Future of Work Tripartite Forum Research

Insights into emissions-intensive, trade-exposed businesses (stage 2)

Preston Davies, Dr Jamie O'Hare, Douglas Yee

June 2024

Contents

Appendices

Tables

Executive summary

Emissions-Intensive, Trade-Exposed (EITE) businesses, including steel manufacturing, chemical processing, paper manufacturing and mining, create substantial contributions to the economy and to employment while also facing competitive pressures in the global market. This research estimates the contribution of businesses[1] to national and regional employment and GDP and highlights the role of EITE businesses in their respective supply chains. By analysing the economic and supply chain impacts, we highlight the economic loss that may occur, should EITE businesses be induced to change the level of their production in the future. We used a mixed-methods approach, combining national and regional input-output tables and semi-structured interviews with 11 EITE business leaders.

Key findings

Our work is guided by five main questions.

- **Where are the key interdependencies between EITE businesses and the rest of the economy?**

Key interdependencies are expressed in terms of the upstream and downstream linkages between sectors of the economy at a national and regional level. At a national level, the sectors that would likely experience the most significant impacts of a scenario where EITE businesses cease, or significantly reduce, production in New Zealand are shown in the table below.

Without EITE production in New Zealand, businesses in the key downstream sectors would be required to source inputs from overseas, which promotes supply chain and carbon leakage risk. Businesses in the key upstream sectors would likely experience an immediate drop in revenue, oversupply, and a reduction in outputs and employment from the cessation, or reduction, of production in EITE businesses.

Table 1: Major collective downstream and upstream linkages of EITE businesses in New Zealand

Major downstream linkages	Major upstream linkages
• Primary food production (horticulture and fruit growing, sheep, beef cattle, grain farming, dairy cattle farming, and poultry, deer, and other livestock farming) • Construction • Machinery manufacturing • Metal product manufacturing • Beverage and tobacco product manufacturing • Oil and gas extraction	• Energy production • Forestry and logging • Road transport • Wood product manufacturing • Fertiliser and pesticide product manufacturing • Wholesaling • Non-metallic and mineral product manufacturing

[1] Businesses in industries and sectors that produce high levels of emissions and exports and are, therefore, vulnerable to international competition. EITEs in New Zealand

At the regional level, interdependencies become more nuanced. Scenarios that consider reduced outputs or closure of EITE businesses in New Zealand need to consider regionalised supply chain effects as well as national ones, to obtain a full understanding of impacts.

- **How would national employment and GDP be affected by a change in the collective output of EITE businesses?**

Nationally, the economic impacts of EITE businesses in this study account for over 22,000 FTE and nearly $4b in GDP contributions.

Table 2: Summary of total economic impact nationally

	Value added ($M)			Proportion (%) NZ GDP ($M) 2023[2]	Employment (FTE)			Proportion (%) of national employment[3]
EITE business	**Direct**	**Direct and Indirect**	**Total**		**Direct**	**Direct and Indirect**	**Total**	
Steel manufacturer	141	511	679	0.18	1,250	3,874	5,369	0.23
Fertiliser manufacturer	53	152	185	0.05	150	479	659	0.03
Cement manufacturer	19	41	53	0.01	220	457	589	0.03
Lime product manufacturer	21	45	59	0.02	78	162	209	0.01
Methanol manufacturer	226	651	789	0.2	250	1,142	1,319	0.06
Pulp, paper, and converted paper product manufacturer	81	322	427	0.11	833	3,275	4,313	0.18
Aluminium manufacturer	79	287	542	0.14	797	2,470	3,423	0.15
Pulp, paper, and converted paper product manufacturer	155	614	816	0.21	694	2,728	3,593	0.15
Gold mine operator	217	341	421	0.11	950	2,093	2,814	0.12
Total	**992**	**2,965**	**3,971**	**1.03**	**5,222**	**16,679**	**22,287**	**0.95**

[2] $387,354M
[3] This proportion is drawn from an estimate of filled jobs, in lieu of a national FTE estimate.

- **How would regional employment and GDP be affected by a change in the collective output of EITE businesses?**

Across the eight regions relevant to this study, we found EITE businesses make significant total impacts on employment and GDP.

Table 3: Summary of total economic impacts by host region

Region	Employment impact (FTE)	Share of regional total (%)	GDP impact ($millions)	Share of regional total (%)
Northland	367	0.5	33	0.3
Auckland	4210	0.5	460	0.3
Waikato	2736	1.2	603	1.7
Taranaki	1487	3.1	768	7.5
Bay of Plenty	786	0.5	177	0.8
Hawke's Bay	2404	3.0	285	2.5
Southland	2260	4.7	406	1.9
Otago	1487	1.2	173	1.0

If EITE businesses were to cease or significantly reduce production in these regions, their impact on GDP and employment would be at risk. Regions hosting multiple EITE businesses, such as Waikato and Taranaki, are particularly vulnerable to any macro-level changes that reduce or conclude EITE business production in New Zealand. Moreover, regions with perennial economic issues, such as Northland, may feel the effects of an EITE business closure more intensely than other regions.

- **What other approaches are taken to support EITE businesses in other jurisdictions?**

EITE related policy in comparator jurisdictions (Australia, Canada, USA, and the European Union), generally recognises the issue of carbon leakage[4]. Consequently, overseas policy aims to retain EITE business production in-country, while also incentivising investment in decarbonising technologies. This is achieved via a suite of financial incentive packages in the form of direct investment in technologies, tax relief, or grants. In the European Union, carbon leakage is further disincentivised by import tariffs placed on goods produced by overseas EITE businesses.

[4] Carbon leakage describes a situation where reducing greenhouse gas emissions in one country leads to an increase in emissions in another, often due to shifting production to regions with looser environmental regulations.

- **How can policy in New Zealand be configured for diversification in EITE businesses to support economic resilience?**

We identify five policy objectives aimed at promoting diversification in EITE businesses towards decarbonisation and promoting economic resilience in the short, medium, and long-term. Interviewees were strongly in favour of bespoke policymaking germane to each EITE business[5]. Our policy considerations do not reflect the respective aspirations of EITE businesses but capture the overarching sentiment of economic resilience.

Table 4: Policy objectives and considerations

Objectives	Policy considerations
Avoid carbon leakage Retain EITE manufacture in New Zealand	• Output-based free allocation to mitigate effects of carbon pricing on some products. • Border tax adjustments for trade-exposed, emissions-intensive products. • Availability of grants to fund decarbonisation projects in EITE businesses. • Tax, or other financial incentives, to EITE businesses for investing in technology development.
Reduce the carbon profile of EITE products manufactured in New Zealand	• Availability of grants to fund decarbonisation projects in EITE businesses. • Tax incentives for investments in decarbonising technologies. • Carbon capture and sequestration tax credits.
Promote cluster development in the regions	• Promotion of industry clusters or ecosystems where EITE businesses can collaborate with upstream and downstream businesses.
Promote the economic resilience of regions where EITE business operate and promote economic growth nationally	• Economic diversification grants. • Skill development programmes. • Innovation and entrepreneurship hubs. • Regional investment incentives.

[5] We acknowledge implicitly throughout the report that EITE business executives stated preferences and aspirations are likely a reflection of their broader commercial incentives.

1. Purpose and approach

Our research estimates the economic impact of, and the interdependencies between, emissions-intensive, trade-exposed (EITE) businesses in New Zealand. This report represents stage two of the research examining New Zealand EITE businesses and focuses on the potential economic impacts arising from a reduction in production.

Stage one of this work sought to better understand the steps that emissions-intensive, trade-exposed (EITE) businesses have, and are, taking to transition to a low-emissions economy, their views of what their future looks like with current and proposed settings, as well as the barriers and possible solutions to transition to a low-emissions economy, in a way that ensures a 'just transition'. Findings of stage one found that:

- decarbonisation in EITE firms is achieved via step-changes in technology that have reduced the carbon intensity of their core processes
- EITE business leaders in New Zealand were of the view that they were further along their decarbonisation journey than most, if not all, of their international counterparts
- importation of EITE products would be necessary, if EITE businesses ceased production in New Zealand
- EITE businesses may find it difficult to compete with other EITE firms operating in jurisdictions with little to no carbon emissions-based regulation
- the commercial viability, rather than the general availability, of technology was cited as a key barrier to EITE businesses achieving their decarbonisation goals
- EITE business leaders sought regulatory stability, particularly in the Emissions Trading Scheme (ETS), to support them in attracting capital investments for new technologies
- EITE business leaders also expressed a desire for bespoke policymaking tailored to each EITE business, and their respective technology curves; and
- Further research is required to identify the challenges and opportunities associated with a low-carbon future, including understanding:
    - the economic impacts of EITE business shrinkage or closure in New Zealand
    - supply chain resilience and availability of alternative fuels, and of alternative technologies; and
    - New Zealand's strategic resilience in the global economy.

Stage two addresses these three points of further research, by collecting, and analysing, data and information from the same EITE businesses involved in stage one. Stage 2 is primarily a piece of economic analysis. Policy is discussed at a high-level in sections four and five to highlight findings from literature and stakeholder interviews. This work sets a foundation for further policy analysis in the future.

1.1 Headline research questions and objectives

Our research question for this report asks:

- **What economic loss may occur, should EITE businesses be induced to change the level of their production in the future?**

To address this question, our research objectives include the following:

- A description of the key interdependencies between EITE businesses and the rest of the New Zealand economy. This includes the identification and measurement (where possible) of upstream and downstream linkages between firms and their relevance to supply chains.
- An assessment of how the New Zealand economy would be affected by a change in collective output from EITE businesses, paying close attention to employment and economic activity in regions where EITE businesses operate.
- A review of approaches in other jurisdictions aimed at supporting EITE businesses to decarbonise.
- Considerations for policy in New Zealand, including considerations for potential diversification in these businesses to support short, medium, and long-term economic resilience.

1.2 Our approach draws on mixed methods

We estimate the economic impacts of EITE businesses in their operating regions using input-output (I/O) tables[6]. We source input data for the tables via examination of businesses' financial statements, and interviews with EITE business executives.

We use a top-down approach. Estimates of employment (FTE) and GDP contributions are made by utilising inter-industry transactions data to calculate multipliers, which are then applied to the best available data on the output (economic activity) of the EITE businesses. The multipliers we focus on this this study are:

- **Direct:** measures the immediate economic impact of an increase in output or activity within a specific sector of the economy.
- **Type 1:** captures both direct and indirect effects of an increase in output. Indirect effects are the secondary economic impacts on other sectors due to inter-industry purchases.
- **Type 2 (frequently referred to as the total impact):** includes the direct, indirect, and induced effects of an increase in output. Induced effects come from increased household spending as workers spend their incomes in other sectors of the economy.

Some EITE businesses in our sample have previously conducted individual economic impact analyses, using bottom-up methods. Analyses produced via bottom-up methods can be more accurate than top-down because they often incorporate granular data from individual sources, providing a comparatively more precise and context-specific analysis. As such, we incorporate the findings of these studies in our report. We signal throughout the report where and how these prior studies have been used.

