Industry Insight.

Metallic and non-metallic mineral products manufacturing.

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Contents.

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Summary.

This report focuses on New Zealand's metallic and non-metallic minerals product sector, which is concerned with the manufacture of ferrous and non-ferrous metals and metal products, cement, ready-mix concrete and a diverse range of concrete products. It also refers to the manufacture of glass bottles and jars and the fabrication of flat glass products.

This sector is big by New Zealand's standards. In 2018, turnover stood at about $13bn representing just over 12% of total manufacturing sales. Metal and metal products accounted for about $10bn of this, while sales of cement, ready-mix concrete and concrete products added another $2.2bn. The manufacture of glass bottles and jars and the fabrication of imported flat glass contributed a further $1bn.

It also has many moving parts. Large firms, mostly foreign owned, tend to dominate upstream production, particularly of basic metal products and cement. By contrast, the many mid-sized and small firms that operate in this sector tend to focus on producing finished metal, glass and concrete products. Some vertical integration exists, especially in metals production where New Zealand's only basic steel producer manufactures several downstream products.

The fortunes of the sector are linked to economic activity and more specifically the performance of downstream industries. Key here is the construction industry, the biggest individual consumer of metal, glass, cement and concrete in New Zealand. Also important is the performance of the downstream manufacturing sector, which incorporates metals into its own products.

Performances here have been mixed. While activity in the construction industry in New Zealand has been buoyant and has helped to grow demand, the same cannot be said for downstream manufacturers who face an ongoing struggle trying to compete with increasingly competitive foreign product.

At its nub though, demand for metallic and non-metallic products is really a function of the many micro-factors that underpin selection choices. Traditionally these have tended to focus on things like relative prices, performance characteristics of competing products and the availability of supply. To a large extent that remains the case today, although increasingly how things are made and what impact they might have on the environment are becoming front-of-mind considerations.

Supplying into this market is challenging. Firms face high electricity costs, skilled labour shortages, and difficulties in accessing the raw materials that they need. Equipment is also prohibitively expensive, especially for the many smaller firms that operate in this sector.

If that weren't enough, they are also vulnerable to global commodity prices, something they have no control over. This affects the costs of their inputs and/or the prices they receive on their outputs. Not only do firms compete with each other within this paradigm, but they also face stiff competition from imports, which are making inroads into the local market. New materials that are being developed at an ever-quickening pace are likely to post a serious competitive threat to the sector in coming years.

At the same time, their counterparts overseas are investing hand over fist into new technologies that improve operational and supply chain efficiencies, minimise costs of production and improve levels of competitiveness. They are also using technologies such as big data and AI to develop insights about their customers' behaviour, identify new opportunities, and assess the risks that they might be exposed to. This is helping to inform decision making at all levels, strategic, tactical and operational.

By contrast the pace of adoption of new technologies in New Zealand has been glacial. Even then, it's really been limited to a handful of large firms. Many of the small firms that operate in this sector just don't have the resources to invest in the technology and machinery needed to remain competitive with offshore firms.

This lack of progress on the technology front might also reflect the nature of competition in New Zealand and our rather small and distant market.

Upstream manufacturing is dominated by large firms that are able use their proximity to the local market and shorter lead times to see off most of the competitive threat posed by imports. They effectively compete on an import parity basis, which in the case of metals, is linked to the global commodity price cycle. In this respect, they are price takers, whose profitability is determined by the ability to minimise unit costs of production by maximising volumes over their fixed cost structures.

Downstream metallic and non-metallic mineral product manufacturing is a different beast altogether. Large firms that operate in this space focus on minimising unit costs of production by maximising volumes over their fixed cost structures. They also seek to differentiate their product offerings through effective marketing and careful brand management, which enables them to charge a price premium.

There are also large downstream metallic and non-metallic mineral product manufacturers that produce to order. They compete on their ability to produce the right quantity and quality of products within specified timeframes, as per their customers specific requirements. The emphasis is not on minimising costs, although operational efficiencies are still important. Instead it is about working with their customers to deliver bespoke solutions, for which they can also charge a premium.

The same is true of the many small firms that operate in this sector, although they tend to be more niched, focusing on a narrower range of product/solutions with a defined geographic area. That's not to say all small firms do this – many still compete based on quantity, quality, and price. We think these are likely to struggle in the future.

Outlook.

Ongoing global uncertainties and a weaker outlook for the world's economy suggests that prices for metallic and non-metallic mineral products will soften over the coming year. This is especially so given the likelihood that supply, especially from China, is unlikely to adjust to a possible slowdown in global demand. The possibility of dumping cannot be discounted, and this should drive prices even lower.

At the same time, economic activity in New Zealand is set to weaken, although some relief is likely to come from a temporary pickup in house prices by late 2020. Importantly, construction activity, a key market for most of this sector's products, is booming at present, but growth is likely to top out soon.

Longer-term, we think that ongoing industrialisation in Asia should continue to drive global demand for materials. However, it's likely to be India rather than China that takes up the growth baton. This should put upward pressure on commodity prices.

Demand in New Zealand over the longer-term is also likely to remain positive, mainly because there is going to be a lot more people calling this place home. This will underpin demand for infrastructure, and by extension demand for metals, cement, ready-mix concrete and concrete products.

For firms that produce primary steel, aluminium and cement, a big chunk of their inputs and virtually all their outputs are globally traded commodities, so weaker prices in the near-term are likely to lower both their unit costs and revenues. However, revenues will be more affected than costs, some of which are denominated in New Zealand dollars. Consequently, profit is likely to come under pressure.

The longer term profitability of firms in New Zealand that produce primary metals, such as steel and aluminium, as well as cement, is likely to be determined by how efficiently they can push volume over their fixed cost structures. Those that can maximise economies of scale and improve operating efficiencies, perhaps through process improvements, should do better than those that don't.

Downstream processors that produce finished metal products made of steel and aluminium, fabricated glass, ready-mix concrete and concrete products are likely to benefit from lower input costs in the short-term. They are also likely to benefit from still elevated construction activity, although a possible weakening of ex-food manufacturing activity might stymie gains for some. All in all, the short-term prospects for downstream manufacturers look reasonably positive.

Longer term, we think that rapid technological change and intensifying environmental pressures will more than offset the impact of the positive economic factors that are likely to underpin demand for metallic and non-metallic mineral products.

The increasing use of big data and analytics, autonomous and collaborative robots, simulation models that replicate reality, Internet of Things (IoT), cloud computing, etc, are likely to become all consuming, resulting in massive changes to how we live, work and play. As smart cities/homes/workplaces increasingly become the norm, the focus on recycling, minimising waste, extending the useful life of existing products, and developing new materials will ramp up dramatically. The emergence of new materials is likely to result in falling demand for traditional metallic and non-metallic mineral products.

These technologies will also change the nature of how these products are made. Increasing levels of automation and functionality, the advent of pre-emptive maintenance and improvements in supply chain logistics are expected to result in greater operational efficiencies in the production process, improved profitability, and in the case of downstream manufacturers, increased competitiveness.

Keeping up though is likely to come at a cost – and a big one at that. New Zealand's large upstream product manufacturers with deep pockets are best positioned to take up the challenge, although there is no guarantee that they will make the investment required. What matters are the returns on investment, and if they don't stack up, there is every chance that these firms could close up shop in New Zealand.

For smaller manufacturers in New Zealand that are largely focused on producing to order, the impacts of technological change are likely to be even more dramatic. Simply put, most cannot afford the investment that is required, and so they will attempt to carry on as they always have done, manufacturing products to customer's exacting requirements and differentiating themselves on the advice that they are able to provide. In the past this has allowed them to extract a price premium.

However, there is a limit to which they can do this in an environment where technology is driving down prices. Indeed, as product prices start to tumble, offshore competitors are likely to become increasingly competitive in the local marketplace. Over time, this is likely to result in more manufacturing moving overseas, and a large chunk of processed product will have to be imported. Many local firms still involved in manufacturing will go out of business and those that remain will either be highly specialised niche players, or they will become design houses working with customers to develop solutions which will then be manufactured offshore.

Introducing the sector.

Defining the sector.

This report focuses on the manufacture of metal and non-metallic mineral products in New Zealand.

Metals and metal products.

More specifically, it looks at firms involved in the primary and secondary manufacture of metals and metal products, further classified as being ferrous or non-ferrous.

Ferrous metals refer to those that include iron, while metals that don't have an appreciable iron content are termed non-ferrous. Most non-ferrous metals and metal products produced in New Zealand are made of aluminium or some sort of aluminium alloy. The production of metal products made from copper, brass, lead, and zinc is tiny by comparison.

The **primary** manufacture of metals and metal products refers to the:

- Smelting and/or refining of ironsands to produce carbon and stainless steel products such as ingots, blooms, billets and slabs, and their conversion through rolling, forming and heat-treating activities, into primary shapes such as sheets, sections, bars and rods.
- Production of basic ferrous products by:
  - Casting of molten iron and steel products, mostly from recycled material; and
  - Cold drawing or hot rolling seamless or welded steel pipes/tubes or tube fittings.
- Smelting of alumina or the use of scrap material to produce aluminium and/or aluminium alloys, copper, silver, lead and zinc.
- Production of basic non-ferrous products by:
  - Casting of molten non-ferrous metals into moulds, mostly from recycled material; and
  - Hot or cold rolling, drawing or extruding.

The **secondary** manufacture of metal products refers to the:

- Cutting, hammering, pressing, rolling, squeezing, and other machining activities to produce finished or semi-finished metal products;
- Production of fabricated structural and architectural components of buildings or other structures, ranging from whole metal buildings, roofing, and guttering to doors, railings, window framing, stairways, and shower screens, etc;
- Production of metal containers, from boilers and tanks and other heavy gauge metal containers to light products such as bins, cans, drums, letter boxes, toolboxes, etc;
- Production of sheet metal product, not referred to above, including duct and chute sheet metal, eyelets, houseware, funnels, vehicle number plates, ventilators, etc; and the
- Production of spring and wire products, nuts, bolts, screws, rivets and a wide range of miscellaneous products. Also included is metal coating and finishing activities.

Non-metallic mineral products.

This report also refers to the manufacture and processing of products made from non-metallic minerals, such as sand, silica and aggregate.

Specifically, it refers to the **manufacture of glass products**, effectively glass bottles and containers that are produced primarily from recycled materials.

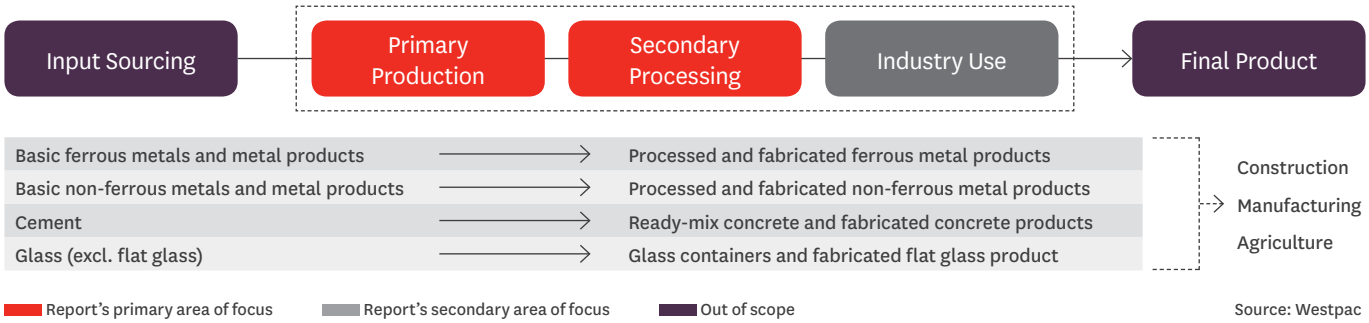
It also refers to the **fabrication of flat glass** that has been imported from overseas. New Zealand does not produce any flat glass on a commercial scale.

Fabrication or processing activities include:

- Cutting, smoothing, edgework, toughening, laminating, printing, etc, of flat glass, and the
- Production of double-glazed windows.

Finally, the report covers the manufacture of **cement** in New Zealand, as well as the downstream production of ready-mix concrete and a range of concrete products, which may incorporate reinforced metal products.

Figure 1: Scope of report



Source: Westpac

Sector size.

Summary.

As shown in Table 1 below, the metallic and non-metallic minerals product sector is large. With revenues of just over $13bn, it accounts for about 12% of all manufactured goods sold in New Zealand and contributes about 10% to total manufacturing value add.

Most of this is generated from sales to the building and construction industry, which accounts for almost all fabricated glass, ready-mix concrete and concrete products produced in New Zealand. It also accounts for about 50% of metals and metal products produced locally.

Metal and metal products are also used extensively by downstream manufacturers. Data from Stats NZ's 2013 Input-Output tables suggests, for example, that machinery and equipment manufacture accounts for about 22% of all steel consumed in New Zealand. Another 18% is used to produce a wide range of products that have a steel component in them, while a further 10% is used to manufacture electrical equipment (as opposed to machinery). Not having a motor vehicle assembly industry means that only about 3% of steel produced in New Zealand finds itself being used by transport equipment manufacture.

Most glass bottles produced in New Zealand are destined for the food and beverage manufacturing sector.

Metals and metal products manufacture.

Primary metal and metal product manufacturing – non-ferrous.

Table 2 below shows that local firms generated about $2bn from the production of primary non-ferrous metals and metal products in 2018. An estimated $1.3bn of this came from exports, just under 90% of which was in the form of aluminium products. Most of this went to countries in Asia, notably Japan and South Korea. Small amounts of copper, lead and zinc were also exported.

