2023, the EU Directorate-General for Climate Action (DG CLIMA) met to begin the process of including agriculture, which was to occur before 2026, and this may be in preparation for equivalence with including agricultural imports under CBAM in January 2026, yet this is not specified.

6.1.2 Impacts of Environmental Disclosures on the Australian Red Meat Industry

The impacts of regulated market-imposed environmental disclosure are not likely to be immediate for Australian red meat processors and exporters. However, it does have the potential to be significant. The potential for a domino effect of policy adoption from the EU watershed of unprecedented taxes on carbon and regulation around deforestation can have flow-on effects in much more significant markets such as the US and Japan. Further, the increasing global political will to address climate change may accelerate the adoption of environmental disclosure

regulation, particularly around greenhouse gases and deforestation, meaning the industry may need to comply in a shorter timeframe than what is predicted from current information.

The nature of the impacts are market access, compliance burden, price pressure, and the cost of practice change. In the case of carbon border adjustment mechanisms, if a product carries an emission burden as determined by the mechanism's measurement process, the impact will either be market access (choosing not to pay tax and thus being excluded from the market) or financial (choosing to pay tax via the purchase of carbon permits and having impacts, potentially significant to margin).

6.2   Case Studies of Proposed Mechanisms

To demonstrate the potential impact of market-imposed environmental disclosures on red meat processors and exporters in Australia, this project undertook two theoretical case studies designed to explore the potential impacts and possible response considerations to meeting and reporting against given regulatory requirements under encroaching market-led disclosure frameworks.

6.2.1   CBAM

Considering the EU's increased climate ambitions, the introduction of CBAM has the overarching objective of addressing climate change by reducing GHG emissions in the EU and globally. The regulation aims to prevent carbon leakage, where energy-intensive materials are produced at a lower cost due to lax environmental control and sold into the EU market.

Currently, CBAM only accounts for scope 1 emissions, with a review to incorporate scope 2 emissions after the transition period. Scope 3 emissions have not been included yet. However, there is a reasonable risk that any move to include food products, including meat, would also be accompanied by the inclusion of scope 3 emissions because of their high significance to the product's final impact.

The data requirements for importers include a declaration of the type and quantity of the type of goods being imported, country of origin, and actual emissions or default values.

The value of CBAM certificates has increased from 34 Euro per tonne of CO_2 to over 85 Euro per tonne of CO_2 at the start of 2023 (PwC, 2023). If beef was exposed to this cost, and scope 3 emissions were included, total costs could be $4/kg wholesale beef if the full emission profile was subject to the tariff. If only the differential in emissions between Australian and EU beef was

charged, this may be $40-90c/kg wholesale beef, if it was assumed that Australian beef had a 10-25% higher emission intensity than EU beef.

Should the CBAM be expanded, costs will arise from reporting and the cost of the CBAM. Considering this is much higher than Australian carbon credits, there would be merit in exploring the provision of a carbon neutral or "low emissions" product that would be eligible to remove the CBAM.

6.2.2   PEF

The PEF scheme is an initiative of the European Commission designed to provide a common means of assessing and communicating product sustainability and environmental credentials. This comprehensive system is based on LCA and covers 16 environmental indicators. It is a commendable initiative and represents a significant step towards more holistic environmental reporting and supply chain transparency. The scheme is currently in a transition phase, subject to final policy directives by the European Parliament. The impact of implanting this system is considered here.

Red meat products exported to the EU undergo multiple processing stages before the final product is retail-ready and typically go through multiple stages of ownership. It is not clear whether such products remain traceable to the final user. Impacts are assessed across the full life cycle, and most impacts from red meat arise from the primary production phase. Primary processors and packers, who typically market meat products into the EU, "inherit" this environmental impact when they purchase live cattle or boxed products from other processors. This creates a complex scenario where determining impacts is highly dependent on the first stages of the supply chain rather than the entity responsible for reporting or managing these impacts.

The results of 1 kg of beef produced in Australia analysed using the PEF methodology, with Australian assumptions, are presented in Figure 6 and Figure 7. The PEF single score for 1 kg boxed beef exported to the EU is 3.4 mPt. The most relevant impact categories were climate change (25%), respiratory inorganics (15%), acidification (15%), terrestrial eutrophication (12%), and water scarcity (11%). Beef liveweight at the farmgate usually has a higher impact than at the feedlot, as the production efficiency gained at the feedlot generally results in reduced emissions intensity and overall impacts per kg output.
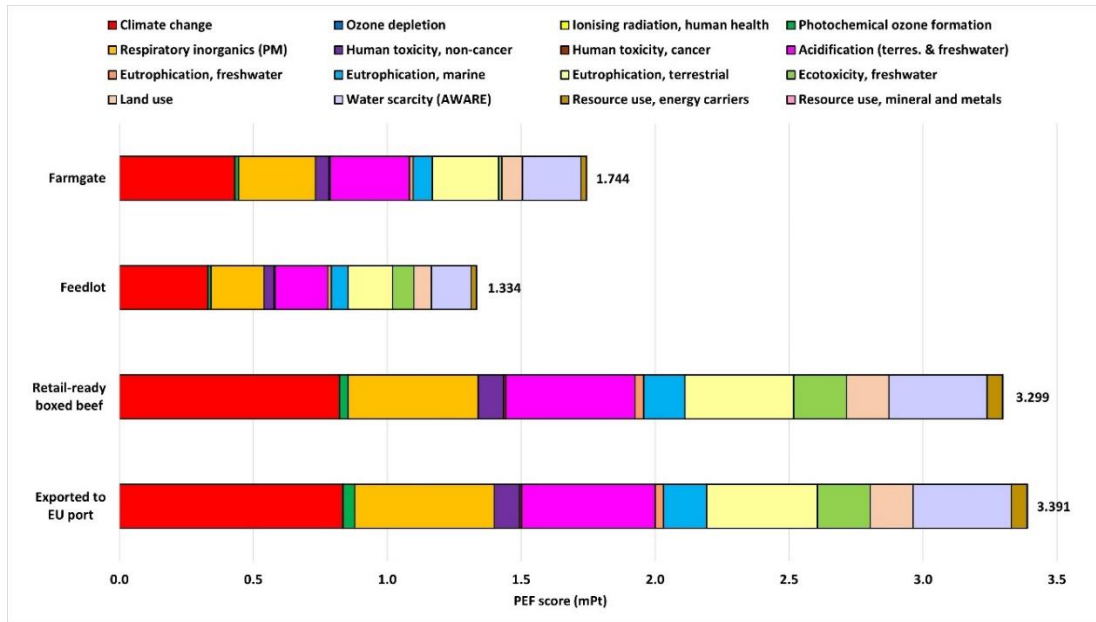
Figure 6. Contribution of impact category to PEF single score for 1 kg beef product at different stages of the supply chain

Compared with other countries, the impacts of Australian beef production are generally on par with other competitors. The largest difference is the water scarcity impacts that are less pronounced in other countries. Meanwhile, Brazil's non-cancer human toxicity and land use impacts were due to activities related to clearing natural forests.
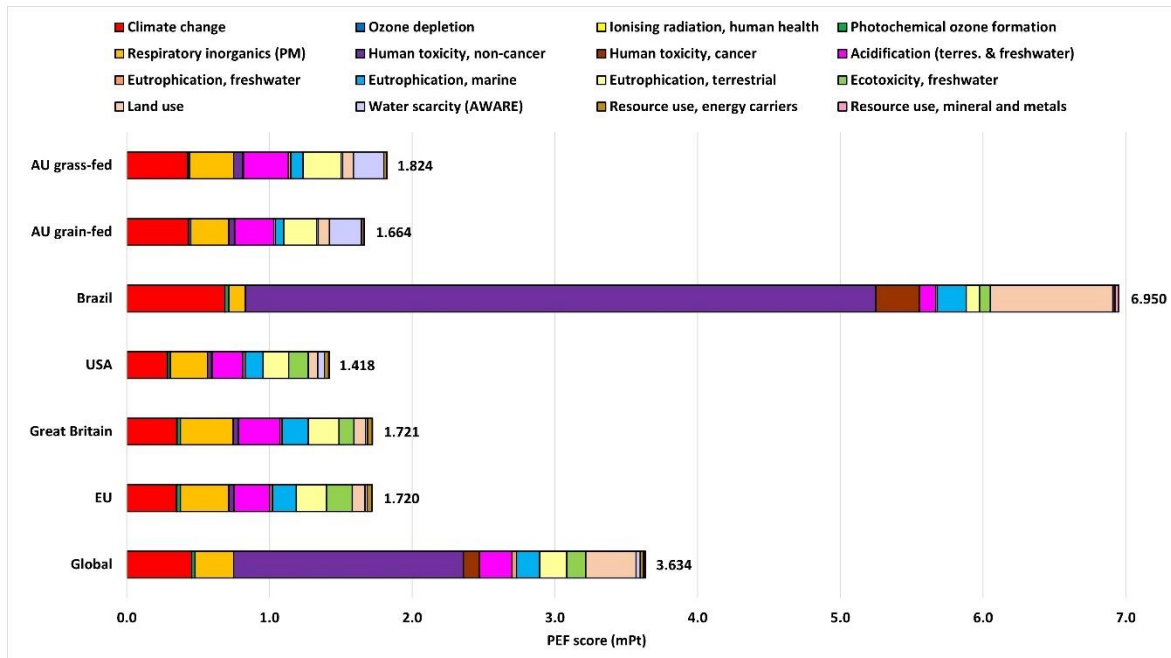

Figure 7. Contribution of each impact category to PEF single score for 1 kg of beef liveweight in Australia compared with other countries, including an EU and Global average

6.2.2.1 Data burden implications

According to the existing PEF Guidelines, it is unlikely that PEF will require datasets at the farm level. It is possible that exporting companies (meat processors or packers) will be asked to demonstrate performance or utilise national averages.

There are three possible scenarios for PEF disclosures, regardless of whether it is mandatory or voluntary compliance (Figure 8). These are:

- **Scenario 1:** The supply chain is fully integrated, owned and operated by the reporting company.
- **Scenario 2:** The supply chain is partially integrated, with the reporting company having access to supplier-/client-specific information for upstream and/or downstream processes.
- **Scenario 3:** The supply chain is not integrated, and the reporting company has no access to supplier-/client-specific information for upstream and downstream processes.
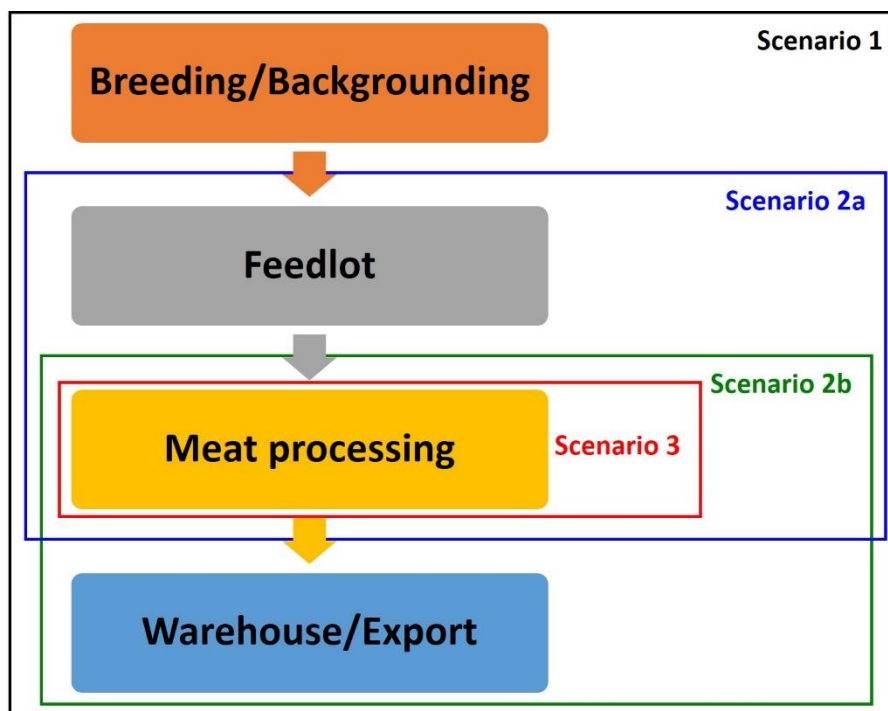

Figure 8. Supply chain stages included in each PEF scenario discuss an integrated supply chain (scenario 1), a partially integrated supply chain (scenarios 2a & 2b), and a non-integrated supply chain (scenario 3).

The compliance burden for each scenario varies as such:

- **Scenario 1:** The reporting company must provide company-specific data (activity data and direct emissions) and create a company-specific dataset across all activities.
- **Scenario 2:** The reporting company can either create a company-specific dataset or use EF-compliant secondary datasets and apply company-specific activity data for transport (distance) and electricity mix.
- **Scenario 3:** The reporting company can use EF-compliant secondary datasets.