We use I/O tables to identify and describe interdependencies between EITE businesses and the wider economy. Our focus is on the most significant upstream and downstream relationships between

[6] Data used for inputs into I/O table multipliers comes from EITE businesses most recent annual reports and other publications, which is 2023 in most cases.

sectors. We also develop short case studies to provide a demonstrative complement to our quantitative analysis and draw on findings from interviews with EITE business executives where appropriate.

Finally, we conduct a literature search to identify policy initiatives and approaches to managing the decarbonisation of EITE businesses in other jurisdictions. The purpose of this search is to identify key policy areas overseas to stimulate further discussion, it should not be considered an exhaustive search.

1.3 We model a counterfactual scenario where EITE businesses cease all production in New Zealand

Our research question asks what economic impacts may occur should EITE businesses be induced to change their production levels in the future? This question implies the counterfactual scenario is one in which EITE businesses continue to manufacture in New Zealand, albeit in a reduced capacity. However, we model a scenario where the EITE businesses cease all production in New Zealand (i.e. an upper bound). We do this for two main reasons:

- EITE business executives are broadly of the view that any material reduction in production seriously challenges the viability of the entire business; and
- I/O tables are linear models that assume if there is a percentage reduction in inputs, their associated economic impacts will decrease by the same percentage.

By modelling a counterfactual, where EITE businesses cease all production in New Zealand, we demonstrate the total employment and GDP impacts that may occur if EITE inputs reduce by 100 per cent. To find the economic impacts of different counterfactuals, such as partially reduced EITE business inputs, our findings can be scaled proportionally.

Understanding the broader limitations of I/O tables is important when interpreting the findings we present in this research. The linearity of I/O tables mean that estimated impacts on GDP and employment (FTE) are proportional to changes in inputs and assume no changes to the structure of the economy or technological advancements, for example. I/O tables are also limited in that they:

- cannot account for substitutions between inputs
- are static, and do not account for dynamic changes over time, such as investment, technology, and consumer preferences
- assume constant returns to scale, implying that doubling the input will double outputs
- cannot account for potential supply constraints
- assume fixed prices, ignoring price elasticity and the potential changes in supply and demand to affect prices; and
- assume stable inter-industry relationships

1.4 We have not completed a quantitative analysis of EITE businesses in the dairy sector because they face a different counterfactual scenario

The counterfactual scenario facing EITE businesses in this study is the cessation of their production activities in New Zealand (we acknowledge that other scenarios, such as a reduction in outputs are possible). To understand the difference in the counterfactual facing businesses in the dairy processing sector, we must first consider their production processes. When milk is used to produce cheese, liquid whey and lactose are created as an unavoidable by-product. Liquid whey and lactose are then dried into a powder form and used in the production of other dairy products such as yoghurts and fortified milks.

The elements of dairy processing that attract industrial allocations, and render some dairy processing businesses as EITE, is the production of whey and lactose powders. In a counterfactual scenario, where dairy processing businesses are unable to produce whey and lactose powers, there are two significant impacts on the businesses: (1) technologies need to be introduced to the production process to safely dispose of liquid whey and lactose, and (2) whey and lactose powders need to be imported from overseas.

We spoke with a leading dairy product manufacturer to better understand this scenario. They estimated the introduction of technology to safely dispose of liquid whey and lactose would require an initial capital investment in the tens of millions of dollars. It would also require additional labour to manage the safe disposal of liquid whey and lactose or the reorganisation of labour within the organisation to manage the disposal process. To sustain their full product portfolio, dairy processing businesses would be required to import whey and lactose powders from overseas. The dairy product manufacturer we spoke with indicated that these powders would most likely come from Europe or the USA, where the associated CO_2 output for the drying process is higher than drying plants in New Zealand. It was also noted that reliance on overseas imports of whey and lactose powders left some of their product portfolio vulnerable to supply chain disruptions and internal price shocks. Qualitatively, the economic impacts of this scenario may include:

- higher production costs, from the higher cost of importing whey and lactose powders
- increased labour costs, arising from the requirement for additional labour or the reorientation of existing labour to manage the disposal process; and
- adverse GDP impacts may arise due reduced domestic production, in favour of importation.

2. EITE businesses make significant contributions to regional economic development

EITE businesses in New Zealand make substantial contributions to the economy. In 2019, EITE businesses employed approximately 15,000 full-time equivalent (FTE) employees and created additional employment in areas where they are based due to flow-on effects to secondary markets (Castalia Strategic Advisors, 2019). We estimate that around 5,200 of these FTE are directly employed by the businesses sampled in this research, and over 22,000 are employed, when accounting for direct, indirect, and induced effects (Type II). In this section, we estimate the employment and GDP contributions EITE businesses make on a national level. We then focus in on the economic contributions in regions where EITE businesses operate, and by implication the impact if EITE businesses were to change production levels in New Zealand.

2.1 EITE businesses in this study contribute almost $4b to New Zealand's GDP

At the national level, we find that the EITE businesses sampled contribute $3,970.72M (Type II) to New Zealand's GDP (around 1.03 per cent of GDP for 2023) and over 22 thousand FTE positions (Type II).

Table 5: National economic contributions of EITE businesses

	Value added ($M)			Proportion (%) NZ GDP ($M) 2023	Employment (FTE)		
EITE business	**Direct**	**Type I**	**Type II**		**Direct**	**Type I**	**Type II**
Steel manufacturer	141	511	679	0.18	1,250	3,874	5,369
Fertiliser manufacturer	53	152	185	0.05	150	479	659
Cement manufacturer	19	41	53	0.01	220	457	589
Lime product manufacturer	21	45	59	0.02	78	162	209
Methanol manufacturer	226	651	789	0.2	250	1,142	1,319
Pulp, paper, and converted paper product manufacturer	81	322	427	0.11	833	3,275	4,313
Aluminium manufacturer	79	287	542	0.14	797	2,470	3,423
Pulp, paper, and converted paper product manufacturer	155	614	816	0.21	694	2,728	3,593
Gold mine operator	217	341	421	0.11	950	2,093	2,814
Total	**992**	**2,965**	**3,971**	**1.03**	**5,222**	**16,679**	**22,287**

Source: Sapere analysis

Over 1 per cent of New Zealand's national GDP is linked to the total (Type II) impacts of the EITE businesses sampled in this research. Our findings indicate that a reduction, or cessation, of the

outputs of these firms would have a considerable impact on productivity, amplified by New Zealand's productivity problem.

New Zealand has an enduring problem with productivity[7]. It has been described by New Zealand Treasury as "the biggest long-run detriment of wages and living standards". Improving living standards is contingent upon raising output per head, which means increasing the value added per worker.

2.2 Economic impacts are felt differently across the regions hosting EITE businesses

In this section, we estimate the employment and GDP contributions EITE businesses make to the regions in which they operate[8], and by implication the impact if EITE businesses cease production in New Zealand[9]. These businesses operate across eight different regions of New Zealand, including:

- Northland
- Auckland
- Waikato
- Bay of Plenty
- Taranaki
- Hawke's Bay
- Southland
- Otago.

2.3 Northland

A cement manufacturer operates in Whangārei, in the Northland region. At 60.7 per cent, Northland has the second lowest employment rate in New Zealand. Northland is ranked fifth lowest for GDP in New Zealand, with a GDP[10] of $10,061 million.

Table 6: GDP and employment impacts of EITE businesses in Northland

	Direct	Type I	Type II	Type II proportion of regional total (%)
GDP ($millions)	17	27	33	0.3
Employment (FTE)	220	322	367	0.5

Source: Sapere analysis

Northland's existing economic challenges, such as high unemployment, poverty and limited opportunities could magnify the impacts of any decline in GDP and employment. Relatively small percentage declines in GDP or employment can exacerbate socio-economic disparities. A 0.5 per cent

[7] https://www.treasury.govt.nz/information-and-services/nz-economy/productivity
[8] The impacts shown in this section are strictly confined to the named region. In other words, these impacts do not account for impacts 'leaked' into other regions.

reduction in employment is a notable loss of jobs in a region already grappling with high unemployment rates.

2.4 Auckland

The Franklin district in Auckland is home to a steel manufacturer. This business manufactures steel and steel products. The Auckland region has a GDP of $148,732 million and employment rate of 71.2 per cent.

Table 7: GDP and employment impacts of EITE businesses in Auckland

	Direct	Type I	Type II	Type II proportion of regional total (%)
GDP ($millions)	141	345	460	0.3
Employment (FTE)	1250	3208	4210	0.5

Source: Sapere analysis

Auckland's relatively robust economy, characterised by diverse industries and a large population provides a stronger foundation for absorbing economic shocks, compared to other regions in this study. Nevertheless, potential losses arising from the closure of this EITE business are significant and would intensify current issues with New Zealand's productivity at the national level.

2.5 Waikato

Three EITE businesses operate in Waikato:

- Lime product manufacturer
- Pulp, paper, and converted paper product manufacturer
- Gold mine operator

Waikato has one of the largest regional economies in New Zealand, with a total GDP of $34,613 million. The Waikato region has a diversified economy, with EITE businesses playing a substantial role in sub-regional districts where natural resources are in great supply. Waikato has the sixth lowest employment rate in New Zealand at 66.3 per cent, 2.8 percentage points below the national average of 69.1 per cent.

Table 8: GDP and employment impacts of EITE businesses in Waikato

	GDP ($m)				Employment (FTE)			
EITE	**Direct**	**Type I**	**Type II**	**Type II proportion of regional total (%)**	**Direct**	**Type I**	**Type II**	**Type II proportion of regional total (%)**
Lime product manufacturer	21	35	43	0.1	78	132	160	0.1
Pulp, paper, and converted paper product manufacturer	106	319	396	1.1	465	1419	1753	0.8
Gold mine operator	104	142	165	0.5	350	655	823	0.4
Total	231	496	603	1.7	893	2206	2736	1.2

Source: Sapere analysis

Hosting three substantially different EITE businesses, Waikato appears particularly vulnerable to macro-level changes or economic shocks that would result in reduced or eliminated output.

2.6 Bay of Plenty

A pulp, paper, and converted paper product manufacturer operates a plant in Kawerau. The Bay of Plenty economy has historically been driven by primary industries such as agriculture, forestry, and fishing, and thus is susceptible to volatility in commodity prices. The Bay of Plenty has the fifth largest total GDP in New Zealand of $22,581 million. However, the Bay of Plenty has the fourth lowest employment rate in New Zealand of 64.7 per cent, and a relatively low GDP per capita of around $64,000. The paper and paper product manufacturing business's economic contributions to the region are outlined below.

Table 9: GDP and employment impacts of EITE businesses in the Bay of Plenty

	Direct	Type I	Type II	Type II proportion of regional total (%)
GDP ($millions)	48	142	177	0.8
Employment (FTE)	229	649	786	0.5

Source: Sapere analysis

The cessation of paper manufacturing in the Bay of Plenty would mean sizeable employment losses from various sub-regions including East Taupō, Rotorua, as well as employees living in the Waikato. There are limited opportunities for skills transfer within the region, with employees likely having to look overseas for new opportunities.