Firms producing primary non-ferrous metal products compete against imports. These amounted to about $0.5bn in 2018. About 40% of imports were primary aluminium products, while copper metal products made up another 30%. Small quantities of zinc, lead, nickel and tin were also imported by downstream fabricators.

Table 1: Summary of revenues, export, imports and local sales

Dimension	Metallic and non-metallic mineral products by type			
	Total ($bn)	Metals ($bn)	Glass ($bn)	Cementitious ($bn)
Revenues	13.3	10.1	1.0	2.2
Exports	2.2	2.2	~	~
Imports	3.1	2.5	0.4	0.2
Local sales	14.2	10.4	1.4	2.4

Source: Stats NZ, Annual Reports, Westpac. Note 1: Revenues are generated by both primary and downstream secondary manufacturers. They also include exports. Note 2: Local sales refer to revenues generated by local firms and imported products less exports. Note 3: ~ Values are either immaterial, do not apply or are just not available.

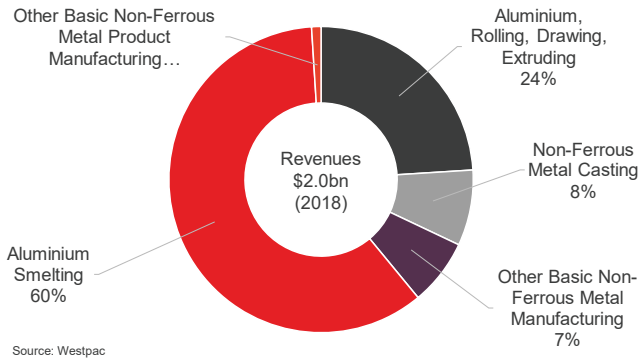
Table 2: Revenues, export, imports and local sales – ferrous and non-ferrous metals

	Sub sector	Revenues ($bn)	Exports ($bn)	Imports ($bn)	Local sales ($bn)
Metals manufacturing					
Primary metals and metal products	Non ferrous	2.0	1.3	0.5	1.2
	Ferrous	1.5	0.6	0.5	1.4
	Total	3.5	1.9	1.0	2.6
Secondary or processed metal products	Non ferrous	2.4	0.1	0.3	2.6
	Ferrous	4.2	0.2	1.2	5.2
	Total	6.6	0.3	1.5	7.8
Total ($bn)		**10.1**	**2.2**	**2.5**	**10.4**

Source: Stats NZ, Annual Reports, Westpac. Note 1: Local sales of primary manufactured products refer to products that are sold to downstream processors. For example, we estimate that $1.2bn of non-ferrous primary metal product was sold to downstream non-ferrous metal processors. Note 2: Local sales of secondary manufactured products refer to products sold to other manufacturers or to firms that supply to or operate in the building and construction industry. Note 3: Some processed metal products (particularly ferrous) are sold to concrete product manufacturers.

Primary metal and metal product manufacturing has a high export propensity.

Figure 2: Revenues by material type - primary non-ferrous metals manufacturing



Source: Westpac

Of the $2bn made from the primary manufacture of non-ferrous metals, about $1.2bn came from sales of aluminium products such as ingots and billets. A further $0.5bn came from sales of rolled, drawn and extruded aluminium product, while an estimated $0.3bn was generated from non-ferrous metals that had been cast, as well as other primary non-ferrous metals and metal product manufacturing.

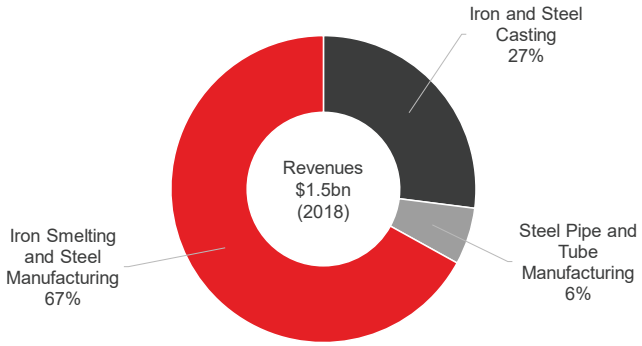
Globally, aluminium ranks 2nd by consumption volume among all metals, surpassed only by steel.

Primary metal and metal product manufacturing – ferrous.

Table 2 on the previous page also shows that local firms generated about $1.5bn from the manufacture of primary ferrous metals and metal products in 2018. About $0.6bn of this came from exports, mostly in the form of iron and steel ingots, billets and slabs. Over 30% of exports went to Australia for further processing, with other key markets being the US, Vietnam and South Korea. Manufacturers of basic steel products face significant competition from imports, which we estimate to be worth about $0.5bn.

Of the $1.5bn in total revenues generated from the manufacture of primary ferrous metals, about $1bn came from iron smelting and steel manufacturing activity, a further $0.4bn was generated from iron and steel casting, while the remaining $0.1bn was estimated to have come from basic steel pipe and tube manufacturing.

Figure 3: Revenues by material type – primary ferrous metals manufacturing



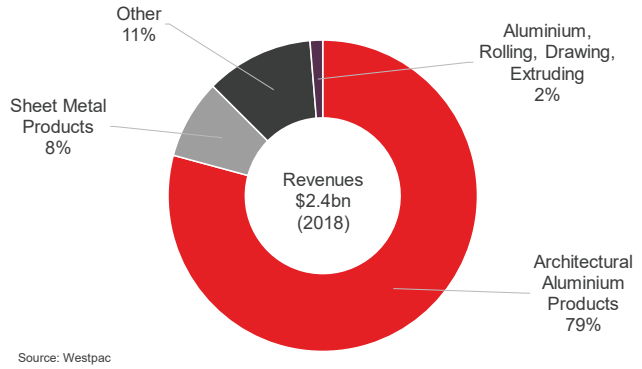
Source: Westpac

About 60% of primary ferrous metal and metal products manufactured locally or imported are consumed by local secondary processors.

Secondary metal and metal products manufacturing – non-ferrous.

Table 2 on the previous page also shows that revenues generated from the manufacture of processed non-ferrous metal products were in the region of $2.4bn in 2018. Most of this came from sales to local industry, mostly firms operating in or providing materials/products to the building and construction sector. Other major consuming industries include those in the broader manufacturing sector that use non-ferrous metals as a raw material input. Small amounts are also sold into the agricultural sector. Very little processed non-ferrous product is exported from New Zealand, while imports, mostly aluminium products, tend to be niche items.

Figure 4: Revenues by material type – secondary non-ferrous metal products manufacturing



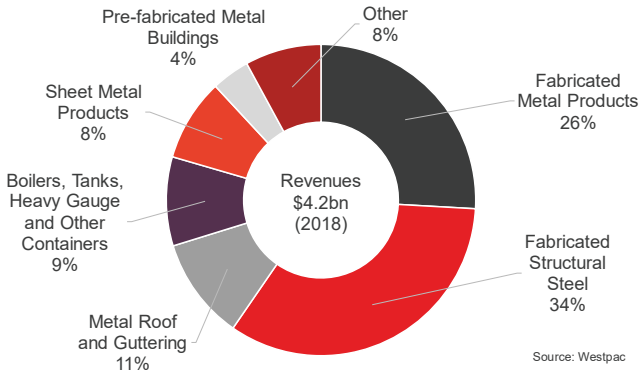
Source: Westpac

Downstream manufacturing of non-ferrous metal products is far less export orientated than its upstream supplier.

Processed metal and metal products manufacturing – ferrous metals.

Table 2 on the previous page shows that the manufacture of processed ferrous metal products generated revenue of about $4.2bn in 2018. Of this, about $1bn came from sales of fabricated structural steel, a further $0.5bn each was generated from metal roof/guttering and smelted iron, while about $2.2bn was estimated to having come from a diverse range of fabricated products, sold to downstream manufacturers.

Figure 5: Revenues by material type - secondary ferrous metal products manufacturing



Like non-ferrous products, exports are small, amounting to just $0.2bn in 2018, with the biggest contributors being structural steel, tubes and pipe fittings and miscellaneous articles.

Imports, however, were far more significant, accounting for a whopping $1.2bn. Major import items include screws, bolts and other fasteners, stoves, ranges and grates and other non-electrical appliances, as well as general iron and steel articles.

Glass product fabrication.

Glass and glass product manufacturing in New Zealand focuses on flat glass, which is typically used in windows, doors, balustrades, etc, as well as glass containers, which refer to bottles and jars, mostly from recycled materials.

There is no primary flat glass production in New Zealand. All flat glass that is fabricated in New Zealand is imported, mostly from Asia, Australia and Europe. As shown in Table 3 on the following page, flat glass fabrication, which involves activities such as cutting, smoothing, edgework, toughening, etc, is estimated to have generated revenues of just over $600m in 2018. Most fabricated flat glass products are sold to locally based window manufacturers, merchants and/or big box DIY stores.

We estimate that revenues generated from the sale of glass bottles and jars, produced mostly from recycled glass at a single production site south of Auckland, were in the region of $250m in 2018.

Very little flat glass, empty bottles and jars are exported.

Cement, ready mix concrete production and fabricated concrete products manufacture.

Table 4: Revenues, export, imports and local sales = cement and concrete

As shown in Table 4 on the following page, the manufacture of cement, which is produced at a single manufacturing plant just south of Whangarei, was worth about $400m in 2018. About half of that again was imported by New Zealand's largest importer and distributor. Of the total $600m that was sold locally, about $400m worth of cement was purchased by ready-mix concrete manufacturers, who mix the cement with aggregate and other binding materials, while the remaining $200m was generated from sales to firms that manufacture concrete products, such as precast concrete, masonry, pipes and tiles.

Sales of ready-mix concrete products to downstream firms supplying and/or operating in the building and construction sector amounted to about $1.0bn in 2018. Concrete product sales were estimated to be in the region of $800m.

Concrete products often include other materials such as reinforcing steel, which can be the largest individual material cost item.

Table 3: Revenues, export, imports and local sales – glass manufacture & fabrication

	Sub sector	Revenues ($bn)	Exports ($bn)	Imports ($bn)	Local sales ($bn)
Glass manufacturing					
Primary glass products	Flat glass	~	~	0.3	0.3
	Recycled glass	0.1	~	~	0.1
	Total	0.1	~	0.3	0.4
Processed glass products	Flat glass	0.6	~	~	0.7
	Recycled glass	0.2	~	0.1	0.3
	Total	0.9	~	0.1	1.0
Total ($bn)		**1.0**	**~**	**0.4**	**1.4**

Source: Stats NZ, Annual Reports, Westpac. Note 1: ~ Values are either immaterial, do not apply or are just not available. Note 2: Local sales of primary glass refers to domestically recycled glass and imported flat glass which is sold to glass fabricators. Note 3: Local sales of processed glass refer to bottles sold to beverage manufacturers or fabricated flat glass which is sold to building contractors.

Table 4: Revenues, export, imports and local sales – cement and concrete

	Sub sector	Revenues ($bn)	Exports ($bn)	Imports ($bn)	Local sales ($bn)
Cementitious product manufacturing					
Primary cementitious products	Cement (primary)	0.4	~	0.2	0.6
Processed cementitious products	Concrete ready-mix	1.0	~	~	1.0
	Concrete products	0.8	~	~	0.8
Total ($bn)		**2.2**	**~**	**0.2**	**2.4**

Source: Stats NZ, Annual Reports, Westpac. Note 1: ~ Values are either largely immaterial, do not apply or are just not available. Note 2: Local sales refers to cement sold directly to end consumers, to ready-mix concrete manufacturers or firms that manufacture concrete products.

Shape of the sector.

Primary metal and metal products manufacturing.

Most primary metal and metal products in New Zealand are manufactured by large, foreign owed firms.

New Zealand Steel (NZ Steel), a subsidiary of Australian based steelmaker Bluescope, is New Zealand's only producer of primary steel product, while New Zealand Aluminium Smelter (NZAS), a subsidiary of Rio Tinto and Japan's Sumitomo Chemical Company, produces high purity aluminium ingots and billets from imported alumina and domestically sourced scrap material.

In addition, there are about 230 small firms that manufacture primary steel and aluminium products, using recycled scrap metal and/or basic metal products produced by NZ Steel or NZAS. These firms are involved in many activities, from the casting of molten metals to the hot rolling, cold rolling, drawing and/or extruding of primary metal product.

Refer to the Appendix at the end of this report for more detail.

Secondary or processed metal and metal product manufacturing.

There are about 2,800 firms that are involved in the secondary manufacture of metal and metal products in New Zealand. The largest of these is NZ Steel, which produces a range of flat and long steel products mostly destined for the construction sector, which it sells to a large number of downstream distributors and other value-add manufacturers, such Steel and Tube, Vulcan Steel, and Pacific Steel. NZ Steel also competes with many small firms, although these tend to have a much narrower regional and product focus.

Many small firms operating in this sub-sector are involved in activities such as machining, precision laser cutting, coating and fabricating. This includes firms that manufacture structural steel products as well as those that specialise in aluminium joinery for windows and doors. These smaller firms typically produce niche products within narrow regional markets according to order and as such do not compete head-on with the likes of NZ Steel. Indeed, they are much more likely to be customers, purchasing steel or aluminium directly from distributors. They also import primary metals, especially grades not readily found in New Zealand.

Refer to the Appendix at the end of this report for more detail.

Most basic metal and metal product producers are small firms that compete in specific geographic and/or niche product markets.

Cement manufacture, ready mix concrete production and fabricated concrete products.

