

IN THE MATTER of the Resource Management Act 1991
AND
IN THE MATTER of an application for resource consents by **TIGA
MINERALS AND METALS LTD**
AND
IN THE MATTER of a submission by the
COAST ROAD RESILIENCE GROUP INC

Statement of evidence of James Renwick
For COAST ROAD RESILIENCE GROUP INC
Topic Climate Change, its impacts and mitigation

Dated: 12 January 2024

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INTRODUCTION

1. My full name is James Arthur Renwick.
2. I hold a PhD in Atmospheric Sciences from the University of Washington, Seattle, USA, awarded in May 1995. I specialise in climate and atmospheric science including the dynamics and statistics of the large-scale atmosphere circulation; climate variability and prediction; climate change; and numerical modelling of the climate. I have over 100 peer-reviewed scientific publications in the field of atmospheric and climate science and have extensive experience as a researcher in these fields.
3. I have the following relevant experience:
 - I am a Commissioner on the New Zealand Climate Change Commission;
 - I was a Coordinating Lead Author for the Intergovernmental Panel on Climate Change (IPCC) 6th Assessment Report (AR6, 2021), and was a Lead Author for the IPCC 5th Assessment (AR5; 2010-2013) and 4th Assessment (AR4; 2004-2007), and contributed towards the 2007 Nobel Peace Prize being awarded to the IPCC and to Albert Gore Jr;
 - I have been a co-chair of the Climate and Cryosphere project of the World Climate Research Programme (WCRP) and served on the Joint Scientific Committee of the WCRP. I am a Member of the American and New Zealand Meteorological Societies, the American Geophysical Union, the European Geophysical Union and the Royal Society of New Zealand. In the past decade, I have served as the Chair of the Royal Society of New Zealand's Climate Expert Panel, and was part of the World Meteorological Organisation Executive Council Panel of Experts on Polar Observations, Research and Services;
 - In 2005 I was awarded the Kidson Medal of the N.Z. Meteorological Society, the highest New Zealand honour for atmospheric and climate sciences. I was awarded the 2018 Prime Minister's Prize for Science Communication and was part of the team that was awarded the 2019 Prime Minister's Science Prize.
4. I have been asked by the Coast Road Resilience Group Inc to provide expert evidence in relation to climate change and the effects of climate change, and the need for emissions reduction, in relation to the application (LU3154-23) by TiGa Minerals and Metals for mining at Barrytown Flats.
5. I have a working knowledge of the TIGA application site through visits to Barrytown, Punakaiki, and surrounding districts, several times over the past 25 years.

6. In preparing this statement of evidence, I have reviewed the following documents.
- IPCC AR6 Reports and summaries, available at <https://www.ipcc.ch/assessment-report/ar6/>.
 - Ministry for the Environment and Stats NZ reports on observed and projected climate change for New Zealand, e.g. <https://environment.govt.nz/publications/our-atmosphere-and-climate-2023/>.
 - Several recent refereed papers in the area of climate change and its effects on New Zealand.
 - Final Terrestrial Ecology Peer Review by Mike Harding
 - TiGA RC Application AEE FINAL.
 - Coast Road Resilience Group Climate Change hearing submission.
 - Inaia Tonu Nei, the Climate Change Commission's advice to Government on emissions reductions.
7. While this is not an Environment Court hearing, I have read the Environment Court's Code of Conduct for Expert Witnesses 2023, and I agree to comply with it. My qualifications are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise.
8. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

9. This evidence covers the following matters:
- The global picture: Climate change today, its drivers and its impacts
 - Climate change in New Zealand: The local picture, in relation to the global
 - Key effects of future change and impacts on the Barrytown Flats area
 - Needs for mitigation of greenhouse gas emissions
 - TiGA application in the context of climate change information

SUMMARY

10. Climate change is on-going and is increasing the frequency and intensity of extreme events in New Zealand and worldwide.
11. To stop climate change at a manageable level, the globe must reduce emissions of carbon dioxide to zero as fast as possible, with emissions declining from 2025. As a developed country, New Zealand is expected to take a lead in such efforts.
12. The proposed TiGa mining operation will be located in an area exposed to several weather and climate hazards, especially heavy rainfall events and landslides, with disruption to road access.
13. The proposed TiGa mining operation will be emissions-intensive and will require emissions offsets or compensating emissions reductions elsewhere to fit within the country's goals to meet a zero-emissions target for carbon dioxide under the Climate Change Response (Zero Carbon) Amendment Act 2019 (CCRA).
14. For these reasons, I do not support the proposed mining operation going ahead.