As of the writing of this report, there are no official PEF category rules (PEFCR) to mandate the data quality requirements of red meat. Therefore, the data requirements of the general PEF guide currently apply and are described above. A sample of data requirements for other similar and relevant PEFCRs is shown for reference (Table 2).

Due to the seasonal variability, PEF requires data for agricultural production to be collected and averaged over an assessment period of three years. Although such a requirement is not mandated for livestock in the PEF guideline, the fluctuating nature of the inputs and outputs of this industry suggests that a similar approach in data collection and averaging is reasonable. Our case study shows that the 3-year assessment period was insufficient to provide the expected 'average' results because of alternating multi-year droughts and good seasons. This study revealed that for Australian systems with far greater fluctuations between seasons and years, a longer averaging period may be required to provide stable results.

Table 2. On-farm primary activity data requirements of PEFCRs related to the production phase of red meat, using a dairy example

PEFCR	Primary activity data to be collected
Dairy	Mass of agricultural by-products consumed per year
	Mass of compound feed consumed per year
	Mass of grass silage consumed per year
	Mass of grazed grass consumed per year
	Mass of hay or haylage consumed per year
	Mass and origin of maize silage consumed per year
	Mass and origin of soybean meal consumed per year
	Mass and origin of wheat silage consumed per year
	Mass of straw used as bedding material, per year
	Cleaning water in dairy farm
	Diesel in truck transport
	Drinking water in dairy farm
	Mass of milk powder consumed per year
	Mass of N, P and K applied as mineral fertilisers & type of fertilisers applied
	Mass of active ingredients applied as pesticides
	Transport distance of raw milk to dairy unit
	Electricity use at dairy farm
	Heat from light fuel oil at dairy farm
	Heat from natural gas at dairy farm
	Volume of water used for irrigation, per year
	Type and surface of agricultural land occupied for feed production.
	Type and surface of agricultural land transformed from natural land (i.e., primary forest, secondary forest, or natural grassland) for feed production.
	Surface of grassland used for grazing
	Surface of grassland transformed from natural or agricultural land (i.e., primary forest, secondary forest, or arable land) for pasture
	Amount of each emission to air, water, and soil, per year
Feed for food-producing animals	None – it is not a requirement to use primary data relating to different feed ingredients, but this option remains available
Leather	None
Pet food	None – Primary data shall be used for all foreground processes, and used for background processes if available
Red meat (unapproved)	Average herd (or flock) composition by age classification and sex, including days per year in/outdoors
	Feed intake and composition for grazing, roughage, wet co-products, dry single feeds, compound feeds and supplements
	Mass, nitrogen and phosphorous balance for animal intake, retention, and excretion
	Fraction of manure storage and manure type
	Electricity use
	Gas use
	Heat use
	Water use
	Bedding materials

6.2.2.2 Methodology implications

Companies could likely comply with PEF by using a relatively small amount of primary data and "database values" for the impact of purchased livestock or boxed meat. However, there would be considerable risk in applying "database values" produced in Europe for Australian products. Recent reviews of the EU PEF database for Australian wool revealed results that were 2.5x higher than Australian, peer-reviewed research. When the assumptions were tested, it was revealed that Australian results were proxied from NZ production, with little care taken in providing representative results. This was concerning, particularly considering the EU-approved dataset did not meet the EU guidelines' stated data quality criteria.

In terms of industry options, there is merit in taking an industry-wide approach to supply truly representative PEF results for Australian livestock production. This should focus on EU-relevant trade categories.

Further, specific businesses may find it beneficial to analyse results for their supply chains, delivering higher quality results that may show lower impacts than competing nations. This task could be streamlined by first developing representative Australian datasets.

6.2.2.3 Methodology concerns

There are a range of concerning methodological issues embedded in the PEF system, which results in the impacts of red meat being higher than reasonable. The elementary flow (or substance) of ammonia accounted for 38% of the PEF score in the red meat case study analysed through its contribution to five impact categories (particulate matter, acidification, terrestrial eutrophication, marine eutrophication, and ecotoxicity). Meanwhile, methane accounted for 20% of the PEF score through its contribution to three impact categories (climate change, non-cancer human toxicity, and photochemical ozone formation). Ammonia impacts are Europe-specific and are not prevalent in Australia, yet they drive more than 1/3 of the apparent environmental impact. This overestimates the total impact and misdirects efforts to reduce impacts. The core problem driving this outcome is the application of European impact assessment systems globally. Australia is a dramatically different environment with different environmental concerns. While a global assessment system is laudable, it is not yet available and implementing European systems worldwide is disingenuous. Beyond these stated issues, there are many conceptual issues identified with PEF, namely:

1. Lack of sufficient guidance for comparative analysis and public disclosure.
2. The choice of attributional LCA methods and variable methods applied for handling multi-functionality.
3. Use of generalised data and small datasets for the background, EU-approved processes without reported sensitivity or uncertainty.

4. Weighting and normalisation which create a "single score" for a complex array of global environmental impacts.

Considering the case study results, PEF disadvantages Australian beef by forcing the adoption of European methods and generating unreasonably high impacts. It is still unclear how PEF scores will be applied, but if they were used to compare across food groups (i.e. red meat compared to other meat or other protein foods), this system would result in very high reportable environmental impacts, possibly accelerating moves in the supply chain to reduce red meat consumption.

Costs for an individual producer to comply with PEF are difficult to estimate. With industry support to establish a common process for data submission, costs should be reduced for early adopting companies, providing flow on benefits in terms of reduced costs and a faster pathway to compliance.

6.3 Existing Platform Capability for Disclosure Reporting

Key to the ability of red meat exporters to report against market-required disclosures is the capability to attach appropriate information or data to consignments that verify compliance. Currently, 70-80% of all red meat exported from Australia each month uses the Meat Messaging system administered by AUS-MEAT to convey key delivery paperwork, such as physical consignment details and health certifications, down the supply chain. Given Meat Messaging's high familiarity with the industry, this project was asked to examine the platform's capability and appropriateness to convey critical information needed for compliance with in-market required environmental disclosures and investigate alternative options that may be emerging and worthy of industry consideration.

6.3.1 Meat Messaging Capacity for Environmental Disclosure

Developed by Management for Technology Pty Ltd and managed by AUS-MEAT, Meat Messaging is a cloud-based software that enables meat exporters to administer and upload consignment information. The platform uses a voluntary portal or login system that supply chain participants and regulatory authorities access to determine the import compliance, authenticity and verification of meat products, allowing for efficient destination port compliance approvals and electronically enabling the continuity of product traceability down the supply chain.

Uploaded information accompanies a consignment at the trade unit level, usually to the carton, and can be accessed by the shipment owner or the import inspection authority in advance through the health certificate or barcode information. Built primarily for the reduction of import destination rejections, the system is used for all export destinations but has a strong USA focus due to the

size of this market and its persistence as the highest rejection destination for Australian red meat products.

The program's management adopts industry oversight through a committee comprising representatives from AMIC, AMPC, AUS-MEAT, DAFF and GS1, along with other industry members.

Meat Messaging requires users to be a registered Australian exporting establishment, having had an Approved Arrangement endorsed by the Australian Government Department of Agriculture Fisheries and Forestry (DAFF). Meat Messaging connects with the establishment to send consignment messages with every shipment that leaves the facility. The information provided and available from meat messaging is the same information that is available on the physical carton or product. The program uses the GS1 barcoding standards and GS1 EANCOM standards for the electronic recording management of the information. These standards do not replace existing regulatory requirements but rather support and assist the traceability and compliance of products to meet these requirements.

Users of the Meat Messaging system need to demonstrate competence with using the system before approval by DAWE (Department of Agriculture, Water & Environment) and the US Food Safety and Inspection Service (FSIS), following which the Australian Meat Exporting Establishment (user) will be registered with FSIS.

Meat Messaging has been developed to have the capability to expand the information incorporated with the shipment. At this time, Meat Messaging is capable of attaching all physical, compliance and claim-based information, including provenance, raising claims (such as organic, grass-fed, EU, etc.), production claims (e.g. Halal, Kosher, etc.) and market-specified claims (such as deforestation-free) including being able to define the animals that make up a consignment and the parcel of land from which they were raised.

6.3.1.1 Suitability for Environmental Disclosures

Meat Messaging is the only GIS-based traceability platform that has government oversight and is currently accepted by international governments, such as the US Food Safety and Inspection Service (FSIS), as a recognised traceability validation tool for the export of red meat products from an authorised establishment through the supply chain to the end user of the consignment. This is a significant advantage for communicating regulatory disclosures required for emerging market frameworks around carbon and the environment.

As Meat Messaging is essentially a 'bucket of data', it can carry all the information a consignment may need or may wish to convey to the customer/end-user of each trade unit in a shipment. These include:

- **Physical details:** e.g., consignment details, number of trade units in consignment, e.g., cartons or pallets.
- **Regulatory import documentation:** e.g., health certificates, meat transfer certificates (MTC).
- **Production information:** e.g., halal, kosher, etc.
- **Emotive claims:** such as providence, quality, compliance or ESG claims, e.g., raising claims – such as grass-fed; breed claims – such as wagyu, certified Angus, etc.; as well as origin and location claims that can include such specifics as the property details on which the animal(s) were raised for the verification of deforestation-free claims.

Further, the platform's use of the universal GIS barcoding system makes it highly adaptable internationally, with information automatically translated into the importing establishment's language through its numbering standards. It is evident from the investigation that the platform has been deliberately built to ensure future regulatory changes to sampling, inspection or compliance are quickly and easily applied to any consignment's message.

While the red meat exporting industry, as a majority, is familiar with Meat Messaging, the economics of its applicability to delivering environmental disclosures should also be considered. Based on these findings, it is considered that Meat Messaging is a highly suitable and economically feasible platform for the transference of information that would need to accompany a consignment of red meat destined for a market with regulated environmental disclosure requirements.

6.3.2   Alternative Platforms for Environmental Disclosure Reporting

A review into the landscape of alternative systems that can ingest and reliably convey, without losing integrity, the information a red meat shipment may need when complying with importing market environmental disclosures was conducted through desktop review and industry consultation. Consumer, and therefore customer, drivers across an increasing array of ESG claims reveal that while food labelling may be adapted to carry data-backed claims that support environmental credentials, very few, if any, platforms exist for the demonstrated capability to transfer critical information with red meat shipments along the logistical supply chain which are universal, data-adaptive, and independently verifiable.

6.3.2.1 Certa

Certa can provide ESG reporting templates, and users can choose different ESG frameworks such as TCFD, GRI and UN SDG. It allows users to report on scope 1 and 2 emissions and

capture scope 3 data across the supply chain by inviting vendors to share their emissions activity. The platform also has an auditing trail. Users can do risk identification scores, vendor validations and tailored questionnaires that automatically identify risks (Certa, 2022).

6.3.2.2 Sedex

The *Sedex* platform has existed for over 20 years and has over 74,000 users, including Tesco and KFC. The platform uses supplier data already available to save internal time and costs. The platform has e-learning resources and training sessions to increase user knowledge. *Sedex* allows global risk assessments for the supply chain, i.e., it can identify suppliers operating in high-risk environments. It largely captures data on labour, health and safety, environment, and business and ethics. It's available in 11 languages for global suppliers and has reporting tools to allow users to report on their activities with stakeholders publicly. It has tools for users to identify the current required legislation to comply with in different countries. According to *Sedex*, companies with an annual revenue greater than AU$100 million that are based or operate in Australia only need to comply with the Modern Slavery Act 2018 (Sedex, 2022).

6.3.2.3 KPMG Origins

KPMG Origins is a blockchain-based track-and-trace platform. It has been designed specifically for food, fibre, and agribusiness industries. It allows traceability in supply chains. The software allows the capture and sharing of digital certification of user organisations, production facilities and products. It can communicate the product's origin, marble score, temperature, and others (KPMG Origins, 2023).

An overview of the alternative platforms can be seen in Table 3.

Table 3. Examples of alternative platforms for environmental disclosure reporting

	Certa	Sedex	KPMG Origins
Type	Online platform	Online platform	Blockchain
Risk assessment capability?	Yes	Yes	No
Reporting automation?	Yes	Yes	No
Training materials?	Some	Yes	No
Agriculture focus?	No	No	Yes
Auditing capability?	Yes	Yes	Unknown

6.4 Mitigating the Impact of Imposed Environmental Disclosures

While there are many frameworks, two systems underpin most, with business reporting of GHG underpinned by the GHG Protocol and LCA or carbon footprinting underpinning product reporting. Both systems share many calculation processes but have their differences. Because of the shared fundamentals, creating systems that deliver outputs for multiple needs is possible.

Scope 3 reporting is a major feature of the requirements of environmental disclosures. It is relatively new to the processing sector, requiring the sector to understand and be able to report for the primary production supply chain. Seeing suppliers sell to multiple meat processors, there appear to be pre-competitive advantages to having a harmonised system for reporting scope 3 emissions through the supply chain.