Local cement production is dominated by Golden Bay Cement (GBC), which is a 100% owned subsidiary of Fletcher Building. GBC is New Zealand's only manufacturer of cement and is its largest supplier, having an estimated 55% share of local market sales. However, it also faces significant competition from imported cement brought in by Holcim NZ, which accounts for most of the remaining 45% of the market. Small quantities of cement are imported separately on a periodic basis.

Both Fletcher Building and Holcim NZ have significant interests in ready-mix concrete mixing plants and concrete product manufacturing facilities. Fletcher's concrete division is vertically integrated, covering not just GBC's cement production, but also supplies of aggregate and sand (Winstone Aggregates), ready-mix concrete (Firth) and manufactured concrete piping products (Humes).

Holcim NZ, meanwhile, has over 40 sites supplying cement, aggregates and sand, ready-mix concrete and lime products. It operates quarries in Auckland, Hawke's Bay and Wellington, as well as 33 ready-mix concrete plants through AML, a joint venture that it has with Allied Concrete.

By contrast, the downstream manufacture of ready-mix and concrete products is fragmented. According to Stats NZ, there are over 250 firms producing ready-mix concrete and concrete products.

Primary glass manufacture and flat glass fabrication.

Primary glass manufacturing in New Zealand is limited to O-I NZ, a US company that specialises in manufacturing a diverse range of glass packaging/containers, mostly from recycled glass. There is no flat glass production in New Zealand, and as such the country is totally reliant on imports.

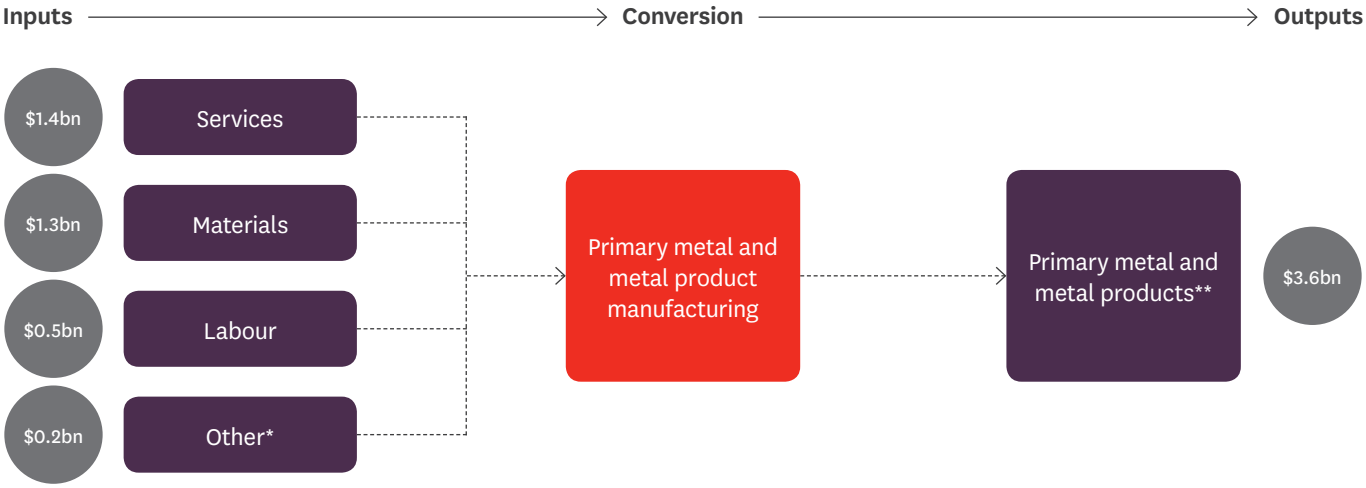
There are about 140 firms, employing over 2,200 staff, involved in glass fabrication in New Zealand. Primary activities include cutting, smoothing, edging, toughening and/or laminating glass. Some are also involved in producing double glazed glass units. The biggest of these is Metro Glass, which accounts for almost 50% of the market. Other notable players include Veridian Glass with an estimated market share of 25%. The remaining 25% is made up of many small firms. Architectural Profile Limited, a large firm that specialises in designing, developing and manufacturing windows and doors, has recently entered the market.

According to an industry source, these firms sell their products to New Zealand's many window manufacturers and glass merchants. They also sell to retailers and big box DIY chains. Some provide value-added services, ranging from window fabrication and installation, to site glazing, residential retrofitting, and commercial fit out.

Value chain model.

The value chain describes the range of activities that are required to bring a product from conception, through the intermediary phases of production, and delivery to final consumers.

Figure 6: Simplified value chain mapping of primary metal and metal products manufacturing



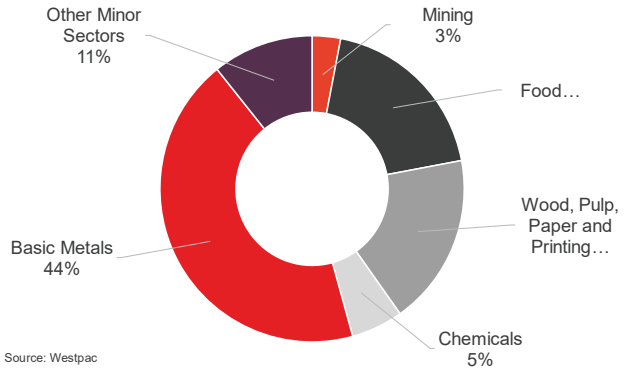
Note: Inputs and Outputs are shown in basic prices for the year ended March 2013. The basic price of an input or output is the monetary amount received by a supplier plus any subsidies received less any taxes payable. It excludes transport charges invoiced separately by a supplier. *"Other" refers to the depreciation of fixed assets. **Includes ferrous and non-ferrous metals.

Source: Stats NZ, Westpac

Primary metal and metals product manufacturing – ferrous and non-ferrous.

Figure 6 above summarises the value of inputs and outputs produced by primary producers of metal and metal products using basic price data from Stats NZ 2013 Input-Output tables. Because they are expressed in basic price terms, they exclude taxes payable, any subsidies received and transport charges that are invoiced. The Input-Output tables do not make a distinction between ferrous and non-ferrous metals.

Figure 7: Industrial electricity consumption by sub-sector



Source: Westpac

Manufacturers involved in producing primary metal and metal products spent about $1.4bn on services, about half of which was on electricity. The smelting of iron and alumina are energy intensive activities, with NZ Steel and NZAS laying claim to being among the largest industrial users of electricity in the country. The metals industry makes up just over 40% of industrial electricity consumption in New Zealand and about 16% overall.

Other major expenditure items include the $370m spent on services incidental to manufacturing and the $120m spent on transportation, mostly road transport. Primary metal and metal product manufacturers spent a further $133m on professional and technical services, ranging from architectural and engineering to management consultancy services. Maintenance and repair services also featured quite highly, while rental and leasing activity accounted for about $75m.

Primary metal and metal product manufacturers also spent about $450m on raw material inputs. These include metallurgical or coking coal, imported alumina (to produce aluminium) and ironsands (to produce iron ore). They purchased an additional $550m of raw materials inputs to manufacture a range of semi-finished rolled, drawn and/or extruded metal products. The industry also spent about $80m on a range of chemicals products.

Over three-quarters of material inputs for primary metal manufacturers are globally traded raw materials.

Labour costs incurred by primary metal and metal product manufactures are significant, amounting to just under $500m. Those employed are often highly skilled and are compensated accordingly. At last count, firms that manufacture primary metal and metal products employed about 4,650 workers, which is down from 6,300 ten years ago. The loss of jobs reflects difficulties in attracting workers and increased levels of automation.

Secondary metal and metals product manufacturing – ferrous and non-ferrous.

Figure 8 shows that firms involved in secondary processing of metal and metal products spent just under $800m on services, about a quarter of which was on professional and scientific services, with management consultancy services being the largest cost item. The cost of renting and leasing property and equipment was also substantial, accounting for about $200m, while services incidental to manufacturing cost about $120m. Transport costs, mostly road based, accounted for about $100m.

Firms operating in this sub-sector spent almost $2bn on raw material inputs, about $1.8bn of which was on basic metal products and other processed metal products. The remaining $200m was spent on a wide range of materials, about $70m of which was for glass and glass products.

The key material inputs used by secondary metal and metal products manufacturers are globally traded commodities.

Labour in this sub-sector is a big cost item, amounting to just under $1bn. Metal processors employ around 26,000 people but the average wage is a lot lower than for workers involved in primary metal and metal products manufacturing. Furthermore, firms involved in secondary processing of metal and metal products have also been taking on more workers, even though the number of firms has fallen from almost 3,500 in 2007 to 2,800 in 2018. Most of these gains have been in structural metal product manufacturing.

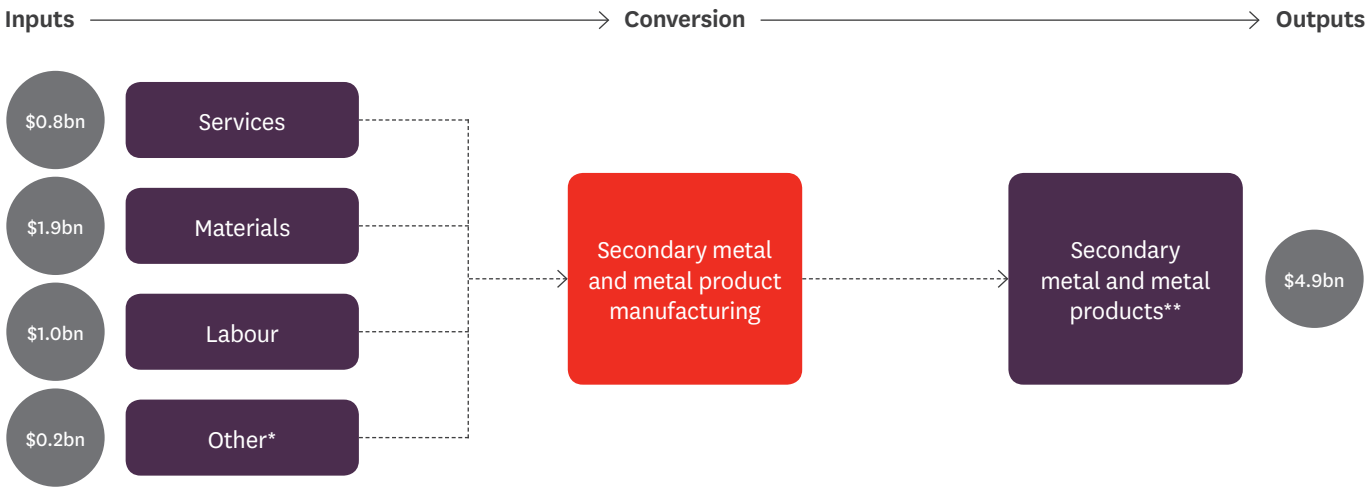
Non-metallic mineral product manufacturing.

Figure 9 shows that non-metallic mineral product manufacturers spent just over $600m on services. About $200m of this was spent on a range of professional and scientific services, while an additional $150m was spent on transport services, mostly road, but also some sea freight. A further $130m was spent on a range of professional services, from management consultancy to advertising, architectural and engineering services. Another $90m was spent on equipment maintenance.

Firms operating in this sub-sector spent just under $740m on materials. This includes $310m on glass and glass products, including recycled material, cement (used to produce concrete) and other articles of concrete and stone. Firms also spent about $80m on structural and fabricated metal products. Other material inputs costs include petrol, diesel, chemicals and plastic products, which together add up to just over $120m. Firms operating in this sub-sector also spent $150m on raw material inputs like coking coal, gypsum, limestone, cement and building stone.

Labour costs in this sub-sector are of a similar magnitude to those found in primary metal and metal products manufacturing. Most of this is incurred by the many small ready-mix concrete and concrete product producers, who collectively employ about 5,900 workers. By contrast, capital intensive cement production employs only about 200 workers.

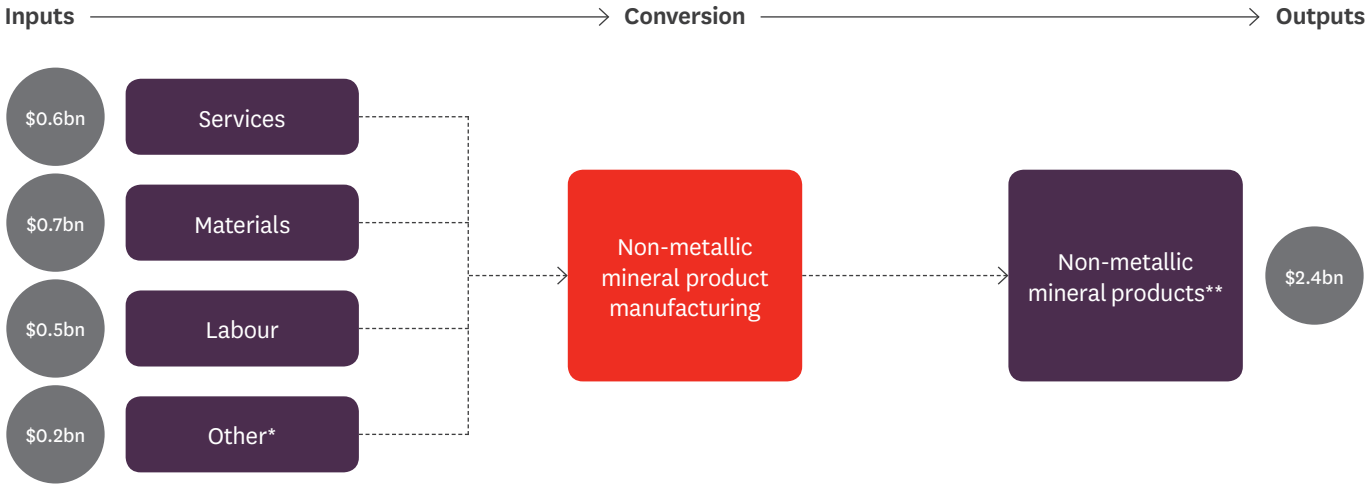
Figure 8: Simplified value chain mapping of the secondary metal and metal products industry



Note: Inputs and Outputs are shown in basic prices for the year ended March 2013. The basic price of an input or output is the monetary amount received by a supplier plus any subsidies received less any taxes payable. It excludes transport charges invoiced separately by a supplier. *"Other" refers to the depreciation of fixed assets. **Includes ferrous and non-ferrous metals.

