NZIER
NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH

Economic impact assessment of TTRL's Taranaki VTM Iron Sands Project

NZIER report to Trans-Tasman Resources Limited

12 March 2025

About NZIER

New Zealand Institute of Economic Research (NZIER) is an independent, not-for-profit economic consultancy that has been informing and encouraging debate on issues affecting Aotearoa New Zealand, for more than 65 years.

Our core values of independence and promoting better outcomes for all New Zealanders are the driving force behind why we exist and how we work today. Our purpose is to help our clients and members make better business and policy decisions and to provide valuable insights and leadership on important public issues affecting our future.

We are unique in that we reinvest our returns into public good research for the betterment of Aotearoa New Zealand.

Our expert team are based in Auckland and Wellington and operates across all sectors in the New Zealand economy and combine their sector knowledge with the application of robust economic logic, models and data and understanding of the linkages between government and business to help our clients and tackle complex issues.

Authorship

This report was prepared at NZIER by Christina Leung, Ting Huang, Daniel Hamill, Tom Dunn, and Philippa Miller-Moore.

It was quality approved by Peter Clough.

The assistance of Sarah Spring is gratefully acknowledged.

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Registered office: Level 13, Public Trust Tower, 22–28 Willeston St | PO Box 3479, Wellington 6140
Auckland office: Level 4, 70 Shortland St, Auckland
Tel +64 4 472 1880 | econ@nzier.org.nz | www.nzier.org.nz

What we are asked to do

You have commissioned NZIER to undertake an economic impact assessment (EIA) of TTRL's Taranaki VTM Iron Sands Project (the Project) to support your application for Fast-track consenting approval. In particular, you have asked us to estimate the direct and flow-on economic impacts of the Project on:

- The local economy – South Taranaki and Whanganui
- The regional economy – the Taranaki Region (South Taranaki, New Plymouth and Stratford) and Whanganui
- The New Zealand economy.

An EIA was undertaken by MartinJenkins in 2015 on the Trans-Tasman Resources Offshore Iron Sands project based on data inputs provided by TTRL. For this EIA, we use updated inputs from TTRL and NZIER's Input-Output multipliers model to estimate the direct and indirect impacts on economic activity, gross domestic product (GDP) and employment resulting from the Project's operation. We will also estimate the additional export earnings and contribution to royalties and taxation paid to the New Zealand Government based on the inputs you provided and more recent data on exchange rates and prices of the relevant commodities.

Our main findings are summarised below.

Summary of main findings

TTRL's VTM Iron Sands Project is a NZ$1 billion capital investment, with about $55 million to be spent in New Zealand across a range of activities involved in the initial setup of the Project

TTRL will make a one-off capital investment of approximately NZ$1 billion in setting up the Project, with more than NZ$55 million of this capital investment to be spent in New Zealand. Capital expenditure in New Zealand will cover costs associated with project management, consultancy, consenting and obtaining permits, and the setup of the TTR Charitable Trust, environmental initiatives, shipbuilding marine research and monitoring vessel and equipment, a vanadium recovery pilot plant and a training facility in Hāwera. Within the capital expenditure in New Zealand, NZ$30 million will be spent in the Taranaki Region and Whanganui District, and approximately NZ$10 million will be in the South Taranaki and Whanganui districts.

TTRL's VTM Iron Sands Project will directly create a total of 303 new full-time equivalent (FTE) jobs across the Taranaki Region and Whanganui District, with an annual direct expenditure of NZ$238 million on a range of industries in New Zealand

In the operational phase of the Project, TTRL will employ 173 crew members to operate the IMV and FSO vessels, with over 50 staff members required to support, engineer, perform environmental monitoring, and conduct fuel bunkering roles. There will also be 35 staff who will undertake general administration roles for the day-to-day operation of the Project.

In addition, TTRL plans to establish its New Zealand head office in New Plymouth, which will add 35 roles to provide marketing and corporate management.

TTRL plans to spend a total of NZ$238 million per annum in New Zealand across a range of industries, of which NZ$234 million of this direct operating expenditure will occur in the Taranaki Region and Whanganui District and within that, NZ$44 million in the South Taranaki and Whanganui districts. In total, the Project's operational activities will directly create 303 FTE jobs in the Taranaki Region and Whanganui, with 77 of those being in the South Taranaki and Whanganui districts.

We estimate the Project's capital investment in New Zealand will result in a NZ$62 million increase in New Zealand's GDP and create 459 new jobs. The Project is estimated to increase New Zealand's annual GDP by NZ$265 million and employment by 1,365 jobs, with about 83 percent of these economic impacts in the Taranaki and Whanganui economies

Based on published GDP data for the year ended March 2023 and Stats NZ's 2024 business demography data, the South Taranaki and Whanganui districts combined made up about 2.7 percent of the New Zealand economy in 2023[1], contributing a total GDP of about NZ$10,749 million. Meanwhile, the Taranaki Region and Whanganui District combined contributed a total GDP of NZ$25,558 million, making up 6.5 percent of the New Zealand economy. In terms of employment, a total number of 32,000 workers were in the combined area of South Taranaki and Whanganui districts. The Taranaki Region and Whanganui District combined had a total count of 74,400 workers, making up 3 percent of the total employment in New Zealand.