EVIDENCE

The global picture: Climate change today, its drivers and its impacts

15. The scientific consensus is clear. Climate change has been under way for a century or more and human activities are the primary contributors to those changes. The most important way that humans contribute to climate change is by burning fossil fuels, including oil, gas, and coal, which results in emissions of greenhouse gases into the atmosphere¹. The most important greenhouse gas emitted by human activity, in terms of its concentration in the atmosphere, its atmospheric lifetime, and its total effect on warming the climate system, is carbon dioxide. Carbon dioxide emissions are a direct by-product of the burning of fossil fuels.
16. The scientific evidence for the phenomena of global climate change and their anthropogenic causes is contained in the broad corpus of writings on the subject from the scientific community. This evidence has been collated by the IPCC, who produced periodic Assessment Reports, and Special Reports, based upon the wider scientific literature on climate change.

¹IPCC (2023)

17. As outlined in the Summary for Policy Makers in the Working Group 1 component of the AR6², the following key points concerning observed changes in the climate were identified:

- a. Human-caused radiative forcing has warmed the climate system. This warming is mainly due to increased greenhouse gas (GHG) concentrations, partly reduced by cooling due to increased aerosol concentrations (air pollution). Observed increases in well-mixed GHG concentrations since around 1750 are unequivocally caused by human activities.
- b. It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. Each of the last four decades has been successively warmer than any decade that preceded it since 1850.
- c. Global mean sea level has risen faster since 1900 than over any preceding century in at least the last 3000 years. The global ocean has warmed faster over the past century than since the end of the last deglacial transition (around 11,000 years ago). A long-term increase in surface open ocean pH occurred over the past 50 million years, however, surface open ocean pH as low as recent decades is unusual in the last 2 million years.
- d. The scale of recent changes across the climate system as a whole – and the present state of many aspects of the climate system – are unprecedented over many centuries to many thousands of years.

18. To stop global warming at what is considered a manageable level as specified in the Paris Agreement, i.e. a global temperature rise of between 1.5°C and 2°C compared to pre-industrial levels, the AR6 estimates that emissions reductions are required urgently, all the way to net-zero CO₂. To have at least a 50% chance of keeping global warming below 1.5°C, global emissions of GHGs must peak before 2025 (i.e. this year at the latest) and then decline rapidly³.

19. Since the AR6 was published, the pace of climate change and GHG emissions has continued to accelerate⁴. The year 2023 was the warmest on record globally, by a

²IPCC (2021)

³ IPCC (2023)

⁴United Nations Environment Programme (2023).

significant margin^{1,5}. The global mean surface temperature in 2023 has been estimated as 1.48°C above pre-industrial temperatures. Overshooting 1.5°C of warming (the bottom of the Paris Agreement range) is now almost inevitable⁶.

20. As the latest “Emissions Gap” reports states: The failure to stringently reduce emissions in high-income countries and to prevent further emissions growth in low- and middle-income countries implies that all countries must urgently accelerate economy-wide, low-carbon transformations to achieve the long-term temperature goal of the Paris Agreement¹.
21. To rein in global climate change, in my opinion, all countries and all economic sectors must reduce their GHG emissions as fast as possible, starting immediately.

Climate change in New Zealand: The local picture, in relation to the global

22. The climate of New Zealand is changing in line with global trends and impacts are being felt across the country. Chapter 11 (“Australasia”) of the Working Group 2 report of the AR6⁷ identified several aspects of climate change of relevance to New Zealand:
 - a. Climate change is affecting Australia and New Zealand in profound ways. Some natural systems of cultural, environmental, social and economic significance are at risk of irreversible change. The socioeconomic costs of climate change are substantial, with impacts that cascade and compound across sectors and regions, as demonstrated by heatwaves, wildfire, cyclone, drought and flood events.
 - b. Climate trends and extreme events have combined with exposure and vulnerabilities to cause major impacts for many natural systems, with some experiencing or at risk of irreversible change in Australia and in New Zealand.