Source: Stats NZ, Westpac

Figure 9: Simplified value chain mapping of non-metallic mineral product manufacturing



Note: Inputs and Outputs are shown in basic prices for the year ended March 2013. The basic price of an input or output is the monetary amount received by a supplier plus any subsidies received less any taxes payable. It excludes transport charges invoiced separately by a supplier. *"Other" refers to the depreciation of fixed assets. **Includes the manufacture of plaster and other non-metallic mineral product totalling an estimated $600m.

Source: Stats NZ, Westpac

Legislative and regulatory environment.

Firms are not subject to particularly onerous sector specific legislation. They are, however, subject to non-specific legislation and regulations that cover anything from health and safety, and environmental considerations to product and other quality standards.

Health and Safety at Work Act 2015.

The Health and Safety at Work Act 2015 (HSWA) is New Zealand's key work health and safety legislation. It is particularly relevant to metal and metal products manufacturing, which is seen as involving hazardous work. Industry operators are also required to monitor their own compliance with existing Occupational Health and Safety Management regulations or gain accreditation through adherence to international standards.

Industry sources suggest that there is a much stronger focus on health and safety requirements than there used to be, and enforcement activity has been ramped up. Some have complained that higher compliance costs are affecting their ability to compete with overseas products.

Failure to comply with Health and Safety regulations can result in significant fines.

In addition, firms are also required to comply with Hazardous Substance Regulations which set out the rules and controls relating to the safe handling of substances categorised as being hazardous. Every hazardous substance imported into or manufactured in New Zealand must be approved and be classified under the Hazardous Substances and New Organisms Act.

Other non-specific legislation that firms producing metal and non-metallic mineral products are subject to include the Building Act 2004, the Resource Management Act 2017, the Dangerous Goods Amendment Act 1964 and the Environmental Protection Authority Act of 2011.

Product standards.

Firms operating in this sector are required to comply with product and service standards specified by Standards New Zealand, which are specific to the products that they manufacture. Standards that apply in New Zealand are closely related to those found in Australia and similar jurisdictions. They are not regarded as being overly burdensome or placing the local industry at a competitive disadvantage.

As a rule, product/service quality standards have risen over time, meaning greater investment in machinery and equipment to ensure compliance.

That said, there have been incidents in the past where cheaper structural metal products, often of lower quality, have entered New Zealand, effectively undercutting higher-standard, but more expensive local product. Dumping is a particularly serious issue for the steel industry, which is vulnerable to imports of cheap, often sub-standard quality product manufactured in other countries.

The Trade (Anti-dumping and Countervailing Duties) Amendment Act 2017 enables the New Zealand authorities to apply anti-dumping and countervailing duties in accordance with World Trade Organisation rules. A recent complaint by NZ Steel against the dumping of cheap steel imports from China resulted in several investigations and court cases, before being rejected by MBIE.

Although not commonplace, there have been examples of local firms misrepresenting the products that they sell. A recent example was Steel and Tube, which pleaded guilty under the Fair Trading Act for making false representations about a steel mesh product it had sold.

Steel Fabrication Certification.

Steel Fabrication Certification (SFC) is an industry-led quality assurance scheme that is in line with best practice European standards. It was developed jointly by Steel Construction New Zealand (SCNZ) and the Heavy Engineering Research Association (HERA). According to an industry source, about 10% of structural steel fabricators have SFC, most of whom are the larger firms operating in this sector, but numbers are growing. SCNZ itself notes that 30 fabricators across New Zealand have achieved SFC, meaning that 86% of local industry output now meets best international practice.

SFC provides an important point of difference for local firms producing fabricated structural steel. Its introduction comes after several well publicised incidents where imported structural steel products from China were found to have been sub-standard.

Until its introduction, the compliance regime for structural steelwork relied mostly on self-inspection and self-certification. This approach was dependent on the expertise,

ethics and quality systems of the fabricator, as well as the knowledge and expertise of engineers and welding inspectors to assess if the steel supplied is compliant.

Under SFC, an independent auditing body, HERA Certification, has been established to audit and certify structural steel fabricators to ensure they have the welding and the fabrication quality management systems in place to consistently produce fully compliant steelwork. This includes having full traceability of materials from source to welding, painting and final installation.

SFC is a seal of quality and offers a competitive point of difference for firms that have been accredited.

SCNZ has also drawn up a checklist for importing steel. The checklist focuses on questions about the steel that is being imported, its fabrication, its welding, the welding inspection and coatings (which protect it from rust and fire). In addition, HERA has also released a 40-page steel procurement compliance guide.

Environmental.

In New Zealand, the Resource Management Act 2017 requires firms to manage the impact their activities have on the physical and natural environment. Firms that manufacture primary and secondary ferrous and non-ferrous products, cement, ready-mix concrete and concrete products, as well as glass bottles, must comply with the regulations that underpin the Act, especially those that govern the disposal of industrial waste, noise and emissions related to their operations.

The New Zealand's Environmental Protection Authority oversees the implementation of environmental regulations under the Resource Legislation Amendment Act 2017. It also holds power to penalise non-compliance.

Increasing compliance requirements are raising the costs of doing business, effectively undermining the ability of local manufacturers to compete with others in jurisdictions not affected by similar requirements.

Climate change.

Primary metals and cement production involve highly energy intensive activities that contribute to greenhouse gas emissions. While the industry has made progress on reducing emissions, further gains depend on the commercial viability of new technologies.

CO_2 emissions.

The manufacture of steel, aluminium, clinker (which is used to produce cement), and glass bottles involves energy intensive activities that produce significant emissions of CO_2. NZ Steel, NZAS, and GBC are among the seven biggest industrial emitters in New Zealand.

That said, the emission profiles of these New Zealand manufacturers are no worse than similar operations overseas. And in some cases, they are better. NZAS, for example, has halved its emissions by introducing low carbon smelting processes. Powered by renewable hydroelectricity, it has one of the lowest carbon footprints of any aluminium smelter in the world, emitting around 15 tonnes less CO_2 per tonne of aluminium produced than its coal-fired competitors.

Figure 10: Direct CO_2 intensity in iron and steel production - global

Similarly, GBC is said to emit 20% less CO_2 per unit of cement produced than competing products imported from overseas. NZ Steel, meanwhile, continues to make changes to its operations, with 60% of what is required to run the Glenbrook mill now coming from gasses and waste heat generated from the steelmaking process. Integrated plants like Glenbrook enable heat and energy generated in one unit to be reused in other units. They also allow for more efficient use of metal, scrap, and waste.

Historically, the primary driver for improving energy efficiencies and reducing emissions intensity was to keep down operating costs. At best, concern for the environment was a second priority. However, under pressure from government (and lobby groups), that mindset has begun to change, and firms are now actively looking at ways to reduce the impact of their operations on the environment.

For primary steel producers, reducing CO_2 emissions effectively means slashing the amount of coking coal they burn in their furnaces. The Glenbrook mill, for example, consumes 800k tonnes of coking coal per annum, with each tonne generating on average about 2¼ tonnes of CO_2 emissions. Alternative technologies such as hydrolysis and carbon capture exist, but these are not commercially viable at present.

Most big emitters like NZ Steel argue that there are no commercially viable technologies to replace existing high emitting manufacturing processes.

Emissions Trading Scheme (ETS).

NZAS, NZ Steel and GBC are participants in the New Zealand Emissions Trading Scheme (ETS), which is essentially a closed system which works off emission credits. In its purest form, emitters are required to pay for their emissions either by surrendering carbon credits or by making direct payments to the Government.

However, under current ETS rules, firms classified as being energy intensive and trade exposed (EITE) receive a free allocation of emission credits. Each firm's free allocation is proportional to its production of metal, cement etc. The free allocation is calculated using industry benchmarks for carbon emissions per unit of production. Firms that emit more per unit of production find that their free allocation covers a lower proportion of their actual emissions. These firms must purchase more emission credits from other participants in the ETS at a market determined price which they then surrender to the Government, or pay the Government directly $25 per tonne of emissions through a fixed price option. Firms that are less carbon-intensive find that their free allocation covers a high proportion of their actual emissions and have less need to purchase additional units.

This set-up gives firms an incentive to reduce their carbon footprint by reducing the emissions intensity of their production. However, it gives them no incentive to limit their carbon footprint by reducing production itself.

Across whole industries, the free allocations are equal to 60% or 90% of benchmarked emissions, depending on the emissions intensity of activities that they undertake. High emission intensive producers, such as NZAS, NZ Steel and GBC, receive an allocation that covers 90% of the emissions.

The price of emission credits is determined by the forces of supply and demand. There is no set limit on prices, although the fixed price option referred to above does currently act as a cap.

It's important to note that the free allocation also extends to indirect carbon emissions from purchased electricity. Under the ETS, firms like NZAS receive a free allocation equal to 90% of the benchmarked emissions from activities related to the generation of electricity which they have purchased. This is akin to a rebate, since electricity producers do pay for their emissions and this is reflected in the price of electricity.

The stated rationale for providing a free allocation to firms classified as EITE is two-fold.

Firstly, it is difficult for energy intensive firms to reduce their emissions given the current level of technology. New technologies are likely to provide the gains required, but at this moment they are too expensive and not commercially viable. An industry source suggested that using these new technologies would raise the cost of steel production by 20% to 30%, which effectively disincentivises firms to embrace them. However, this argument misses the point of an ETS, which is to promote activities which provide the biggest reduction in overall emissions.

Secondly, without free credits, these trade exposed firms would be at a competitive disadvantage when competing with imported products produced by firms in other countries that are not subject to the same ETS requirements. This could result in firms relocating to other countries that do not have similar climate change policies, which could lead to a rise in emissions worldwide.

The Government has announced a series of reforms to the ETS, including a gradual reduction in the free allocation of emission credits over time. The plan is to begin phasing down industrial allocations at 1% per year from 2021 to 2030, then at 2% from 2031 to 2040, and at 3% per year from 2041 to 2050. This suggests that by 2050, firms such as NZ Steel, NZAS and GBC will be still be receiving 30% of their credits for free. Indeed, it could be more, but that depends on recommendations made by the Climate Change Commission, which will be set up soon.

The industry has lobbied hard to maintain its protected status, arguing that if it had to pay fully for its emissions, it would effectively go out of business.

Associated with the above is the progress of the Climate Change Response Bill, commonly referred to as the "Zero Carbon Bill", which aims to ensure net zero emissions for most greenhouse gases by 2050. The Bill remains a source of concern to the metals and cement producing industries. NZ Steel, NZAS and GBC have been vocal critics of what is currently in the Bill, suggesting that it does not adequately recognise the fact that a large chunk of imported product which they have to compete against is unlikely to be subject to the same restrictions on carbon emissions.

NZ Steel has even gone as far as threatening to close its doors if the Bill progresses in its current form. This will not only result in a significant loss of jobs – about 5,000 people would be affected directly or indirectly, but also the elimination of steelmaking capacity in New Zealand.

Summary of competitive forces.

