Wood Mackenzie

September 2024

New Zealand Draft Critical Mineral List

Prepared for the New Zealand Ministry of Business, Innovation & Employment

Summary

The New Zealand Draft Critical Minerals List has been developed by Wood Mackenzie for the Ministry of Business, Innovation and Employment (MBIE).

New Zealand's Critical Minerals List includes the minerals that are economically important to New Zealand and whose supply is at risk. This includes minerals that are:

- essential to New Zealand's economy, national security, and technology needs, including renewable energy technologies and components to support our transition to a low emissions future; and/or
- in demand by New Zealand's international partners to enable us to benefit from international economic opportunities, contribute to the diversification of global mineral supply chains and improve the pipeline of the end-use products for which these minerals are essential; and
- susceptible to supply disruptions domestically and internationally. In some instances, New Zealand relies on domestic sources of minerals, but the supply of these minerals can be constrained. Internationally, supply chain disruptions could arise due to global supply shortages, or geopolitical risks.

New Zealand's Draft Critical Minerals List has been developed in consultation with a range of industry stakeholders, through the following steps:

1) Definition of Critical Minerals within the New Zealand context
2) Analysis of New Zealand mineral production, consumption and trade, including analysis of indirect demand through imported goods
3) Data gap analysis and industry consultation to further understand New Zealand mineral requirements and production
4) Development of a Long List identifying minerals produced by and/or essential to New Zealand
5) Supply risk assessment to assess the risk of domestic/international supply disruption for each mineral

Out of this process, the following minerals have been identified as critical for New Zealand:

Table 1: New Zealand Draft Critical Minerals List

Aggregate & Sand	Aluminium	Antimony	Arsenic	Beryllium
Bismuth	Boron	Cesium	Chromium	Cobalt
Copper	Fluorspar	Gallium	Germanium	Graphite
Indium	Magnesium	Manganese	Molybdenum	Nickel
Niobium	Phosphate	Platinum Group Metals	Potassium (Potash)	Rare Earth Elements
Rubidium	Selenium	Silicon	Strontium	Tellurium
Titanium	Tungsten	Vanadium	Zinc	Zirconium

Additional detail on the Draft Critical Minerals List is available in Appendix A and an overview of the process followed to develop the Draft List is included in Appendix B.

Appendix A: New Zealand Draft Critical Minerals List (Details)