We estimate that the capital investment in the Project's setup phase will:

- Increase GDP by NZ$62 million and add 459 new jobs to the total New Zealand economy
- Make a GDP contribution of NZ$27 million and add about 211 new jobs to the regional economy of the Taranaki Region and Whanganui
- Contribute NZ$9 million of GDP and add about 86 new jobs to the local economy of the South Taranaki and Whanganui districts.

For each year of the Project's operation, we estimate:

- An annual GDP contribution of NZ$265 million and about 1,365 jobs to the total New Zealand economy
- Within that national impact, an annual GDP contribution of NZ$222 million and about 1,123 jobs to the regional economy of Taranaki and Whanganui
- Within that regional impact, an annual GDP contribution of NZ$37 million and about 224 jobs to the local economy of the South Taranaki and Whanganui districts.

Table 1 and Table 2 summarise the total economic impacts of the Project at the local, regional and national levels of its capital investment and operation activity in New Zealand, respectively. Note that the three sets of economic outcomes are not additive. That is, the New Zealand impact includes the regional impact, which includes the local impact.

[1] In nominal terms.

Table 1 Estimated economic impact of the VTM Project's capital investment

Study area	South Taranaki/ Whanganui	Taranaki Region/ Whanganui	New Zealand
Output ($million, NZD)	$17	$57	$128
GDP ($million, NZD)	$9	$27	$62
Employment	86	211	459

Source: NZIER

Table 2 Estimated economic impact of the VTM Project's operational activity

Study area	South Taranaki/ Whanganui	Taranaki Region/ Whanganui	New Zealand
Output ($million, NZD)	$81	$479	$568
GDP ($million, NZD)	$37	$222	$265
Employment	224	1,123	1,365

Source: NZIER

To the extent that our approach to estimating the economic impacts reflects the expenditure to carry out the activities for the Project, fluctuations in the exchange rate, prices of the commodities produced from the Project's iron sand mining and the price of Intermediate Fuel Oil (IFO) used for bunkering will not materially affect our economic impact estimates. We recognise the impacts through revenue and, in turn, tax paid to the Crown.

It is important to note that our economic impact analysis captures the benefits from the level of operational and economic activities by overlaying the current structure of the local, regional and national economies rather than the price of iron ore, price of Intermediate Fuel Oil (IFO) or exchange rate. Given that the Project's operation is a relatively fixed process, the level of the Project's operational and economic activities will unlikely change over time.

We estimate the Project could contribute iron ore export earnings of NZ$658 million per annum and vanadium pentoxide (V_2O_5) export earnings of NZ$196 million per annum, and pay annual royalties of between NZ$36 million and NZ$54 million to the Crown from its output

Based on the recent average exchange rate of the New Zealand dollar against the US dollar and the assumed long-term average prices of iron ore (US$90 per metric ton) and V_2O_5 (US$5.45 per pound)[2], we estimate that the Project will contribute additional iron ore export earnings of NZ$658 million per annum and V_2O_5 export earnings of NZ$196 million per annum. These sum up to total export earnings of $854 million per annum the Project's outputs of iron ore make iron ore exports one of the top 12 of New Zealand's principal export categories. Earnings from iron ore and V_2O_5 exports combined will double New Zealand's exports in the broader iron and steel and articles of iron and steel category,

[2] We applied the assumed long-term average prices for iron ore and V_2O_5 in the Siecap NZ's pre-feasibility study for the Taranaki VTM Project. These are US$90 per metric ton of iron ore concentrate and US$5.45 per pound of V_2O_5.

adding up to a value of around NZ$1.69 billion, which would be about 2.6 percent of the total exports.

Based on TTRL's cash flow projections, the 2024 average exchange rate and assumed prices of iron ore, V_2O_5, IFO price and shipping cost, we estimate that the Project will contribute NZ$36 million to NZ$54 million of royalties from its outputs of iron ore and V_2O_5, and NZ$91 million to NZ$136 million corporate tax per year to the New Zealand Government. The lower bound of royalties and corporate tax estimates reflect the higher financing costs in the initial start-up phase of the Project.

TTRL notes the project outputs in this impact assessment are based on only iron ore concentrate sales of 4.9 million tonnes per year and some 19,000 tonnes of V_2O_5 from the VTM concentrate at metallurgical recovery rates of 77 percent. This report does not include any potential revenue credits (sales) for titanium, even though it is contained in the concentrate. TTRL refers to estimates that this potential upside in production amounts to some 327,000 tonnes of titanium dioxide (TiO_2) per annum in the VTM concentrates at metallurgical recovery rates of 77 percent to 79 percent. TTRL notes these additional metal sales have the potential to make a material contribution to the Project's future annual revenue stream, with flow-through effects on foreign exchange earnings, royalties, and corporate tax receipts for the New Zealand Government.