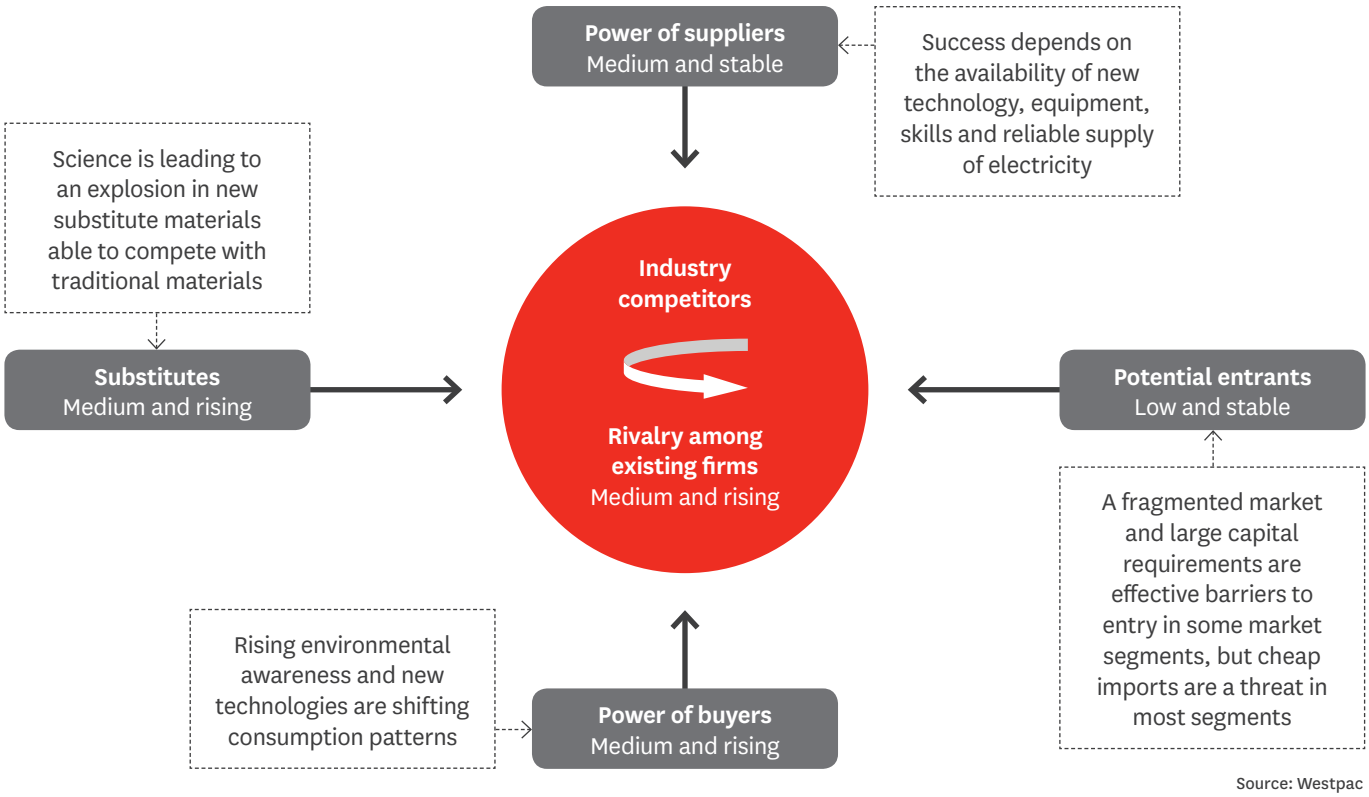
The competitive forces affecting the metallic and non-metallic minerals product sector are intensifying because of changing consumption patterns, increasing levels of environmental awareness, competition from foreign producers, and the rapid development of new substitute materials.

This sector has many moving parts. Large firms, mostly foreign owned, dominate upstream production, particularly of basic metal products and cement. They primarily compete against imports. Some of these firms are vertically integrated, manufacturing a range of branded downstream products, which are then sold through distribution networks that span the country. They compete head-on with smaller firms that manufacture a limited range of products for a smaller geographic market. In addition, there are many small to mid-sized firms that manufacture a diverse range of finished metal, glass and concrete products to customer order. They compete on their ability to produce differentiated products on budget and on time, for which they can extract a price premium.

Figure 11 below summarises the magnitude of the competitive forces shaping the metallic and non-metallic minerals product sector in New Zealand and provides a high-level assessment of where they are headed in the future. Specifically, it assesses where a competitive force currently has a "high", "medium" or "low" impact on firms in the sector and whether this impact will be "rising", "stable" or "falling" in the future.

The figure uses a framework developed by Professor Michael E Porter from Harvard Business School. It includes three forces that relate to "horizontal" competition: the threat of substitutes, which in this case refers to the threat posed by existing and new materials; the level of rivalry between firms; and the threat posed by new entrants that might be attracted to its growth potential. It also includes two other forces that relate to "vertical" competition: namely the relative negotiating position of those that supply inputs, ranging from raw materials and skilled labour to technology and electricity; and the bargaining power of customers, increasingly being influenced by new technologies and increased environmental awareness.

Figure 11: Porters 5-forces model for the metallic and non-metallic minerals product sector



Source: Westpac

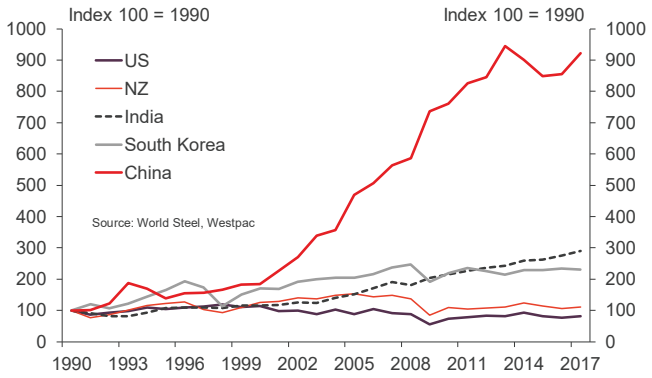
Factors that influence demand.

Demand is being shaped by factors such as levels of economic development, technological change and the shift towards a circular economy. However, in the short-term what really counts is the performance of consuming industries, and the many micro-factors that affect purchasing decisions.

Structural factors.

Economic development.

Figure 12: Per capita steel consumption by country

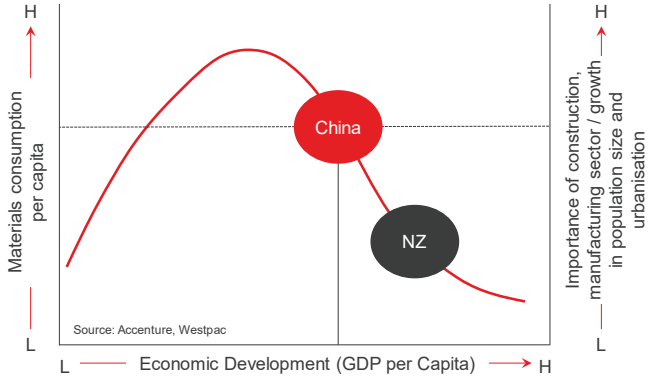


Demand for metallic and non-metallic mineral products is closely linked to stages of economic development. As a rule, demand grows more strongly for rapidly industrialising countries than for less developed agrarian economies or developed countries that have begun to de-industrialise, relying instead on an expanding services sector to drive economic prosperity.

This has certainly been true for China, where rapid industrialisation, massive rural-urban migration and accelerating income levels have been key factors driving demand for metallic and non-metallic mineral products in recent decades. Although lagging, India seems set to follow a similar path.

By contrast, in already developed Western countries, with settled urbanised populations and slowing income growth, per capita demand for metallic and non-metallic products has effectively flat-lined.

Figure 13: Consumption and economic development



The economic logic behind this is simple. At the outset, fast growing developing countries, with rapidly expanding middle classes and rapid rates of rural-urban migration, require physical capital to facilitate growth. This implies large-scale consumption of cement, ready-mix concrete, steel and aluminium to build housing, ports, roads, etc. However, once the main infrastructure has been built, incremental additions and maintenance work requires much less of these materials, so their consumption tends to fall. The now developed country can still grow, but rather through lighter, less tangible assets than continuous massive investment in bulky infrastructure.

The amount of steel required to generate one unit of GDP in New Zealand has been declining in recent years as the economy becomes increasingly service orientated.

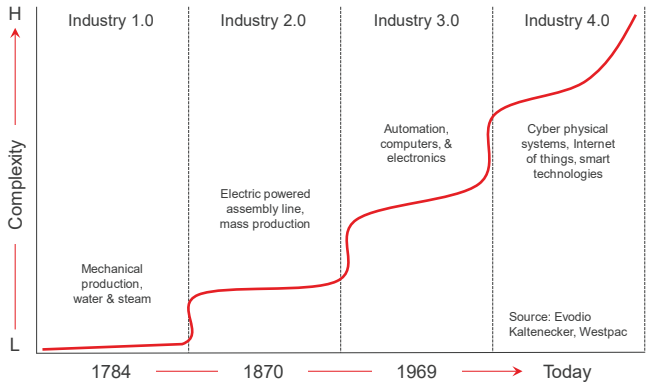
However, it not just the internal drivers referred to above that have underpinned demand for metallic and non-metallic mineral products in rapidly industrialising countries. External drivers have also been a factor. Indeed, much of the success enjoyed by these countries has been because of the low-cost nature of their manufacturing sectors and their ability to compete in export markets. Nowhere is this truer than in China, which has been able to leverage off massive economies of scale to become the world's biggest producer and exporter of manufactured goods. However, being able to satisfy export demand requires huge volumes of metallic and non-metallic mineral products, a big chunk of which has to be imported. This implies that much of China's demand for metallic and non-metallic mineral products is really a function of re-exports.

Technological change.

Emerging technologies that not only allow devices to communicate each other autonomously, but also make decisions, are changing the way we work, live and play, and this is having a knock-on effect on demand for metal and non-metallic mineral products.

However, the shift to smart cities, homes and workplaces (including factories), underpinned by 4th industrial revolution technologies such as big data analytics, robotics, simulation models, IoT, cloud computing, additive manufacturing (3-D printing) and augmented reality, has only just begun, so its impact on demand for metallic and non-metallic mineral products has so far been limited.

Figure 14: Industrial revolution pathway



But, as this shift gathers momentum, demand for end products that incorporate metallic and non-metallic mineral products is likely to be disrupted. Products that have short useful lives and cannot be recycled and/or reused will be weeded out, while those that can, will be actively promoted. To some extent, this is already happening with the emergence of the sharing economy. For example, the advent of driverless cars and car-sharing is capping demand for new vehicles, and as a result, components made of metal and glass.

However, the disruptive impact of technological change is likely to go much further, increasing demand for new materials that are not only price competitive, but also offer superior performance characteristics to traditional metallic and non-metallic mineral products. Increasing demand for these substitute materials can be expected to slow demand for manufactured goods that incorporate traditional metallic and non-metallic mineral products.

This dynamic is likely to be seen first in mature developed economies, although fast growing industrialising ones will soon follow. In New Zealand, it's likely that demand for substitute materials will be limited to niche products initially but become more broad-based over time.

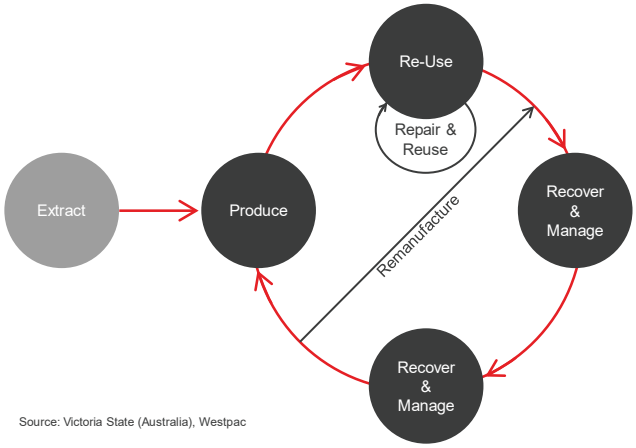
4th industrial revolution technologies are reducing the use intensity of steel, aluminium, cement and concrete products.

Circular economy.

The growing awareness of the adverse impacts that human activity are having on the environment is resulting in a pivot away from the historical linear models of consumption based on "take, make and dispose" towards ones that focus on recycling, keeping products and materials in use, and regenerating natural systems.

The shift to a circular economy, however, does not necessarily imply a reduction in demand for glass, steel or aluminium manufacturing. Each of these materials are 100% recyclable and can be repeatedly reused without any degradation in performance and so lend themselves to the circular economy.

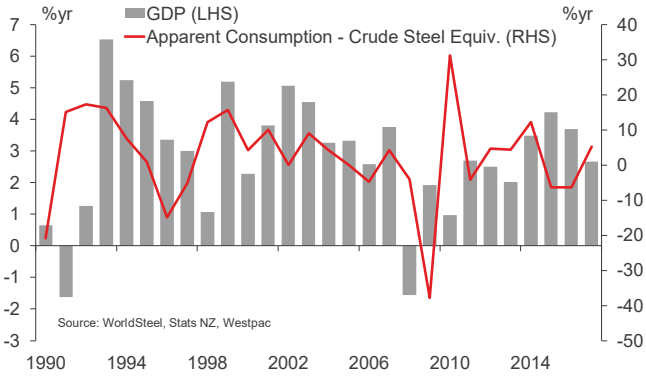
Figure 15: Circular economy cycle



Cyclical factors.

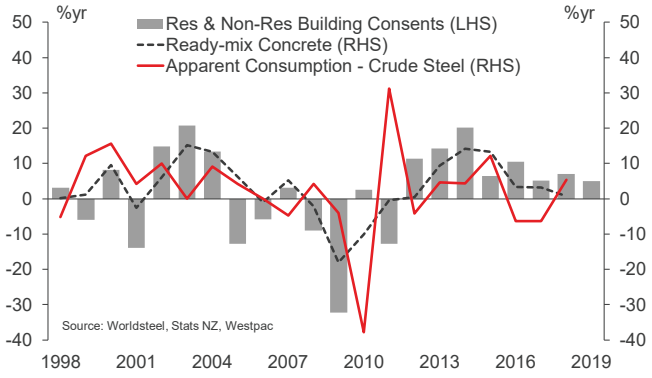
While stages of economic development, the impact of the 4th industrial revolution and the emergence of the circular economy might affect demand for metallic and non-metallic mineral products over the long-term, it is economic growth and activity levels in key downstream consuming industries that count in the short-term.

Figure 16: Economic growth vs steel consumption



In New Zealand, as is the case globally, the building and construction sector, encompassing residential, non-residential and civil construction activity, is by far the largest consumer of metallic and non-metallic mineral products. As mentioned earlier, we estimate that at least 50% of metals and metal products produced in New Zealand end up in the local building and construction industry, while the percentages for aluminium, fabricated flat glass, cement, ready-mix concrete and concrete products are likely to be even higher.

Figure 17: Construction activity vs steel and ready-mix concrete consumption



Factors underpinning activity in the building and construction sector are either structural or cyclical in nature.[1] Structural factors tend to focus on changes in the size and composition of New Zealand's population over time. Cyclical short-term drivers typically focus on changes in interest rates, disposable incomes, commercial and residential property prices, prevailing housing shortages and shifting migration patterns. In the case of civil construction activity, which is largely publicly funded, government policy and budgetary allocations loom large.