6.4.1 Mitigation strategies for EU PEF compliance reporting

While the future of PEF is uncertain, it would be prudent for Australian industries to prepare in advance, considering it is expected to take time to address the data requirements and methodological issues. The main strategies are:

(1) Submitting the dataset with an explanatory briefing note highlighting the main methodology issues, conceptual issues, and over-reported impacts

(2) Commencing work on a critical review of PEF and the apparel and footwear PEFCR for publication in the peer-reviewed literature

This will allow the industry to continue to critique the system, explaining that impacts are overestimated and to clearly state method problems, not data problems, drive this.

6.4.1.1 Dataset submission

In the 'do nothing' scenario, Australian produce would likely be treated as a generic "world average" or default to use Australian datasets developed by European data providers. In the latest release of the EF3.1 datasets, Australian-specific datasets are available for sheepmeat, while beef defaults to the global average dataset. Australian beef is expected to perform better than the global average for many reasons. Results from previous work with the wool industry suggest that currently reported sheepmeat impacts are likely to be overestimated by approximately 78%. Therefore, it appears to provide a competitive advantage in supplying Australian-specific data. This is a continuously evolving space, and there will be decisions for industry in providing data to the European Commission to be used in PEF studies. For example, decisions will be made on the level of disaggregation in data provided and the amount of investment and work done on the

inventories to deliver a better outcome (for example, around nutrients, toxicity and land use). In any case, delivering industry PEF datasets would have the following basic requirements Table 4.

Table 4. Expected data collection task for PEF compliance

Parameters	Scope
Scale	National coverage
Production system focus	EU market specification for beef
Timescale	Updated every 2–3 years, using a rolling average to minimise seasonal variation
Impact Assessment methods to be used	PEF methods – all 16 indicators must be reported
Inventory methods to be used.	There is discretion around inventory methods within the bounds of the ILCD. Methods should be made available for supply chain-scale studies that voluntarily choose to conduct PEF-compliant analyses.

Establishing and maintaining a reporting system must be considered. Development of methods and datasets (where data cannot be extracted from existing surveys) will represent the highest cost. Most Australian agricultural LCAs have focused on GHG, with some covering water, energy, land occupation or other impacts. Expanding to the full PEFCR inventory list requires method development and a far broader inventory than exists for any one industry today.

Our investigation showed that multiple input and activity data would be needed to develop EF-compliant datasets (Table 5). Currently, multiple surveys conducted by the Australian Bureau of Statistics (ABS), the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), and respective industry peak bodies could be utilised to obtain economic, input, and activity data. Although the frequency and coverage of these surveys are sufficient to fulfil the time- and geographical-representativeness requirements of PEF, the data types collected fall short of the technological-representativeness requirements. Much more detail is required surrounding the type, tonnage, and application rate of various inputs and waste outputs. Further, there is a challenge to accurately allocate whole-farm data to individual enterprises for accurate analysis and reporting.

The most efficient way to gather these data is by incorporating additional questions into the existing surveys. In particular, ABARES surveys could request information to be provided in both physical and monetary units. From an analytical perspective, it is also sensible to categorise farms with high water usage industries according to drainage catchment and river basin regions, as this would allow a more appropriate assessment of water scarcity and aquatic eutrophication impacts. However, with recent announcements by the ABS (ABS, 2023) that a shift away from ABS surveys

will be gradually implemented, alternatives such as collaboration with farm management apps, software databases, and cloud-computing platforms may need to be sought to obtain these data.

Table 5. Data collection needs for each industry

Beef	Sheep meat
Farm stage	**Farm stage**
Beef herd data	Sheep flock data
Land use and LUC	Land use and LUC
Supplementary feed inputs	
	Water inputs and supply losses
Fertiliser inputs	
Lime inputs	
	Chemical inputs
	Fossil fuel inputs
Electricity inputs	Electricity inputs
Freight and transport	Freight and transport
Feedlot stage	
Beef herd data	
Supplementary feed inputs	
Electricity inputs	
Freight and transport	
Abattoir stage	**Abattoir stage**
	Fossil fuel inputs
Electricity inputs	Electricity inputs
Freight and transport	Freight and transport
Waste output data	Waste output data

Production systems data are usually relatively stable between seasons but can vary significantly between regions. Currently, these data are sporadically available in literature and public archives, and a central location is lacking to maintain a comprehensive database for such information. Due to the relevance of this information to each specific industry, it can be collected in less frequent intervals and maintained by industry peak bodies.

Environmental data are usually derived from input and activity data based on pre-established knowledge and understanding built on previous research. Since, under PEF guidelines, the provision of environmental data can be based on calculations, it is thus unnecessary to gather these data. However, there is a need to conduct occasional measurements to ensure the assumptions of these calculations are accurate.

Table 6. Sources of secondary datasets currently available

Secondary datasets	Time representativeness	Geographical representativeness					
ABS Surveys							
Agricultural Census (AC)	Five-yearly	National	State	SA4*	NRM		
Rural and Agricultural Commodities Survey (REACS)	Annually between AC	National	State	SA4*	NRM		
Meat and Livestock survey	Quarterly	National	State				
Water Supply and Sewerage Services (WSSS)	Annually	National	State				
Energy, Water and Environment Survey (EWES)	Three-yearly	National	State				
Environmental Indicators Survey (EIS)	Annually between EWES	National					
Land use and land cover survey	Once-off	National	State	SA2**			
ABARES Surveys							
Australian Agricultural and Grazing Industries Survey (AAGIS)	Annually	National	State			Zones	ABARES regions
Australian Dairy Industry Survey (ADIS)	Annually		NSW / VIC				ABARES regions
Murray–Darling Basin Irrigation Survey	Annually						MDB regions
Natural Resource Management and Drought Resilience Survey	Once-off	National					

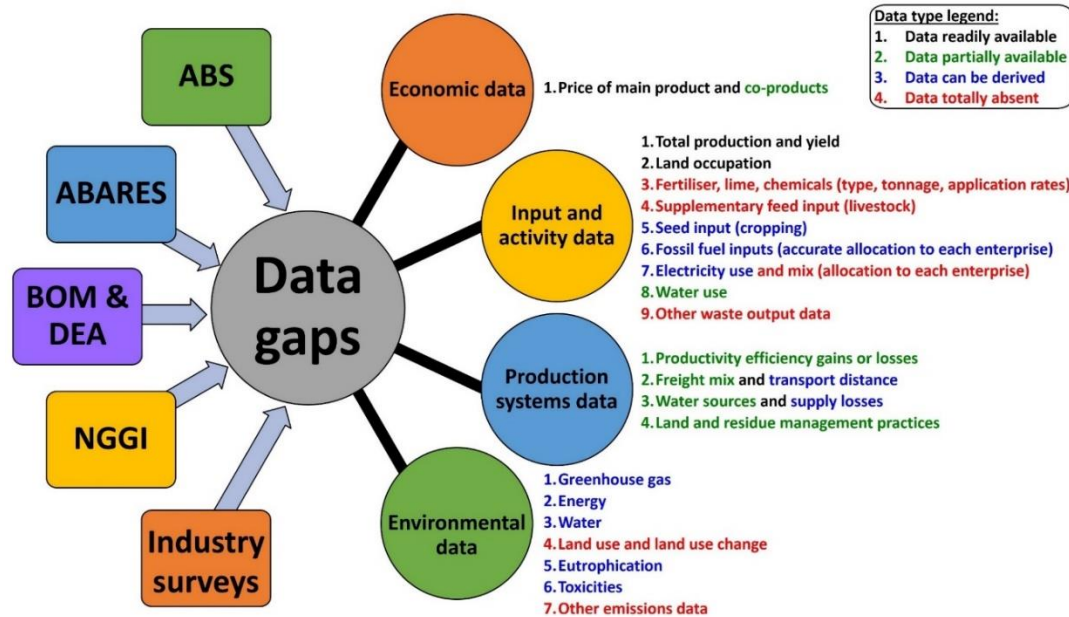** Statistical Area Level 4*

** Statistical Area Level 2

Figure 9. Data gaps needed to be filled to provide an EF-compliant secondary dataset on a national scale for the Australian agriculture industry

6.4.1.2 Methodological Revision

Particulate matter, acidification, terrestrial eutrophication, and marine eutrophication are four separate impact categories influenced by different substances. A common substance shared by all four impact categories is ammonia. Ammonia is an important emission from agricultural activities such as animal excretion or urea fertiliser application. However, due to the vast area on which extensive livestock production in Australia occurs, the amount of ammonia dispersed into the atmosphere is negligible and comparable to natural background deposition. These nuances are not captured in the characterisation factors for ammonia produced from different sources and misrepresent the true impact of these activities on the environment.

Both terrestrial eutrophication and acidification are measured by determining the degree to which the emissions push an ecosystem to exceed its critical limit regarding acidity and soil nitrogen (for eutrophication). Where this critical limit is not exceeded in an ecosystem, emissions theoretically do not affect this impact category (Seppälä et al., 2006). However, accepted critical limits for acidification and terrestrial eutrophication exist only in European countries (Posch et al., 2008). Europe has country-specific characterisation factors implemented in PEF, with all other locations using the average European characterisation factor as a default. This is grossly misrepresentative of Australian regions with much lower acidification and terrestrial eutrophication risks than Europe. If critical limits and resulting characterisation factors are calculated for Australia, it gives a more realistic depiction of acidification and terrestrial eutrophication impacts.

Generalised assumptions also skew the impact of ammonium on the particulate matter impact category. Particulate matter and respiratory inorganics modelling calculate disease incidence

based on the population potentially at risk due to exposure to the substance (Fantke et al., 2016). In Europe, densely populated cities are situated close to the source of pollutants. Thus, the impacts of ammonia on human respiration are elevated. However, populations in Australia are generally sparse, with agricultural production usually distant from metropolitan areas. PEF currently only differentiates between low-population (rural) and high-population (urban) areas, with no distinction between different population densities across the globe. The rural population density used in the model is 110 people km^{-2}. In contrast, Australia's total population density (including major cities) is 3.3 people km^{-2} (Australian Bureau of Statistics, 2021), resulting in high error against the actual exposure rate in Australia. Ammonia characterisation factors for Australia must be revised to reflect the human and environmental impact of ammonia emissions.

There is also a need to develop regional characterisation factors for ammonia, nitrogen dioxide, nitrogen oxides, sulfur dioxide, and sulfur oxides in line with the PEF allowance for Europe. It is recognised that there are significant differences between characterisation factors for each country, and regionalisation has already been developed for the EU. As the land area of Australia is approximately 76% of Europe, the argument for regionalised characterisation factors in Australia is well justified on at least a Statistical Area Level 4 (SA4).

6.4.1.3   Regional isation for the Australian agricultural industries

Regionalisation of characterisation factors and datasets is crucial in determining environmental impacts that are representative of the industry. The scale of regionalisation required is different between characterisation factors and datasets.

For characterisation factor regionalisation (or the variables required to calculate a characterisation factor), a 'region' is defined by the geographical, climatic, and anthropogenic boundaries in which the characterisation factors are meaningful, such as river basins, soil types, rainfall zones, population densities etc. These regions are industry-generic and are relevant only to certain impact categories influenced by the variables defining these regions.

At a minimum, Australian characterisation factors are required. Over time, sensitive characterisation factors such as acidification, eutrophication, toxicity, and land impacts should be developed at the state- or catchment scale.

For dataset regionalisation, a 'region' is defined by the major production regions and the degree of similarity in production systems and management practices. These regions constitute areas where input types and activity data required to produce comparable outputs or yields are similar. These can be based on Statistical Areas (e.g. SA4, SA3 etc.), Natural Resource Management (NRM) regions, or industry-defined production.

At a minimum, Australian datasets should be used. In the future, specific supply chains will likely characterise the PEF studies for the supply chain of each industry. To support this, regional datasets would be helpful.

6.4.2 Steps for mitigating market-imposed environmental disclosure impact on the red meat industry

Integrity Ag has developed strategies for planning emissions reduction and impact mitigation through detailed industry work in environmental credentials of agricultural supply chains over many years. Here, we have considered steps industry can take to manage and mitigate the potential impacts of market-imposed environmental disclosures in export markets for red meat.

6.4.2.1 Develop a common method for scope 3 assessment in red meat

Greenhouse gas reporting and its role in product carbon footprints make GHG emissions a high priority for the meat processing sector. Red meat supply chain scope 3 emissions dominate the profile for meat processors and are often a major contributor to overall emissions for end customers. The scope 1 and 2 emissions of meat processors or major retailers are minor relative to scope 3. For this reason, retailers will increasingly require emission reporting and emission reductions from their suppliers. As primary production is the largest contribution to scope 3 in the supply chain, meat processors are a controllable point of responsibility in the supply chain, and a new level of supply chain reporting is needed.

Scope 3 emissions can be considered a 'carbon cost of production' through the whole supply chain back to breeding. Reporting meaningful scope 3 results is a very large undertaking. While it may be perceived as a threat, there could also be 'first mover' advantages to reporting and reducing emissions through the supply chain, improving Australia's competitiveness and cementing its ongoing reputation for being a market leader in traceability and responsibility in production.