Mineral	Key identified use(s)	Supply Risk Score	NZ Demand	NZ Production	International Partner Critical Minerals List				
					USA	UK	EU	AUS	CAN
Fluorspar	Used in aluminium production, insulating foams, refrigerants and steel	8.90	Direct Demand	N/A	Y	N	Y	N	Y
Gallium	PV cells, electronics (semiconductors)	8.90	Indirect Demand	N/A	Y	Y	Y	Y	Y
Silicon	Glass, casting sand, nanomaterials and electronics	7.80	Direct Demand	Current producer (unquantified)	N	Y	Y	Y	Y
Chromium	key alloying element in steels	7.58	Direct Demand	Potential future producer	Y	N	N	Y	Y
Antimony	Crucial for defence applications, EVs and medical	7.25	Direct Demand	Potential future producer	Y	Y	Y	Y	Y
Germanium	Electronics (semiconductors)	7.20	Indirect Demand	N/A	Y	N	Y	Y	Y
Platinum Group Metals[1]	Catalysts, hydrogen fuel cells, EVs, electronics and communications	7.18	Direct Demand	Potential future producer	Y	N	Y	Y	Y
Aluminium	Packaging, automotive, aerospace, defence	7.05	Direct Demand	Current producer	Y	N	Y	N	Y
Rare Earth Elements[2]	Permanent magnets, glass polishing, ceramics, metal alloys, LEDs, lasers	6.95	Direct Demand	Current producer	Y	Y	Y	Y	Y
Tungsten	Drilling, mining, cutting	6.95	Indirect Demand	Potential future producer	Y	Y	Y	Y	Y
Zinc	Anodising and corrosion protection	6.88	Direct Demand	N/A	Y	N	N	N	Y
Molybdenum	Common alloying element for steels and high temp alloys	6.75	Direct Demand	N/A	N	N	N	Y	Y
Indium	Electronics, solders, batteries, PV cells, bearings	6.58	Indirect Demand	N/A	Y	Y	N	Y	Y
Graphite	Battery and energy storage applications	6.58	Direct Demand	N/A	Y	Y	Y	Y	Y
Nickel	Alloying in steel, stainless steel, batteries and energy storage applications	6.53	Direct Demand	N/A	Y	N	N	Y	Y
Bismuth	Data storage	6.35	Direct Demand	Potential future producer	Y	Y	Y	Y	Y
Tellurium	PV cells, electronics	6.33	Direct Demand	N/A	Y	Y	N	Y	Y
Vanadium	Steel and titanium alloys, catalysts, magnets, coatings, battery and energy storage systems	6.30	Direct Demand	Current producer	Y	Y	Y	Y	Y
Selenium	Agricultural uses as well as PV cells and electronics	6.23	Direct Demand	N/A	N	N	N	Y	N
Niobium	High-temperature superalloys	6.13	Indirect Demand	N/A	Y	Y	Y	Y	Y
Manganese	Used in steels, aluminium alloys, batteries, catalysts, glass, fertilisers and electronics	5.93	Direct Demand	N/A	Y	N	Y	Y	Y
Cobalt	Battery and energy storage applications, steel alloys	5.88	Direct Demand	Potential future producer	Y	Y	Y	Y	Y
Arsenic	Treatment of wood and electronics including semiconductors	5.83	Indirect Demand	Current producer (unquantified)	Y	N	Y	Y	N
Copper	Power transmission, electronics and EVs	5.65	Direct Demand	Potential future producer	N	N	N	N	Y
Strontium	Magnets, alloys and paints	5.58	Direct Demand	N/A	N	N	Y	N	N
Cesium	Cancer treatments, electronics and optics, space and PV cells	5.50	Indirect Demand	Potential future producer	Y	N	N	N	Y
Rubidium	Medical and electronics	5.50	International Partner Demand	Potential future producer	Y	N	N	N	N
Boron	Permanent magnets, electronics, PV cells	5.48	Direct Demand	N/A	N	N	Y	N	N
Magnesium	lightweight alloys	5.35	Direct Demand	Potential future producer	Y	Y	Y	Y	Y
Titanium	Aerospace parts, medical implants	5.28	Direct Demand	Current producer	Y	N	Y	Y	Y
Zirconium	Fuel cells, auto catalysts, bearings	5.18	Direct Demand	Current producer (unquantified)	Y	N	N	Y	N
Beryllium	Critical aerospace parts	5.10	International Partner Demand	N/A	Y	N	Y	Y	N
Potassium (Potash)	Agriculture fertilisers	5.08	Direct Demand	N/A	N	N	N	N	Y
Phosphate	Agriculture fertilisers, battery and energy storage applications	4.23	Direct Demand	Potential future producer	N	N	Y	N	N
Aggregate & Sand	Roading and construction	3.43	Direct Demand	Current producer	N	N	N	N	N

1. Platinum Group Metals include Iridium, Osmium, Palladium, Platinum, Rhodium and Ruthenium.
2. Rare Earth Elements include Cerium, Dysprosium, Erbium, Europium, Gadolinium, Holmium, Lanthanum, Lutetium, Neodymium, Praseodymium, Promethium, Samarium, Scandium, Terbium, Thulium, Ytterbium and Yttrium.

Appendix B: Critical Minerals List Development Process

The New Zealand Draft Critical Minerals List has been developed by Wood Mackenzie for the Ministry of Business, Innovation and Employment (MBIE). This appendix outlines the process undertaken to formulate the Draft List.

New Zealand's Draft Critical Minerals List has been developed in consultation with a range of industry stakeholders, through the following steps:

1) Definition of Critical Minerals within the New Zealand context
2) Analysis of New Zealand mineral production, consumption and trade, including analysis of indirect demand through imported goods
3) Data gap analysis and industry consultation to further understand New Zealand mineral requirements and production
4) Development of a Long List identifying minerals produced by and/or essential to New Zealand
5) Supply risk assessment to assess the risk of domestic/international supply disruption for each mineral

Basis of New Zealand's Critical Minerals List

New Zealand's Critical Minerals List includes the minerals that are economically important to New Zealand and whose supply is at risk. This includes minerals that are:

- essential to New Zealand's economy, national security, and technology needs, including renewable energy technologies and components to support our transition to a low emissions future; and/or
- in demand by New Zealand's international partners to enable us to benefit from international economic opportunities, contribute to the diversification of global mineral supply chains and improve the pipeline of the end-use products for which these minerals are essential; and
- susceptible to supply disruptions domestically and internationally. In some instances, New Zealand relies on domestic sources of minerals, but the supply of these minerals can be constrained, for example by regulatory factors. Internationally, supply chain disruptions could arise due to global supply shortages or geopolitical risks. The extraction and processing of many minerals is concentrated in few countries. Socio-political disturbance in a country of high minerals concentration could unsettle the international minerals market dynamics and adversely impact import-dependent countries.

Definitions

As defined by the New Zealand Crown Minerals Act 1991 (CMA), a **Mineral** "means a naturally occurring inorganic substance beneath or at the surface of the earth, whether or not under water and includes all metallic minerals, non-metallic minerals, fuel minerals, precious stones, industrial rocks and building stones, and a prescribed substance within the meaning of the Atomic Energy Act 1945."

For the purposes of this project, additional filters were applied to define the minerals to be assessed:

- exclusion of non-solid minerals (such as mercury and liquid or gaseous hydrocarbons) except for helium and hydrogen
- exclusion of building or decorative stone.

The list of minerals assessed by Wood Mackenzie for the critical minerals assessment expands on the non-exhaustive list of minerals noted in the CMA, and included minerals such as cobalt, graphite, lithium and rare earths.

A **Critical Mineral** includes minerals that are:

- essential to New Zealand's economy, national security, and technology needs, and/or equally important to New Zealand's international partners; and is
- susceptible to supply disruptions domestically and internationally.

Essential is defined as critical to maintaining the New Zealand's economy today and into the future and not readily substitutable.

New Zealand Mineral Demand and Production

Wood Mackenzie completed an initial assessment of mineral demand in New Zealand, including domestic mineral production. To estimate mineral demand in New Zealand, Wood Mackenzie considered the following:

- Mineral production
- Net mineral imports (imports less exports)
- Indirect mineral imports (excludes indirect mineral exports), estimated across the following sectors:
    - Battery Storage
    - Vehicles (Electric vehicles (EVs) including hybrid and battery electric vehicles, Internal Combustion (ICEV))
    - Wind Turbines
    - Solar Panels
    - Appliances/white goods
    - Fertiliser
    - Semiconductors (mineral inputs identified but not quantified due to data availability)
- Total mineral demand in New Zealand is calculated as:
    - Mineral production + net mineral imports (imports less exports) + indirect mineral imports.

New Zealand demand has been categorized as "Direct Demand" where minerals are imported into New Zealand and/or where production is greater than exports. Where New Zealand has been identified as an importer of the goods listed above, containing identified minerals, we have categorized New Zealand as having "indirect demand" for these minerals.

Demand and production data was sourced from various New Zealand government publications, Wood Mackenzie mineral and end-market coverage, the Institute of Geological and Nuclear Sciences Limited (GNS), Global Trade Tracker, United Nations publications as well as through New Zealand industry and stakeholder consultation.

This initial assessment identified 94 minerals which may be essential to New Zealand, for further investigation during stakeholder consultation.

Consultation Process

Wood Mackenzie sought consultation from over 50 stakeholders within New Zealand, based on a list developed with MBIE and relevant industry bodies. Stakeholders were asked to provide their informed views and data on which minerals they believed to be essential to New Zealand's economy, national security, and technology needs, including renewable energy technologies and components to support New Zealand's transition to a low emissions future. They were also encouraged to provide any information regarding the current production and potential future supply within New Zealand of the 94 minerals identified in the initial assessment. Additionally, the stakeholders were also given the opportunity to suggest any further minerals or products to be considered.

Industry consultation was conducted via a survey and/or a meeting. Wood Mackenzie received twenty-three survey responses and conducted 14 meetings, culminating in the further refinement of the NZ demand and supply data.

The consultation process and subsequent analysis yielded the following outcomes:

- A total of 79 minerals were identified as essential to New Zealand, making up the Long List which proceeded to the supply risk assessment.