We explain our approach to estimating the economic impacts of TTRL's operations and results on New Zealand in more detail in the following sections.

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1 The proposed Taranaki VTM Iron Sands Project

The proposed VTM Iron Sands Project plans to extract iron sands resource from the seabed off the South Taranaki Bight (STB). The Project will produce iron ore concentrate for export and other critical minerals, such as vanadium, which are inputs for clean energy transition. The iron sands resource is located between 22 km and 36 km off the coast of South Taranaki[3] and in waters ranging between 20 to 50 metres deep.

In setting up the project, TTRL will make a capital investment of approximately NZ$1 billion in leading edging seabed mineral extraction and shipboard mineral processing technologies and ship-to-ship bulk concentrate transfer equipment, along with mining support and marine research and monitoring vessels and equipment to establish the mineral recovery operation in the STB. More than NZ$55 million of the capital investment will be spent in New Zealand, which will cover costs associated with project management, consultancy, consenting and obtaining permits, and the setup of the TTR Charitable Trust, environmental initiatives, shipbuilding marine research and monitoring vessel and equipment, a vanadium recovery pilot plant and a training facility in Hāwera. Within the capital expenditure in New Zealand, NZ$30 million will be spent in the Taranaki Region and Whanganui District, and approximately NZ$10 million will be in the South Taranaki and Whanganui districts.

Once the Project becomes operational, TTRL plans to produce 4.9 million tonnes of iron ore concentrate per annum, which will be processed aboard Integrated Mining Vessels (IMV). The iron ore concentrate from the IMV will then be transferred to floating storage and offloading (FSO) vessels for trans-shipment, where it will be de-watered and stored and ready for transfer to bulk carrier vessels for shipping to overseas markets.

These vessels will be supported by a mid-sized Anchor Handling Tug (AHT) that will assist with the provisioning of the vessels, transfer of equipment, connecting the IMV to FSO during trans-shipment, the berthing of the FSO to the conventional bulk cargo vessels, and anchor and mooring relocation. The AHT will also provide refuelling assistance. A geotechnical survey vessel (GSV) will undertake testing and monitoring activity for the Project. TTRL will also contract a third-party company for bunker fuel supply, which has a facility in New Plymouth that employs six people.

The Project will directly employ over 170 crew to operate the IMV and FSO vessels and a further 50 plus staff in supporting engineering, environmental monitoring and fuel bunkering roles. There will also be 35 general administration staff for the day-to-day operation of the Project. In addition, TTRL plans to establish its New Zealand head office in New Plymouth, which will add 35 marketing and corporate management roles.

While TTRL is seeking a 35-year consent for the Project, the actual harvesting activity of iron ore will take place over 20 years once the Project starts to operate.

[3] This is within New Zealand's Exclusive Economic Zone, but beyond the 12-mile limit so the Fast Track Approval applies.

1.1 Our task

NZIER was commissioned to assess the economic impact of the VTM Iron Sands Project, capturing the direct and the flow-on impacts of the Project's capital investment and 20-year operation in New Zealand on the local, regional and national economies.

We were also asked to estimate the Project's contribution to New Zealand's export revenue from exporting its outputs of iron ore concentrate and V_2O_5, and contributions to royalties and taxes to the New Zealand Government.

Section 2 outlines our methodology and the key inputs and assumptions used in our analysis.

2 Methodology

2.1 Regions for economic impact analysis

Our economic impact analysis is applied to three study areas: 1) the local area, 2) the regional area, and 3) the overall New Zealand economy. The local area comprises the South Taranaki and Whanganui districts, which are closest to the location of the iron sands resource.

The regional study area is the Taranaki Region and Whanganui District. Most of the Project's operational activities will take place across the South Taranaki, Whanganui and New Plymouth districts. These include the onshore operations associated with iron sand mining and most of the direct employment in supporting offshore operations.

Besides the economic impacts on the local and regional economies, our analysis also estimates the flow-on impacts of the Project's operational activities on the New Zealand economy.

Table 3 below summarises the gross domestic product (GDP) and employment in our local and regional study areas and the total New Zealand economy. MBIE and Stats NZ's GDP estimates for the year ended March 2023 suggest that our local study area combining the South Taranaki and Whanganui districts made up about 2.7 percent of the New Zealand economy, contributing a total GDP of about NZ$10,749 million. Meanwhile, our regional study area, which combines the Taranaki Region and Whanganui District, contributed NZ$25,558 million of GDP, making up 6.5 percent of the national GDP.