Reporting scope 3 could be a method (which suppliers may need to program into their system to develop a report) or a tool used to calculate emissions.

6.4.2.2 Develop reporting framework and methods for Australian GHG reporting into international systems

Most reporting schemes defer to the GHG Protocol or ISO standards (14040, 14064). This creates scope to include Australian best practices in many (but not all) systems. For example, the GHG protocol requires that "companies… use the most accurate calculation approach available to them and that is appropriate for their reporting context (Greenhouse Gas Protocol, 2011; The

Greenhouse Gas Protocol, 2004). In IPCC terminology, best practice involves the use of 'Tier 3' methods, which are preferred over Tiers 1 and 2:

- **Tier 1**: simple emission factor approach based on international default values.
- **Tier 2:** more region-specific.
- **Tier 3:** location-specific calculations delivering a more accurate result.

The challenge with Tier 3 methods is often a greater number of (e.g., feed attributes) or more specific (e.g., geography) data inputs, which are used to drive more sophisticated models.

Documents that describe Australian best practices include the following:

- National Greenhouse and Energy Reporting Scheme.
- Australia's National Greenhouse Accounts (includes the National Greenhouse Gas Inventory).
- Climate Active Ag Sector Guidance.
- A Common Approach to Sector-Level GHG Accounting for Australian Agriculture.
- Red meat minimum standards for carbon accounting.

A key advantage of a harmonised method is automation – the limited number of methodologies makes data capture and analysis more efficient, especially when automated by tools (e.g., software, spreadsheets). Conversely, modifying such a tool to accommodate international frameworks with contrasting underlying methodologies may require a similar investment despite the limited application (i.e., a lower return).

6.4.2.3 Develop a template for emission reduction collaboration and implementation in red meat supply chains

Research on emission reduction in red meat supply chains is sufficiently mature that the most effective mechanisms are well known. However, the pathway for implementation and accepted levels of emission reduction that may be achieved are less understood and must be achieved through collaboration between processors and primary producers, which is a challenge requiring new market-based or voluntary systems. Currently, companies are grappling with these challenges alone, and multiple approaches are likely to emerge, forming a complex web of requirements across the sector. There is merit in investigating common reporting structures, agreed metrics and structures that allow the sharing of risks and rewards up and down the supply chain. Getting this "right" will be key to industry adaptation and adoption of low net-emission systems.

The challenge is that some methods for reducing net emissions are associated with considerable uncertainty (e.g., soil carbon), are not market-ready or economically viable (e.g., some anti-methanogenic supplements) or may represent independent assets saleable on the carbon market (i.e. ACCU scheme credits). There are very large costs involved in some interventions, and others may have counter-productive impacts if implementation is widespread, such as reducing available

grazing land because of large revegetation programs. Collective investigation of plausible options could provide a template for action and avoid "over-promising and under-delivering".

To underpin some activities, new systems are required. For example, reliance on trees and soil may be high in the interim future because emission reduction through optimising production and deploying new technology may be incremental and/or cost-prohibitive in the near term. This brings the need for reliable 'insetting' methods into focus to verify the emission removals achieved by trees and soil.

New models must also partner up and down the supply chain to manage costs and expectations around emission reduction and removals. This is an emerging space where multi-business engagement may be beneficial, particularly with very large international customers. Risks such as deforestation will also need to be faced, and collaboration will once again be required between processors who will first receive the requirements, and producers, who may be directly engaged in restricted activities influencing the credentials of the products they sell.

7.0 Conclusions and Recommendations

There are two emerging perspectives from this report. Firstly, risks and costs are likely to arise from the requirement from industry to comply with environmental market disclosure requirements. Secondly, opportunities may emerge to improve Australia's standing compared to key competitors and cement Australia's reputation and capability for delivering high-quality, traceability, and low-impact beef.

Market-imposed environmental disclosures will likely remain 2-3 years away for red meat, and customer, finance, and domestic Government requirements appear likely to precede these. There is a key risk that industry may have to comply with a raft of systems, creating a substantial compliance burden and resulting in confusion. This is heightened by the fact processors will need to engage with producers and will need to collect, for market reporting purposes, sensitive environmental information regarding primary production, including details of emissions and other impacts from primary production businesses, and potentially compliance with deforestation requirements. It is truly a new era, requiring a level of trust and transparency that has not existed in the industry previously between primary producers and processors with respect to data sharing.

Before these multiple systems become embedded, there is an opportunity for industry to establish systems for collaboration between primary producers and processors and to design reporting structures that will meet multiple objectives, taking a sensible approach specific to Australian production. Establishing systems at an industry scale would reduce costs for individual members and speed up market access for companies.

It is feasible that environmental compliance could open opportunities for forward-looking Australian red meat processors. While there are always risks, Australia has remarkable capabilities to provide traceability and highly sophisticated reporting of environmental impacts. Compared to other major exporters like Brazil, Australia is a secure partner backed by sophisticated compliance systems. Along with this, Australia is generally unable to compete as the lowest cost supplier, making 'value add' initiatives more attractive. While first appearing as a risk, environmental disclosures, including deforestation, may be opened as opportunities for high-value markets to select beef that can deliver these new attributes.

Mitigating risks and harnessing opportunities can largely be achieved through the same process. This report recommends the following further steps and initiatives:

1. The fast-moving nature of this area means that information in this report will be dated quickly. We recommend extending this project to maintain a watching brief, inform industry via communications and enable establishment of a working group to meet bi-annually between interested industry members to keep abreast of new requirements and opportunities and to identify collaboration opportunities.

2. Our review of EU legislation regarding deforestation concluded that agricultural land was exempt, resulting in relatively low short-term impacts. This conclusion should be reviewed frequently to check for emerging risks from this issue.

3. Develop methods and mechanisms for reporting scope 3 impacts in a standardised and compliant way will deliver value by enabling consistency across the sector. This should be pursued as an 'industry good' activity.

4. Harmonising key reporting requirements and exploring 'whole of industry' approaches to compliance to overcome producer/processor hurdles is recommended. This may best be done using a pilot-based approach. Standardised requirements and clarity across the sector will be key to having a harmonised and transferrable approach between businesses, in much the same way as standard carcase specifications ensure fairness and uniformity in the trade between processors and producers.

5. Our review concluded that the Meat Messaging system could carry further specification data around environmental disclosures. Depending on the verification level needed in third-party markets, this may vary from a 'certification' verified in Australia to providing some primary data with actual shipments of beef. There is no imminent need for verification with beef shipments from regulatory systems. However, trialling this system for customer-led trade would provide interesting insights and help the industry be responsive to regulatory needs, should they emerge.

8.0 Bibliography

ABS. (2023). *Modernising ABS agricultural statistics*. https://www.abs.gov.au/statistics/detailed-methodology-information/information-papers/modernising-abs-agricultural-statistics

Australian Bureau of Statistics. (2021). *Regional Population*. https://www.abs.gov.au/statistics/people/population/regional-population/latest-release

Bill Cassidy MD United States Senator for Louisiana. (2023). *ICYMI: Cassidy's Plan for a Foreign Pollution Fee*. https://www.cassidy.senate.gov/newsroom/press-releases/icymi-cassidys-plan-for-a-foreign-pollution-fee

Brauch, M., Arnold, J., Klonsky, E., & Everard, F. (2021). *Event Highlights: Carbon Border Adjustments in the EU, the U.S., and Beyond*. https://ccsi.columbia.edu/content/event-highlights-carbon-border-adjustments-eu-us-and-beyond

Certa. (2022). *Meet the procurement & compliance platform of the future*. https://www.getcerta.com/

Cohen, A. (2023). *Bipartisan Carbon Border Adjustment Mechanism - A Political Unicorn?* https://www.forbes.com/sites/arielcohen/2023/03/15/bipartisan-carbon-border-adjustment-mechanisma-political-unicorn/?sh=5ef2c16768df

EU-ASEAN Strategic Partnership 2022. (2022). *EU Green Deal*. https://euinasean.eu/eu-green-deal/

European Commission. (2017). *PEFCR Guidance document - Guidance for the Development of Product Environmental Footprint Category Rules (PEFCRs), version 6.3, December 2017*.

European Commission. (2023). *Green claims*. https://environment.ec.europa.eu/topics/circular-economy/green-claims_en

European Parliament. (2023). *EU carbon border adjustment mechanism: Implications for climate and competitiveness*. https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2022)698889

Fantke, P., Anton, A., Basset-Mens, C., Grant, T., Humbert, S., McKone, T. E., & Rosenbaum, R. K. (2016). Estimating pesticide emission fractions for use in LCA: A global consensus-building effort. *10th International Conference on Life Cycle Assessment of Food 2016*.

Financial Review. (2023). *Farrell hits a wall in his push for EU trade deal*. https://www.afr.com/world/europe/farrell-hits-a-wall-in-his-push-for-eu-trade-deal-20230606-p5degr

Finkbeiner, M. (2014). Product environmental footprint—breakthrough or breakdown for policy implementation of life cycle assessment? *International Journal of Life Cycle Assessment*, *19*, 266–271.

Global Reporting Initiative. (2021). *Full set of GRI Standards 2021*.

Greenhouse Gas Protocol. (2011). *Quantifying the Greenhouse Gas Emissions of Products*. https://ghgprotocol.org/sites/default/files/standards_supporting/GHG Protocol PAS 2050 Factsheet.pdf

Greenhouse Gas Protocol. (2014). *GHG Protocol Agricultural Guidance: Interpreting the Corporate Accounting and Reporting Standard for the agricultural sector*.

KPMG. (2023). *A high-level introduction to the EU Deforestation-Free Regulation (EUDR)*. https://kpmg.com/be/en/home/insights/2023/02/sus-the-eu-anti-deforestation-regulation.html

KPMG Origins. (2023). *Food & Agribusiness*. https://kpmgorigins.com/food-agriculture-traceability

MLA. (2023). *Market Snapshot - Beef & Sheepmeat*. https://www.mla.com.au/globalassets/mla-corporate/prices--markets/documents/os-markets/red-meat-market-snapshots/eu_2022-mla-industry-insights-market-snapshot_270323.pdf

Posch, M., Seppälä, J., Hettelingh, J.-P., Johansson, M., Margni, M., & Jolliet, O. (2008). The role of atmospheric dispersion models and ecosystem sensitivity in the determination of characterisation factors for acidifying and eutrophying emissions in LCIA. *The International Journal of Life Cycle Assessment*, *13*(6), 477–486.

PwC. (2023). *EU Carbon Border Adjustment Mechanism (CBAM) – what do businesses in the Middle East need to know?* https://www.pwc.com/m1/en/services/tax/me-tax-legal-news/2023/eu-carbon-border-adjustment-mechanism.html

Reinhard, J., Wernet, G., Zah, R., Heijungs, R., & Hilty, L. M. (2019). Contribution-based prioritization of LCI database improvements: the most important unit processes in ecoinvent. *International Journal of Life Cycle Assessment*, *24*(10), 1778–1792. https://doi.org/10.1007/s11367-019-01602-0

SBTi. (2020). *Science-based Target Setting Manual – Version 4.0* (Issue April). https://sciencebasedtargets.org/wp-content/uploads/2018/10/C2A-guidelines.pdf

SBTi. (2023). *FOREST, LAND AND AGRICULTURE SCIENCE BASED TARGET-SETTING GUIDANCE*.

