Submitter information

The Ministry of Business, Innovation and Employment (MBIE) would appreciate if you would provide some information about yourself. If you choose to provide information in the "About you" section below it will be used to help MBIE understand the impact of our proposals on different occupational groups. Any information you provide will be stored securely.

A. About you

Name: Dr Jim Goddin

Email address: Privacy of natural persons

B. Are you happy for MBIE to contact you if we have questions about your submission?

☒ Yes ☐ No

C. Are you making this submission on behalf of a business or organisation?

☒ Yes ☐ No

If yes, please tell us the title of your company/organisation:

thinkstep-anz (thinkstep ltd.)

D. The best way to describe your role is:

☐ Academic/researcher/research institute
☐ Community group (please specify below)
☒ Consultant (please specify below)
☐ Tradesperson (please specify below)
☐ Industry group (please specify below)
☐ Industry participant (please specify below)
☒ Independent expert (please specify below)
☐ Business owner (please specify below)
☐ Environmental NGO (please specify below)
☐ Student (please specify below)
☐ Other (please specify below)
☐ Prefer not to say

Please specify here:

Critical materials specialist and member of the UK government advisory committee on critical minerals and advisory board member of the international round table on materials criticality, former expert member of the EU's Rare Earth Competency network (ERECON) and working group member of the European Innovation Partnership on Raw Materials

E. Privacy information

☐ The Privacy Act 2020 applies to submissions. Please check the box if you do not wish your name or other personal information to be included in any information about submissions that MBIE may publish.

☐ MBIE may upload submissions, or a summary of submissions, received to MBIE's website at www.mbie.govt.nz. If you do not want your submission or a summary of your submission to be placed on our website, please check the box and type an explanation below:

I do not want my submission placed on MBIE's website because… [insert reasoning here]

F. Confidential information

☐ I would like my submission (or identifiable parts of my submission) to be kept confidential and have stated my reasons and ground under section 9 of the Official Information Act that I believe apply, for consideration by MBIE.

If you have checked this box, please tell us what parts of your submission are to be kept confidential.

A Draft Critical Minerals List for New Zealand

MBIE is developing a critical minerals list for New Zealand to identify the 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, we rely on domestic sources of minerals, but the supply of these minerals can be constrained, for example by regulatory factors and social licence. Internationally, supply chain disruptions could arise due to geopolitical risks and external market forces.

Minerals play an essential role in New Zealand's economic growth through high-paying jobs, Crown royalties, direct positive impact in the regions where mining takes place, and through export revenues. Minerals are also critical inputs into products that are necessary for other sectors to thrive, including the use of aggregates in construction and infrastructure.

Minerals are also essential to modern economies as they are needed to manufacture advanced technologies such as semi-conductors, defence applications and medical equipment. Minerals are also critical for a clean energy transition as low emission technologies requires more mineral inputs than those fuelled by fossil fuels.

The extraction and processing of the minerals essential to New Zealand and our international partners are concentrated in a few countries. Any disruption that interrupts operations at a large facility or group of facilities can have a major impact on supply availability, and therefore on prices. The greater the concentration of production the larger the affect a disruption can have.

In addition, New Zealand does not manufacture a wide range of technologies, we are generally an end consumer of many products produced internationally and rely on the functioning of international supply chains and their access to resilient supplies of minerals.

The development of a critical minerals list is one of the key actions identified in the draft Minerals Strategy that was publicly consulted on from 23 May – 31 July 2024. Due to the technical nature of the list, MBIE engaged a consultancy with specialist expertise, Wood Mackenzie, to support the development of the list.

We are seeking feedback on the content of the draft list that has been developed by Wood Mackenzie for New Zealand. It identifies the minerals that are critical to New Zealand and summarises the reason for their inclusion in the list. Once the list is finalised, actions could be identified to help us reduce the 'criticality' of those minerals, i.e., secure better access to them.

Please see the draft Critical Minerals List attached below for more information.

Questions for the consultation

1. Have we missed the inclusion of any mineral(s) on the draft Critical Minerals List?

☒ Yes, (please provide more details below) ☐ No, the list is okay. ☐ Not sure/no preference
Is there anything you would like to tell us about the reason(s) for your choice?