⁵<https://www.theguardian.com/environment/2024/jan/09/2023-record-world-hottest-climate-fossil-fuel>, accessed 11 January 2024.

⁶Achakulwisut et al. (2023).

⁷ Lawrence et al (2022)

- c. Climate risks are projected to increase for a wide range of systems, sectors and communities, which are exacerbated by underlying vulnerabilities and exposures.
- d. A step change in adaptation is needed to match the rising risks and to support climate resilient development.

23. New Zealand has warmed at close to the global rate over the past century⁸. In recent years, Marine Heat Waves have been a prominent feature of the climate in the New Zealand region, associated with widespread disruptions to marine and terrestrial ecosystems, aquaculture and agriculture (Salinger et al. 2019; 2020; 2023). Extreme rainfall events in early 2023 (notably the Auckland floods in late January, and ex-tropical cyclone Gabrielle in February)⁹ alerted many people to the realities of extreme rainfalls in a warmer and moister climate.

24. On the national average, New Zealand sea level have risen around 20cm over the past century and are projected to rise approximately another 20-40cm by 2050 and by 50-100cm by 2100¹⁰. Sustained mass loss by ice sheets would cause larger sea level rise, and some part of the mass loss may be irreversible. Abrupt and irreversible ice loss from a potential instability of marine-based sectors of the Antarctic ice sheet in response to climate forcing is possible, but current evidence and understanding is insufficient to make a quantitative assessment. It is considered a “low likelihood, high impact” pathway.

Key effects of future change and impacts on the Barrytown Flats area

25. The Barrytown Flats area, and much of the West Coast generally, is exposed to many climate change-related hazards, especially extreme rainfalls and associated landslips, and coastal erosion from increasing sea-level rise. Rainfall amounts are observed to have increased since 1960¹¹ and are projected to increase by around 10% in winter (4% in annual average) by mid-century and by around 20% in winter

⁸Ministry for the Environment & Stats NZ (2023)

⁹<https://niwa.co.nz/climate/summaries/annual-climate-summary-2023>, access 12 January 2024

¹⁰ Ministry for the Environment (2017)

¹¹Ministry for the Environment and Stats NZ (2023)

(8% in annual average) by the end of the 21st century, for a mid-range scenario of GHG emissions¹².

26. Such rainfall increases are associated with sharp increases in extreme rainfall amounts. NIWA estimates that per degree of warming, the magnitude of 1-in-50-year rainfall amounts in the Barrytown region would increase by between 10 and 20%⁶. Similar percentage increases are modelled for much more common events, down to the one-in-two-year frequency.
27. I do not have expertise in assessing associated changes to landslide risk but recent experiences in the North Island associated with ex-TC Gabrielle and other heavy rainfall events suggests that increases in peak rainfall rates of up to 20% would be associated with increased landslide risk and likely damage to roading and land transport generally.
28. Sea level rise along the Barrytown coast is expected to continue at close to the national average. Vertical land movement as identified in the SeaRiseNZ¹³ project is not considered an issue for the Barrytown coastal strip as that part of the coastal strip is not noticeably moving up or down¹⁴. However, even without coastal land subsidence, the projected rise in sea levels during the life of the mining operation (through to 2040) will drastically alter the frequency of occurrence of coastal flooding and erosion events. A general rule of thumb is that a 10-cm rise in sea level increases the frequency of flooding to a given height by a factor of approximately three¹⁵. Hence, a 30cm rise by 2050 means the 1-in-100 year coastal flood would be occurring around once in 3-4 years, a 27-times (3x3x3) increase in frequency. Such changes, combined with increasing depth of coastal floods and increasing intensity of heavy rains in storms, implies a large increase in the coastal flooding hazard over short time frames. Moreover, groundwater levels rise as sea levels rise, leading to more frequent ponding and slower drainage after rainfall events.