Sedex. (2022). *Sustainability solutions for your supply chain*. https://www.sedex.com/

Seppälä, J., Posch, M., Johansson, M., & Hettelingh, J.-P. P. (2006). Country-dependent characterisation factors for acidification and terrestrial eutrophication based on accumulated exceedance as an impact category indicator. *International Journal of Life Cycle Assessment*, *11*(6), 403–416. https://doi.org/10.1065/lca2005.06.215

Task Force on Climate-related Financial Disclosures. (2022). *2022 Status Report*. https://assets.bbhub.io/company/sites/60/2022/10/2022-TCFD-Status-Report.pdf

Taskforce on Nature-related Financial Disclosures. (2023a). *The TNFD Nature-related Risk and Opportunity Management and Disclosure Framework - Annex 4.2*. https://framework.tnfd.global/wp-content/uploads/2023/03/23-23882-TNFD_v0.4_Annex_4.2_v4-2.pdf

Taskforce on Nature-related Financial Disclosures. (2023b). *The TNFD Nature-related Risk and Opportunity Management and Disclosure Framework - Final Draft*. https://framework.tnfd.global/wp-content/uploads/2023/03/23-23882-TNFD_v0.4_Integrated_Framework_v6-1.pdf

The Greenhouse Gas Protocol. (2004). *A Corporate Accounting and Reporting Standard REVISED EDITION*. https://www.wbcsd.org/Programs/Climate-and-Energy/Climate/Resources/A-corporate-reporting-and-accounting-standard

Trading Economics. (2023). *EU Carbon Permits*. https://tradingeconomics.com/commodity/carbon

True Animal Protein Price Coalition. (2023). *EU Commission presents study ETS options for GHG-emissions in food systems*. https://www.tappcoalition.eu/nieuws/20522/eu-commission-dg-clima-present-draft-study-ets-options-for-ghg-emissions-in-food-systems

Valatsas, D. (2019). *Green Deal, Greener World*. https://foreignpolicy.com/2019/12/17/united-states-democrats-green-new-deal-eu-europe-technically-feasible-environment-progress/

Victoria University Centre of Policy Studies. (2021). *Australia's economy can withstand the proposed EU carbon tariff*. https://theconversation.com/australias-economy-can-withstand-the-proposed-eu-carbon-tariff-159062

Wiedemann, S., McGahan, E., Murphy, C., Yan, M.-J., Henry, B., Thoma, G., & Ledgard, S. (2015). Environmental impacts and resource use of Australian beef and lamb exported to the USA determined using life cycle assessment. *Journal of Cleaner Production*, *94*, 67–75. https://doi.org/10.1016/j.jclepro.2015.01.073

Younis, M. (2021). *Sharply Fewer in U.S. View Foreign Trade as Opportunity*. https://news.gallup.com/poll/342419/sharply-fewer-view-foreign-trade-opportunity.aspx

9.0 Glossary of Terms

Abbreviation	Term	Definition
A-EU FTA	Australian-European Union Free Trade Agreement	Free trade agreement negotiations between Australia and the EU commenced in 2018 and are currently ongoing.
CBAM	Carbon Border Adjustment Mechanism	Product regulation for products being imported into the EU. Currently in pilot trial phase for high emission products in the EU. Results in carbon certificates needing to be purchased by importers for goods imported into the EU.
COP26	UN Conference of the Parties in Glasgow	This conference was attended by countries that have signed the UN Framework Convention on Climate Change treaty. It was held to discuss climate change science, solutions, political will to act, and clear indications of action amongst participating countries.
EEA	European Environmental Agency	An agency of the European Union that delivers knowledge and data to support Europe's environment and climate goals.
ERF	Emission Reduction Fund	Government body run by the Clean Energy Regulator that provides methods to quantify emission reduction and ACCU generation by organisations.
ESG	Environmental, Social and Governance	A framework used to assess an organisation's practices and performance, as well as risks and opportunities, on various sustainability and ethical issues.
ETS	Emissions Trading System	The world's largest carbon-pricing system. Functions as a cap-and-trade scheme where a limit is placed on the emittance of specified pollutants over a geographic area, and companies trade rights for such emissions within that area, known as permits.
EUDR	European Union Deforestation Regulation	Regulates products connected to deforestation and forest degradation in the EU.
FSIS	Food Safety and Inspection Service	United States Department of Agriculture body that is part of a science-based national system to ensure food safety and food defence. The Service ensures food safety and humane animal handling through multiple Acts for meat, poultry, and egg products.

GHG	Greenhouse Gas	A gas that absorbs and emits radiant energy at thermal infrared wavelengths, causing the greenhouse effect.
GIS	Geographic Information System	Global system used, amongst other things, to map and track vegetation growth/reduction on properties and across areas.
GRI	Global Reporting Initiative	International independent standards organisation that helps businesses, governments and other organisations understand and communicate their impacts on climate change and other global issues.
IPCC	Intergovernmental Panel on Climate Change	The United Nations body for assessing the science related to climate change. They provide assessments of climate change, its impacts and future risks, and options for adaptation and mitigation.
ISO	International Organisation for Standardisation	An independent, non-governmental international organisation that develops voluntary, consensus-based, market relevant International Standards that support innovation and provide solutions to global challenges.
LCA	Life Cycle Assessment	Regulation that determines how GHGs of a product are reported.
LUC	Land Use Change	Used in emission accounting and reporting where emissions have been released or removed by an organisation due to a change in land use e.g., emission removal due to land converted from cropping to pasture, or an emission release due to land converted from forest to pasture, etc.
MTC	Meat Transfer Certificates	A document, either manual or electronic, that is a legislated export requirement, required to accompany meat and meat products being transferred between export registered establishments.
PEF	Product Environmental Footprint	A scheme developed by the European Union, and led by the European Commission, to provide a uniform system for reporting the environmental impacts of a product or organisation.
SBTi	Science-Based Target initiatives	Voluntary framework for organisations to measure and report emissions.
SBTi FLAG	Science-Based Target initiatives for Forest, Land and Agriculture	Voluntary framework for organisations, specifically with 20% or more of their supply chain emissions in the forest, land and/or

			agricultural industry, to measure and report emissions.
TCFD	Task Force on Climate-related Financial Disclosures		A non-governmental member group developed to provide climate-related financial disclosure recommendations to help companies provide better information to support informed capital allocation.
TNFD	Taskforce on Nature-related Financial Disclosures		A non-governmental member group that provides a risk management and disclosure framework for organisations to report and act on evolving nature-related risks with the aim of supporting a shift towards nature-positive financial flows.
	Deforestation		Multiple global regulations have different definitions of deforestation. These include but aren't limited to; - The conversion of forest to agricultural use, whether human-induced or not. - Loss of natural forest because of conversion to other non-forest land use, tree plantation, or severe and sustained degradation.
	Environmental disclosures		A form of corporate responsibility for the environmental impacts caused by organisation operation activities. Disclosures also provide a way of reporting and communicating to stakeholders about the impact of an organisation's actions on the environment.
	EU Green Deal		A set of proposals and policy initiatives to roadmap the EU as a continent toward climate neutrality by 2050.
	GHG Protocol		Regulation that determines how organisations report GHGs.
	Meat Messaging		Cloud-based software that enables meat exporters to administer and upload consignment information for the product.

10.0   Appendices

Appendix 1 – Customer Targets

US customer targets and requirements were researched and can be seen in Table 7. This provides an example of what Australian processors may need to comply with to meet customer expectations in the future, if not at present. Processors should pay particular attention to scope 3 and deforestation targets set by customers.

Table 7. Examples of customer sustainability achievements and targets

	Ahold Delhaize	Albertsons Companies	ALDI	Costco	HelloFresh	Kroger	Marley Spoon	Target	Walmart
Animal welfare and nature	· 100% sustainable sourcing for seven commodities in own products by 2020	· Transitioning to group housed breeding sows	· Welfare policy for all beef, pork, poultry	· Aim to have deforestation free beef		· 100% gestation crate free pork by 2025 · Aim to have deforestation free beef	· Publish animal welfare policy by 2021 · 56% alignment with Better Chicken Commitment in 2020 · 100% alignment with Better Chicken Commitment by 2025 · Afforestation project in Uruguay	· Eliminate deforestation from value chain · Cattle sourced from deforestation free areas · Soil health on 100,000 acres row crop for cattle feeding	· Conserve one acre land for every acre developed by Walmart · Reverse 50 Mil acres nature loss by 2030 · Encourage suppliers to develop fertiliser optimisation plans · 100% verified deforestation free beef
Carbon neutral target (date)	· 2050				· 100% emissions offset in 2020		· 100% emissions offset in 2020	· 2040	· 2040

	Ahold Delhaize	Albertsons Companies	ALDI	Costco	HelloFresh	Kroger	Marley Spoon	Target	Walmart
Emissions (scope 1 and 2)	· Reduce scope 1&2 emissions by 50% by 2030	· Currently baselining	· Reduce emissions by 26% by 2025	· Scope 1&2 emission reduction plan in 2022	· Reduce emissions by 60% by 2022 · Purchase offsets	· Reduce emissions by 30% by 2030	· Reduce scope 1&2 emissions by 50% by 2022 · Reduce scope 1&2 emissions by 70% by 2025	· Reduce scope 1&2 emissions by 50%	· Reduce scope 1&2 emissions by 35% 2025 and 65% by 2030
Emissions (scope 3)	· Reduce scope 3 emissions by 15% by 2030 · Engage supply chain to source low-carbon products			· Engage supply chain to set goals on emission reduction	· Prioritise sourcing local products		· 85% vendor participation in sustainability in 2020 · 100% vendor participation in sustainability by 2022	· Reduce scope 3 emissions by 30% · 80% of suppliers to set reduction targets of scope 1 & 2 by 2023	· Reduce or avoid 1 gigaton of scope 3 emissions by 2030
Deforestation	100% of own brand 'high risk' products (tea, palm oil etc.) certified against an acceptable standard by 2025		100% of ALDI brand product containing wood or paper material to be certified sustainable or made 100% recyclable by 2020	Aim to have deforestation free beef		Aim to have deforestation free beef	Afforestation project in Uruguay	Eliminate deforestation from value chain Cattle sourced from deforestation free areas	Reverse 50M acres of nature loss by 2030 100% verified deforestation free beef
Energy	· Increase energy efficiency	· Currently baselining · 2 on site 1 megawatt wind turbines · 20% of facility energy via solar · LED lighting	· 100% renewable energy by solar and purchases · 30% reduction of emissions by 2020 · Smart sub-meters/lighting/HVAC since 2015 · LED lighting since 2015	· LED lighting · Fuel cells	· Solar installations on facilities · 10% of energy from renewable energy providers	· Two anerobic digesters · 3% annual reduction in electricity · 3% annual reduction in natural gas · Purchase renewable energy	· 22% renewable in 2020 · 90% renewable by 2022 · LED lighting	· 60% renewable by 2025 · 100% renewable by 2030	· 50% renewable by 2025 · 100% renewable by 2035 · Installing smart meters
Labelling	· Nutritional labels by 2025	· How2recycle labels by 2022	· Date labelling for "best if used by" and "use by" · How2Recycle labels in 2020	· Recycle and compost labels		· Increase use of "Please Recycle" labels		· How2Recycle labels by 2020	· How2Recycle labels by 2022

	Ahold Delhaize	Albertsons Companies	ALDI	Costco	HelloFresh	Kroger	Marley Spoon	Target	Walmart
Packaging	· 100% plastic recyclable, compostable, reusable by 2025 · 25% PCR plastic by 2025	· 100% recycle/reuse/compostable by 2025 · Reduce plastic use · 20% recycled plastic by 2025	· Certified responsibly managed forests/recycled packaging in 2020 · 100% recycle/reuse/compostable by 2025 · 15% reduction of packaging material by 2025 · Eliminate PS by end of 2021	· Reduce packaging use · Increase sustainable packaging · Increase recycled content · Increase compostable packaging · Increased cardboard recycling in operations	· Avoid completely when possible · Reduce when packaging is necessary · Optimize for recycling	· 100% recyclable/compostable/reusable packaging by 2030 · 10% recycled content by 2030 · Increase plastic recyclability · Sustainably sourced carboard · Reduce unnecessary packaging · Increase PCR plastic to 20%	· 0 paper waste by 2021 · Reduce cardboard per meal by 2022 · Reduce plastic waste and increase recyclability by 2025	· Reduce virgin plastic by 20% by 2025 · 100% recyclable, reusable, compostable plastic by 2025 · Paper packaging from sustainable forests by 2022 · Eliminate problematic or unnecessary plastic packaging by 2025 · 20% PCR plastic in Target packaging by 2025 · 30% bio-based plastic by 2030	· 100% Walmart packaging PVC free in 2020 · 59% recyclable, reusable, compostable in 2020 · 20% Walmart packaging from PCR by 2025 · 100% recyclable, reusable, compostable by 2025 · 15% reduction in virgin plastic by 2025
Refrigerants	· Transition to low GWP refrigerants	· Currently baselining	· Ammonia refrigeration since 2015 · GreenChill program	· CO_2 refrigerant use · Leak detection systems		· 10% annual reduction in refrigerant leakage · Low GWP refrigerants by 2026	· Low GWP refrigerants in 2020	· Transition to low GWP refrigerants via GreenChill program	· Low GWP refrigerants by 2040 (CO_2, NH3 and glycol)

	Ahold Delhaize	Albertsons Companies	ALDI	Costco	HelloFresh	Kroger	Marley Spoon	Target	Walmart
Transport	· Policy to encourage third party providers to reduce emissions	· Currently baselining ·89% of truck fleet EPA SmartWay certified · Biodiesel program for trucks	· Driver Training to encourage fuel efficiency · Fuel-efficient technology and equipment · Telematics to maximise MPG	· Two electric trucks in California	· Reduce transport distances by sourcing local products · Electric vans in Europe	· Improve ton MPG by 20% by 2020 · Replace old trucks with fuel efficient models · Use hybrid-electric diesel trucks · Testing EVs by 2022	· Increase transport efficiency through reduced box sizes	· Adopt cleaner and more fuel-efficient transportation practices	· 0 emissions by 2040
Waste	· Reduce food waste by 50% by 2030	· Reduce Pacific Coast food waste by 50% by 2030 · 0 waste by 2022	· Divert 90% operational waste by 2025 · Reduce 50% food waste by 2030	· Divert 80% of waste away from landfill	· Reduce food waste by 50% by 2022	· Reduce food waste by 50% by 2025 · 95% food waste diversion by 2025 · 0 food waste to landfill by 2025	· <1% food wasted in 2020 · Food donation at all sites by 2021 · Composting collection at all sites by 2022 · 0 waste by 2025	· 0 waste to landfill by 2030 · 80% of waste diverted from landfill in 2020	· Diverted 81% of waste from landfill and incineration in 2020 · 0 waste to landfill and incineration by 2025
Water		· Tap aerators reduce use and heating		· Reduce water usage · Installed water metering system	· Monitor and reduce water usage per product	· 3% annual reduction in water use	· Water-efficient fixtures · Rainwater for toilets and gardens	· 15% reduction in water use by 2025	

Appendix 2 – Description of Environmental Disclosures

A summary of the voluntary and customer-led frameworks can be seen in Table 8.