Based on the employee counts from Stats NZ's business demography data, as of February 2024, a total number of 32,000 people were working in our local study area, which was only 1.3 percent of the total employee count in New Zealand. The Taranaki Region and Whanganui District combined had a total count of 74,400 workers, making up 3 percent of the total employment in New Zealand.

Table 3 GDP[1] and employment[2] in the local, regional and national study areas

Millions of dollars (NZD) and headcount

	South Taranaki/ Whanganui	Taranaki Region/ Whanganui	New Zealand
GDP	10,749	25,558	393,523
Employment	32,000	74,400	2,502,700

1 GDP for the year ended March 2023

2 Count of employees as of February 2024

Source: Ministry of Business, Innovation and Employment's (MBIE) Modelled Territorial Authority GDP, Stats NZ's GDP and business demography data

2.2 Regional input-output multiplier model

We developed a regional input-output (I-O) multiplier model specifically for the three regions to look at the direct, indirect and induced impacts of the Project's operational activities on the local, regional and national economies.

We estimate two flow-on impacts based on the expenditure on inputs used in the mining process:

- Indirect impacts – the change in economic activity in industries which provide supporting goods and services to the mining process.
- Induced impacts – the change in economic activity as a result of people working in the supporting industries or upstream industries increasing their consumption given increased earnings.

The direct impacts are provided by TTRL. The sum of direct and indirect impacts is referred to as a Type I impact, whereas the sum of direct, indirect, and induced is referred to as a Type II impact.

We assess flow-on impacts by applying indirect and induced multipliers calculated using Stats NZ input-output tables for the year ended March 2020.

National output multipliers are calculated by obtaining each supporting industry's input coefficient, the amount of output required from the industry to produce a mining industry output and summing the input coefficients across industries.

Regional output multipliers are calculated using the simple location quotient approach. The location quotient is a measure of industry concentration. It is calculated by dividing the share of Taranaki/Whanganui districts' employment in the industry by the share of national employment in the industry. If the location quotient is greater than one, then Taranaki has a higher concentration of the industry than the country as a whole. In this case, we assume the regional input coefficient is equal to the national input coefficient. If the location quotient is less than one, then Taranaki has a lower industry concentration, and we assume the regional input coefficient is equal to the national input coefficient times the location quotient. We obtain the regional indirect multipliers by summing up the regional input coefficients.

This process is repeated for the South Taranaki and Whanganui areas.

There are several limitations associated with using economic multipliers to estimate flow-on impacts:

- **Linear relationships** – they assume that relationships between industries are linear and that firms always require the same quantity and mix of inputs to produce the same level of output.
- **No displacement** – they do not consider the potential for displacement that may occur when output in one industry increases and requires additional resources.
- **No price effects** – they assume that prices remain fixed and do not consider the effects of suppliers raising or lowering prices in response to changes in demand.
- **No supply constraints** – they assume that resources (including labour and capital) are available in unlimited quantities and that extra output can be produced in one industry without taking resources away from other industries.

2.3 Key inputs and assumptions

TTRL provided us with their planned employment and expenditure for the Project's operational activities and capital expenditure in New Zealand involved in the Project's setup. These are the inputs for our regional I-O multipliers analysis to estimate the economic impacts of those activities on the local, regional and national areas.

2.3.1 Direct employment

Direct expenditure and employment are the key inputs that go into our regional I-O multipliers to estimate the indirect and induced economic impacts of the Project's operational activities.

Table 4 sets out the number of employees that will be directly employed for the day-to-day operation of the Project by region. All direct employment by TTRL for the Project will be in the Taranaki/Whanganui region, adding a total of 303 full-time equivalents (FTEs). Of those, 77 FTEs will be located in the local area (South Taranaki/Whanganui). Note that the six FTEs for bunkering will be employed by TTRL's third-party bunker fuel supplier based in New Plymouth.

Table 4 Direct employment by activity and region

Number of FTEs

Activity	South Taranaki/ Whanganui	Taranaki Region/ Whanganui
IMV and FSO vessels	52	173
Anchor Handling Tug	0	36
Bunkering	0	6
Geotechnical Survey Vessel (GSV)	18	18
General and admin	7	35
Head office	0	35
Total	**77**	**303**

Source: TTRL

Table 5 summarises the number of direct FTEs created in the local and regional areas by the relevant industry classification.

Table 5 Direct employment by industry and region

Number of FTEs

Industry	South Taranaki/ Whanganui	Taranaki Region/ Whanganui
Exploration and other mining support services	52	173
Other transport	14	50
Basic material wholesaling	0	6
Scientific, Architectural and Technical Services	4	4
Legal and accounting services	7	35
Advertising, market research and management services	0	35
Total	**77**	**303**

Source: TTRL

2.3.2 Direct expenditure

TTRL provided us with their estimates of direct expenditure in New Zealand, including both the capital expenditure in the Project's setup phase and operational expenditure during the Project's 20-year operation.