- A further 34 minerals were assessed through consultation but ultimately excluded from the Long List due to one of the following reasons: lack of New Zealand demand; not having a defined chemical composition; where constituent element(s) were captured individually or being deemed out of scope.

Supply Risk Assessment Overview

The 79 minerals on the Long List were subject to a global market supply risk assessment to determine their criticality. From this process, the essential minerals which have a high risk of supply disruption will be included on the Draft Critical Minerals List.

Supply risk for rare earth elements (REE) and platinum group metals (PGM) were considered collectively, as they are generally grouped on international partner country Critical Minerals Lists.

The supply risk assessment assessed each mineral identified in the Long List against 6 supply risk criteria, culminating in overall supply risk scores for each mineral. The supply risk assessment methodology was developed based on consideration of factors which are likely to indicate a heightened risk for New Zealand's mineral sourcing, as well as considering how various partner nations developed their respective critical minerals lists. All of the six metrics used for the New Zealand supply risk assessment have been used by one or more international partner countries: trade data and import dependence (Australia, USA), mineral market balance outlook (US, EU), reserve availability (EU), supply concentration (Australia, USA) and supply country risk (USA).

The six selected metrics for the supply risk assessment quantify the risks to the New Zealand and the global supply chain for each mineral:

1) New Zealand import dependence
2) New Zealand net import dependence
3) Global 2029 market balance
4) Global reserve availability
5) Global supply concentration
6) Global supply country risk

These six metrics were each given a weighting based on their likelihood of causing a supply disruption. A score was calculated for each metric for every mineral. When combined with the weightings these were summed to provide an overall supply risk score for each mineral as outlined in Table 2.

Table 2: Supply risk assessment score weightings and calculations

Mineral	Score	Weighting[1]	Total Score
Mineral #1	New Zealand import dependence	7.5%	Score x Weighting
	New Zealand net import dependence	7.5%	Score x Weighting
	Global 2029 market balance	42.5%	Score x Weighting
	Global reserve availability	5.0%	Score x Weighting
	Global supply concentration	25.0%	Score x Weighting
	Global supply country risk	12.5%	Score x Weighting
Mineral #1	Total	100%	Total of the Score x Weightings

Note: 1. Weighting sensitivity analysis has been undertaken and is described below.

1. New Zealand import dependence

To measure how reliant New Zealand is on imports for each mineral, a score was produced considering the domestic consumption (direct and indirect) versus the imports (direct and indirect) for each mineral. The imports (direct and indirect) relative to the domestic consumption (direct and indirect) determined the import dependence score.

Table 3: Import dependence score

Import dependency (%)	Score
0%	0
10%	1
20%	2
30%	3
40%	4
50%	5
60%	6
70%	7
80%	8
90%	9
100%	10

2. New Zealand net import dependence

Similar to the previous score but the net import dependency factors in the domestic production of minerals, with the score determined according to the same scale presented in Table 3, following comparison of percentage of the net imports (imports minus exports) to the domestic demand.

The rationale for including the two metrics, import dependence and net import dependence, is to differentiate the impacts for minerals that New Zealand imports and secondly, the minerals that New Zealand exports (and produces), which may act as an offset to limit any supply disruption to imports.

3. Global 2029 market balance

Global shortages of minerals are expected to have a significant impact on the ability for New Zealand and international partners to secure required minerals. A 5-year time horizon has been selected to keep the current edition of the New Zealand Critical Mineral list focused on near-term supply risk.

A global market balance percentage has been calculated for each mineral where data is available, calculated from the global market balance (surplus or deficit) as a percentage of global annual demand. Scores have then been assigned based on the market balance percentage, with a high score indicating a forecast deficit, and low score indicating a forecast surplus (Table 4).

Table 4: Market balance score

Market balance (%)	Score
-12.5% (and less)	10
-10.0%	9
-7.5%	8
-5.0%	7
-2.5%	6
0%	5
2.5%	4
5.0%	3
7.5%	2
10.0%	1
12.5% (and greater)	0

For minerals where an adequate market balance forecast for 2029 was not available, price volatility over the previous 10 years (2014-2023) was used as a proxy. As price spikes usually indicate market tightness, this is a reasonable indicator of markets which experience shortages. A price spike was defined as price movement of greater than 50% in a 12 month period, with the score given according to the number of spikes, as detailed in Table 5.