Alumina: Important for polishing, catalysts, coatings and refractory materials. Significant monopoly of supply and elevated supply risk in producing regions.

Bromine: Important for fire retardants, chemicals, pest control, and pharmaceuticals. It has a significant monopoly of supply, albeit in lower-risk regions. Use in New Zealand is limited but some applications are likely to not have suitable alternatives.

Nitrogen: An important source of fertilisers and a precursor for nitric acid and ammonia (a potential carrier for hydrogen as fuel). It is likely to be low risk but perhaps on the margin of becoming medium risk and, therefore, worthy of monitoring.

Sulphur: Important for acid, fertilisers, chemicals, petroleum, rubber, water treatment, food preservation, and cosmetics. It is likely to be a low risk from our initial assessment but should be included in the evaluation due to wide-ranging applications.

2. Have we included any mineral(s) that you think should not be on the list?

☐ Yes, (please provide more details below) ☒ No, the list is okay. ☐ Not sure/no preference
Is there anything you would like to tell us about the reason(s) for your choice?

3. Do you have any further feedback on the list, or the methodology under which it was developed?

☒ Yes, (please provide more details below) ☐ No, the list is okay. ☐ Not sure/no preference
Is there anything you would like to tell us about the reason(s) for your choice?

The methodology followed has several significant gaps and flaws. In some cases we believe these will have led to misrepresenting the risks associated. Most minerals assessed will be impacted as a result.

1. **Economic importance was not assessed by the report**
   While the authors have included import dependence as a component of their assessment, this only quantifies the mass flow and does not reflect the economic impact to New Zealand from possible supply disruptions.

   It does not necessarily follow that the largest economic impacts will result from the largest disruptions in flows. Indeed, comparatively minor material disruptions can have disproportionate economic effects.

As such, the assessment is missing a vital dimension that reflects the economic dependence of New Zealand industry and the losses in revenue and jobs that may result from supply disruptions. This important component is present in every other major assessment of critical minerals and impacts the value industry can extract from this report. We would have expected this work to have included stronger industry engagement in order to evaluate the potential economic impacts to New Zealand businesses of supply disruptions to each of these minerals.

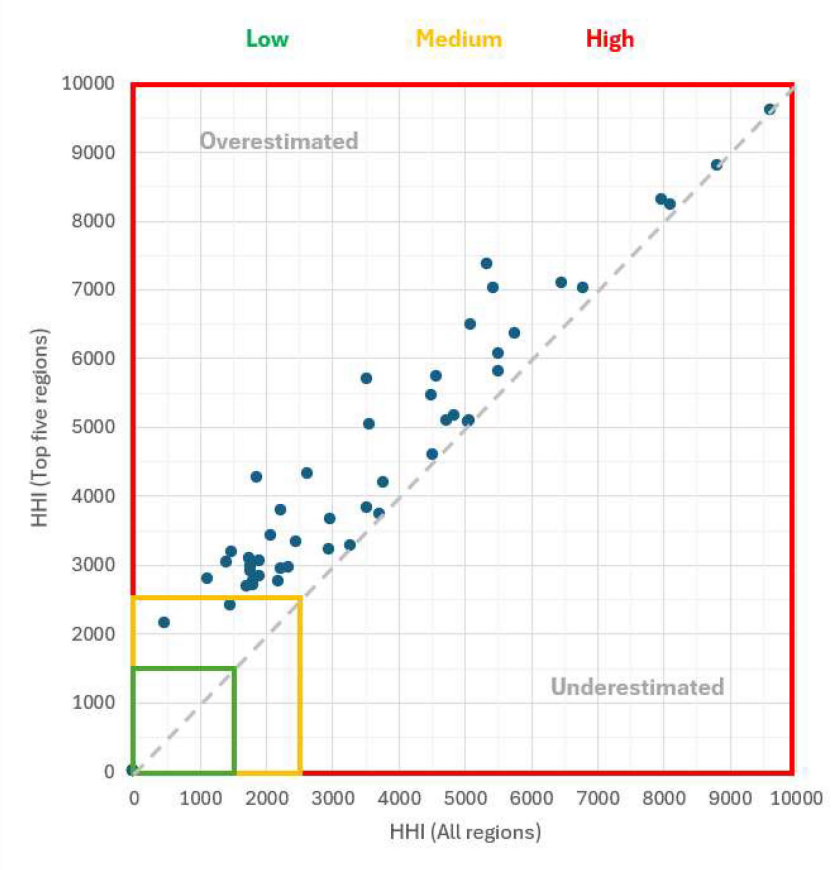
2. **Year & source of production data used**