Based on the inputs provided by TTRL, it plans to spend around NZ$55 million in New Zealand (in 2024 New Zealand dollars) in the Project's setup phase, accounting for about 6 percent of the Project's total capital investment. Table 6 shows the breakdown of the capital expenditure in New Zealand by industry classification and the region where it is expected to occur. Note that the expenditure in the South Taranaki/Whanganui districts is within the expenditure in the Taranaki Region/Whanganui District, which is within the expenditure in New Zealand. Within the capital expenditure in New Zealand, 54 percent will be spent in the Taranaki Region/Whanganui District (approx. NZ$30 million), and about 18 percent (approx. NZ$10 million) will be in South Taranaki/ Whanganui districts.

Table 6 The Project's capital expenditure in New Zealand

$million, NZD

Industry	South Taranaki/ Whanganui	Taranaki Region/ Whanganui	New Zealand
Advertising, market research and management services	$0.12	$3.73	$15.55
Air and space transport	0	$0.21	$1.06
Travel agency and tour arrangement services	0	$0.06	$0.06
Exploration and other mining support services	0	$1.16	$1.16
Construction services	0	$1.75	$3.50
Central government	0	$0	$10.86
Scientific, architectural and engineering services	$3.52	$3.52	$3.52
Adult, community and other education	$6.23	$6.23	$6.23
Fabricated metal product manufacturing	0	$9.34	$9.34

Industry	South Taranaki/ Whanganui	Taranaki Region/ Whanganui	New Zealand
Transport equipment manufacturing	0	$3.76	$3.76
Total	**$9.87**	**$29.76**	**$55.04**

Source: TTRL, NZIER estimates

For the operational phase, TTRL's current project plan suggests that 72 percent of the Project's annual operating expenditure will be spent in New Zealand, and the remaining portion will be spent offshore. We calculated that the Project's operational expenditure in New Zealand will be approximately NZ$238 million per annum. Within this expenditure in New Zealand, over 98 percent (approx. NZ$234 million) will be spent in the Taranaki Region/Whanganui District, and about 19 percent will be in South Taranaki/Whanganui districts.

Table 7 shows the breakdown of the Project's operational expenditure per annum by industry classification and the region where it is expected to occur.

Table 7 The Project's direct operational expenditure in New Zealand

$million, NZD, per annum

Industry	South Taranaki/ Whanganui	Taranaki Region/ Whanganui	New Zealand
Exploration and other mining support services	$27.86	$99.58	$99.58
Basic material wholesaling	0	$52.37	$52.37
Fabricated metal product manufacturing	$8.04	$16.09	$16.09
Other transport	$0.83	$23.78	$23.78
Scientific, architectural and technical services	$4.10	$13.49	$13.49
Health and general insurance	0	$0.92	$4.61
Legal and accounting services	$3.08	$15.41	$15.41
Advertising, market research and management services	$0	$12.33	$12.33
Total	**$43.92**	**$233.97**	**$237.65**

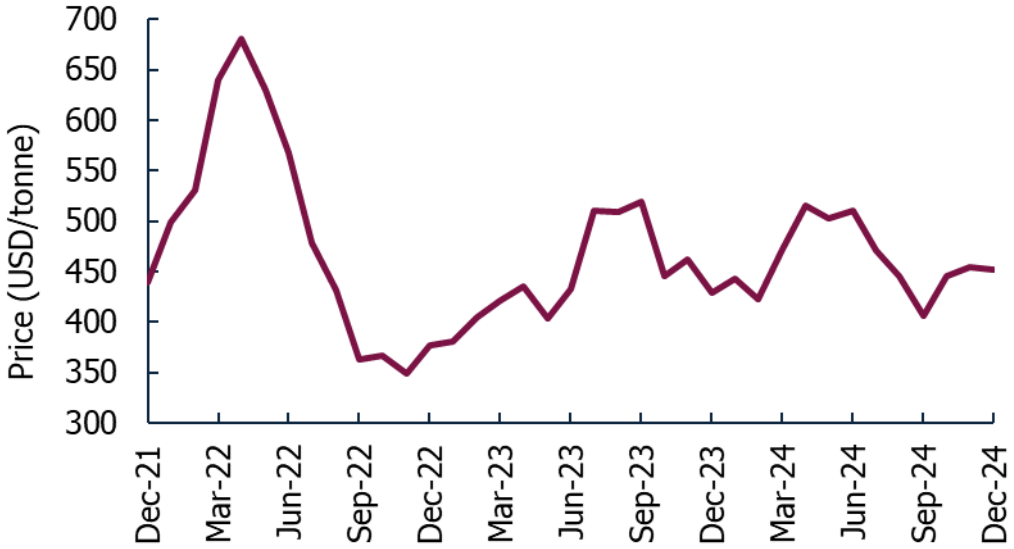
Source: TTRL, NZIER estimates

2.3.3 Intermediate Fuel Oil prices

Our economic impact analysis is based on the direct expenditure in New Zealand, as shown in Table 6 and Table 7 above. The operation of the Project is a relatively fixed process. According to information from TTRL on the cost structure of the Project, over two-thirds of the direct operational costs are considered fixed. The remainder is the cost of Intermediate Fuel Oil (IFO) used to operate the IMVs. Although TTRL will source IFO through its supplier located in New Plymouth, IFO will be imported by TTRL's third-party supplier. This means that IFO costs are exposed to volatility in the global IFO price and exchange rates.