Table 5: Price spike history score

No. of price spikes (>50% move over 12 month period) in last 10 years (2014 onwards)	Score
0	0
1	2
2	4
3	6
4	8
5 (and greater)	10

4. Global reserve availability

The availability of large global reserves for a mineral provides additional security against supply disruptions, as identified reserves can be extracted to increase supply to mitigate expected shortages, though usually with significant lead times. Global reserves as a multiple of current annual global production have therefore been assessed for each mineral as an additional measure of supply risk, with scores attributed as per Table 6.

Table 6: Global supply availability score

Global reserves / production multiplier	Score
<= 5	10
<=10 and > 5	9
<=15 and > 10	8
<=20 and > 15	7
<=25 and > 20	6
<=30 and > 25	5
<=35 and > 30	4
<=40 and > 35	3
<=45 and > 40	2
<=50 and > 45	1
> 50	0

5. Global supply concentration

The assessment of supply concentration was undertaken globally, except in two cases where high-volume minerals are sourced domestically due to market economics (aggregate & sand, and lime). The 2023 market share of the top 5 countries producing the relevant mineral was assessed, based on data availability.

Measurement of supply was based on a combination of refined supply (where available), or mined production. Refined supply was prioritsed to account for processing concentration/bottlenecks.

Wood Mackenzie has used the well-known Herfindal Hirschman Index (HHI) approach to determine a supply concentration score for each mineral. The score is calculated by squaring the relevant market share and tallying up the squares of market shares to derive a score between 1 and 10,000.

Industries that are highly concentrated, e.g. where individual countries produce a significant portion of the mineral are classified as having a high industry concentration and are given a score of 10. At the other end of the spectrum, where production of minerals is highly diverse, and as a result has a low industry concentration, these are given a score of 0.

The HHI ranks supply concentration, and scores adopted by Wood Mackenzie for this metric of assessment are as follows:

Table 7: HHI and global supply concentration score

HHI score	HHI industry concentration	Score
1 – 1,500	Low	0
1,500 – 2,500	Medium	5
<=15 and > 10	High	10

6. Global supply country risk

Wood Mackenzie assessed supply country risk by extending the analysis for global supply concentration. Wood Mackenzie utilised the Fraser Institute's Investment Attractiveness Index (2023) as a proxy for supply risk. The Fraser Institute is a Canadian research NGO which conducts a Mining Survey to assess the relative investment attractiveness across global mining locations. In 2023, 293 senior executives scored 57 countries for their attractiveness for mining investment. A higher score on the index results in lower supply risk, while a lower score on the index results in a higher supply risk.

For each country (top 5) or producer (in New Zealand for aggregate & sand, and lime), Wood Mackenzie utilised the country risk score, which was multiplied by the market share to determine an aggregate supply country risk rating for each mineral as detailed in Table 8.

Table 8: Supply country risk assessment and calculations

Supply country market share	Market share (%)	Country risk score	Market share (%) * country risk score
Country 1	X	Y	X * Y
Country 2	X	Y	X * Y
Country 3	X	Y	X * Y
Country 4	X	Y	X * Y
Country 5	X	Y	X * Y
Total			Sum (X * Y)

The aggregate scores for each mineral were then assessed on the following range to determine whether the mineral was deemed to have low, moderate or high supply country risk, including scores.

Table 9: Supply country risk score

Supply country risk classification	Supply country risk score	Score
>=50	Low	0
<50, >=25	Moderate	5
<25	High	10

Table 10: 2023 Fraser Institute investment attractiveness score

Country	Investment attractiveness score (2023)	Country	Investment attractiveness score (2023)	Country	Investment attractiveness score (2023)
Botswana	76.9	Greenland	53.0	Bulgaria	38.9
United States	75.7	Angola	52.5	Portugal	38.7
Finland	75.7	Spain	50.5	Uganda	38.4
Sweden	75.6	Northern Ireland	48.9	India	38.2
Canada	72.5	Mauritania	48.5	Mali	38.0
Australia	72.4	Turkey	46.7	Colombia	36.9
Morocco	69.6	Tanzania	46.4	Philippines	36.9
Brazil	68.5	Guinea	46.0	Liberia	36.7
Fiji	68.2	South Sudan	45.4	Mexico	36.5
Zambia	64.2	Indonesia	45.2	Vietnam	36.5
Ireland	63.9	PNG	44.9	Cambodia	36.4
Argentina	63.9	Ghana	44.4	Bolivia	36.3
Norway	62.1	Peru	44.0	Kazakhstan	36.1
Chile	59.8	Thailand	43.3	Senegal	35.9
Serbia	56.5	DRC	43.0	Zimbabwe	33.4
Namibia	56.4	South Africa	41.8	Mozambique	31.9
New Zealand	55.8	Mongolia	41.7	Solomon Islands	25.2
Ivory Coast	55.7	Ecuador	40.7	China	19.1
Kenya	55.2	Burkina Faso	39.0	Niger	14.6