2.7 Taranaki

Two EITE businesses are based in Taranaki. One operates an ammonia-urea manufacturing plant in Kapuni, while the other operates a methanol production facility near the Waitara Valley.[11] Taranaki has an employment rate of 69.1 per cent, and its GDP is $10,241 million.

Table 10: GDP and employment impacts of EITE businesses in Taranaki

	GDP ($millions)				Employment (FTE)			
EITE	**Direct**	**Type I**	**Type II**	**Type II proportion of regional total (%)**	**Direct**	**Type I**	**Type II**	**Type II proportion of regional total (%)**
Fertiliser manufacturer	49	86	98	1	150	348	419	0.8
Methanol manufacturer	226	651	670	6.5	250	1142	1294	2.3
Total	275	737	768	7.5	400	1490	1713	3.1

Source: Sapere analysis and privately disclosed impact analysis

By virtue of hosting two EITE businesses, Taranaki is particularly vulnerable to any macro-level changes that reduce or conclude EITE business production in New Zealand. Despite its position in the middle tier of employment and GDP rankings nationally, Taranaki maintains a reliance on key sectors for economic vitality. In addition to a significant economic contraction in the region, the loss of one or both businesses would likely lead to a loss of talent in the region.

2.8 Hawke's Bay

The Hawke's Bay region is host to a pulp, paper, and converted paper product manufacturer, a large paper and pulp manufacturing EITE business. The region's GDP is $11,385 million and has an employment rate of 66.8 per cent, the seventh lowest in New Zealand. The region's economy can be characterised by primary sectors, such as forestry, agriculture, and horticulture.

Table 11: GDP and employment impacts of EITE businesses in Hawke's Bay

	Direct	**Type I**	**Type II**	**Type II proportion of regional total (%)**
GDP ($millions)	81	228	285	2.5
Employment (FTE)	833	2016	2404	3.0

[11] The EITE business operating a methanol production facility provided us with an economic impact assessment previously conducted as well as an updated direct employment figure. We have updated their previous study using the updated employment figure and for inflation. We then sense checked our findings with multipliers for the sector in which this EITE firm operates to arrive at our final estimate.

Source: Sapere analysis

The significance of a 2.5 per cent drop in GDP is intensified given the interrelationships between this business and forestry, and forestry related businesses, in the region. Moreover, a three per cent drop in regional employment would see Hawke's Bay become the third lowest region by employment in New Zealand, ranking above only Northland and the West Coast.

2.9 Otago

One EITE firm operates a gold mine in the Otago region. Otago has a GDP of $16,755 million and an employment rate of 70.2 per cent. Otago is host to a diverse economy, with large horticulture, agriculture, and education sectors.

Table 12: GDP and employment impacts of EITE businesses in Otago

	Direct	Type I	Type II	Type II proportion of regional total (%)
GDP ($millions)	112	149	173	1.0
Employment (FTE)	600	1172	1487	1.2

Source: Sapere analysis

The departure of this business could lead to a loss of specialised skills and expertise in the region, such as tradespeople and engineers, hindering future economic development and the innovativeness of remaining businesses. Economic impacts stemming from the departure of this business may also lead to a reduction in population of towns and villages with few inhabitants.

2.10 Southland

An EITE firm in Southland operates an aluminium smelter.[12] Southland has a GDP of $8,271 million, the fourth lowest in the country and an employment rate of 70.1 per cent.

Table 13: GDP and employment impacts of EITE businesses in Southland

	Direct	Type I	Type II	Type II proportion of regional total (%)
GDP ($millions)	67	117	406	4.9
Employment (FTE)	797	1126	2260	4.7

Source: Sapere analysis and disclosed impact analysis

Southland's economy is primarily characterised by dairy farming, meat and meat product manufacturing, and sheep and beef farming. If this EITE business were to cease production in the

[12] Our estimates of this firm's economic impacts draw heavily from a prior study completed on behalf of the EITE business.

region, Southland would suffer a reduction in economic diversification, promoting its dependence on agriculture and farming, making it more vulnerable to market fluctuations and changing environmental conditions.

2.11 Displaced employees may struggle to find alternative employment opportunities locally

EITE business executives explained that most of their employees are considered highly skilled and qualified. Employees are often qualified engineers and experienced tradespeople. While some EITE production processes are highly specialist, most EITE business executives were generally of the view the skills of their employees are transferable to other manufacturing businesses. However, others, particularly those in the primary metal and metal product manufacturing sector, were of the view that skills were not easily transferable to other sectors of the economy.

EITE business executives expressed doubt there would be alternative employment opportunities available to displaced employees of closed EITE businesses in the regions where they operate. Consequently, displaced employees would be required to leave the region, or leave New Zealand, to find appropriate alternative employment. However, employees at EITE businesses tend to have long tenures and may be reluctant to leave the region for alternative employment opportunities. As a result, displaced workers may end up in lower-skilled roles or face unemployment in the region following the closure of their EITE employer. Future research could analyse data contained within the Integrated Data Infrastructure (IDI), to understand the landscape of employment in each region, and then cross-reference this with an assessment of relevant alternative job opportunities in the same region, to estimate the extent to which employees might be displaced if an EITE business were to cease production.

3. Upstream and downstream linkages highlight key interdependencies between EITE businesses and the wider economy

To highlight the key interdependencies between EITE businesses and the wider economy, we analyse I/O table inter-industry transactions. We demonstrate the upstream (the sectors where EITE businesses make input purchases from) and the downstream (the sectors that purchase EITE business outputs) linkages between sectors with EITE businesses and other sectors in the economy.

We present our findings on a national level and then on a regional level. We support our analysis with findings obtained during our interviews with EITE business leaders. This analysis is intended to shed a spotlight on upstream and downstream interdependencies. To better understand risks to supply chains and supply chain resilience in New Zealand there is an opportunity examine inter-sector transactions with more granularity. Further work might focus on the volumes and types of products and services being transacted between EITE firms and the rest of the economy, contextualised against the backdrop of international imports to sectors of strategic significance to New Zealand.

3.1 On a national level, sectors with EITE businesses have notable upstream and downstream interdependencies

Sectors with EITE businesses are recipients of substantial inputs from other sectors of the national economy. If EITE businesses were to cease production in New Zealand, sectors supplying inputs would likely experience significant negative economic impacts arising from the loss of revenue from EITE businesses. Similarly, sectors with EITE businesses provide significant volumes of outputs to other sectors that are important to the New Zealand economy, such as construction and primary food production. Recipient sectors of EITE business outputs would likely be required to import substitute products, if EITE businesses were to cease production in New Zealand.

3.1.1 National sectors, such as machinery manufacturing and fabricated metal manufacturing receive significant inputs from EITE business sectors

Examining downstream interdependencies on a national level, we find that machinery manufacturing and fabricated metal manufacturing receive a large proportion of their inputs from sectors where EITE businesses operate, with each receiving around 26 per cent of their inputs from EITE sectors respectively. Other sectors, such as primary food production,[13] oil and gas extraction, construction,[14]

[13] Horticulture and fruit growing, sheep, beef cattle, grain farming, dairy cattle farming, and poultry, deer, and other livestock farming

[14] Residential building construction, non-residential building construction, heavy and civil engineering construction, and construction services

and beverage and tobacco product manufacturing also receive large volumes of inputs from sectors with EITE businesses.

Table 14: Downstream impacts of EITE business outputs

Impacted sector	Proportion of total inputs from EITE businesses (%)	Top five inputs from EITE businesses (%)
Primary food production	7	Fertiliser and pesticide manufacturing (5.7%)
		Pulp, paper, and converted paper product manufacturing (0.8%)
		Primary metal and metal product manufacturing (0.3%)
		Non-metallic mineral product manufacturing (0.2%)
		Basic chemical and basic polymer manufacturing (0.3%)
Oil and gas extraction	18	Primary metal and metal product manufacturing (15.5%)
		Fertiliser and pesticide manufacturing (1.5%)
		Non-metallic mineral product manufacturing (0.5%)
		Basic chemical and basic polymer manufacturing (0.2%)
Beverage and tobacco product manufacturing	11	Pulp, paper, and converted paper product manufacturing (5.6%)
		Non-metallic mineral product manufacturing (4.3%)
		Primary metal and metal product manufacturing (0.8%)
		Fertiliser and pesticide manufacturing (0.3%)
		Basic chemical and basic polymer manufacturing (0.2%)
Fabricated metal product manufacturing	26	Primary metal and metal product manufacturing (23.5%)
		Non-metallic mineral product manufacturing (1.6%)
		Pulp, paper, and converted paper product manufacturing (0.3%)
		Basic chemical and basic polymer manufacturing (0.1%)
		Fertiliser and pesticide manufacturing (0.1%)
Machinery manufacturing	26	Primary metal and metal product manufacturing (25.2%)
		Non-metallic mineral product manufacturing (0.3%)

		Pulp, paper, and converted paper product manufacturing (0.2%)
		Basic chemical and basic polymer manufacturing (0.2%)
		Fertiliser and pesticide manufacturing (0.1%)
Construction sectors	5[15]	Non-metallic mineral product manufacturing (3.9%)
		Primary metal and metal product manufacturing (0.5%)
		Pulp, paper, and converted paper product manufacturing (0.4%)
		Basic chemical and basic polymer manufacturing (0.2%)

Source: Sapere analysis

In a scenario where EITE businesses cease production in New Zealand, firms in impacted sectors would be required to seek inputs from alternative sources. In most cases, those sources would be from overseas EITE counterparts. There are two primary risks associated with sourcing inputs from overseas:

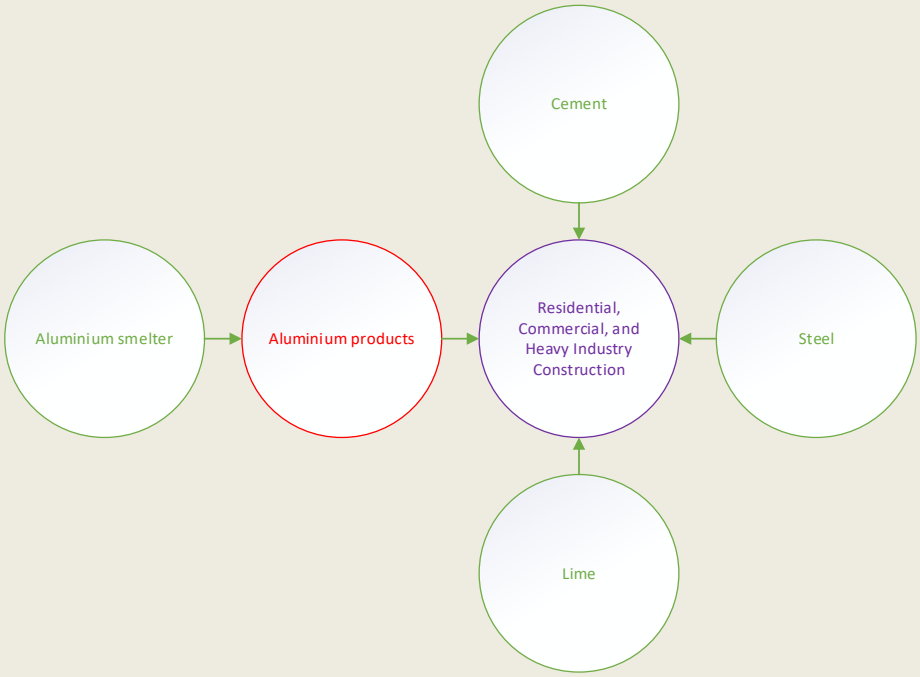
- Businesses sourcing inputs from overseas are left vulnerable to global pricing fluctuations and are exposed to international supply chain shocks. These amount to compromises to New Zealand's overall strategic resilience.
- If inputs are sourced from international markets where the CO_2 per tonne of goods produced is higher than in New Zealand, then carbon leakage and, therefore, increased global emissions are likely.