The type of IFO TTRL plans to use for the Project is IFO 380. This type of IFO originates from Singapore, which is the closest refinery from which a New Zealand-based company can import IFO. Figure 1 shows that, over the last three years, the price of IFO 380 fluctuated between US$349 per tonne and US$680 per tonne, with the average price in the 2024 year being US$462 per tonne.

Figure 1 IFO 380 Singapore bunker fuel price, monthly average



Source: Bloomberg

Looking ahead, IFO prices tend to correlate with movements in crude oil prices. Consensus Economics' latest consensus forecasts point to a downward trend in crude oil over the coming years as the increase in global supply is expected to outpace the increase in demand.[4] This presents a downside risk to IFO prices over the coming years.

It is important to note that our economic impact analysis captures the benefits from the Project's operational and economic activities within the current structure of the local, regional, and national economies, along with TTRL's expected expenditure on the operations. According to TTRL's plan, the Project will use 7,000 tonnes of IFO 380 fuel per month. This volume is unlikely to change over the Project's operational phase. Our economic analysis is underpinned by the level of activities and the structure of the New Zealand economy, not the prices of inputs. Therefore, our economic impact estimates should not be materially affected by changes in IFO prices.

2.3.4 Exchange rate

The Project's IFO cost can also be affected by movements in the New Zealand dollar to US dollar exchange rate.

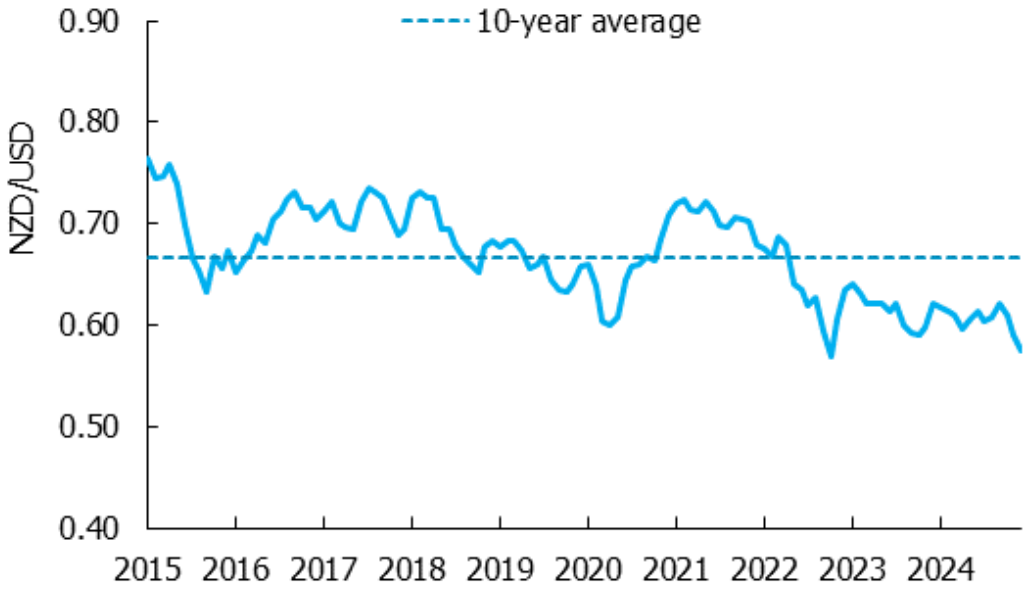
Figure 2 shows that the New Zealand dollar has fluctuated between US$0.57 and US$0.76 over the last 10 years between 2015 and 2024, with a 10-year average of US$0.67. Since

[4] Energy, metals & agriculture consensus forecasts compiled by Consensus Economics Inc.

early 2021, the New Zealand dollar against the US dollar has been trending lower. In particular, the New Zealand dollar has been depreciating against the US dollar in recent months, bringing the average New Zealand dollar currency to around US$0.58. This is similar to the exchange rate used in the VTM Project pre-feasibility study by Siecap NZ[5] and TTRL's projections of the Project's cash flows.

Looking ahead, with the markets expecting further interest rate cuts by the Reserve Bank of New Zealand and the US Federal Reserve slowing in their interest rate cuts in 2025, these will weigh on the yield attractiveness of the New Zealand dollar against the US dollar over the coming year. Beyond that, we expect a pick-up in the NZD currency over the longer term.