Supply Risk Assessment Sensitivity Analysis

The relative weighting of the six supply risk assessment scores, detailed in Table 2, was subject to a sensitivity analysis to confirm the robustness of the supply risk assessment. 10 scenarios were run, with each supply risk assessment score's weighting adjusted as outlined in Table 11.

Table 11: Supply risk assessment score sensitivity scenarios

Supply risk assessment score	Original	S1	S2	S3	S4	S5
Market balance	42.5%	**32.5%**	**27.5%**	**50%**	**35%**	**30%**
Import dependency	7.5%	**12.5%**	**15%**	7.5%	7.5%	7.5%
Net import dependency	7.5%	**12.5%**	**15%**	7.5%	7.5%	7.5%
Global reserve availability	5%	5%	5%	5%	5%	5%
Market concentration	25%	25%	25%	**17.5%**	25%	25%
Supply risk country rating	12.5%	12.5%	12.5%	12.5%	**20%**	**25%**
Supply risk assessment score	**Original**	**S6**	**S7**	**S8**	**S9**	**S10**
Market balance	42.5%	42.5%	**40%**	**35%**	42.5%	**32.5%**
Import dependency	7.5%	7.5%	7.5%	7.5%	**10%**	7.5%
Net import dependency	7.5%	7.5%	7.5%	7.5%	**10%**	7.5%
Global reserve availability	5%	5%	5%	**12.5%**	**7.5%**	5%
Market concentration	25%	**30%**	**35%**	25%	**20%**	**30%**
Supply risk country rating	12.5%	**7.5%**	**5%**	12.5%	**10%**	**17.5%**

Throughout the scenarios tested, 29 minerals (including PGM and REE groupings) maintained an overall supply risk score of 5+ in all the scenarios. These include aluminium, antimony, arsenic, bismuth, cadmium, chromium, cobalt, copper, fluorspar, gallium, garnet, germanium, graphite, indium, lead, manganese, molybdenum, nickel, niobium, PGM, REE, selenium, silicon, strontium, tellurium, tungsten, vanadium, zinc and zirconium. The overall consistency in the scoring of these minerals added additional confidence in the overall process.

An additional 7 minerals received an overall supply risk score of 5+ in at least 8 scenarios (out of 11, including the base case scenario), as described in Table 12. Phosphate and Aggregate & Sand did not gain a score of 5+ in a significant number of scenarios, however their inclusion in the Draft Critical Minerals List is discussed below.

Table 12: Supply risk assessment score sensitivity results for marginal minerals

Mineral	% of scenarios, scored >= 5
Boron	91%
Cesium	91%
Potassium (Potash)	91%
Rubidium	91%
Magnesium	82%
Beryllium	73%
Titanium	73%
Phosphate	18%
Aggregate & Sand	0%

Of the minerals on the Long List which did not make the Initial Draft Critical Minerals List, Table 13 illustrates what proportion of the sensitivity scenarios they scored above or equal to a five.

Table 13: Supply risk assessment score sensitivity results for excluded minerals

Mineral	% of scenarios, scored >= 5
Cadmium	100%
Garnet	100%
Lead	100%
Lithium	73%
Thorium	73%
Thermal Coal	45%
Helium	45%
Rhenium	27%
Hafnium	18%
Tantalum	18%
Barite (Barium)	9%
Gold	9%
Iodine	9%
Tin	9%
Metallurgical Coal	0%
Hydrogen	0%
Iron	0%
Lime (including Limestone and Dolomite)	0%
Silver	0%

The reasoning behind the omission of cadmium, garnet and lead from the Draft Critical Minerals List is below.