The authors have used production data from 2023. While it is laudable to attempt to use the most recent data, geological surveys often do not publish complete data for the most recent year. Indeed, they often continue to retrospectively update production data up to four years afterwards. The most reliable year to have used data from would have been 2022, which has a much more complete dataset for most minerals.

The authors do not state the sources of the production data they have used; however, we would **strongly recommend using a combination of data from the USGS and BGS** as there are often discrepancies. The USGS often withholds US production data—this is, however, often published by the BGS (the most recent BGS data is for 2022).

3. **Global Supply concentration**

The authors have calculated the Herfindahl-Hirschman Index (HHI) based on only the top five producers of each commodity. This will overestimate the degree of supply concentration for many commodities, especially impacting those with significantly distributed production bases.



Our graph above illustrates how selecting just the top five producing regions impacts the calculated HHI for the minerals and commodities included in the report.

From a quick assessment, we believe the degree of supply concentration that exists has been overestimated for most minerals in the assessment. We strongly recommend repeating the assessment with the full set of producing regions included – noting that production data is much more complete for 2022, as mentioned above. Our initial analysis suggests this will materially impact the ranking of the following minerals: Chromium, Antimony, PGMs, Zinc, Molybdenum, Copper, Titanium, Hafnium, Aggregate and Sand, Lime and Iron. We would, however, strongly recommend updating the data for all of the minerals covered.

For Lime production, we believe the reported global supply concentration is incorrect and significantly underestimates the supply concentration, ranking the risk as 0 when it should be 10 – Lime has an HHI score of 5,338 based on 2022 data from the USGS and BGS, which clearly places it in this high-risk category. The USGS and BGS data for Lime in 2022 is in close agreement, and there appears to have been no significant change between 2022 and 2023, as reported by the USGS. The error in the report may be due to the authors using the data for limestone and dolomite rather than the production data for lime – the former being types of stone and the latter being the chemical that is of interest, particularly for agriculture.

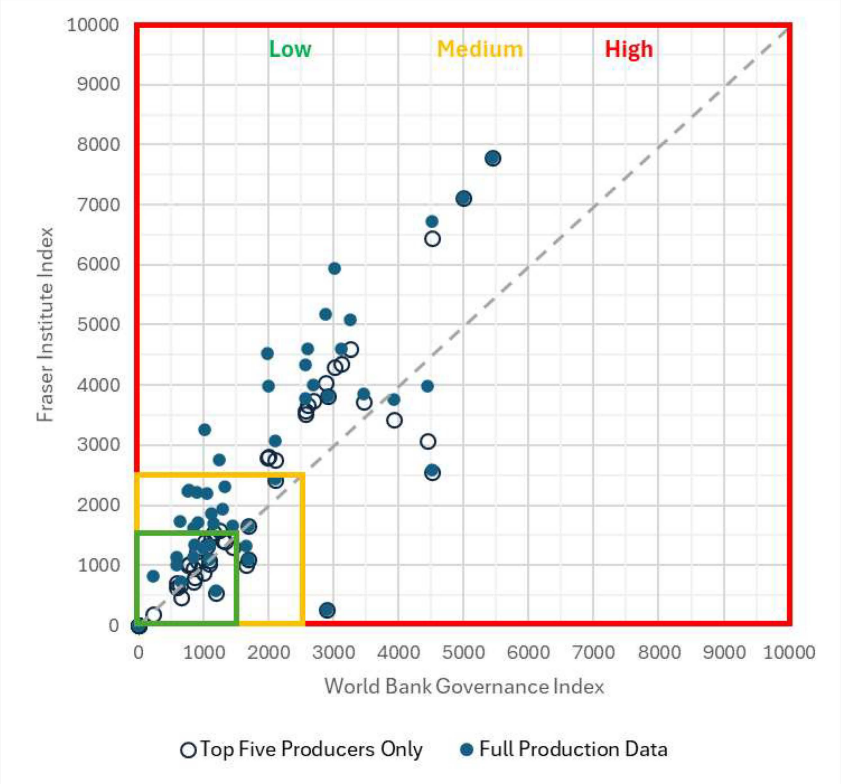
The report fails to highlight that production data for construction sand (HS250510 & HS250590) is unavailable (as highlighted by 2022 UNEP report) but is reported together with aggregates. This is likely to significantly underestimate the risks associated with sand production as not all types of sand are suitable for construction and those that are, are reported by UNEP as becoming harder to access and are often associated with adverse environmental and social impacts.