[15] A further 5.8 per cent of construction sector inputs come from fabricated metal product manufacturing.

Case study: The New Zealand construction sector utilises a suite of EITE products

Amongst a suite of other domestically produced products and services, New Zealand's construction sectors are reliant on mineral product manufacturing; metal and metal product manufacturing; fabricated product manufacturing; and cement manufacturing. New Zealand's construction sectors access these products via a combination of domestic manufacture and overseas imports. There are four EITE businesses in New Zealand supplying essential construction products, including:

- *Fletcher Building* – through the manufacturing of cement
- *New Zealand Steel* – through the manufacture of steel pipes and frames
- *Rio Tinto* – by supplying aluminium extruders that, in turn, create finished aluminium products, used for door and window framing
- *Graymont* – through the manufacture of lime and lime products, which have wide-ranging applications in construction, from construction, and steel manufacture to water treatment.



Construction sector resilience could be compromised by an increased reliance on imports

At present, these EITE businesses supply around five per cent of all construction sector inputs. At the same time, around 11 per cent of construction sector inputs come from overseas inputs. Without inputs from EITE businesses, construction sector inputs from imports would likely increase to 15-16 per cent. An increased reliance on overseas imports further exposes the construction sector to international pricing fluctuations and supply chain shocks. This poses increased vulnerability to domestic, commercial, and infrastructure construction projects across New Zealand. However, importation of alternatives is not always feasible. To illustrate, during COVID-19, GIB Board was scarce at equivalent products from Australia could not be imported and used as an alternative, delaying construction projects.

3.1.2 Sectors with EITE businesses source high proportions of their inputs from other parts of the national economy

EITE production inputs are sourced from various domains of the economy. Businesses in the primary metal and metal product manufacturing, and basic chemical and basic polymer manufacturing sectors receive a high proportion of their inputs from producers of energy, such as oil and gas extraction, electricity generation and on-selling, and electricity transmission and distribution.

Table 15: Significant sources of inputs to EITE business sectors

Sector with EITE businesses	Most significant source of inputs	Share of total inputs (%)
Metal ore and non-metallic mineral mining and quarrying	Road transport	11
	Rental and hiring services	9
	Petroleum and coal product manufacturing	6
Pulp, paper, and converted paper product manufacturing	Forestry and logging	20
	Pulp, paper, and converted paper product manufacturing	13
	Wood product manufacturing	7
Basic chemical and basic polymer manufacturing	Oil and gas extraction	39
	Gas and water supply	16
	Electricity generation and on-selling	8
Fertiliser and pesticide manufacturing	Fertiliser and pesticide manufacturing	36
	Basic material wholesaling	16
	Other goods and commission-based wholesaling	8
Non-metallic mineral product manufacturing	Non-metallic mineral product manufacturing	11

	Road transport	8
	Metal ore and non-metallic mineral mining and quarrying	6
Primary metal and metal product manufacturing	Electricity generation and on-selling	22
	Basic material wholesaling	8
	Electricity transmission and distribution	8

Source: Sapere analysis

The cessation of EITE business production is likely to result in an immediate and significant loss of revenue for energy producers. With the loss of a significant purchaser of energy outputs, energy producers may face capacity issues, where generation exceeds the new reduced level of demand.

Other sectors supplying inputs to EITE businesses may experience an immediate, and potentially sustained, loss of revenue following the cessation of EITE business production in New Zealand, as they will have lost a key purchaser of their outputs. This is followed by a period of oversupply in which prices are likely to drop, further impacting revenue and profitability. With an overall reduction in demand, suppliers of inputs to EITE businesses may reduce operations which as we have estimated, would have a negative impact on employment, particularly regional employment, and GDP.

3.2 At a regional level, interdependencies between EITE business sectors and the rest of the economy are somewhat more nuanced

The national picture is broadly repeated at the regional level, in that businesses providing inputs to EITE businesses may face immediate, and potentially sustained, economic shocks following the closure of EITE businesses – assuming businesses providing inputs to EITE businesses cannot easily identify alternative purchasers of their outputs. Those in receipt of EITE business outputs will likely have to look to overseas markets to source their inputs. That said, there are inter-regional variations which we explore here.[16]

3.2.1 Waikato metal ore and mineral mining and quarrying

The EITE business in this category operates a gold mine in North-East Waikato. All outputs from this business are exported overseas for processing. Consequently, there are no downstream outputs in Waikato to speak of concerning this business. However, a suite of Waikato-based businesses provide inputs to Waikato-based mining companies. The top five providers of inputs are road transport (13

[16] Data tables informing this section can be found in Appendix A.

per cent), rental and hiring services (except real estate) (nine per cent), electricity generation and on-selling (seven per cent), construction services (six per cent), scientific, architectural, and engineering services (six per cent).

3.2.2 Waikato non-metallic mineral product manufacturing

The EITE business in this category produces lime and lime products. The top five providers of inputs to this business include other non-metallic mineral product manufacturing firms (11 per cent), road transport (10 per cent), metal ore and non-metallic mineral mining and quarrying (eight per cent), fabricated metal product manufacturing (six per cent), and electricity generation and on-selling (four per cent). More than half of downstream purchases (68 per cent) of outputs from this business are sold on to different domains of the construction sector, including:

- residential building construction (22 per cent)
- construction services (22 per cent)
- heavy and civil engineering construction (13 per cent)
- non-residential building construction (10 per cent)
- non-metallic mineral production manufacturing (seven per cent).

Altogether, this indicates that the outputs of this business are essential for the Waikato construction sector.

Case study: Lime provides products to at least five other New Zealand EITE businesses

The lime sector's core business operations include the extraction of limestone and the production of lime products.

The production of lime and lime products

The production of lime and lime products generally follows a process of:

- **Quarrying:** where limestone is extracted from quarries.
- **Crushing and screening:** where quarried limestone is crushed into smaller pieces to facilitate further processing.
- **Calcination:** where crushed lime is fed into kilns where it is heated to temperatures between 900 and 1,000 degrees Celsius. At lime sites in New Zealand, this process is fuelled by a combination of coal and natural gas, with the kiln at Te Kuiti being fuelled by natural gas. High temperatures cause thermal decomposition of the limestone, which releases CO_2 gas, leaving behind calcium oxide, otherwise known as quicklime, or burnt lime. Depending on the quicklime use, CO_2 can be reabsorbed in many instances.
- **Hydration:** quicklime can be further processed to produce hydrated lime by adding water in a controlled reaction, called slaking. The process creates heat and results in a fine, dry powder or slurry (depending on the volume of water used).

Lime and lime products are used by a range of organisations, including several other EITE businesses

Lime and lime products have multiple applications across various sectors of the New Zealand economy, including sectors where other EITE businesses operate. For example, quicklime is used for soil stabilisation in residential construction and infrastructure development (particularly roading). Lime products are also used in steel manufacture as flux to remove impurities; fertiliser manufacturers use lime for producing low leachate products; gold mining uses lime for the processing of gold ore; and businesses in the pulp and paper sector have various uses for lime, including bleaching and wastewater treatment. The dairy sector also has multiple uses for lime, including sanitation, animal health, and soil amendment. Additionally, lime is supplied for treating drinking water in New Zealand.

Suitable alternatives may be hard to source

If lime product production ceased in New Zealand, lime as a calcium or pH adjuster would most likely come from Southeast Asia, where coal tends to be used as the source of fuel for kilns. The cessation of lime production in New Zealand would likely lead to carbon leakage, from the comparatively higher CO_2 profile of lime production in Southeast Asia. Lime products used in steelmaking may be more difficult to source due to the specifications required in steelmaking.

3.2.3 Waikato pulp, paper, and converted paper product manufacturing

An EITE business in the pulp, paper, and converted paper product manufacturing has multiple locations in the Waikato. Perhaps unsurprisingly, forestry and logging products comprise the largest proportion of pulp, paper, and converted paper product manufacturing inputs in the region (25 per cent). This is followed by other pulp, paper, and converted paper product manufacturing firms (11 per cent) and wood product manufacturing firms (nine per cent). These inputs highlight the significance of firms in the Waikato pulp, paper, and converted paper product manufacturing sector to forestry in the region. Although the downstream impacts are comparatively more diverse, they further highlight interdependencies between pulp, paper, and converted paper product manufacturing firms and with wood product manufacturing:

- Pulp, paper, and converted paper product manufacturing (18 per cent)
- Wood product manufacturing (eight per cent)
- Dairy product manufacturing (six per cent)
- Meat and meat product manufacturing (five per cent)
- Non-metallic mineral product manufacturing (four per cent).

An EITE pulp, paper, and converted paper product manufacturing executive in Waikato advised that *"We are the biggest user of wood residues in the country, roughly four million tonnes of wood and wood waste per annum. There would be a fairly significant impact on forestry, including price, and sawmill chip (considered a waste product) which would potentially go to landfill."* On the downstream impacts, the executive explained that they supply about 50 per cent of packaging market for horticultural exports. If production of packaging in New Zealand were to cease, horticultural exporters would most likely source alternatives from South America. He noted that the CO_2 from production in South America is likely higher than in New Zealand as *"marginal electricity here comes from thermal generations. We are 80 per cent renewable excluding electricity, with electricity about 85 per cent."*

3.2.4 Aluminium production in Southland is utilising a high proportion of inputs from energy producers

The EITE business in the fabricated metal product manufacturing sector produces aluminium in the south of Southland. In Southland, around 29 per cent of EITE primary metal and metal product manufacturing input purchases come from either electricity transmission and distribution (15 per cent) and electricity generation and on-selling (14 per cent). Other significant domains of input purchasing include machinery wholesaling (five per cent) and material wholesaling (15 per cent). The most significant purchasers of EITE primary metal and metal product outputs include fabricated product manufacturing (38 per cent), primary metal and metal product manufacturing (23 per cent), and machinery manufacturing (16 per cent).

An executive from an aluminium smelter in Southland explained the upstream impacts of closing the plant would be felt intensely by contractors and trades people in the region, and engineering firms would be adversely affected by the closure. In the executive's view, there were limited alternatives in the region for engineering consultants and tradespeople currently supplying services to the smelter. Downstream, the executive advised that the smelter supplies four aluminium extruders in New Zealand. These extruders generally make products for the residential and commercial construction sectors. He also noted that the smelter is the only smelter currently producing "ultra-high purity aluminium using hydro energy." Japanese computer hardware manufacturers rely on ultra-high purity aluminium to produce hard drives and other forms of computer memory[17]. Disruption in the supply of aluminium could, therefore, lead to disruption in the supply of computer technology globally.