Table 8. Examples of non-regulatory environmental disclosure frameworks developed for broad applicability

	Science Based Targets' Forest, Land and Agriculture Guidance	Science Based Targets' Corporate Net-Zero Standard	Global Compact	Carbon Disclosures Project	Stakeholder Capitalism Metrics
Acronym	SBTi FLAG	(NA)	(NA)	CDP	SCM
Link	Link	Link	Link	Link	Link
Administered by	Science Based Targets Initiative	Science Based Targets Initiative	United Nations	CDP Global (a NFP organisation)	World Economic Forum
Purpose	Rules for setting near-term (five-ten year) FLAG emissions and removals targets, alongside industrial targets	To commit, develop and validate a target, then communicate the target and disclose progress against it	Supports companies to do business responsibly and to take strategic action to advance UN SDGs	Provide a global standard for environmental reporting	Improve the ways that companies measure and demonstrate their contributions towards creating more prosperous, fulfilled societies and a more sustainable relationship with our planet.
Audience/target	Forestry, agriculture, food and beverage processing, tobacco, food retailing companies, and companies with >20% FLAG gross emissions	Includes sector-specific guidance for many industries.	Companies	Companies, cities	International Business Council
Products only?	Companies and specific commodities (beef, chicken, dairy, leather, maize, palm oil, pork, rice, soy, wheat, and timber & wood fibre).	Companies (not NGOs, cities, etc, and not yet oil and gas companies)	Companies	Companies, cities	Companies
Scopes considered	Scopes 1, 2 and 3	Scopes 1, 2 and 3	(see SBTi)	Scopes 1, 2 and 3	Scopes 1 and 2, and 3 where appropriate
CA or CF?	CA	CA	(see SBTi)	CA	CA
Voluntary?	Voluntary	Voluntary	Voluntary	Voluntary	Voluntary
Targets	5–10-year targets in-line with 1.5°C by 2050 FLAG emissions reduced by 74% by 2050 0% deforestation by 2025	Halve emissions by 2030 Approx. zero emissions by 2050	Principle 7: Businesses should support a precautionary approach to environmental challenges; Principle 8: undertake initiatives to promote greater environmental responsibility; and Principle 9: encourage the development and diffusion of	Respondents must indicate whether they have targets including TFCD, UN SDG, 2018 RobecoSAM Corporate Sustainability Assessment (DJSI), NZAM	Pursue targets to limit warming to 1.5C and achieve net zero by 2050

	Science Based Targets' Forest, Land and Agriculture Guidance	Science Based Targets' Corporate Net-Zero Standard	Global Compact	Carbon Disclosures Project	Stakeholder Capitalism Metrics
			environmentally friendly technologies.		
Timeframe	Available for implementation now	Available for implementation now	Available for implementation now	Annual corporate reporting. Asks for five-year projection	Annual corporate reporting.
Deforestation reporting	<u>Requires</u> a public commitment to no deforestation by the end of 2025	Yes - see SBTi FLAG	(see SBTi)	Yes	Not mentioned under climate change reporting, but an important metric pertaining to 'nature loss'
Non-carbon indicators	None	None	Yes, considers a broad array of actions, including those relating to water, clean/safe production, recycling, as well as others relating to society/employees	Considers climate change, water security and deforestation as well as biodiversity, soil, and yield	Nature loss, freshwater availability, air pollution, water pollution, solid waste, resource availability
Underpinning method or standard	GHG Protocol	GHG Protocol	SBTi (link)	TFCD	TFCD, GHG Protocol, GRI, IFRS

A summary of the voluntary financial frameworks (Table 9), environmental frameworks (Table 10) and environmental disclosures (Table 11) can be seen below.

Table 9. Examples of environmental disclosure frameworks developed for the finance sector reporting

	Task Force on Climate-Related Financial Disclosures	International Financial Reporting Standards Foundation Climate-related Disclosures	International Financial Reporting Standards Foundation General Sustainability-related Disclosures
Acronym	TCFD	IFRS	IFRS
Link	Link	Link	Link
Administered by	Financial Stability Board	International Sustainability Standards Board	International Sustainability Standards Board
Purpose	To provide and increase standardised reporting of climate-related financial information	To require an entity to provide information about its exposure to climate-related risks and opportunities	To require an entity to provide information about its impact and dependence on resources
Audience/target	Reporting by corporations for stakeholders	To provide users of financial reports with more consistent, complete, comparable, and verifiable information	See IFRS
Products only?	Organisations	Organisations	Organisations
Scopes considered	Scopes 1, 2 and 3 to be considered. However, targets may be scope specific. For example, high-emitting sectors may focus on scopes 1 and 2.	Scopes 1, 2 and 3	Not applicable
CA or CF?	CF	CA	Syn. with CA
Voluntary?	Voluntary, but there is a shift towards regulation that would make reporting climate risk disclosures compulsory. APRA, the ASX and the RBA have endorsed the TCFD framework, ASIC recommends reporting under the TCFD for companies with material exposure. Some countries in Asia and Europe have made disclosures mandatory.	See TCFD	See TCFD
Targets	Provides guidelines on target setting, which should be 'specific and complete'	Provides guidelines for metrics and targets, but does not prescribe these	Provides guidelines for metrics and targets, but does not prescribe these
Timeframe	Available for implementation now	ISSB currently deliberating on a Climate-Related Disclosures draft	Draft actively being reviewed
Deforestation reporting	Context-dependent	Not mentioned	Not mentioned
Non-carbon indicators	Includes risks and opportunities posed by climate change, such as physical risks to assets and incentives provided to senior management for achieving climate-related goals. Agriculture, food, and forest product group organisations are encouraged to report metrics such as water use, emissions from biological processes, as well as GHG emissions from LULUC.	Requires broad consideration of both event-driven and long-term risks posed by climate change, such as water availability/quality and temperature	A broad array of indicators should be considered, including industry-specific topics. Meat, poultry, and dairy-specific topics include GHGs, energy, water, land use/ecological impacts, food safety, antibiotic use, WHS, animal welfare, feed sourcing
Underpinning method or standard	GHG Protocol, or national methodologies if they are consistent with the GHG Protocol	GHG Protocol	NA

Table 10. Examples of Australian regulations and methodologies of direct relevance to environmental disclosures

	National Greenhouse and Energy Reporting Scheme	Australia's National Greenhouse Accounts (includes the National Greenhouse Gas Inventory)	Climate Active Carbon Neutral certification	A Common Approach to Sector-Level GHG Accounting for Australian Agriculture
Acronym	NGERS	NGGI	None	None
Link	Link	Link	Link	None
Administered by	The Australian federal government's Clean Energy Regulator	The Australian federal government's Department of Climate Change, Energy, the Environment and Water	Climate Active	CSIRO, QUT, NSW DPI, UoM, Integrity Ag, AWRI
Purpose	A single national framework for reporting and disseminating company information about greenhouse gas emissions, energy production and energy consumption	Compile inventories used to meet emissions reporting requirements under the Paris Agreement, UNFCCC, and Kyoto Protocol	To provide proof a brand has achieved carbon neutrality	Provides a common framework for greenhouse gas (GHG) accounting of Australian agricultural activities at the sector level
Audience/target	See entry under 'Voluntary?'	The Australian federal government's greenhouse gas emission reports and projections	Australian businesses, but clients include Australian councils	Australian agricultural sectors
Products only?	Facilities and corporate groups	Reporting by sector	Organisations, products, services, events, buildings, precincts	Provides guidance, but cannot be used to generate, both carbon footprints and carbon accounts
Scopes considered	Scopes 1 and 2	Scope 1	Scopes 1, 2 and 3	Scopes 1, 2 and 3
CA or CF?	CA	CA	Relevant to both CA and CF	Relevant to both CA and CF
Voluntary?	Compulsory if thresholds for facilities (25 kt scope 1 and 2, or production/consumption of 100 TJ energy) or corporate groups (double those of facilities) are exceeded, per financial year	Compulsory for the Australian federal government to meet reporting requirements	No	Not applicable - provides guidance
Targets	NA		None. Annual reporting, and an emissions reduction strategy must be made public	Not applicable
Timeframe	In use	In use	Available for implementation now	Draft for consultation in circulation
Deforestation reporting	Not specifically mentioned in the Act, but should be captured under scope 1 emissions	Included as a distinct inventory item	Not mentioned	To be included as a distinct inventory item
Non-carbon indicators	Energy generation and consumption	None	None	None
Underpinning method or standard	IPCC	IPCC	GHG Protocol, ISO 14040 and 14064	ISO standards, NGGI approaches, LEAP, GHG Protocol

Table 11. Common underlying methodologies for environmental disclosure reporting systems, with a particular focus on those relevant to the red meat industry.

Methodology	Acronym/ short title	Description	Purpose	Indicators	Author	Takes guidance from
Environmental Footprint method of the European Commission	PEF	Link	To enable companies to measure and communicate their environmental performance and thereby compete on the market based on reliable environmental information	16 indicators, including (but not limited to) climate change, fossil energy, water, eutrophication, toxicity, and the impact of land occupation	Joint Research Centre of the European Commission	Many standards, including those of ISO, GHG Protocol, British Standards Institute, LEAP
Environmental management - Life cycle assessment - Principles and framework	ISO 14040/44		Provides principles and framework and provides some methodological requirements for conducting LCA studies.	Not prescribed	ISO (the International Organisation for Standardisation), a worldwide federation of national standards bodies (ISO member bodies).	Aligns with other ISO standards
Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification	ISO 14067		Provides a generic standard for the quantification of the carbon footprint of products.	Climate change/carbon footprint	ISO (the International Organisation for Standardisation), a worldwide federation of national standards bodies (ISO member bodies).	Aligns with ISO 14060 family of standards
LEAP small and LEAP large guidelines	LEAP	Link	To introduce a harmonised international approach to the assessment of the environmental performance of large ruminant supply chains	Small ruminant guidelines - GHG and fossil energy Large ruminant guidelines - GHG, fossil energy, eutrophication, acidification, land occupation	Livestock Environmental Assessment and Performance (LEAP) Partnership, which is a partnership between the private sector, FAO member countries and NGOs	ISO 14040/44, IPCC
GHG Protocol Corporate Accounting and Reporting Standard	Corporate Standard	Link	Provides requirements and guidance for companies and other organisations preparing a corporate-level GHG emissions inventory	Climate change (greenhouse gases considered by the Kyoto protocol)*	GHG Protocol, a partnership between World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD)	IPCC
Corporate Value Chain (Scope 3) Accounting and Reporting Standard	Corporate Value Chain (Scope 3) Standard	Link	Allows companies to assess their entire value chain emissions impact and identify where to focus reduction activities. Is a supplement to the GHG Protocol Corporate Standard	Climate change	GHG Protocol, a partnership between World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD)	IPCC
Product Life Cycle Accounting and Reporting Standard	Product Standard	Link	To understand the full life cycle emissions of a product and focus efforts on the greatest GHG reduction opportunities	Climate change	GHG Protocol, a partnership between World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD)	IPCC

Appendix 3 - Questionnaire

WHAT'S HAPPENING NOW?

1. What environmental reporting are you currently doing (into what systems, and what type of information)?

2. In your opinion, what is driving changes in environmental reporting/disclosures in your business?

   a. Regulatory

   b. Market (non-regulatory)

   c. Customer (Specification)

   d. Finance/Investor

   e. Internal innovation

SYSTEMS & INFORMATION

3. What systems do you use to collate this environmental information?

4. What challenges do you face with either the systems or data required for these environmental disclosures?

5. What major gaps do you believe exist that is impacting reporting or the accuracy of reporting?

6. Has there been any other learnings that have arisen from your environmental reporting?

COST & COMPLIANCE

7. Do you see environmental reporting as incurring significant costs to the business?

   a. How could these costs be reduced or relieved?

   b. Do you believe that government should be doing more to support the costs in the early stages of widespread environmental reporting, or do you believe this is for industry to manage?

<u>**BENEFITS**</u>

8. Has the business experienced any benefits from environmental reporting?

9. Do you think there is opportunity for access to different premium markets, or price premiums for superior and demonstrated environmental performance?