The supply risk assessment sensitivity analysis confirmed the consistency in which the process identifies a large number of minerals with an elevated supply risk, independent of the selected weighting. This provides confidence in the overall supply risk process and that the weightings described in Table 2 are appropriate.

Supply Risk Assessment Outcomes

The supply risk assessment returned the following outcomes, detailed in Table 14 below:

- 35 minerals were recommended by Wood Mackenzie for inclusion on New Zealand's Draft Critical Minerals List.
    - 33 of the included minerals received a supply risk score of 5+, are believed to have an elevated supply risk and were recommended for inclusion in the Draft Critical Minerals List.
    - The 18 minerals which scored below 5 on the supply risk assessment were subject to further scrutiny. Through this process phosphate and aggregate & sand were recommended for inclusion in the Draft Critical Minerals List due to their high level of economic importance to New Zealand.
- Wood Mackenzie recommended the exclusion of 3 minerals which achieved a score above 5, cadmium, garnet and lead. These minerals were recommended for exclusion due to their absence from partner critical mineral lists and their toxicity and discouraged use (in the case of cadmium and lead) and due to the availability of substitute minerals (in the case of garnet).

Table 14: Supply risk assessment results

Mineral	New Zealand import dependence	New Zealand net import dependence	2029 Market balance	Global supply availability	Market supply concentration	Supply country risk rating	Overall supply risk score	Comment	Recommended Adjustment
Fluorspar	10	10	8	5	10	10	**8.90**		
Gallium	10	10	8	5	10	10	**8.90**		
Silicon	10	10	6	0	10	10	**7.80**		
Chromium	10	10	6	8	10	5	**7.58**		
Antimony	10	10	4	6	10	10	**7.25**		
Germanium	10	10	4	5	10	10	**7.20**		
Platinum Group Metals	10	10	6	0	10	5	**7.18**	Score based on Rhodium (highest scoring PGM)	
Aluminium	10	0	6	0	10	10	**7.05**		
Rare Earth Elements	10	10	4	0	10	10	**6.95**	Score based on Neodymium (highest scoring REE)	
Tungsten	10	10	4	0	10	10	**6.95**		
Zinc	10	9	6	8	5	10	**6.88**		
Molybdenum	10	10	5	0	10	5	**6.75**		
Indium	10	10	4	5	10	5	**6.58**		
Graphite	10	10	3	1	10	10	**6.58**		
Garnet	10	0	6	3	10	5	**6.58**	Not elemental but produced in NZ. Substitutes are available for key end use (sandblasting, reducing criticality).	Down
Nickel	10	10	4	4	10	5	**6.53**		
Bismuth	10	10	2	5	10	10	**6.35**		
Tellurium	10	10	4	0	10	5	**6.33**		
Vanadium	0	0	6	0	10	10	**6.30**		
Selenium	10	10	6	6	5	5	**6.23**		
Cadmium	10	10	6	5	5	5	**6.18**	Toxic and use discouraged by the UN. Not on partner CM lists	Down
Niobium	10	10	5	0	10	0	**6.13**		
Manganese	10	10	6	0	5	5	**5.93**		
Cobalt	10	9	3	1	10	5	**5.88**		
Lead	10	0	5	10	5	10	**5.88**	Harmful to human health. Not on partner CM lists.	Down
Arsenic	10	10	2	7	10	5	**5.83**		
Copper	10	1	5	4	5	10	**5.65**		
Strontium	10	0	4	0	10	5	**5.58**		
Cesium	10	10	0	5	10	10	**5.50**		
Rubidium	10	10	0	5	10	10	**5.50**		
Boron	10	10	2	0	10	5	**5.48**		
Magnesium	10	0	2	0	10	10	**5.35**		