Figure 2 NZD/USD exchange rate, monthly average, 2015 to 2024



Source: Reserve Bank of New Zealand

Because our economic impact analysis captures the direct expenditure in New Zealand in New Zealand dollars, fluctuations in the exchange rate will not have a material impact on the economic impact of the Project's activities in New Zealand. However, given that the iron ore concentrate and V_2O_5 from iron sands mining will be exported to global markets, movements in the exchange rate will directly impact TTRL's revenue generated from the Project. A lower New Zealand dollar against the US dollar means higher export earnings in New Zealand dollars.

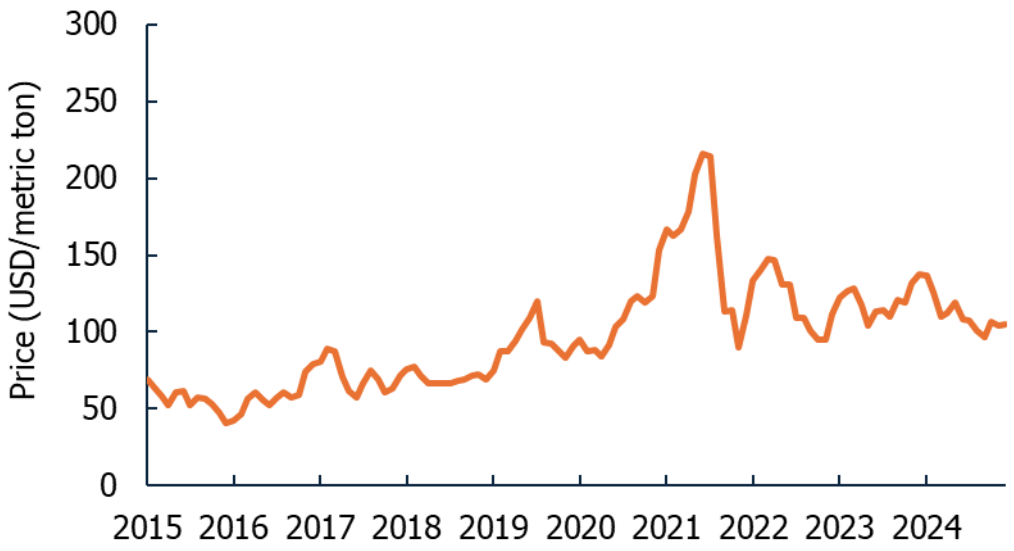
2.3.5 Prices of iron ore and vanadium pentoxide

TTRL's revenue from the Project will also depend on the prices of commodities produced by the Project, including iron ore and vanadium pentoxide (V_2O_5).

[5] Provided by TTRL.

As shown in Figure 3, the average price of iron ore (compiled by the IMF) increased sharply during the first year of the COVID-19 pandemic between mid-2020 and mid-2021, reaching US$216 per metric ton by June 2021. The price then fell in late 2021 to around US$90 per metric ton. Since then, the iron ore price has been fluctuating between US$90 per metric ton and US$147 per metric ton. For the 2024 year, the average price was US$111 per metric ton. Consensus Economics' latest consensus forecasts point to expectations for iron prices to trend lower, averaging around the lower end of the US$90 to US$100 per metric ton price range. Siecap NZ's pre-feasibility study assumes a long-term average iron ore price of US$90 per metric ton based on various long-term iron ore price forecasts.