3.2.5 Electricity generation and on-selling comprises a large proportion of steel production inputs in Auckland

The EITE business in the fabricated metal product manufacturing sector produces steel in South Auckland. Most EITE primary metal and metal product manufacturing business inputs in Auckland come from electricity generation and on-selling. Machinery and equipment wholesaling (eight per cent) and primary metal and metal product manufacturing (seven per cent) are other significant domains of input purchases. The most significant downstream purchasers of primary metal and metal products in the Auckland region include businesses from the fabricated metal product manufacturing sector (40 per cent) and machinery manufacturing (14 per cent).

An executive of a steel mill in Auckland noted that a significant domain of inputs come from mines, many of which are owned by the mill. Downstream, he noted that steel products from the mill are supplied to companies in New Zealand making steel tubing and other fabricated steel products, as well as businesses in the construction sector. If steel manufacture were to cease in Auckland, downstream sectors would most likely source steel imports from Australia. While significant volumes of steel are manufactured in South-East Asia, it often does not meet required quality standards for further fabrication and use within New Zealand.

3.2.6 Oil and gas inputs comprise more than half of inputs into methanol production in Taranaki

The EITE business in the basic chemical and polymer manufacturing sector is a producer of methanol. 53 per cent of upstream purchases by this sector in Taranaki come from the oil and gas extraction sector, and a further 15 per cent come from gas and water supply, highlighting the degree of interdependence between EITE businesses and energy producers. Concurrently, most downstream outputs are sold to other businesses in the basic chemical and polymer manufacturing sector (27 per

[17] https://www.sakaial.co.jp/english/products/0005/

cent), with significant proportions going to the dairy sector (11 per cent) and oil and gas extraction (eight per cent).

Insights provided by a methanol producing executive in Taranaki advised there are limited downstream impacts from his business in New Zealand, as most of the methanol is exported.

3.2.7 Fertiliser and pesticide manufacturing in Taranaki provides a large proportion of outputs to the dairy farming sector

Most inputs to fertiliser and pesticide manufacturing firms in Taranaki come from other firms in the same sector (52 per cent). Other significant domains of inputs come from material wholesaling (13 per cent) and road transport (six per cent). Outputs from the EITE business producing fertiliser in Taranaki are purchased by other fertiliser and pesticide manufacturing firms (35 per cent), dairy farming (32 per cent), oil and gas extraction (14 per cent) and sheep, beef, and grain farming (seven per cent). Altogether, this suggests that primary food production in Taranaki is, in part, sustained by fertiliser and pesticide manufacturing in the region.

An executive from a Taranaki-based fertiliser manufacturer advised that they are a large buyer of gas, noting that the business is reliant on "affordable or more affordable and internationally competitive gas prices". The upstream impact for gas suppliers is a steady and consistent demand for gas, which would be lost if his business were to cease production in New Zealand. Gas suppliers benefit from a steady and consistent demand for their product, ensuring stable revenues and financial predictability. If the business ceases production, gas suppliers would lose a significant and reliable customer, leading to potential revenue declines.

3.2.8 Road transport inputs comprise a significant proportion of gold mining inputs in Otago

The EITE gold mining business in Otago is the same as those operating in Waikato. As in Waikato, the outputs of this business are exported in their entirety, as such there are no direct output-related interdependencies with other sectors in Otago to describe. Proportions of inputs to metal ore and mineral mining companies in Otago are from sources broadly similar to those in Waikato:

- Road transport (17 per cent)
- Rental and hiring services (12 per cent)
- Scientific, architectural, and engineering services (seven per cent)
- Construction services (six per cent)
- Fabricated mental product manufacturing (six per cent).

Insights provided by a team of executives at an EITE gold mining firm in Otago confirmed that extracted gold ore is exported in entirety to Australia to be processed. Consequently, their downstream impacts are not directly felt in New Zealand. Executives advised that the most significant upstream impacts would be felt by engineers, scaffolders, and other trades people who are regularly contracted to carry out work at the mine site.

3.2.9 Cement production in Northland receives a high proportion of inputs from road transport firms, while providing outputs mainly to the residential building construction sector

The non-metallic mineral product manufacturing EITE business in Northland produces cement. Firms in this sector receive inputs from other non-metallic mineral product manufacturing firms in the region (14 per cent) and road transport firms (12 per cent). Downstream, 23 per cent of non-metallic mineral product manufacturing outputs are used as inputs for the residential building construction sector, and a further 22 per cent are used as inputs for construction services, 12 per cent for heavy and civil engineering construction, and nine per cent for non-residential building construction. In other words, the outputs of mineral product manufacturing in Northland help sustain housing, commercial, and infrastructure construction projects in the region and nationally.

During an interview with a team of executives at a Northland-based EITE cement manufacturer, we were advised that cement manufactured in New Zealand has considerably lower rates of associated CO_2 output (14 to 20 per cent), compared to alternatives from South-East Asia, where lower alternate thermal fuel usage and high proportions of fossil fuelled electrical generation leads to much higher output of CO2 emissions. The executives advised that most cement produced in New Zealand is used domestically, with approximately 20 to 50 thousand tonnes, out of a total of 800 to 900 thousand tonnes being exported (mostly to Pacific Islands). As such, if cement manufacture in Northland were to cease, the New Zealand construction sector would become more reliant on cement imports, thereby increasing the likelihood of carbon leakage and leaving the sector vulnerable to supply chain shocks.

3.2.10 Forestry and logging provide over a quarter of inputs to the pulp, paper, and converted paper product manufacturing sector in Hawke's Bay

Like the pulp, paper, and converted paper product manufacturing sector in Waikato, the sector in Hawke's Bay receives the greatest proportion of its inputs from the forestry and logging sector (26 per cent) and the wood product manufacturing sector (six per cent). The highest proportion of outputs from the pulp, paper, and converted paper product manufacturing sector in Hawke's Bay go to other firms in the same sector (35 per cent). Outputs also support various domains of the food production sector including beverage and tobacco manufacture (11 per cent), horticulture and fruit growing (eight per cent), meat and meat product manufacturing (five per cent), and fruit, oil, cereal, and other food product manufacturing (five per cent).

Case study: Economic shocks expose key interdependencies between businesses

Pan Pac Products Limited is a Japanese-owned, integrated forestry and timber products business. The company is located at Whirinaki, near Napier, and has cutting rights over 33,000 hectares of plantation forests across five regions of Hawke's Bay. The business produces pulp (850 tonnes of BCTMP[18] daily) and lumber.

Cyclone Gabrielle (2023) incapacitated the Whirinaki site

Figure 1: Pan Pac Whirinaki site the day after Cyclone Gabrielle

Source: New Zealand Herald

Two metres of silt and water poured into the site, flooding key electrical systems, controls, and power distribution equipment. The plant was not operational for several months, with the chip mill becoming operational again during August and September of 2023, six months after the incident. In January of 2024, the sawmill was running again at about 50 per cent capacity. The full suite of kilns used to dry wood after it has been through the sawmill are not yet fully operational.

Employment at the site was maintained. Pan Pac created an employee skills matrix, which helped identify where and how employees could contribute to the site's recovery.

Local sawmills were impacted by Pan Pac's temporary closure

Pan Pac source high volumes of woodchip from four different sawmills in the Hawke's Bay region. Prior to the cyclone, these sawmills were reliant on the revenue from supplying Pan Pac. During its closure, Pan Pac was unable to accept inputs of woodchip from these firms, threatening their financial sustainability. Interestingly, these firms demonstrated a strong degree of resilience by establishing a small woodchip export business as a consortium, to ensure the continuation of their revenue streams while their primary customer recovered from the cyclone damage[19].

Potential downstream impacts were small compared to exports, but still significant from a consumer perspective

Even though around 95 per cent of Pan Pac's outputs are exported to overseas markets, some domestic outputs are used as inputs to a business in the Bay of Plenty that manufactures toilet paper and tissue paper. Although these products might not be considered as fundamental to New Zealand's strategic resilience, the COVID-19 pandemic exposed how fragile the supply of these products can be.

[18] Bleached Chemi-Thermomechanical Pulp

[19] Interestingly, this is an example of a dynamic scenario which cannot be captured by I/O tables, highlighting the limitations of our analysis.

4. An overview of approaches to supporting EITE businesses in New Zealand and other jurisdictions

In this section, we provide an overview of policy mechanisms in New Zealand and other jurisdictions. This is not an exhaustive review of all relevant policy, nor is it an evaluation of relevant policy. Instead, this section is intended to initiate a discourse that feeds into subsequent policy discussions and analysis. We have focused on comparator jurisdictions of Australia, Canada, European Union, and the USA. This means we have not focused on other jurisdictions that have made significant investments in green technologies, such as China. A comprehensive review of relevant international policy will need to investigate these jurisdictions.

Many jurisdictions have enacted regulation to support EITE businesses whilst also supporting their respective emissions reductions plans. A significant unintended consequence of emissions pricing is this could force businesses to close or reduce capacity, to the point where production moves overseas where there is higher emissions intensity, a complication known as carbon leakage (Castalia Strategic Advisors, 2019). Carbon leakage is widely recognised in international regulation, and thus significant consideration is given to EITE businesses to allow them to continue to operate sustainably.

Mechanisms to mitigate carbon leakage are often built into ETS schemes. At present, five cities, 25 provinces and states, 13 countries, and the EU have implemented emissions trading (ICAP, 2024). Table 16 below outlines specific initiatives to support the decarbonisation of EITE businesses across various relevant jurisdictions. The initiatives in scope across these jurisdictions are those that pertain specifically to EITE businesses, or would extend to only EITE businesses, by the nature of their initiative.

Table 16: Comparison of policy initiatives across jurisdictions

Jurisdiction	Free industrial allocations for EITEs	Tariff on imports of products at risk of carbon leakage	Incentives for RD&D and shifts to alternatives
Australia	✓	✓	✓
Canada	✓		✓
European Union	✓	✓	
USA	In some states		✓
New Zealand	✓		

Australia seemingly has amongst the most robust initiatives in place to support EITE businesses and their decarbonisation goals. Moreover, while there may be challenges in implementing EITE-focused initiatives due to differences between state-level and federal legislation, there are other policies and initiatives that inadvertently support EITE businesses such as the Inflation Reduction Act.

On a policy-basis, it appears that EITE businesses in New Zealand are not as well supported as in other comparable jurisdictions.