<u>**DEFORESTATION**</u>

10. Some customers have "called out" deforestation, with relation to Australian beef (quote ALDI USA, QLD beef).

    a. Have you as a company developed a response to Australia's credentials on deforestation?

    b. If Northern Australia was ruled out of significant export markets (USA, Japan, Korea) on deforestation, how would this affect your supply chain and how would you undertake to respond?

11. Are there risks that will arise from environmental disclosures in your key markets (for example, if red meat is labelled on the shelf with a carbon footprint which is very high compared to other protein products?)

12. If you are not under a high degree of pressure to report now, when do you think these requirements for reporting are likely to arise (short term: 2023-2024, mid-term: 2025-2027, long term: 2027+)

13. How well equipped do you believe Australia's meat processing industry is to be able to respond to rapidly changing environmental disclosure requirements in export destinations?

14. What could AMPC do to help address challenges or help harness opportunities?

Appendix 4 – PEF Requirements and Cost of Compliance

Generic Data Requirements

The method (European Commission, 2017) clearly states that a PEF report should contain the following (Section B.7.2):

- Full life cycle inventory.
- Characterised results in absolute values, for all impact categories (including toxicity; as a table).
- Normalised and weighted results in absolute values, for all impact categories (including toxicity; as a table).
- The aggregated single score in absolute values.

Thus, although PEFCRs identify the most relevant impact categories, all impact categories must be reported. The data requirements for a PEF study fall into 'mandatory' and 'secondary' categories. What constitutes mandatory data is determined by a PEFCR. The mandatory data should comprise that which is 'most relevant' to an environmental footprint. However, there is also scope for discretion: authors of a PEFCR can consider the effort and amount of data required before deeming it mandatory.

Identifying the 'most relevant' elements begins at the impact category level. PEFCRs are asked to consider as relevant at least three impact categories, and all impact categories making up the top 80 % of weighted impacts for a benchmark (i.e., representative) product. For each of these select impact categories, it is then necessary to identify as most relevant the life cycle phases that make up the top 80 % of weighted impacts. Then, within the 'most relevant' life cycle phases of each 'most relevant' impact category, it is necessary to identify the processes that make up the top 80 % of the impacts. In a fourth and final iteration of this procedure, the most relevant *direct elementary flows* are those direct elementary flows that make up the top 80 % of the impacts for the process. A *direct elementary flow* is a resource or emission directly related to a process. For example, the animal feed PEFCR identified the processes under each impact category considered most relevant and identified the mandatory company-specific data (i.e., feed ingredients, nutritional analysis, energy consumption, outbound transport). A recent study aimed at identifying ways to improve the quality and quantity of LCI databases showed that processes related to (1) electricity generation, (2) waste treatment activities and (3) energy carrier provision (petroleum and hard coal) consistently caused large impacts on all product systems studied (Reinhard et al., 2019). Companies and industries seeking to apply PEF and PEFCR methods should therefore anticipate the need for activity data and processes relating to these processes.

Data Quality Requirements

This section describes how the data quality of EF compliant datasets shall be assessed (Table 12). There are quantitative and qualitative measures of an EF-compliant dataset. The PEFCRs should specify the minimum list of processes/activity data that shall be covered by company-specific data. For these processes, company-specific data are required if the processes were run by the company applying the PEFCR as an integrated in-house production system, or if there is a possibility of accessing company-specific information (e.g., the processes were run by a specific contract supplier). Otherwise, under the PEF guidelines, companies applying the PEFCR are then allowed to use the default secondary dataset provided in the PEFCR as a proxy, mandatorily substituting only the sub-processes used for electricity mix and transport distance.

Table 12. Data quality requirements for EF-compliant datasets

Parameters	Description
Minimum requirements	Completeness
	Methodological appropriateness and consistency
Data quality criteria (scored)	Technological Representativeness *(TeR)*
	Geographical Representativeness *(GeR)*
	Time-related Representativeness *(TiR)*
	Precision *(P)*
Documentation	Compliant with the International Reference Life Cycle Data System (ILCD) format and with additional requirements on the metadata information available in the Guide for EF compliant datasets
Nomenclature	Compliant with the ILCD nomenclature structure (use of EF reference elementary flows for IT compatible inventories
Review	Review by a 'Qualified reviewer'
	Separate review report

Data Quality Rating (DQR) Formula

The PEF method (European Commission, 2017) prescribed a formula for determining the data quality rating (*DQR*) of mandatory and secondary datasets based on semi-quantitative scores for technological-, geographical-, time-representativeness, as well as precision/uncertainty (*TeR*, *GeR*, *TiR*, *P*, respectively):

$$DQR = \frac{TeR + GeR + TiR + P}{4}$$
<div align="right">Equation 1</div>

The representativeness terms describe the degree to which the processes and products selected comprise the inventory and modelling and depict the system being assessed, and the precision term relates to the way the data is derived and its uncertainty. For secondary datasets, the

precision/uncertainty factor is omitted, taking only the average of the three remaining components. Each PEFCR provides a largely PEF method-mandated scheme for assessing these scores, whereby the lower the *DQR*, the better the data quality. The total *DQR* is an impact-weighted average of all *DQR* scores for the most relevant processes and elementary flows. The *DQR* of a study should be reported – if the *DQR* of a study does not satisfy the requirements of a PEFCR, the study may be non-compliant. Concerns exist that the data quality of the "data quality assessment" will often be worse than the data quality of the LCA study; that ascribing data quality scores is onerous; and that the quality assessment will not deliver a much-needed quantitative assessment of the results (Finkbeiner, 2014).

Required *DQR* scores differ between company-specific and secondary data sets. For company-specific data sets, the score for *TeR*, *GeR* and *TiR* should be ≤ 2, and *P* ≤ 3. Focusing on the minimum requirements, the data should at least:

- Be measured/calculated/literature and plausibility checked by a reviewer, or be a qualified estimate based on calculations plausibility checked by a reviewer.
- Be less than two years old at the time of the environmental footprint report.
- Consist of elementary flows that are a technological proxy for the newly developed dataset.
- Partly reflect the geography where processes were modelled in a newly created dataset.

For secondary data sets, all scores should be ≤ 3. Again, focusing on the minimum requirements, the data in a secondary dataset should at least:

- Be less than four years old at the time of the environmental footprint report.
- Have a technological scope that partly includes that of the environmental footprint study.
- Represent the geographical region (but not necessarily the specific region) in which the processes are modelled.

Of the above-stated requirements for company-specific and secondary datasets, only the time components can be modified by a PEFCR.

All data required outside of the mandatory data should be listed by a PEFCR in a 'data needs matrix' (Table 13). The data needs matrix is used by a PEF study author to evaluate what data is needed, which varies depending on the level of influence the company has on each process in its supply chain. *DQR* scores will need to be assigned or taken from the relevant PEFCR.

Table 13. Data Needs Matrix (DNM)

		Data requirements
Situation 1: process run by the company	Option 1	Provide company-specific data (both activity data and direct emissions) and create a company-specific dataset (DQR ≤ 1.5).
Situation 2: process <u>not</u> run by the company but with access to company-specific information	Option 1	Provide company-specific data and create a company-specific dataset (DQR ≤ 1.5).
	Option 2	Use an EF-compliant secondary dataset and apply company-specific activity data for transport (distance), and substitute the sub-processes used for electricity mix and transport with supply-chain specific EF compliant datasets (DQR ≤ 3.0).
Situation 3: process <u>not</u> run by the company and without access to company-specific information	Option 1	Use an EF-compliant secondary data set in aggregated form (DQR ≤ 3.0).

The geographical data quality ratings are particularly relevant to Australia's large and heterogenous agricultural zones. For company-specific information, the highest rating (score = 1) is achieved when data comes from the exact geographical area in which the process is modelled for the PEF study. Datasets that 'partly' reflect such areas are also acceptable (score = 2). For secondary datasets, the highest score (= 1) is obtained when the data comes from the country in which the PEF study takes place. Four more tiers, each requiring less stringent geographical relevancy, are considered acceptable (scores between 2 and 5). The requirements for company-specific information are clearly more onerous, and the geographical relevancy of secondary data can be comparatively vague, depending on the *DQR* score for the other indicators (Equation 1). The implication is that industry bodies or government agencies (such as the Australian Bureau of Statistics or Australian Bureau of Agricultural and Resource Economics and Sciences) could have a role to play in the provision of high scoring secondary datasets to PEF studies, thereby minimising the work required by individual companies. For example, the Global Feed LCA Institute was selected by the European Commission to develop EF compliant datasets for major animal feed ingredients.

Agricultural Modelling

The PEF method contains a specific sub-section on the modelling of agricultural activities. The following is a summary of the salient points:

- Averaging data: three years for annual crops; perennials to be modelled at steady state and inputs/outputs to be determined over three years; for sub-annual production cycles (e.g., lettuce harvested after several months), data are to be obtained over three consecutive cycles.
- Pesticides: modelled as 90 % emitted to agricultural soil, 9 % to air and 1 % to water.
- Phosphorous and nitrogen leave the technosphere as emissions when they leave the field or enter the air.
- A set of default factors to model nitrogen emissions is provided in the PEF method, but it is permissible to use better data and models when available.
- As an alternative to the above, a nitrogen balance approach is to be tested during the PEF transition phase.
- It is optional whether to model the uptake of heavy metals by crops and their final fate (e.g., heavy metals in crops used in animal feed may be released into the environment in manure).
- Machine use (hours, type), fuel consumption, energy for irrigation and transport should be modelled.
- The burning of crop residues should be modelled.

The PEF method provides additional detail on the modelling of livestock production, but explicitly acknowledges that improvements will be made in this area during the transition phase (2018 – 2020). Again, a list of salient points is provided:

- Biophysical allocation is used within the farm module when it is not possible to clearly subdivide processes, for allocating impacts between milk/cull cows and surplus calves, and for allocating impacts between the co-products from sheep/goats (milk, wool, meat).
- Economic allocation is used to allocate impacts between piglets and sows, and between slaughterhouse outputs.
- The default option for modelling cattle manure is to allocate impacts for its management to other farm outputs, but if manure has an economic value at the farm gate, economic allocation can be used to assign impacts between manure and other outputs (milk, liveweight). If the manure is treated as waste, there is an end of life 'circular footprint' formula that can be used to determine impacts.

An overview of the data requirements of PEFCRs that are used in the modelling and are relevant to the red meat processing sector can be seen below (Table 14).

Table 14. Data requirements of PEFCRs of relevance

PEFCR	Most relevant impact categories	Mandatory company-specific data
Feed for food producing animals	Climate change, particulate matter, acidification, terrestrial eutrophication, impact of land occupation, water scarcity	Feed ingredients, feed nutritional analysis, feed mill energy consumption, outbound transport
Dairy	Climate change, particulate matter, acidification, terrestrial, marine, and freshwater eutrophication, the impact of land occupation, water scarcity, resource use (fossil fuels)	Dairy processing, wastewater processing, non-dairy inputs to processed products (e.g., fruit, salt), packaging
Leather	Climate change, particulate matter, acidification, terrestrial eutrophication, the impact of land occupation, water scarcity, resource use (fossil fuels), resource use (minerals and metals)	Chemical inputs, energy, water, packaging, waste treatment
Red meat footprint category rules (not an official PEFCR)	Climate change, terrestrial eutrophication, acidification	75 % of farming impacts to be based on primary data. Slaughterhouse processes including cutting, packaging, transport, energy (consumption and production).

Mandatory Compliance

Due to a lack of clarity in policy surrounding requirement of exporting nations to comply with the PEF scheme, it is uncertain what degree of mandatory compliance should be expected of the Australian agriculture industry. While compliance will be focused on meeting the minimum standard, we believe it will be prudent for Australian agriculture industries to report data as EF-compliant datasets with the highest data quality rating scores to demonstrate the capacity of Australian producers to deliver premium, sustainable products. Of course, the industry-by-industry decision to do this will be influenced by the likely market advantage.

Data collection is required every three years (DQR 3) but could be done annually (DQR 1). The measured (or calculated) data is then externally verified (DQR 1), instead of internally verified and plausibility is checked by a reviewer (DQR 2).

Opportunities may emerge in the future for companies that can provide suitable data showing average or below average impacts measured against PEF in the near- to mid-term. As such, there would be an advantage in developing a systemic and standardised approach to data collection methodology that could be applied across a wide range of farm business models (grazing farm, feedlot, etc) and sizes. Development of clear, specific inventory modelling methods for developing PEF analyses would enable studies to adopt this at a finer scale of resolution (supply chain- or even farm-scale) and build comparisons to national averages. It is important that any comparison is done on a 'like-for-like' basis using the same method choices, and industry has a role in standardising this.