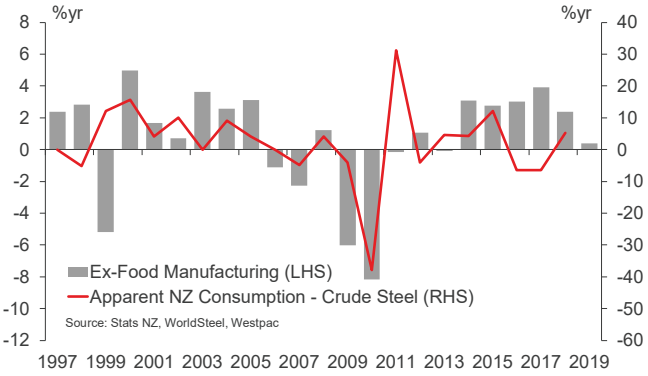
Figure 18: Construction activity vs steel consumption

Construction activity tends to be cyclical and this has knock-on effects for suppliers of metal products, cement and ready-mix concrete.

We expect many of these factors will support construction activity well into the future, although the pace of growth should ease as slowing net migration curbs population growth over time. This in turn should slow demand for metallic and non-metallic products, increasing competition between manufacturers, already under threat from imports.

Downstream manufacturing is also a major consumer of metallic and non-metallic mineral products. Most of the remaining 50% of metals and metal products that are not sold to the building and construction industry find their way into other manufactured goods, while bottles and jars are used by downstream manufacturers as a packaging material. Meanwhile, fabricated flat glass is used extensively to produce other value-added products, such as double-glazed window units, which are then sold to firms servicing the building and construction industry.

Figure 19: Non-food manufacturing vs steel consumption



Many of the factors that affect near-term building and construction activity also drive demand for manufactured goods. The extent to which this translates into demand for locally produced metal and metal products and fabricated flat glass, however, depends on whether local manufacturers can compete against offshore competition, both in the domestic as well as export market.

The evidence suggests that the competitiveness of local manufacturing has declined over time, and this has had negative consequences for growth in demand for metals, metal and flat glass products. Indeed, outside of food, manufacturing output growth has been patchy at best, growing by an average of 0.6% since the turn of the century. This compares to New Zealand's population, which grew by an average 1.3% per annum and per capita disposable income levels, which rose by 2% on average over the same period. In addition, the contribution of non-food manufacturing to overall economic activity has fallen from just under 9% at the turn of the century, to slightly more than 5% in 2019, while its contribution to exports has effectively halved to just 25%.

The inability of local ex-food manufacturing to compete against cheap imports has stifled demand for locally produced metal and metal products.

1 For more detail refer to: https://www.westpac.co.nz/assets/Business/Economic-Updates/2017/Bulletins-2017/Industry-Insight-Residential-Building-September-2017.pdf

For New Zealand's only glass bottling manufacturer, downstream demand for beverages is important. Structural demographic factors, such as population growth and age profiles as well as cyclical factors like changes in disposable income levels, customer preferences, and the relative prices of substitutes, for example, steel cans versus glass bottles, come into play. A significant proportion of beverages produced in New Zealand are exported, so economic conditions abroad can also be added to the list. As a rule, these factors have tended to support demand for glass products manufactured in New Zealand.

Decision making micro-drivers.

Ultimately though, demand for metallic and non-metallic mineral products depends on decisions that are made by individual consumers. Traditionally, factors to be considered included relative prices, performance characteristics and the availability of supply.

And if truth be told, that largely remains the case today.

For example, although aluminium is far more expensive than steel, it is often is used instead of steel in certain applications because of its low weight, high strength, superior ductility and excellent corrosion resistance. Similarly, stainless steel is often used in food manufacturing because it is easy to clean and promotes food safety. The same applies for fabricated flat glass products, which have replaced concrete in several structural building applications, despite being more expensive. This is especially true in new builds where specially engineered glass is routinely used to control internal temperatures while still providing protection against the elements.

Substitutability is a function of relative lifecycle costs and the performance characteristics of competing products.

Increasingly though, additional decision-making criteria are being considered. Indeed, an industry source has suggested that environmentally conscious consumers are increasingly looking at the relative impacts that manufacturing processes have on the environment when selecting metals and other substitute products. A key observation was that they tend to pick substitute products that at first glance might seem to have lower environmental impacts but often have higher impacts over the longer-term because it is more difficult and costly to extend their useful lifetimes.

Industry sources suggested that some end consumers are ill-informed about the environmental impact profiles of competing materials.

Natural events.

There are, of course, unforeseen disruptive factors such as natural disasters that can have a major impact on downstream demand for metals and non-metallic mineral products. The most obvious example is the rebuild of Christchurch post the 2011 earthquake. A 2017 Quake Centre report on reconstructing Christchurch examined the types of structural systems used during the reconstruction of the city, clearly identifying a shift away from concrete to structural steel. Some 88% of the buildings rebuilt in Christchurch are now made of structural steel.

Steel's versatility and the innovation of its producers and users have helped to establish steel as the material of choice particularly in energy, transportation and construction.

Factors that influence supply.

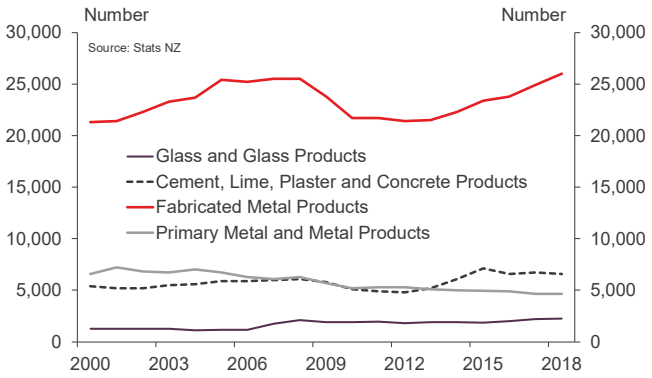
The correct quantity and quality of factor inputs, technology-driven improvements to materials and processes, and a better understanding of customers are driving the supply of metal and non-metallic mineral products in New Zealand.

Factor inputs.

The ability to address demand depends, in part, on having the correct quantity and quality of factors inputs, from having the right skilled labour, raw materials and scrap for recycling purposes to having a reliable supply of energy.

Labour.

Figure 20: Employment by sub-sector



The availability of skilled labour is a key supply side constraint, with many in the metallic and non-metallic minerals product sector indicating that they find it difficult to attract suitably qualified staff. This is despite employment being seemingly on the rise in this sub-sector.

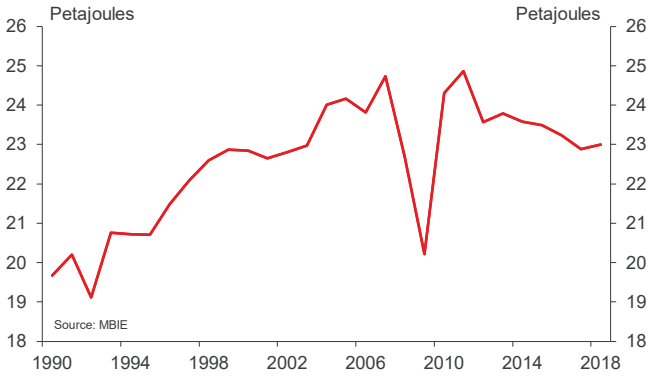
Industry sources suggested that even when they find suitable applicants for their apprenticeships, they often struggle to convince candidates that a career path in a trade is a viable option. In part this is because working conditions are often not the most appealing – workshops and factories are often noisy places, can be dirty, and the work can be physically demanding. An industry source also indicated that absenteeism is high, and this can affect the ability to meet production deadlines, especially for some of the smaller firms.

According to one industry source, past efforts to recruit from local schools have proved largely unsuccessful and indicated that they were now looking to be an accredited employer with the New Zealand Immigration service so that they could recruit skilled people from overseas on work visas. Other industry sources that are already accredited actively recruit workers from countries like China and the Philippines. Others confirmed a heavy reliance on foreign workers – one firm suggested that at least 75% of their staff had originally come from overseas but had been living in New Zealand for a while.

The workforce is ageing and skills from local sources are in short supply, which could mean consolidation in some sub-sectors, notably metals fabrication.

Energy.

Figure 21: Energy Consumption- primary metal manufacturing



Primary steel, aluminium and cement production are energy intensive activities. Firms that manufacture these products in New Zealand tend to be very sensitive to the availability, reliability and cost of electricity, which is deemed to be high by world standards. This is especially so for primary aluminium and steel producers who have a high exposure to globally determined commodity price movements for both their inputs and outputs.

The Tiwai Point aluminium smelter, for example, accounts for a whopping 13% of total electricity consumption in New Zealand just by itself. About 85% of this is produced from renewable resources produced at the Manapouri hydroelectric power station some 180km away. Until relatively recently, there had been a question mark over its viability, but a four year electricity deal struck with Meridian Energy in 2018 for an extra 50 MWh set at a contract price below market, and the subsequent re-opening of previously mothballed capacity, looks to have made its future more secure. The re-opening of the potline has increased production by about 85 tonnes of aluminium per day, which translates to a 9% increase in daily output. This agreement is separate to Meridian's main electricity agreement with NZAS which is to supply 572MWh until 2030.

But it's not just Tiwai Point that is sensitive to developments in the electricity sector. NZ Steel is also a big consumer, using

about the same amount of electricity as Wellington City each year. Its Glenwood mill consumes about 1.1 MWh per year, about 0.6MWH is consumed by the plant's two iron smelters. In the past, NZ Steel has made several submissions regarding proposed changes to electricity pricing, in some cases arguing that they threatened the profitability of its operations, increasing the likelihood of closure and significant job losses. This is despite its relatively low reliance on electricity from the national grid. Electricity only accounts for between 10-15% of energy use at its Glenwood mill, as much as 70% of which is generated from hot waste gas produced by its huge blast furnaces. Most of the mill's remaining energy needs come from natural gas sourced from Taranaki's natural gas fields.

Smaller metal product manufacturers, such as those involved in casting, machining and fabricating, are obviously not as big as users of electricity as Tiwai Point and NZ Steel and so are not able to extract the same favourable terms and conditions. An industry source suggested that smaller manufacturers can and do suffer significant production losses because of disruptions to electricity supply. These issues have prompted some to employ the services of aggregators which use the collective buying power of many firms to achieve better terms and conditions.

The affordability and reliability of key energy resources, including electricity, natural gas and coal, are essential to the industry's competitiveness.

Access to materials.

The primary manufacture of steel, aluminium and cement is dependent on having access to the right quantity and quality of raw materials, such as such iron ore (extracted from ironsand), alumina, clay, silica, sand, limestone, and aggregate.

For steelmaking, water is also a key resource. The Glenbrook mill requires up to 1m tonnes of water each day which it circulates through its steelmaking and finishing processes. Most of this is recycled and/or reused through captured stormwater. The mill also requires 20k tonnes of fresh water each day, which it sources from the nearby Waikato river. Water is also mixed with mined ironsand at the Waikato North Head mine so that it can be transported 18km by underground pipeline to the mill.

Most of the raw materials used by the sector are sourced locally, although alumina, the key ingredient for producing aluminium, is imported from Australia. Raw materials sourced locally are either mined by the firms themselves or purchased on long-term supply contracts from other firms that operate nearby quarries. NZ Steel, for example, operates under a 100-year permit to mine ironsands, for which it pays a royalty to the Government.

Most primary manufacturing plants tend to be situated near the source of raw materials. In part this reflects a need to have secure supplies – the primary manufacture of steel and cement is a volume driven activity that requires a continuous supply of raw materials of a specified quality. However, it also reflects the high cost of transport relative to the cost of raw materials used. Transporting large volumes of low-cost raw materials over long distances can significantly push up operating costs and reduce profitability.

Secondary manufacturing of metallic and non-metallic mineral products relies on the supply of products from primary manufacturers in New Zealand and/or similar imported products. Importing typically occurs when the type or grade of product required is not manufactured locally.

However, getting hold of imported products for further processing can be problematic.

An industry source in the stainless steel sub-sector, for example, indicated that the availability of imported product can become an issue during times of high global demand, especially when stainless steel manufacturers abroad focus on the needs of customers in bigger offshore markets.

There have also been examples in the past where some local manufacturers have imported cheap sub-standard metal product in order to secure business from downstream customers. On-time deliveries of ready-mix concrete because of capacity constraints has also been an issue.

An industry source in the glass fabrication industry indicated that having enough stock of glass on hand to meet spikes in demand was critical to the success of their business.

Recycling.

As mentioned above, a circular economy is one that focuses on recycling, reusing and regenerating natural systems.

For those in the metals and glass manufacturing/fabrication industries, being part of the circular economy has several benefits, including the conservation of raw materials through the minimisation of waste, reduced CO_2 emissions through lower energy use, less pressure on the environment caused by resource extraction, improved operating efficiencies, and increased levels of innovation.

Every tonne of steel that is recycled saves 1.5 tonnes of iron ore and reduces carbon emissions by 86%.

Currently about 740k tonnes of metal is recycled annually in New Zealand. According to the Scrap Metal Recycling Association of New Zealand, most new steel products made in New Zealand use at least 25% of scrap steel in their production. Scrap steel comes from a variety of sources ranging from offcuts generated by manufacturers to steel locked up in items that have come to the end of their useful life.