4.1 New Zealand

New Zealand's Emissions Reduction Plan (ERP) contains policies and strategies aimed at decarbonising every sector of the economy. New Zealand is using a series of emissions budgets to meet its 2050 emission target. Three of these budgets were published in 2022:

- 2022-2025
- 2026-2030; and
- 2031-2035

4.1.1 Emissions budgets

Emissions budgets account for the total quantity of emissions permitted to be released during the budget period. Budgets act as interim targets to reaching 2025 targets, which include:

- Net zero greenhouse gas emissions (except for biogenic methane)
- A 24- 27 per cent reduction in biogenic methane

Table 17: Summary of emissions budgets

Budget period	2022-25	2026-30	2031-35
All gases, net (AR5)	290 Mt CO2e	305 Mt CO2e	240 Mt CO2e
Annual average	72.5 Mt CO2e	61 Mt CO2e	48 Mt CO2e

Source: https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/emissions-reductions/emissions-budgets-and-the-emissions-reduction-plan/

4.1.2 Emissions trading scheme

The Emissions Trading Scheme (ETS) is a cornerstone of the ERP, which seeks to drive reductions in emissions in the energy and industry sectors (which includes EITE businesses). The ETS aims to reduce emissions via three key mechanisms:

- requiring businesses to measure and report on greenhouse gas emissions
- requiring businesses to surrender one 'emissions unit' to the government for each tonne emissions they emit; and
- limiting the number of emissions units available to emitting businesses.

The government sets and reduces the units supplied into the scheme over time. This limits the volume of emissions businesses can emit in line with New Zealand's overall emissions targets. ETS participants can trade units with one another. The price of units allows businesses to make efficient choices about emissions reduction initiatives.

4.1.2.1 Industrial allocations

Industrial allocations are units given to businesses conducting activities which are impacted by the ETS. Their purpose is to mitigate impacts and ensure the economy is not unfairly affected by the ETS. Businesses eligible for allocations are those in the EITE category – their processes are energy intensive, meaning the cost of their production may cost more because of the ETS, but their ability to pass this cost on to their customers is constrained due to the level of international competition from overseas firms who do not face the same, or similar, constraints.

4.2 Australia

Australia joins a number of jurisdictions in setting greenhouse gas emissions reduction targets. Australia's goals are to reach 43 per cent below 2005 levels by 2030, and net zero emissions by 2050. To ensure emissions reduction whilst also addressing carbon leakage, an emissions trading scheme through Australian Carbon Credit Units (ACCUs) are managed by the Safeguard mechanism (ICAP, n.d.).

4.2.1 Safeguard Mechanism

The Safeguard Mechanism reforms apply to certain EITE facilities to safeguard against carbon leakage. Facilities emitting more than 100,000 tonnes of carbon dioxide equivalent per annum are deemed safeguard facilities. The Safeguard Mechanism sets baselines on the net greenhouse gas emissions of safeguard facilities. There are currently 219 facilities in the following sectors (Clean Energy Regulator, 2024):

- Mining
- Manufacturing
- Transport
- Oil
- Gas
- Waste.

The Safeguard Mechanism is administered by the Clean Energy Regulator, who publishes information on safeguard facilities and their emissions.

If a facility does not exceed tits baseline,[20] it may be entitled to Safeguard Mechanism Credit Units (SMCs). Each SMC represents one tonne of CO_2 equivalent of emissions below a facility's respective baseline. SMCs are tradeable units, whereby facilities can either:

- sell them to other safeguard facilities
- surrender them to stay within their baseline
- retain them for future use, until 2030.

Facilities that exceed their baseline must manage their emissions by:

- surrendering Australian carbon credit units (ACCUs) or SMCs
- applying to become a trade-exposed baseline-adjusted (TEBA) facility

[20] i.e., if a facility keeps emissions below baseline for a financial year or keeps net emissions below net baseline for a multi-year monitoring period.

- applying to borrow baseline from the subsequent financial year
- applying for a multi-year monitoring period.

TEBA facilities

TEBA facilities receive a discounted baseline decline rate for up to three years. While emissions decline rates are 4.9 per cent for other safeguard facilities, decline rates are as low as one per cent for TEBA facilities.

- Non-manufacturing facilities must show that they meet the lower threshold of a cost impact metric based on revenue. They may be eligible for a decline rate as low as two per cent.
- Manufacturing facilities must show that they meet the lower threshold of a cost impact metric based on earnings before interest and tax (EBIT). They may be eligible for a decline rate as low as one per cent.

4.2.2 Powering the regions fund

The Australian Government supports the decarbonisation of existing industries through the Powering the Regions Fund (PRF). The PRF encompasses grants of $500,000 to $50,000,000 to EITE facilities to reduce their emissions and contribute to emissions reductions targets. The grants cover up to 50 per cent of eligible project expenditure for EITE facilities that are not new or expanded coal or gas production facilities. The objectives of this grant are to:

- support EITE facilities covered by the Safeguard Mechanism to reduce their emissions and contribute to meeting 2030 and 2050 emissions reductions targets
- reduce the risk of carbon leakage
- provide skills development to existing industrial workforce in new equipment and processes that contribute to the reduction of scope one "direct" emissions.[21]

4.3 Canada

Canada has enacted several policy initiatives to incentivise decarbonisation and reach its emissions reductions targets of 40 per cent below 2005 levels by 2030, and net-zero emissions by 2050. Canada has enacted carbon pricing, from $20 per tonne in 2019, eventually rising to $170 per tonne in 2030 (Government of Canada, 2022). Canadian EITE industries may also be "subsidised" from a carbon reduction stand-point through the "output-based pricing system", or its provincial equivalent where applicable. In these systems, an industry average baseline gets set and emissions above need to be covered through the purchase of carbon units at this price. But if emissions are below, one may receive the delta in carbon units and trade it for the equivalent value.

[21] These are emissions such as emissions from refrigerants, emissions from fuels used in transport, and fugitive emissions (methane leaks from coal mines, production of electricity by burning coal).

4.3.1 Economy-wide support

An economy-wide initiative that supports EITE business decarbonisation is through heavy incentives to move to low carbon fuel alternatives. Clean Fuel Regulations increase incentives for the development and adoption of clean fuels, technologies, and processes, whilst requiring fossil fuel suppliers to reduce carbon intensity from fuels produced and sold in Canada over a period of time. These regulations are supported by CAD$1.5bn from the Clean Fuel Fund to increase support for domestic production and adoption of low carbon fuels (Government of Canada, 2022). The Clean Fuel Regulations are complemented by initiatives such as the Hydrogen Strategy and the Energy Innovation Programme, which provides annual grants to fund advancement in clean energy technologies.

4.3.2 Sectoral initiatives

There are a number of initiatives in place that support EITE businesses in the various sectors in Canada. Similar to Canada's economy-wide initiatives, many of these initiatives incentivise shifts towards lower carbon-intensive alternatives. Table 18 below highlights the initiatives that have been and are soon to be implemented to support EITE businesses and the broader economy of emissions-intensive industries.

Table 18: Decarbonisation initiatives for EITE businesses in Canada.

Sector	Initiatives
Heavy industry (mining; manufacture of steel, cement and chemicals)	• Launched the $8 billion Strategic Innovation Fund – Net Zero Accelerator to support the decarbonisation of Canada's largest industrial emitters through adoption of clean technology. • Proposed in Budget 2021 to reduce by half the general corporate and small business income tax rates for businesses that manufacture zero-emission technologies. • Launched the $155 million Clean Growth Program in 2017 to invest in clean technology research, development, and demonstration in Canadian energy, mining, and forestry sectors.
Building	New key actions • Develop a Low Carbon Building Materials Innovation Hub to drive further research, building code reform, and demonstration activities, all promoting the use of lower carbon construction materials (e.g., wood, steel, cement, etc.) in the built environment. • Develop regulatory standards, and an incentive framework to support the transition of fossil-fuels for heating systems. • Develop an approach to require EnerGuide labelling of homes at the time of sale, and design a complementary Climate Adaptation Home Rating Program. • Launch a new Net Zero Building Code Acceleration Fund to accelerate adoption and implementation of the highest performance tiers of the national model energy codes, incentivising stakeholder participation while

Sector	Initiatives
	addressing persistent challenges in Canada's codes system and paving the way to a code for alterations for existing buildings. • Improve federal capacity and technical support to provinces, territories and key stakeholders for the development and adoption of net zero emission codes, and alteration to existing buildings codes. • Develop an approach to increase the climate resilience of the built environment.
Electricity	• Accelerated the phase-out of coal, implemented natural gas regulations and put a price on carbon pollution. • Funded several programs to meet the rising demand for clean electricity including the $964 million Smart Renewable Electrification Pathways Program, the $99 million Smart Grids program and the $200 million Emerging Renewable Power Program. • Launched the Small Modular Reactors (SMR) Action Plan to advance the potential of using this technology as a way to reduce emissions. New key actions: Investment in emerging technologies such as geothermal, tidal, SMRs, carbon capture and storage, and electricity storage. This investment comes in the form of: • $600 million to the Smart Renewables and Electrification Pathways Program to support additional renewable electricity and grid modernization projects • $250 million to support predevelopment work of large clean electricity projects, in collaboration with provinces, through the Electricity Predevelopment Program • $2.4 million for the creation of the Pan-Canadian Grid Council to provide external advice to the Government of Canada to promote clean electricity infrastructure investments.
Oil and gas	• Established federal regulations requiring the oil and gas sector to reduce methane emissions by 40-45% below 2012 levels by 2025. • Proposed Clean Fuel Regulations will reduce the carbon intensity of liquid fossil fuels, including reducing emissions from oil and gas production. • Launched the $750 million Emissions Reduction Fund (ERF) – Onshore Program to support oil and gas companies to invest in green solutions. • Launched the Energy Innovation Program (EIP) that includes the Canadian Emissions Reduction Innovation Network to accelerate development, validation and deployment of clean technologies, and the Carbon Capture Utilisation, and Storage (CCSU) Stream to advance CCUS technologies. • Developing an investment tax credit for capital invested in carbon capture, utilisation, and storage (CCUS) projects to encourage the development and deployment of CCUS technologies. New key actions: • Capping emissions: the Government of Canada is committed to cap and cut emissions from the oil and gas sector at the pace and scale needed to get to net zero by 2050.

Sector	Initiatives
	• Advancing carbon capture, storage and utilisation (CCUS): the Government of Canada is supporting development of CCUS technology and working to provide policy certainty to facilitate the development and deployment of this technology. • Eliminating subsidies for fossil fuels: developing a plan to phase-out public financing for the fossil fuel sector, including by federal Crown corporations.
Transportation	• $400 million in additional funding for ZEV charging stations, in support of the Government's objective of adding 50,000 ZEV chargers to Canada's network. • $199.6 million to retrofit large trucks currently on the road.
Agriculture	• Launched the $3 billion, five-year, Canadian Agricultural Partnership, cost-shared with provinces and territories, that supports on-farm environmental stewardship programs. • Launched the $165.7 million Agriculture Clean Technology Program to support development and adoption of clean technology. • Established the $385 million Agricultural Climate Solutions Fund to support farming practices that tackle climate change. • Committed to set a national fertiliser emission reduction target of 30% below 2020 levels by 2030.

Source: Government of Canada, retrieved from canada.ca

According to Mani et al. (2024), EITE businesses in Canada are largely concentrated in the heavy industry sector. The authors find that the cost of using renewable energy alternatives is becoming more viable. For example, cost of solar panels and wind turbines have significantly reduced in recent history. Utility-scale battery storage is also improving and becoming affordable.