¹² Ministry for the Environment (2018)

¹³<https://www.searise.nz/>

¹⁴<https://searise.takiwa.co/map/6233f47872b8190018373db9/embed>, accessed 11 January 2024

¹⁵<https://www.eea.europa.eu/en/analysis/indicators/extreme-sea-levels-and-coastal-flooding>

Needs for mitigation of greenhouse gas emissions

29. As noted in paragraphs 19-22, there is an urgent need for emissions reductions globally. The implications of this for the TiGa application is discussed in paragraphs 206-214 of the WCRC s42a Officers report by Dr Michael Durand. As specified in the Paris Agreement, as a developed country New Zealand is expected to reduce its emissions faster than the global average, to take a lead in emissions reductions. Under the Climate Change Response (Zero Carbon) Amendment Act 2019 (the “CCRA”), New Zealand is committed to reaching net-zero carbon dioxide emissions no later than 2050, and staying at net-zero or below every year thereafter.
30. The Climate Change Commission in its advice to Government on the first Emissions Reduction Plan, *Ināia tonu nei*¹⁶, stated that the country should (and could afford to) reduce net emissions of carbon dioxide by 15% by 2025 and by 63% by 2035, just over one decade away. The report notes that making the transition to a low-emissions economy “...will involve changes to individual and corporate behaviours, changes to existing processes and ways of operating, and technological innovation.”
31. All sectors of the national economy must reduce their emissions of GHGs if the country is to meet the goals laid out in the CCRA.

TiGA application in the context of climate change information

32. The TiGa Assessment of Environmental Effects (AEE) report determines that the proposed activities will have no more than minor adverse effects on the environment. The proposal involves mitigation measures to reduce the effects on the environment, such as effects on landscape and visual amenity, noise effects, traffic effects, indigenous flora and fauna and water bodies. However, the effects on New Zealand’s contribution to global climate change and to our efforts to live up to the Paris Agreement and the CCRA seem not to have been considered.
33. The TiGa proposal appears to be emissions-intensive, starting with the work required to establish the mining plant. Once operational, the plant will be diesel-powered, and the proposed mining activity is estimated to generate approximately 50 truck and trailer movements per day and 140 light vehicle per day, estimated to be a total of 390 Equivalent Car Movements per day. Moreover, many workers at the TiGa plant are likely to be flown in and out of the West Coast region on a regular basis over the

¹⁶Climate Change Commission (2021)

course of operations. It would be useful if TiGa could estimate total annual carbon dioxide and general GHG emissions from these activities.

I note the sustainability material in paragraphs 35-42 of the statement of evidence of Robert Brand. If TiGa are able to upgrade the electricity network on the West Coast and therefore to electrify much of their operations, that would go some way to reducing the mine's greenhouse gas emissions. Prior to this happening, it would be useful to know what plans TiGa has to either offset their emissions to help other sectors reduce their emissions to compensate.

34. TiGa plan to avoid lowering land levels during their operations and aim to restore the land surface upon completion of operations. They claim that their recovery plans "...will ensure that the groundwater table is not encountered." It is not clear whether this factors in rising groundwater levels.
35. Planned plantings on the sea side of the mine would act to mitigate some of the coastal flooding and erosion risk. However it is not clear whether the expected rapid increase in coastal flooding events (paragraph 29) has been considered in planning such mitigation efforts.
36. In my opinion, it is a poor time to be initiating such emissions-intensive mining activities, especially in a location exposed to increasing heavy rainfall events and increasingly frequent coastal flooding.

CONCLUSION

37. Climate change is on-going and is increasing the frequency and intensity of extreme events in New Zealand and worldwide.
38. To stop climate change at a manageable level, the globe must reduce emissions of carbon dioxide to zero as fast as possible, with emissions declining from 2025. As a developed country, New Zealand is expected to take a lead in such efforts.
39. The proposed TiGa mining operation will be located in an area exposed to several weather and climate hazards, especially heavy rainfall events and landslides, with disruption to road access.
40. The proposed TiGa mining operation will be emissions-intensive and will require emissions offsets or compensating emissions reductions elsewhere to fit within the country's goals to meet a zero-emissions target for carbon dioxide under the CCRA.

41. For these reasons, I do not support the proposed mining operation going ahead.

James Renwick

12 January 2024

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