4. **Global supply country risk**

The calculation methodology adopted by the authors was to multiply the market share by the country risk and to sum the totals. This approach essentially creates a weighted average score for the risk, whereas the more typical approach uses a modified Herfindahl Hirschmann Index. The disadvantage of the approach adopted by the authors is that it potentially downplays or smooths out the risks posed by a dominant supplier. It may also downplay the risks associated with a dominant supply from a moderate-risk region. Using a modified HHI keeps the issue of supply concentration in focus when looking at supply risks – which is why most critical minerals reports adopt this approach.

The authors have used the Fraser Institute's Investment Attractiveness Index (2023) as a proxy for supply risk. This is a puzzling choice for several reasons:

1. The majority of other national risk assessments use the World Bank Governance Index (WGI), which is a comprehensive metric that incorporates a range of relevant social and geopolitical risks and is available for **every** producing region of interest – i.e. those that produce the minerals in this report.
2. The Fraser Institute Investment Attractiveness Index, while seemingly comprehensive, does not include values for many of the regions in which relevant production takes place, leading to an incomplete assessment. On average, we estimate the percentage of global production covered by the index is 81%, but for some commodities, this can be 50% or lower. This significantly impacts the relevance and accuracy of this metric, and we strongly recommend the WGI replace this metric to ensure both accuracy and consistency with other critical minerals lists.
3. Combined with the coverage of only the top five producers, the partial data coverage of the Fraser Institutes index leads to some potentially significant errors in the assessment – see below:



Our initial analysis suggests the partial coverage of the Fraser Institutes Index will materially impact the ranking of the following minerals: Chromium, Antimony, PGMs, Aluminium, Zinc, Molybdenum, Indium, Nickel, Selenium, Cadmium, Niobium, Manganese, Cobalt, Lead, Copper, Boron, Titanium, Zirconium, Potassium (potash), Lithium, Thorium, Gold, Hafnium, Phosphate, Tin, Iodine, Silver, Barium, Metallurgical Coal, Lime and Iron.

5. **Missing dimensions of risk**

   The report focusses on geopolitical sources of risk and so is missing several important non-geopolitical risk factors that should have been included. For example:

   1. **Exposure to climate change** – the production of many resources relies on the availability of water, energy and strong transportation routes, all of which are likely to be disrupted by climate change. Many producing regions are already subject to climate related stresses and these should have been considered. Suitable indices for this already exist.
   2. **Ethical risks** – Much of the global production of many resources takes place in emerging economies that are more likely to experience forced or child labour. While these factors may not directly influence the availability of resources, they can have a significant impact on the value of New Zealand goods that incorporate them. They also reflect deficiencies in production that, once corrected, may lead to price increases as the true cost of production starts to get passed on.
   3. **Environmental footprint** – As much as 50% of the reductions in emissions we need to achieve are associated with the production and use of materials and as much as 3% of global energy use is associated with communition. An over-reliance on high-emission materials is an important risk that should be considered in order to create a direct link between this list and New Zealand's Emissions Reduction Plan.

   Data to support the evaluation of these metrics is readily available and has been used in other works of this nature.

Thank you

Thanks for your feedback, we really appreciate your insight on the development of New Zealand's Critical Minerals List.