Mani et al. (2024) develop a technological roadmap that identifies the pathways to decarbonising EITEs, and finds that EITE businesses in the aluminium, mining, cement, pulp and paper, and oil and gas sectors are well placed to achieve substantial or complete decarbonisation following the initiatives put in place.

4.4 European Union

The effect of carbon pricing on the competitiveness of EITEs with foreign emissions-intensive businesses that have weaker regulation is featured heavily in EU policy (Fragkos & Fragkiadakis, 2022). As such, the Carbon Border Adjustment Mechanism (CBAM) aims to prevent carbon leakage by imposing a tariff on imported goods produced by emissions-intensive industries (Ernst & Young, 2023).

4.4.1 Carbon Border Adjustment Mechanism

The Carbon Border Adjustment Mechanism (CBAM) is being gradually phased in since its adoption in 2023, and there are no financial penalties in place during the transition period. The Ernst & Young (2023) report outlines implications on multinational corporations' supply chain as businesses begin to

understand the composition of their emissions. The CBAM is expected to accelerate efforts in other countries to introduce similar initiatives which could have a lasting impact on markets such as Australia and New Zealand.

Under the CBAM definitive regime (effective from 2026), EU importers of goods captured by the CBAM must register with national authorities where they are entitled to purchase CBAM certificates. The price of the certificate varies by the weekly average auction price of EU ETS allowances. Importers must declare the emissions embedded in imports and surrender the corresponding number of certificates each year.

During its transitional phase, the CBAM is applied to imports of goods whose production is most at risk of carbon leakage: cement, iron and steel, aluminium, fertilisers, electricity, and hydrogen; it captures more than half of the emissions in ETS sectors (European Commission, n.d.-b). During this period, importers of goods in scope only have to report greenhouse gas emissions embedded in imports. Indirect emissions in certain sectors, such as cement and fertilisers, will be covered in scope under the definitive regime.

4.4.2 Allocation to industrial installations

The provision of free allowances limits costs for industries participating in the EU ETS in relation to competitors operating outside of the EU, i.e. to mitigate the risk of carbon leakage (European Commission, n.d.-a). Free allocation in phase four of this initiative (effective 2021-2030) sees the prolonging of the system of free allocations with a revising of the rules. There is added focus on sectors at the highest risk of reallocating production outside of the EU; these sectors will receive 100 per cent of allowances for free. Less exposed sectors currently receive 30 per cent of allowances for free, with this being phased out in 2026. The list of EITE sectors was developed at NACE-4 level and is dependent on factors such as exports, imports, market size, gross value added and emissions intensity. Sectors with large volumes of exports, imports and emissions intensity are likely to be classified as EITE sectors, while sectors with a significant EU market size and larger gross value added are not as likely to be classified as EITE sectors.

4.5 United States of America

The American industrial sector, producing chemicals, electronics, machinery, steel, metals, textiles and other products, roughly accounts for a third of the USA's energy-related emissions. The USA has ambitions to achieve net-zero greenhouse gas emissions by 2050 (U.S. Department of Energy, n.d.).

4.5.1 Industrial Decarbonisation Roadmap

The roadmap identifies the five most emissions-intensive industries: iron and steel, cement and concrete, food and beverage, chemical manufacturing, and petroleum refining. These industries account for over half of industrial sector emissions, and about 15 per cent of US emissions. To achieve the net-zero target, the roadmap highlights the key actions that can be taken by the various industries.

Table 19: Actions by emissions-intensive industries to reduce emissions

Sector	Key actions
Chemical manufacturing	• Develop low thermal budget process heating solutions and improve the effectiveness of thermal energy use to increase energy efficiency of whole systems. • Expand advanced reactions, catalysts, and reactor systems to improve reaction performance in addition to reducing carbon emissions and improving energy efficiency. • Electrify processes and use hydrogen, biomass, or waste as fuel and feedstocks for manufacturing. • Improve materials efficiency and increase materials circularity.
Petroleum refining	• Improve energy efficiency both in processes and on-site steam and power generation. • Lower the carbon footprint of energy sources and feedstocks by using lower-carbon fossil energy and introducing low-fossil carbon sources such as nuclear heat and electricity, clean electricity, clean hydrogen, or biofuels.
Iron and steel	• Transition to low-and no-carbon fuels and expand industrial electrification. • Pilot demonstrations for transformative technologies such as hydrogen-steel production, electrolysis of iron ore, and carbon capture and utilisation storage. • Improve materials efficiency and increase materials circularity.
Food and beverage	• Improve energy efficiency by advancing the electrification of process heating, evaporation, and pasteurisation processes. • Reduce food waste throughout the supply chain through methods identified in life cycle assessments and collaboration between manufacturers. • Pursue recycling and material efficiency through alternative packaging and package waste reduction.
Cement	• Evolve existing processes to reduce waste, including circular economy approaches for concrete construction. • Improve materials and energy efficiency with deployment of breakthrough technologies and innovative chemistry solutions. • Expand use of carbon capture, utilisation, and storage technologies. • Increase use low carbon binding materials and natural supplementary cementitious materials to lower the carbon-intensity of clinker and solid materials used to create cement.

Source: US Department of Energy, retrieved from energy.gov

4.5.2 Carbon pricing

Some states in the US have implemented regional or state-level ETS, allowing businesses to trade emissions.

California Cap-and-Trade

The California Cap-and-Trade programme is a tracking system for allocation, auction, distribution, and trading of compliance instruments. This initiative covers around 75 per cent of California's greenhouse gas emissions.

Under the Cap-and-Trade programme, industrial facilities receive free allowances to minimise carbon leakage. The number of allowances are determined by product-specific benchmarks, production volumes, a cap adjustment factor and an assistance factor based on an assessment of leakage risk (International Carbon Action Partnership, n.d.).

Regional Greenhouse Gas Initiative (RGGI) Cap-and-Trade

The RGGI Cap-and-Trade initiative is a market-based effort among the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont to cap and reduce CO_2 emissions from the power sector (RGGI, 2024).

5. Policy considerations to support economic resilience and enable just transitions in the event of change

Here, we identify and discuss considerations for policy in New Zealand, including consideration for potential diversification in EITE businesses to support economic resilience in the short, medium, and long term. This section has been informed primarily by our discussions with EITE business executives and is intended to create discourse around subsequent policy development and analysis. It serves as a first word on policy in this area, rather than the final.

An important finding from our discussion with EITE business executives is that there is an appetite across the board for bespoke policymaking, in which each EITE business negotiates individual policy agreements with the government. The policy considerations we present here do not necessarily reflect the policy aspirations of individual EITE businesses, but instead aim to capture the overarching sentiment of what policy should seek to achieve if it wishes to support the economic resilience of EITE firms in New Zealand. We have taken the opportunity when interviewing EITE executives for this work to gain their insights into policy perspectives. This means the discussion of policy in this section needs to be balanced with alternative perspectives when subsequent policy analysis is conducted.

5.1 Regulatory stability to attract investment in new technology

Mirroring a key finding from stage one of this work, EITE business executives and other stakeholders highlighted the importance of regulatory stability in aiding EITE businesses to diversify into lower carbon technologies. When asked about regulatory instability, EITE business executives explained that potential resetting of the ETS baseline made it difficult to attract capital investments for carbon-reducing technologies.

5.2 Promoting the uptake of green technologies and minimising carbon leakage

The objectives of promoting uptake of green technologies and minimising carbon leakage can be addressed with the same suite of policy considerations, set out below.

Allocation of grants to businesses that provide critical inputs to the rest of the economy to support EITE businesses on their decarbonisation journey, by co-funding decarbonisation projects. This could simultaneously support diversification and economic resilience by:

- sustaining manufacturing in New Zealand, while businesses transition
- ensuring an uninterrupted flow of locally produced critical inputs to the rest of the economy
- supporting the development of lower emissions critical inputs, such as steel or lime products
- promoting clean energy industries

- minimising the risk of carbon leakage by encouraging ongoing domestic manufacture, and disincentivising the shift of manufacture to jurisdictions with more emissions-intensive manufacturing practices.

Border tax adjustments (BTA) for trade exposed, emissions-intensive products like the Carbon Border Adjustment Mechanism in the European Union, aims to minimise carbon leakage by disincentivising EITE businesses from moving their production to jurisdictions with lower environmental standards to avoid higher costs associated with carbon pricing and emissions regulation. It can also ensure that EITE products manufactured in New Zealand can remain competitively priced in international markets, and that EITE businesses' market share is protected from foreign competitors not subject to the same environmental regulation. This protection can encourage EITEs to continue domestic operations, rather than relocating to jurisdictions with weaker environmental standards.

BTAs are often considered protectionist measures that disadvantage exports from other countries. Therefore, consideration is needed as to how BTAs might impact trade agreements, and trade relationships, between New Zealand and other countries. BTAs also come with a strong degree of administrative complexity, as robust systems are required for measuring and verifying carbon content in traded goods.

Output-based free allocation (OBFA) to mitigate the effects of carbon pricing can result in a reduction in compliance costs. An OBFA would provide EITE firms with a free allocation of emissions permits based on their level of output. This allocation reduces the direct costs associated with purchasing emissions permits. OBFA can disincentivise EITEs from relocating to other jurisdictions with weaker emissions standards, and therefore reduce the risk of carbon leakage. Moreover, a reduction in compliance costs may free up capital for investment in carbon reducing technologies.

Tax incentives for investment in green technologies may encourage EITEs to invest in green technologies, while disincentivising their closure or relation to other jurisdictions where carbon leakage becomes a risk. Incentive schemes, such as the Research and Development Tax Incentive scheme already exist, but are aimed at in-house R&D. A similar tax incentive for the adoption and integration of existing green technologies may be more befitting to EITE firms in New Zealand which have identified possible green alternatives but are uncertain of their commercial viability.

5.3 Reducing the carbon profile of EITE products manufactured in New Zealand

Reducing the carbon profile of EITE products manufactured could be achieved subsequent to adoption of green technologies. Adjacent to incentivising investment in green technologies could be **incentivising carbon capture and sequestration (CCS)**[22]. CCS technologies are intended to reduce net CO_2 emissions from fossil fuel-fired plants and other industrial sources. Other jurisdictions, such as the USA,[23] offer tax credits for CCS. A tax credit is paid to an industrial source for each metric ton of

[22] https://sgp.fas.org/crs/misc/R44902.pdf
[23] https://sgp.fas.org/crs/misc/IF11455.pdf

qualified CO_2 captured. To claim the credit, emissions must be measured at the point of capture and the point of disposal, injection, or other use. Again, this incentive could:

- reduce the net emissions for products manufactured by EITEs in New Zealand
- encourage continued manufacture in New Zealand, minimising risks of carbon leakage
- provide economic certainty for regional New Zealand.

5.4 Promote cluster development in the regions

Promoting cluster development in regions where EITE businesses operate could promote strategic resilience and long-term strategic resilience. Fostering a cluster around EITE businesses could be achieved via a range of mechanisms, such as:

- tax incentives
- workforce development programmes
- infrastructure development
- business incubators and accelerators.