According to NZ Steel an average of 85% of the steel in New Zealand buildings is recovered for recycling. For steel packaging, that figure is around 68%.

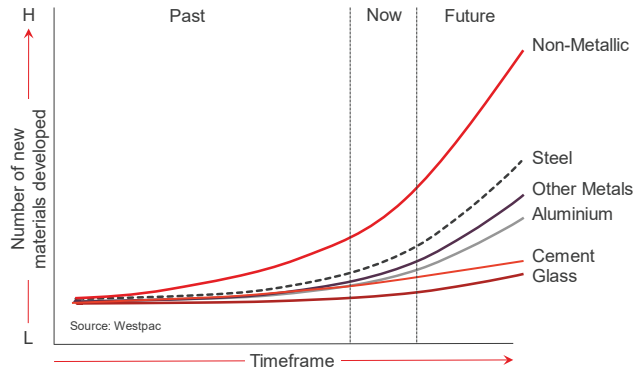
Similarly, about 90K tonnes of glass is recycled annually in New Zealand, while another 60k tonnes goes to landfill. The country's only glass bottle manufacturer uses about 70% recycled glass or cullet to produce new glass bottles and containers. Globally, over a ton of natural resources are saved for every ton of glass recycled. Energy costs drop about 2-3% for every 10% of cullet that is used in the manufacturing process.

Technology.

Technology is fundamentally changing the nature of supply, leading to the development of new materials, new production processes and new customer insights. Unfortunately, New Zealand seems to be lagging in many respects.

Materials science.

Figure 22: Materials development by type



Developing new materials is nothing new. According to the Word Steel Association there are over 3,500 grades of steel, ranging from carbon and alloy steels to stainless and tool steel, each of which encompasses unique physical, chemical and environmental properties. Some of the steels being manufactured today are six times stronger than those produced a decade ago. Similarly, there are many different grades of aluminium, glass and cement products, each with specific performance characteristics.

What is new is the increasingly rapid pace at which new materials are being developed.

Traditionally, the development of materials has been a slow, painstaking process, but by using new powerful simulation techniques, sophisticated machine learning algorithms and data sharing, scientists are now able to cut average development times from 20 years down to one or two.

This shortening of development times is leading to a proliferation of new non-metallic materials, which are increasingly competing with traditional steel, aluminium and other metallic products, disrupting end-markets in the process. For New Zealand's big metals and metallic products producers, the implications are clear. In the future, they are likely to face more competition from an expanding range of substitute products that will have as good if not better performance characteristics as the products they produce.

The threat posed by substitute materials is likely to grow and this will have serious implications for firms operating in New Zealand's metals and non-metallic mineral products sector, particularly those involved in upstream manufacturing. If they respond to this threat by doing nothing, the likelihood is that the sector will lose market share and die a slow death. They could introduce their own new products, but this is only likely to feasible for firms with offshore parents that have deep pockets. Alternatively, they might close shop, which would mean that New Zealand would then become totally reliant on imports for primary metal and non-metallic mineral products. There is already a precedent for this. All flat glass fabricated locally is already manufactured abroad, while Holcim NZ closed its Westport cement factory in 2016, and now operates as an importer/distributor.

Production processes.

Technology is not just limited to the development of new materials. It's also resulting in fundamental changes to production processes. In the steel industry, for example, iron and steelmaking technologies have significantly reduced energy and greenhouse gas emissions. Globally, the industry has reduced its energy intensity and CO_2 emissions by 35% and 37% respectively since 1990.

As mentioned earlier, further gains depend on the adoption of new technologies, such as carbon capture and storage, as well as the use of electrolysis, hydrogen and/or biomass to reduce iron ore. At present the industry argues that these technologies are not commercially viable. Their implementation on a larger scale requires large quantities of carbon-free hydrogen, biomass and electricity to be readily available, which implies a fundamental transformation of the global energy system. This is unlikely to happen any time soon.

New technologies, such as advances in AI, IoT, robotics, cloud computing, and augmented reality, that allow devices to communicate with each other autonomously and make decisions, are increasingly being used to monitor and manage real time developments along the entire supply chain, helping

manufacturers to optimise logistics, reduce inventory holding costs, minimise wastage and improve operational efficiencies. They are also enabling more effective tracking of products through the production process which is helping to improve quality control.

Manufacturing plants themselves are becoming smarter. With the use of sensors, cameras and data analytics, firms operating in the metallic and non-metallic minerals product sector are increasingly able to determine when a piece of equipment might fail, even before it does. IoT enabled systems can diagnose warning signs, use data to create maintenance timelines and pre-emptively service machinery before problems can occur. Even when equipment does fail, servicing can be carried out autonomously and remotely.

New technologies are also resulting in the development of new machines that offer increased levels of automation, greater functionality and improved operating efficiencies, reducing the need for skilled labour, which can be reassigned to more value-added activities.

Keeping assets up and running has the potential to significantly decrease operational costs.

However, while many of these new technologies are increasingly being adopted abroad, the rate of take up in New Zealand is relatively slow and limited to a handful of large firms. This is particularly true in the metals processing and concrete product manufacturing sub-sectors where there are many small firms that just don't have the resources to invest in the technology and machinery needed to remain competitive with offshore firms.

Failure to digitise will mean greater exposure to cheaper imports, which over time could lead to a loss of market share.

Customer insights.

Firms in the metallic and non-metallic minerals product sector are also using technologies to exploit the transaction data that they hold to better understand their customer needs. They are increasingly using predictive analytics to develop insights about changing demand patterns, opportunities in new and existing markets, and assess the risks that they might be exposed to. This is helping to inform decision making at all levels, strategic, tactical and operational.

However, the pace of adoption in New Zealand has been glacier like. Even where new technologies have been adopted, it has been limited to a handful of large firms.

Indeed, the use of digital technology in the metallic and non-metallic minerals product sector in New Zealand has mostly been limited to allowing customers to purchase and order online. And even this has proved to be a bit of a stretch for many in the sector.

In part this reflects a traditional focus on production orientated operating models and cultures. This is particularly true of large volume "old line" metal firms, that have traditionally "pushed product".

However, it also reflects the nature of the many small firms in this sector that are involved in downstream manufacturing activities. While some still operate as "product pushers", most are customer orientated, typically producing to order. They are often too small, too operationally focused and/or just too busy to invest in new technologies to better understand their customers.

Firms operating in this sector are typically reactive rather than proactive to changes in demand.

Basis of competition.

Primary manufacturers compete by minimising unit costs of production in an environment where a large proportion of their input costs and output prices are determined by global forces. By contrast, secondary manufacturers compete on their ability to deliver to their customer's requirements.

Global backdrop.

Global demand and supply dynamics tend to drive both input and output prices for primary manufacturers. However, further down the value chain there is more room for adding value.

Metals are vulnerable to global boom and bust price cycles. This is mainly because the global supply of metals is unable to respond quickly to changes in global demand. In large part this reflects the fragmented nature of production globally.

The economics is simple. When demand rises suddenly, the absence of a supply side response typically results in an excess demand situation, which puts upward pressure on metal prices. As prices start to rise, metal producers see margins expand, incentivising them and new entrants to invest and expand capacity. Over time this brings more metal to the market. However, at the same time as supply is growing, higher prices have begun to erode demand.

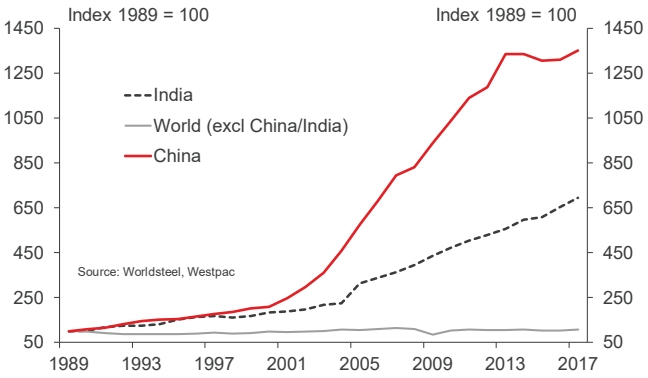
The global steel industry is relatively fragmented, with the market share of top 10 steel producers at 28%.

Supply keeps growing eventually overwhelming demand, driving prices lower. As the reality of lower prices begins to hit, some metal producers start reducing their capacity in order to avoid margin squeeze. However, because of the degree of fragmentation that exists, most will maintain capacity even when prices fall, resulting in tighter margins. Cutting capacity is often a difficult decision for firms, made all the worse by the fact that it is expensive to bring back productive capacity into operation to meet an upswing in demand. Only when they start making losses will most, but not necessarily all, metal producers start to make meaningful cuts to capacity. The evaporation of production capacity provides the basis for the supply constraints witnessed once the cycle turns and demand rises again.

Steel producers have also traditionally turned to mergers and acquisitions in pursuit of operating and capital expenditure efficiencies amid challenging market conditions.

That's at least the theory. However, there are several other factors which distort metal price cycles that also need to be considered.

Figure 23: Global steel production



The biggest of these is the China factor. Not only is China the world's biggest producer of steel and aluminium, it is also its largest consumer. In 2017, China produced eight times more steel than Japan or India, and ten times more than the US. At the same time, it consumed well over 50% of the world's steel production.

Aluminium production is just as skewed, with China again producing ten times more than second and third placed India and Russia. Indeed, the top 3 global aluminium producers are Chinese. In 2017, it consumed 53% of the world's total production.

India is an emerging producer of primary steel and aluminium and poses a long-term threat to China's dominance.

Clearly what happens in China matters. However, unlike the rest of the world, the basic laws of supply and demand underpinning the commodity price cycle don't always apply in that country. Indeed, steel production capacity in China seems to operate independently from the economic cycle. Even during a downturn, it is not unusual for new, large and more efficient steel mills in that country to come online, supported in large measure by a host of government subsidies and tax breaks. Admittedly some older, smaller, and less efficient mills in China have closed in recent years, but this has as much to do with Chinese Government's attempts to reform

the industry and reduce pollution as it does with market forces. In 2019, China loosened its environmental protection constraints, which along with an expansion in steel capacity, has contributed to an increase in steel output.

Foreign government subsidies and other market-distorting policies have resulted in massive global steel overcapacity.

Figure 24: Global steel prices

At the same time as steel production in China has increased, so demand has also grown, led in part by residential building activity, which continues to grow despite the introduction of government policy aimed at slowing the country's property market. Rising demand in China during early 2019 had put pressure on inventory levels, providing much needed support for steel prices.

However, the introduction of a further round of policy interventions targeting property developers has begun to slow demand for steel in the second half of 2019. The inability/unwillingness of the large mills to respond by cutting back supply has, in the first instance, led to a pickup in inventories, and there is a risk that this could eventually result in a dumping of steel on global markets. In an environment where a slowing global economy is already softening demand for commodities, a glut of steel on international markets is likely to drive prices sharply lower. Indeed, China has often been accused of unfair trade practices, with cheap, subsidised steel product flowing into other markets, including New Zealand.

Domestic impacts.

Changing metal commodity prices driven by global supply and demand dynamics affect New Zealand's manufacturers at each point along the value chain. However, the extent to which these manufacturers are impacted is determined by levels of exposure to global commodity prices, the costs of transportation, and to a lesser extent, the performance of the New Zealand dollar.

Primary metal products manufacturing.

The impact of changing commodity prices is likely to be felt more acutely in primary metals manufacturing where prices for raw materials, such as iron-ore and bauxite/alumina (about 40% of total input costs), and primary outputs, such as ingots, billets and slabs (almost 100% of outputs), are determined in global markets. To all intents and purposes, firms operating in this sub-sector are price takers. This excludes, of course, the normal price adjustments that might form part of contractual agreements. Transport costs also need to be considered.

Contrary to expectations, the exchange rate only has a minor part to play. This is because the currency affects both input costs and output prices in roughly equal measure. Even when output is sold into the local market, prices are typically set at or close to import parity, which is affected by the New Zealand dollar. Setting prices any lower than import parity would mean a loss of revenue, while setting them any higher increases the chance of losing market share. Indeed, even if the currency has an impact, it's likely to be limited to differences in the exchange rate between the time that inputs are procured, and outputs are sold.

Primary metal manufacturers compete largely on their ability to deliver the required quantity of product to specified quality standards within agreed timeframes. Proximity infers a competitive advantage over imports. For firms like NZAS, profitability is determined by the ability to minimise unit costs production by maximising volumes over a given fixed cost. Given that this firm is a price taker on both inputs and outputs, this may explain why, as New Zealand's largest industrial consumer of electricity, it is sensitive to changes in the availability and price of electricity.

The same might be said of NZ Steel, although there are some significant differences. NZ Steel pays the Crown royalties to mine iron ore from ironsands, but this does not necessarily reflect global prices for iron ore and/or for that matter the performance of the New Zealand dollar. And while it does produce carbon steel in various forms which it sells to secondary manufacturers, most of its production is processed steel sold to distributors that compete with similar products made by other downstream metal processors.

NZ Steel effectively competes in this downstream market by differentiating its products from those of its competitors. It does this through effective marketing and providing a range of value-added services, including technical advice. Brand management is extremely important for NZ Steel to maintain its market position and enabling it to charge a price premium.

Like NZAS, NZ Steel focuses on delivering the required quantity and desired quality according to specified timeframes. It also relies on economies of scale to minimise unit costs of production.

Pivoting to the customer represents a tectonic shift for steel producers whose operating models have been production driven.

Secondary metal products manufacturing.