Mineral	New Zealand import dependence	New Zealand net import dependence	2029 Market balance	Global supply availability	Market supply concentration	Supply country risk rating	Overall supply risk score	Comment	Recommended Adjustment
Titanium	6	0	4	0	10	5	**5.28**		
Zirconium	10	10	4	2	5	5	**5.18**		
Beryllium	10	10	2	5	10	0	**5.10**		
Potassium (Potash)	10	10	4	0	5	5	**5.08**		
Lithium	10	10	0	6	10	5	**4.93**	Lithium market now in surplus globally through the medium term, therefore less supply risk through to 2029. Partner critical mineral lists developed during periods of deficit.	No change
Thorium	10	10	0	5	10	5	**4.88**	NZ potential supplier long term however unlikely. Radioactive product and not on any partner lists.	No change
Helium	10	10	2	0	10	0	**4.85**	Minimal risk in securing NZ demand	No change
Thermal Coal	1	0	3	6	10	5	**4.78**	Market in surplus, minimal risk in meeting import requirements and alternate supply options.	No change
Gold	10	0	5	7	0	10	**4.48**	Minimal risk in securing NZ demand and not on any partner list	No change
Hafnium	10	10	2	5	5	5	**4.48**	Limited NZ demand but recognise it is on several partner's critical minerals lists.	No change
Phosphate	10	10	2	0	5	5	**4.23**	Given the importance of supply for the agriculture industry in NZ, this becomes critical.	Up
Tantalum	10	10	2	0	5	5	**4.23**	Limited supply risk but recognised as critical by all partner countries	No change
Tin	10	10	4	8	0	5	**4.23**	Limited qualitative data on future market balance however there are concerns for potential market shortages and on a number of partner's lists. Risk reduced through diversity of supply	No change
Hydrogen	1	1	5	0	5	5	**4.15**	Limited risk across the board and not on any partners lists	No change
Iodine	10	0	2	0	10	0	**4.10**	Not on any partners lists	No change
Rhenium	10	10	0	0	10	0	**4.00**	Limited NZ demand and on limited number of partner's critical minerals lists	No change
Silver	10	8	2	7	0	10	**3.80**	Minimal risk in securing NZ demand and not on any partner list	No change
Barite (Barium)	10	10	0	5	5	5	**3.63**	Limited qualitative data on future market balance but on a couple of partner's lists	No change
Metallurgical Coal	5	0	1	3	10	0	**3.45**	Low global supply risk	No change
Aggregate & Sand	0	0	6	5	0	5	**3.43**	Regulatory constraints limiting new supply in NZ, alternate sourcing at significantly higher cost.	Up
Lime (including Limestone and Dolomite)	0	0	5	5	0	5	**3.00**	Limited domestic supply risk	No change
Iron	2	0	0	6	10	0	**2.95**	Low global supply risk	No change

Comparison to International Partner Critical Mineral Lists

New Zealand's Draft Critical Minerals List closely aligns with those of its international partners. However, there are 6 minerals which are included on the Critical Minerals Lists of 2+ international partners, which underwent the supply risk assessment and were excluded based on their overall supply risk score. These minerals and a discussion of the key drivers behind their supply risk scores are included in Table 15.

Table 15: Key minerals excluded from the Draft Critical Minerals List

Mineral	Overall supply risk score	International partner List inclusion	Comment on exclusion from NZ Draft List
Lithium	4.93	USA, UK, EU, Australia and Canada	Current international partner critical mineral lists were generally developed prior to 2023 when global lithium markets were tight, however recent supply growth has moved global lithium markets into surplus, which is forecast to continue through the rest of this decade.
Helium	4.85	EU and Canada	Helium has important medical applications and supply is concentrated. However, there are large reserves and large volumes are produced by NZ partner countries, resulting in its exclusion from the Draft NZ List.
Hafnium	4.48	USA, EU and Australia	Hafnium is a niche but important input to specialist alloys used in aerospace and nuclear industries. The global market is small, which may have been factored into partner supply risk assessments. However, relatively diversified production, including in NZ international partner countries and lack of price volatility results in its exclusion from the Draft NZ List.
Tantalum	4.23	USA, UK, EU, Australia and Canada	Tantalum is used in specialist electronics and the global market is small, which may have been factored into partner supply risk assessments. However, relatively diversified production and lack of price volatility results in its exclusion from the Draft NZ List.
Tin	4.23	USA, UK and Canada	Tin is a key metal used as solder in electronics and the global market is small, which may have been factored into partner supply risk assessments. However, relatively diversified production results in its exclusion from the Draft NZ List.
Barite	3.63	USA and EU	Barite is an important input for Solar cells and the global market is small, which may have been factored into partner supply risk assessments. However, relatively diversified production and lack of price volatility results in its exclusion from the Draft NZ List.

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