The clustering of businesses upstream, downstream, and alongside EITE industries promotes supply chain integration. Instead of exporting products like aluminium for processing elsewhere, conducting value-adding processes within the same region as EITE firms maximises economic benefits the region receives. Clusters often exhibit supply chain resilience because disruption in one part of the supply chain can be identified and mitigated within the clusters. Businesses in a cluster can also collaborate to find alternative suppliers to minimise disruptions.

5.5 Promote economic resilience in the regions where EITE businesses operate

Our research indicates substantial economic impacts on regions if EITE businesses cease production in New Zealand. While maintaining EITE production in New Zealand is economically preferable, enhancing regional economic resilience is also crucial in case of the closure of EITE businesses. We identify four considerations of policy aimed at promoting economic resilience in the regions where EITE businesses operate:

- **Economic diversification grants:** Grants aimed at diversifying the regional economy. Funds can support initiatives that encourage the development of new industries or expand existing ones. By diversifying the economic base, regions become less vulnerable to downturns and shifts affecting EITE industries.
- **Skill development programmes:** Focusing on the development of local workforce skills and adaptability. Examples may include subsidised training in vocational education partnerships with local industries. Equipping workers with relevant skills lubricates the transition between industries emerging from economic diversification efforts.
- **Innovation and entrepreneurship hubs:** Hubs that provide physical spaces and support for start-ups, innovators, and entrepreneurs. Hubs are intended to foster idea exchange and a culture of innovation. Successful entrepreneurs can create new job opportunities and attract investment, which in turn promote regional economic resilience.

- **Regional investment incentives:** Incentives intended to attract investment to the region may include grants, tax breaks, or subsidised lending for businesses expanding or relocating to the region. By lowering the cost of investment and reducing financial risks, these incentives encourage businesses to establish or grow in the region, thereby stimulating economic activity and creating a more robust economic environment.

6. We recommend conducting a social impact assessment to fully comprehend how communities are affected by EITE businesses

In this report we have focused exclusively on the economic impacts of EITE businesses across the regional economies of Aotearoa New Zealand. These economic impacts have been framed as direct and indirect, GDP contributions and employment, as well as supply chain implications. We have not focused on the subsequent and associated social impacts arising from changes to regional economies. A social impact assessment would facilitate an examination of the social implications, changes in community dynamics, health, education, housing, and overall quality of life arising following the closure of EITE businesses across the country.

From this work, we suppose that communities in which EITE businesses operate could experience a period of outward migration to both domestic and international locales, as people seek alternative employment and economic opportunities if EITE businesses were to cease operation or reduce their production levels. Combining outward migratory flows with a sustained increase in unemployment may result in a suite of social impacts, such as increased deprivation and crime. There may also be significant cultural impacts, particularly as mana whenua leave their ancestral lands in pursuit of alternative opportunities.

To fully understand how economic impacts may manifest in the community, we recommend a social impact assessment be conducted. Understanding social impacts in communities where employees of EITE businesses reside is also a core to ensuring a just transition towards a low-emissions economy.

We imagine that this would be a boots-on-the-ground exercise, where researchers visit a sample of potentially affected communities to engage a broad range of stakeholders, including community members, social service providers, advocacy groups, and local iwi and Māori. A prioritisation sampling criterion, based on the extent of economic impacts, could be followed to determine which communities to include in the assessment. However, we suggest the Marsden Point refinery be included in a social impact assessment as an ex-post example of impacts of an EITE business closure.

References

Castalia Strategic Advisors. (2019). *Emissions Intensive Trade Exposed Businesses' Contribution to New Zealand's Low Emissions Economy*. https://businessnz.org.nz/wp-content/uploads/2022/07/EITE-Report-Final.pdf

Clean Energy Regulator. (2024). *Safeguard Mechanism*. https://cer.gov.au/schemes/safeguard-mechanism

Ernst & Young. (2023). *Carbon Pricing and the New Competitive Edge: The EU's Carbon Border Adjustment Mechanism and What it Means for Your Business*. https://www.ey.com/en_nz/sustainability/the-carbon-border-adjustment-mechanism

European Commission. (n.d.-a). *Allocation to Industrial Installations*. Retrieved 18 April 2024, from https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation/allocation-industrial-installations_en

European Commission. (n.d.-b). *Carbon Border Adjustment Mechanism*. Retrieved 18 April 2024, from https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en

Fragkos, P., & Fragkiadakis, K. (2022). Analyzing the Macro-Economic and Employment Implications of Ambitious Mitigation Pathways and Carbon Pricing. *Frontiers in Climate*, *4*. https://doi.org/10.3389/fclim.2022.785136

Government of Canada. (2022, July 12). *2030 Emissions Reduction Plan – Sector-by-sector Overview*. https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030/sector-overview.html

ICAP. (n.d.). *Australian Safeguard Mechanism*. Retrieved 22 April 2024, from https://icapcarbonaction.com/en/ets/australian-safeguard-mechanism

ICAP. (2024). *Emissions Trading Worldwide: Status Report 2024*. International Carbon Action Partnership. https://icapcarbonaction.com/system/files/document/240416_report_final.pdf

International Carbon Action Partnership. (n.d.). *USA - California Cap-and-Trade Program*. https://icapcarbonaction.com/system/files/ets_pdfs/icap-etsmap-factsheet-45.pdf

Mani, A., Budd, T., & Maine, E. (2024). Emissions-Intensive and Trade-Exposed Industries: Technological innovation and Climate Policy Solutions to Achieve Net-Zero Emissions by 2050. *RSC Sustainability*, *2*(4), Article 4. https://doi.org/10.1039/D3SU00335C

New Zealand Ministry of Foreign Affairs and Trade. (2024, February 9). *United States of America: Inflation Reduction Act - February 2024*. New Zealand Ministry of Foreign Affairs and Trade. https://www.mfat.govt.nz/en/trade/mfat-market-reports/united-states-of-america-inflation-reduction-act-february-2024

RGGI. (2024). *The Regional Greenhouse Gas Initiative*. https://www.rggi.org/

U.S. Department of Energy. (n.d.). *Industrial Decarbonization Roadmap*. https://www.energy.gov/industrial-technologies/doe-industrial-decarbonization-roadmap

Appendix A Regional EITE input and output transactions

Table 20: Waikato metal ore and mineral mining and quarrying inputs

ANSIC description	Proportion of purchased inputs (%)
Road transport	13%
Rental and hiring services (except real estate)	9%
Electricity generation and on-selling	7%
Construction services	6%
Scientific, architectural, and engineering services	6%

Table 21: Southland primary metal and metal product manufacturing inputs

ANSIC description	Proportion of purchased inputs (%)
Electricity transmission and distribution	15%
Basic material wholesaling	15%
Electricity generation and on-selling	14%
Machinery and equipment wholesaling	5%
Primary metal and metal product manufacturing	5%

Table 22: Southland primary metal and metal product manufacturing outputs

ANSIC description	Proportion of purchased outputs (%)
Fabricated metal product manufacturing	38%
Primary metal and metal product manufacturing	23%
Machinery manufacturing	16%
Sheep, beef cattle, and grain farming	4%
Residential building construction	3%

Table 23: Auckland primary metal and metal product manufacturing inputs

ANZSIC description	Proportion of purchased inputs (%)
Electricity generation and on-selling	17%
Basic material wholesaling	11%
Machinery and equipment wholesaling	8%
Primary metal and metal product manufacturing	7%
Scientific, architectural, and engineering services	5%

Table 24: Auckland primary metal and metal product manufacturing outputs

ANZSIC description	Proportion of purchased outputs (%)
Fabricated metal product manufacturing	40%
Machinery manufacturing	14%
Primary metal and metal product manufacturing	8%
Electronic and electrical equipment manufacturing	7%
Construction services	5%

Table 25: Taranaki basic chemical and polymer manufacturing inputs

ANZSIC description	Proportion of purchased inputs (%)
Oil and gas extraction	53%
Gas and water supply	15%
Electricity generation and on-selling	5%
Road transport	3%
Basic chemical and basic polymer manufacturing	3%

Table 26: Taranaki basic chemical and polymer manufacturing outputs

ANZSIC description	Proportion of purchased outputs (%)
Basic chemical and basic polymer manufacturing	27%
Dairy product manufacturing	11%

Oil and gas extraction	8%
Electronic and electrical equipment manufacturing	6%
Polymer product and rubber product manufacturing	5%

Table 27: Otago metal ore and mineral mining and quarrying inputs

ANZSIC description	Proportion of purchased inputs (%)
Road transport	17%
Rental and hiring services (except real estate)	12%
Scientific, architectural, and engineering services	7%
Construction services	6%
Fabricated metal product manufacturing	6%

Table 28: Waikato non-metallic mineral product manufacturing inputs

ANZSIC description	Proportion of purchased inputs (%)
Non-metallic mineral product manufacturing	11%
Road transport	10%
Metal ore and non-metallic mineral mining and quarrying	8%
Fabricated metal product manufacturing	6%
Electricity generation and on-selling	4%

Table 29: Waikato non-metallic mineral product manufacturing outputs

ANZSIC description	Proportion of purchased outputs (%)
Residential building construction	22%
Construction services	22%
Heavy and civil engineering construction	13%
Non-residential building construction	10%
Non-metallic mineral product manufacturing	7%

About Sapere

Sapere is one of the largest expert consulting firms in Australasia, and a leader in the provision of independent economic, forensic accounting and public policy services. We provide independent expert testimony, strategic advisory services, data analytics and other advice to Australasia's private sector corporate clients, major law firms, government agencies, and regulatory bodies.

'Sapere' comes from Latin (to be wise) and the phrase 'sapere aude' (dare to be wise). The phrase is associated with German philosopher Immanuel Kant, who promoted the use of reason as a tool of thought; an approach that underpins all Sapere's practice groups.

We build and maintain effective relationships as demonstrated by the volume of repeat work. Many of our experts have held leadership and senior management positions and are experienced in navigating complex relationships in government, industry, and academic settings.

We adopt a collaborative approach to our work and routinely partner with specialist firms in other fields, such as social research, IT design and architecture, and survey design. This enables us to deliver a comprehensive product and to ensure value for money.

For more information, please contact:

Preston Davies
Phone: +64 9 909 5822
Mobile: +64 21 412 102
Email: pdavies@thinkSapere.com

Wellington	Auckland	Sydney	Melbourne	Canberra	Perth
Level 9 1 Willeston Street PO Box 587 Wellington 6140	Level 20 151 Queen Street PO Box 2475 Shortland Street Auckland 1140	Level 18 135 King Street Sydney NSW 2000	Level 5 171 Collins Street Melbourne VIC 3000	GPO Box 252 Canberra City ACT 2601	PO Box 1210 Booragoon WA 6954
P +64 4 915 7590	P +64 9 909 5810	P +61 2 9234 0200	P +61 3 9005 1454	P +61 2 6100 6363	P+61 8 6186 1410

www.thinkSapere.com

independence, integrity and objectivity