Metal processing activities, from machining to fabrication, are also exposed to global prices because about 50% of their inputs are the outputs produced by primary metal product manufacturers. Most metal casting firms, both ferrous and non-ferrous, for example, depend on having enough recycled metal on hand, which means that they are exposed to global scrap metal price movements and movements in the New Zealand dollar. However, because they produce differentiated products, their output prices are largely determined by their ability to negotiate prices with their customers. This in turn is influenced by a range of factors, including reputation for quality work, intensity of industry rivalry, import pricing, and proximity to customers, amongst others.

Most firms involved in metal processing activities tend to be small operations. Work organisation methods are orientated towards short-production runs, and typically consist of clusters of stand-alone machines that operate independently from each other. They are very different to the sequentially ordered chains like those found at NZ Steel or NZAS, which seek to maximise volumes over a given fixed cost structure.

Firms compete in this space not by their ability to produce metal products, but rather by their ability to meet their customer's exacting requirements, with respect to price, delivery timeframes, and specified quality standards. To differentiate themselves further, some manufacturers work with their customers to design products rather than just produce them. They are effectively solution providers rather than "product pushers", competing more on the advice that they can give than their manufacturing prowess. The ability to show empathy is becoming an increasingly important trait, which poses a real challenge for many in the industry.

A key advantage that local firms have over imports are shorter lead times. They are also near their customers, which helps. Reputations count and trust is a key factor. In the case of structural steel fabrication, having SFC is a point of differentiation.

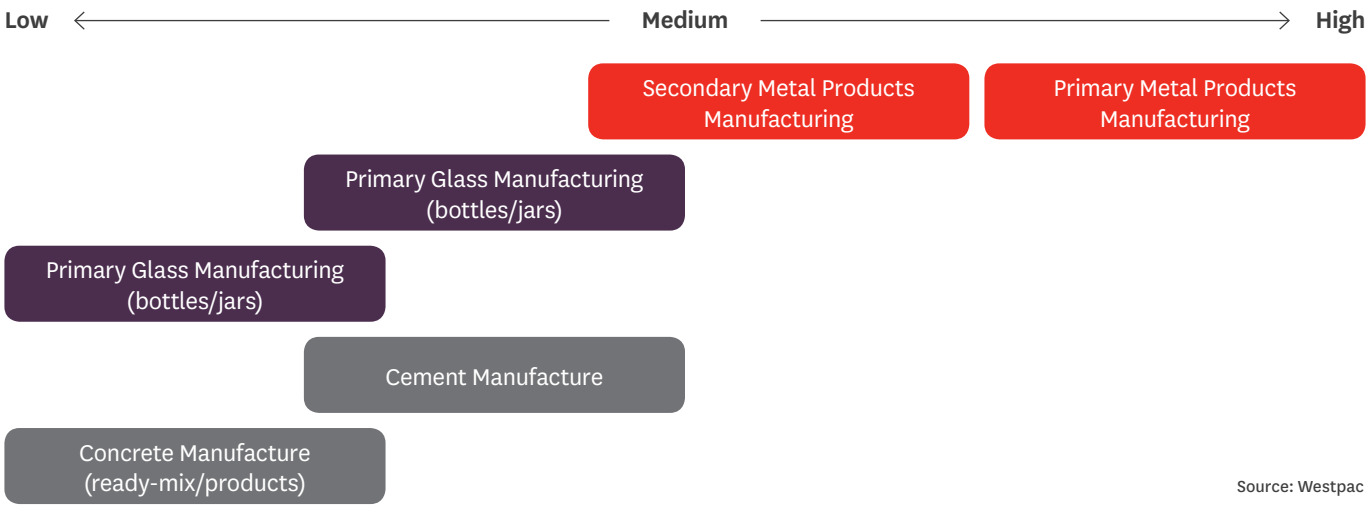
Reputation based on past performance is a key point of difference for firms operating in the metals manufacturing sub-sector.

Cement and concrete manufacturing.

Competition in New Zealand's cement industry pitches its only cement producer, GBC, against imports. Imported cement is primarily brought into the country by Holcim NZ on long-term supply contracts established with Japanese cement producer Mitsubishi Materials Corporation (MMC).

Excess global cement production capacity limits the scope for exports and increases the threat of import competition.

Figure 25: Global commodity price exposure by sub-sector



Source: Westpac

These firms compete across many different types of cements, each having different performance characteristics. They compete on two fronts, specifically price and the ability to deliver the quantity and quality required by downstream ready-mix concrete producers and concrete product manufacturers.

Holcim prices are import parity prices that reflect MMC's cost of production, transport costs from Japan and the impact of the New Zealand dollar. GBC's prices are set on a cost-plus basis, which are effectively capped at Holcim's import prices for equivalent products. According to one industry source, downstream purchasers may also end up paying a convenience/security of supply premium for locally produced cement. Larger consumers may receive discounts for bulk purchases.

To a large extent, price premiums reflect the costs associated with uncertain supply from abroad.

For GBC, prosperity lies in how effectively it can manage its inputs and operating costs. Much like NZ Steel, electricity looms large - cement production requires large machinery that can only be driven by electricity. Any changes to the pricing of electricity or its availability will affect GBC's production costs and possibly cement prices. Other major input costs relate to raw materials, specifically lime, silica, alumina and ferrous oxides needed to produce clinker, an intermediate product which is grinded to produce cement.

Access to the desired quality and having the necessary quantity of raw materials to maximise capacity utilisation of their production plant is key to GBC's competitiveness, and this probably explains why production facilities tend to be situated close to limestone quarries. This is especially important given that the firm is really competing with cement that is produced at MMC's massive cement plants, which benefit from economies of scale.

Cement production is a volume driven business and maximising capacity utilisation is important to remaining competitive.

Managing the flow of production through distribution networks is also a key driver of competitiveness. Both GBC and Holcim NZ have cement storage facilities and transport cement by ship to marine terminals around New Zealand for forwarding to distribution centres and onto customers, who might range from ready-mix concrete manufacturers to cement wholesalers and retailers.

Holcim also has a direct interest in AML, a joint venture between Holcim NZ and Allied Concrete. AML, which trades as Allied Concrete, is a ready-mix concrete producer that competes head-on with Firth, a sister company to GBC, and part of Fletcher Building's Concrete Division. Allied Concrete and Firth do not only compete with each other, but also other ready-mix concrete producers, who may originally have purchased cement from GBC and Holcim NZ. They may also have imported it separately.

Ready-mix concrete production is also a volume driven business, with capacity utilisation being key to prosperity. Competition between ready-mix concrete producers is largely based on price, the ability to deliver according to set timeframes and quality standards, and the availability of other ready-mix products with similar performance characteristics.

The same cannot be said for the large number of downstream concrete fabricators, who produce differentiated products, primarily for the construction sector. These firms operate in similar vein to downstream metal processors, working with their customers to produce solutions specific to their requirements. Firms increasingly compete in this space not by their ability to produce concrete products, but rather by their ability to meet their customers exacting requirements, with respect to price, delivery timeframes, and specified quality standards. Increasingly, they are becoming solution providers rather than "product pushers", providing advisory services which can extend back into the design stage.

Flat glass manufacturing.

Firms that fabricate imported flat glass compete largely on their ability to deliver to the individual requirements of their customers, and much like their counterparts in the metal processing and cement product manufacturing sub-sectors, will seek to differentiate themselves on that basis. Responsiveness is key, with short lead times providing some protection against imports. However, shorter lead times also puts pressure on the industry. According to an industry source, failure to deliver can quickly lead to a loss of business. Much like their counterparts in other sub-sectors, firms that fabricate flat glass are typically involved in "jobbing" and as such are geared towards short-production rounds. Factory operations are typically not laid out in sequentially ordered chains like those found in a large volume producer, although machinery and equipment are usually located in close proximity.

Downstream metal, concrete and glass fabricators are increasingly shifting from being product pushers to being solutions providers to preserve margin.

Critical success factors.

Irrespective of where firms operate in the metallic and non-metallic minerals product sector, there are some common factors that are critical for achieving success.

The first critical success factor is having access to the right quantity and quality of factor inputs.

In the first instance this means having access to a consistent flow of raw material inputs. This is particularly relevant to volume producers of basic steel, aluminium and cement, which need a continuous flow of raw materials to maximise capacity utilisation.

Figure 26: Critical success factors

Source: Westpac

It also means having people with the necessary entrepreneurial, relationship, advisory, technical and conceptual thinking skills to deliver solutions to customers. As a result, Emotional Quotient (EQ) is becoming just as important as Intelligence Quotient (IQ). This is true across the sector, but particularly relevant in downstream metal and concrete product manufacturing, which increasingly produces to order. In such cases, advisory is becoming more important and showing empathy and understanding establishes a point of difference.

Having the right equipment is a no-brainer. For upstream producers of basic steel, aluminium and cement, this means having equipment that consumes less electricity, minimises adverse environmental impacts, and is closer to meeting the requirements of a circular economy. For downstream metal manufacturers and glass fabricators, it means having machinery with high levels of automation and functionality that can deliver product to the customer requirements at the lowest possible operating cost.

It also means having the technology to improve supply chain efficiencies and maximise operational efficiencies. Technology is also key to developing customer insights.

The second critical success factor focuses on having the internal capacity to combine these factor inputs to maximise revenues and minimise operating costs. For upstream producers of basic steel, aluminium and cement, the key remains being able to push as much volume as possible over an already sunk fixed cost while at the same time minimising the costs over which they have some control. Digital technologies which improve supply chain management and operational efficiencies are critical.

For downstream producers, including glass fabricators, it's less about minimising costs, although this is still important, but more about how to use available factors inputs to differentiate product/solution offerings.

The third critical success factor is having the ability to adapt to changing circumstances. Successful firms are increasingly using technology to evaluate changes in their external environment, which they then use to not only inform their strategic direction, but also their tactical and operational decision making with respect to market positioning, factory configurations and product development.

The fourth critical success factor is having well developed relationships along the value chain. This is an industry that is based on relationships not only with customers, but also with raw material suppliers. Relationships are particularly important for the firms that operate in the downstream metals, concrete products and glass fabrication industries who depend on repeat business. The same can be said for large volume producers who rely on downstream distributors and manufacturers to distribute their product.

Being customer centric is less important for upstream manufacturers of basic steel, aluminium, and cement, where product differentiation is limited. That said, they still need to deliver the correct quantity and quality within specified timeframes to downstream manufacturers and distributors, both at home and abroad. However, being customer centric is critical for downstream metal, glass, and cement product manufacturers who work to order, and are looking at ways to differentiate themselves from their competitors. The use of digital technologies, such as AI to better understand their customers and predict demand will become increasingly important for the prosperity of these firms.

Admittedly, there are quite a few firms that operate in this sector that are not particularly customer centric. Most have been around a long time and continue to operate because they have a successful track record for producing to time and quality standards. These small firms are likely to continue to

plod along, eventually closing their doors when their owners retire. The real success stories will be those that partner up with their customers to deliver solutions.

The final critical success factor relates to having a clear vision and understanding of markets being targeted. Most firms operating in the metals, glass, cement and concrete industries do not actively segment and target customers. They do not use predictive analytics and as a result they tend to be reactive rather than proactive, relying on past glories and a built-up reputation. However, as technology and material science ramps up and new substitute materials enter the market, many of these smaller firms operating in the downstream manufacturing space could very well find themselves under threat. To address this, firms in the future will need to really understand the needs of individual markets, focusing on those which still require the products that they produce.

Appendix – Shape of metals manufacturing.

Sub sector	Structure	Key players	Established firms	Established employees	Comment
Primary ferrous metals manufacturing (steel making)	Dominant firm	New Zealand Steel (NZ Steel)	144	1,200	A subsidiary of Australian based Bluescope. NZ Steel is New Zealand's only producer of carbon steel and its largest manufacturer of secondary ferrous metal product. It operates a fully integrated steel mill at Glenbrook, which is the only one in the world to use iron sand as its main raw material input.
Other primary ferrous metals manufacturing	Fragmented	Numerous		2,000	Includes small firms involved in ferrous metal casting. Employee count has fallen from just over 2,900 at the turn of the century. While the number of enterprises has remained constant, the mix has changed, with 3 times more enterprises involved in primary ferrous metal manufacturing than there were at the beginning of the century.
Primary ferrous metal product manufacturing					
Primary non-ferrous metals manufacturing	Dominant firm	New Zealand Aluminium Smelter (NZAS)	87	1,000	A subsidiary of Rio Tinto and Sumitomo Chemical Company, NZAS operates the Tiwai Point smelter in Southland and is New Zealand's only manufacturer and exporter of primary aluminium ingots and billets.
Primary non-ferrous metal product manufacturing	Fragmented	Numerous		1,650	Employee count has fallen from about 3,650 in 2000. The number of firms involved in primary non-ferrous activities such as casting, has fallen slightly over the last 18 years.
Secondary metals and metals product manufacturing	Fragmented	Steel & Tube, Pacific Steel, Numerous	2,800	26,000	Includes many small firms that machine, treat and fabricate primary metal products to order. Metals processing is far more fragmented than upstream metals manufacturing. The top 4 firms contribute less than 10% to industry turnover.

Most primary metals and metal product manufacturers are small firms that compete in specific geographical markets and/or niche product markets. They do not compete head-on with the large dominant firms that produce primary metals and metal products.

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Past performance is not a reliable indicator of future performance. The forecasts given in this document are predictive in character. Whilst every effort has been taken to ensure that the assumptions on which the forecasts are based are reasonable, the forecasts may be affected by incorrect assumptions or by known or unknown risks and uncertainties. The ultimate outcomes may differ substantially from these forecasts.

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