Voluntary Compliance

From our analysis, we concluded that it is unlikely producers will be required under EU legislation to do a PEF analysis within a time frame of five years. However, brands and accreditation systems will adopt PEF voluntarily, sooner than this. While a formal regulatory requirement is unlikely, the influence of PEF is expected to be felt by Australian farms and processors because of market initiatives and supply chain pressures to provide sustainability credentials. We are particularly aware of this movement gaining ground, especially in the fashion textile, apparel and footwear industry, with multiple companies and industry associations already committing to PEF reporting (e.g. Sustainable Apparel Coalition, Textile Exchange, Eurojersey, Décathlon, H&M, Lacoste, HUGO BOSS, etc.). Key scoping decisions for processors to consider in relation to developing an EF-compliant dataset can be seen below (Table 15).

Table 15. Key scoping decisions for developing EF-compliant datasets

	PEF Minimum requirement	Options to consider
Company-specific data		
Technological-representativeness *(TeR)*	The elementary flows and the activity data are a proxy of the dataset's technology	The elementary flows and the activity data explicitly depict the technology of the dataset
Geographical-representativeness *(GeR)*	The activity data and elementary flows partly reflect the geography where the modelling of the process in the dataset takes place	The activity data and elementary flows reflect the exact geography where the modelling of the process in the dataset takes place
Time-representativeness *(TiR)*	The data refers to a maximum of three annual administration periods regarding the EF report publication date	The data refers to the most recent annual administration period regarding the EF report publication date
Precision/Uncertainty *(P)*	Measured/calculated/ literature *OR* qualified estimate based on calculations plausibility checked by reviewer	Measured/calculated and externally verified
Secondary datasets		
Technological-representativeness *(TeR)*	The technologies used in the EF study are like those included in the scope of the dataset.	The technology used in the EF study is exactly the same as the one in scope of the dataset
Geographical-representativeness *(GeR)*	The process modelled in the EF study takes place in a country that is not included in the geographical region(s) for which the dataset is valid, but it is	Regional-scale analysis may deliver better, more specific benchmarks

	estimated that there are sufficient similarities based on expert judgement	
Time-representativeness *(TiR)*	The EF report publication date is no later than 6 years beyond the time validity of the dataset.	Annual analysis with 3–5 year rolling averages will even out seasonal variations
Production system/market type		Products with specifications for EU market may potentially have higher environmental ratings than general products for local Australian consumption

Appendix 5 – Public Communications Article

EU Deforestation Regulation

Under the Protecting Nature pillar of the EU Green Deal, the EU has enacted the EU Deforestation Regulation (EUDR), legislation aimed at protecting the world's forests. This policy initiative is designed to ensure that products placed in the EU market do not contribute to deforestation or forest degradation. Under this Regulation, companies must demonstrate that their products, especially those linked to key deforestation risk industries, are not directly or indirectly associated with deforestation or forest degradation.

The EUDR was launched in June 2023, and during its initial phase, it will focus on seven specific commodities: soy, cattle, palm oil, coffee, paper and wood products, cocoa, and rubber. The EUDR will also focus on imported products containing these specified products as components or ingredients (e.g. leather, cosmetics, confectionary, etc.). The Regulation will require any company importing or exporting these commodities or related products to prove the products were produced on deforestation and degradation-free land. All companies are included, whether EU-based or not, and it will relate to illegal and legal forms of forest degradation and/or clearing.

A product is defined as deforestation-free when the product itself, its ingredients or its derivatives were not produced on land that has undergone deforestation or forest degradation. The Regulation applies to land after the cut-off date of 31 December 2020 to minimise disruption to international supply chains (KPMG, 2023).

After EU Member States' adoption, each Member State's respective authorities are responsible for enforcing the Regulation. To support the Regulation's adoption, an online system is planned to be set up to facilitate the exchange of information on products placed on the EU market.

EUDR Definition

The EUDR is effectively a prohibition. Relevant products shall not be allowed to be made available on the market in the EU or exported from the EU to be sold elsewhere, unless the conditions of deforestation-free status under the EUDR are satisfied, which includes a substantial due diligence requirement.

The key objectives of the EUDR are to:

- avoid that the listed products Europeans buy, use, and consume contribute to deforestation and forest degradation in the EU and globally.
- reduce carbon emissions caused by EU consumption and production of the relevant commodities by at least 32 million metric tonnes a year.
- address all deforestation driven by agricultural expansion to produce the commodities in the scope of the regulation, as well as forest degradation.

Under the EUDR, "deforestation-free" means that a product that does not contain, has not been fed with, or is not made using commodities where deforestation has occurred. "Deforestation" is defined as the conversion of forest to agricultural use, or forest degradation, being where the structural change to a forest cover by either replacement by plantation or other wooded land, whether human-induced or not, has occurred.

Further, the Regulation defines a product as deforestation-free when the product itself, its ingredients or its derivatives were not produced on land subject to deforestation or forest degradation after the cut-off date of 31 December 2020. This cut-off date has been established to minimise disruption to international supply chains.

Critically for those that may be subject to the Regulation, a forest is defined as "land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10%, or trees able to reach those thresholds in situ, excluding land that is predominantly under agricultural or urban land use".

This definition of forest is different to the Australian definition, which is land greater than 0.2ha, trees greater than 2m, and canopy cover of more than 20%.

Large companies have been given until December 2024 to comply with the EUDR by the provision of a due diligence statement, while micro, small and medium-sized enterprises (SMEs) will need to comply by June 2025.

Risk rating assessment

A three-tier benchmarking system will be used to classify countries into a low-, standard-, or high-risk country. Countries with a 'low-risk' status will be allowed to exercise simplified due diligence process, whereas 'high-risk' countries will undergo enhanced scrutiny. Classification and benchmarking will be based on an assessment of the complexity of the supply chain, the risk of circumvention of the EUDR, and the risk of mixing with products of unknown origin. The data used for benchmarking is not yet publicly available provided, however it will be based on the following assessment criteria, considering latest scientific evidence and internationally recognised sources:

1. rate of reforestation and forest degradation;
2. rate of expansion of agriculture land for relevant commodities; and
3. production trends of relevant commodities and of relevant products.

Upon commencement of the EUDR, all countries will be assigned a 'standard-risk' status. The European Commission will then begin classifying countries and publish a list of high- and low-risk countries no later than 18 months after the date of entry into force of the EUDR. This list will be reviewed and updated as often as necessary in light of new evidence.

There is a lack of clarity what simplified due diligence process for low-risk countries means. However, it is clear that that Member States of the EU needs to conduct annual checks of the operators exporting relevant products. They are required to cover at least 1% of all operators in a low-risk country, 3% in a standard-risk country, and 9% in a high-risk country. This may include *in situ* checks.

Due diligence requirement

Operators (i.e., exporters) are required to comply with the due diligence requirements which include three elements, complemented by reporting obligations:

1. information requirements;
2. risk assessment; and
3. risk mitigation measures.

Operators need to provide information demonstrating the absence of deforestation and forest degradation and that legal requirements were fulfilled, by providing the country of production **including the geolocation coordinates of relevant plots of land and establishments where the livestock were kept**. The due diligence statements will be submitted to the information system provided by the European Commission. A record of the due diligence statements shall be kept for five years from the date of submission. There is also a requirement to make public anonymised non-commercially sensitive data. This is one of the key challenges in meeting the legislation that will need to be considered by the Australian industry.

Clarification of deforestation definitions relevant to Australia

On behalf of Australian red meat supply chains, Integrity Ag sought clarification of the deforestation definitions, under the Market-imposed Environmental Disclosures project (AMPC 1006-2023).

Clarification was sought from the European Commission (EC) (Unit of Planetary Common Goods, Universal Values and Environmental Security, governed by the European Commission Director-General for Environment) regarding the definitions of agricultural land.

Specifically, the EC was asked to clarify whether the EUDR will be relevant to agricultural land parcels, including Australian pastoral land. A representative of the EC provided the following response by email:

> "when it comes to the notion of "excluding land that is predominantly under agricultural or urban land use" we would like to refer you to article 2 [section] (5) whereby " 'agricultural use' means the use of land for the purpose of agriculture, including for agricultural plantations and set-aside agricultural areas, and for rearing livestock"; therefore a land [parcel] that falls predominantly under the above definition or that is predominantly urban area will not be considered as forest."

From this reading, and the response, it is reasonable to read that the deforestation requirement will not include Australian land currently used for grazing or other agricultural use. However, we note that the regulation may be subject to further technical guidance to outline specific definitions, and that the definitions of forest "degradation" remain ambiguous and require further clarification.

Considering this, it is possible that the ability of Australian red meat suppliers to meet these requirements could increase competitiveness in the EU, by supporting the import of products produced from Australian cattle such as beef, leather, cosmetics, and pharmaceuticals.

Indications from the research deem it unlikely for the EC to change the parameters of the Regulation until at least the first phase-in period has been completed (June 2025), giving industry significant time to prepare, or better still, further influence bipartisan policy for the recognition of local jurisdiction laws.

Future expansion

1. The EUDR acknowledges that ecosystems, including managed ecosystems, such as wetlands, savannahs, peatlands and others require particular urgent protective action and further degradations needed to be prevented. Therefore, the European Commission will evaluate and, where appropriate, present a legislative proposal on extending the scope of the EUDR to include 'other wooded land' at latest one year after the date of entry into force (29 June 2024). Next, the European Commission will present further legislative proposal within two years (29 June 2025), extending the EUDR to include: Other natural ecosystems, including other land with high carbon stocks and with a high biodiversity value such as grasslands, peatlands, and wetlands.
2. Further commodities, including maize.
3. Pay specific attention to the potential inclusion of biofuels.

Possible policy responses

The EUDR legislation is already passed in the European Parliament and has entered into force, therefore trade partner nations have no ability in the near term to alter this decision. However, there may be a small allowance to influence how it is currently implemented. Subsequently, a more concerted effort across multiple stakeholders will be required to address concerns on future expansions of the EUDR. Responses can be categorised into broader government-level policy responses, and immediate compliance responses for meeting practical due diligence requirements. The following responses should be considered:

Policy response

1. Advocate for country- or ecologically-relevant definitions for forest, degradation, wooded land, etc.
2. Seek 'low-risk' rating for Australia.
3. Advocate for acceptance of local land and vegetation management laws for clearing.
4. Capitalise on Australia's strength in traceability and sustainable land management to negotiate for increased export quota and capture larger market share.

5. Engage the European Commission on EUDR expansion issues relevant to red meat production, such as other wooded land, grasslands, commodities for animal feed, and use of biodiesel.

Compliance response

1. Clarify what 'simplified due diligence' entails for 'low-risk nations'. The due diligence requirements are one of the largest challenges and risks with this legislation and urgently need clarification and examination of how compliance would work in practice. This would include preparing for geolocation requirements to be provided as latitude and longitude coordinates with an accuracy of at least six decimal digits.
2. Clarify what 'non-commercially sensitive data' needs to be made accessible to the wider public.
3. Develop due diligence documentation for industry that adheres to templates provided in legislation.
4. Provide support to businesses in conducting supply chain risk assessments and risk mitigation strategies.

Confirming the requirements regarding deforestation has the potential to reduce the short-term compliance burden and increase the attractiveness of beef supplied to the EU. Further detail is required to confirm the agricultural land exemption, the forest degradation, and the due diligence requirements before this can confidently be considered a trade advantage for Australia.

Timeframes surrounding the implementation of the EUDR give an important window for industry to advance policy negotiations and frameworks for the advent of agricultural inclusion. This policy advocacy may enable Australia to be recognised as a low-risk jurisdiction, and to have local vegetation management laws recognised, reducing complexity and in turn costs of compliance to future environmental disclosures required across the value chain.

Highlighted secondary benefit to Australian red meat processors and exporters is the weaking of competitiveness of rival exporting countries vulnerable to the EUDR, being those with growing agricultural conversion occurring using land that was previously primary forest such as Brazil, Uruguay and, to a lesser degree, Argentina. Issues for supply chain transparency and compliance may even flow onto key linked exporters to the EU such as the US through connections such as soy or palm oil in stockfeed. Key competitors such as Brazil, Argentina and Uruguay ,may find it challenging to comply with the EUDR because of the capability of national whole-of-life traceability systems, existing industry dynamics and market systems, as well as ongoing reports of problematic supply chain leakage whereby it is difficult for processors in those origins to ensure that animals and or resulting exported relevant products, are in fact free of connections with deforestation or forest degradation. Beyond this, the costs of compliance within these countries have been projected to levels that would make their red meat products less competitive to Australian products in the EU market.

This review concluded with cautious optimism regarding the definitions applied for deforestation, which exclude agricultural land and therefore exclude grazing land. Definitions for forest degradation are less clear, and the due diligence requirements remain untested. Considering broad-scale land clearing of primary forest ceased in Australia many years prior to 2020, this may become a trade advantage compared to other nations exporting beef to the EU.

Further, known EUDR expansions continue to pose significant risk to Australian red meat industry, and should continue to be a matter of priority. Lastly, due diligence requirements may in-themselves result in considerable burdens and barriers arising from this legislation.

Useful Resources

EUDR Regulation

https://environment.ec.europa.eu/topics/forests/deforestation/regulation-deforestation-free-products_en