Figure 3 Iron ore price, monthly average, 2015 to 2024

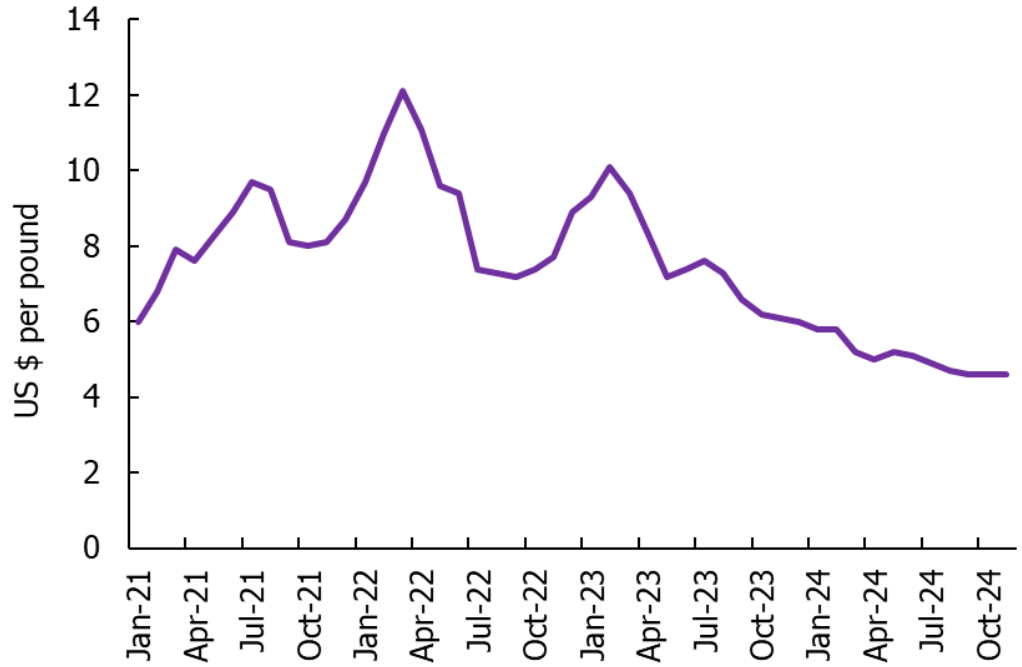


Source: IMF

The iron ore concentrate that the Project will be extracting from iron sands mining is 58 percent iron ore concentrate, which gets exported at a discount. The discount generally varies between 10 and 20 percent, and information from TTRL recommends a discount of 13.7 percent applied to the price of the 62 percent iron ore concentrate, which is very similar to the IMF's series of average iron ore prices.

The Project will also produce other minerals, such as V_2O_5, from its mining activity. Figure 4 shows the monthly average spot prices of V_2O_5 in the European spot market over the last three years. Prices have been trending lower since mid-2023 and stabilising at a lower level in late 2024. The Siecap NZ's pre-feasibility study report notes an average V_2O_5 price of US$5.45 per pound in 2024, as reported by the US Geological Survey. It assumed this as the long-term average V_2O_5 price, given that the downward trend in V_2O_5 prices over the past year reflects a stabilisation of prices following a period of fluctuations.

Figure 4 Price of V_2O_5 98% in the Europe spot market, monthly average



Source: Bloomberg

2.3.6 Royalties and taxes

As a mining permit holder, TTRL must pay royalties to the Crown with respect to all minerals obtained under the permit. It must pay the higher of:

- An *ad valorem* royalty of 2 percent of the net sales revenue of the minerals obtained under the permit, or
- An accounting profits royalty of 10 percent of the accounting profits, or provisional accounting profits, of the minerals obtained under the permit.

Besides royalties, TTRL will also have to pay company tax as it is a registered New Zealand Company. Any new employment will pay income taxes, and new spending generates GST and excise taxes on fuel. However, it is not practical to estimate individual taxes due to variations in tax provisions. In any case, they are not significantly different from any other project of similar scale, so while we acknowledge this as an additional contribution to government revenues, it is not estimated here. Royalties warrant estimation as they are a distinct revenue source.

While the focus of our economic impact analysis is on the Project's direct expenditure in its activities, changes in exchange rates and prices of iron ore and V_2O_5 or IFO prices will lead to changes in the Project's costs of inputs and revenue. These ultimately influence the Project's economic contribution in terms of royalties and taxes paid to the New Zealand Government from its production of iron ore and V_2O_5.

Our calculations of the additional economic contribution of the Project, in terms of export earnings, royalties and taxes, used the following assumptions:

- exchange rate at US$0.58, which reflects the average in recent months and is in line with the exchange rate assumed in the Siecap NZ's pre-feasibility study and TTRL's cash flow model
- IFO 380 price at US$462 per tonne, which is the 2024 average
- iron ore price at US$90 per metric ton, which is our assumed long-term average iron ore price, based on information from both the Consensus Economics' iron ore price consensus forecasts and the Siecap NZ's pre-feasibility study report
- price of V_2O_5 at US$5.45 per pound, which is our assumed long-term average V_2O_5 price, based on recent price trends and information from Siecap NZ's pre-feasibility study report.

Our analysis of export earnings royalties and corporate tax payments to the New Zealand Government is based on the data and projections provided by TTRL.

3 Results of economic impact analysis

Economic impact analysis (EIA) shows the additional impact on economic activity (gross output, GDP and employment) directly attributable to an event or action. The EIA has been calculated for the local area (South Taranaki and Whanganui districts), the regional area (the Taranaki Region and Whanganui District), and New Zealand. The three sets of economic outcomes are not additive. That is, the New Zealand impact includes the regional impact, which includes the local impact.

Expenditure in Table 7 is used to estimate the operational costs to which we have applied the multipliers.

Each section contains information on initial setup, capital contributions and operational expenditure contributions during the Project's 20-year operation phase.

3.1 Impacts at a local level

TTRL forecast that NZ$10 million will be spent on capital for the initial setup of the Project. This expenditure results in a NZ$9 million increase in GDP and an addition of 86 jobs (measured by headcount) when accounting for Type II impacts (as seen in Table 8 below).

Table 8 Economic impact of the setup phase at a local level

Millions of dollars (NZD) and headcount

	Direct	Direct + Indirect	Direct + Indirect + induced
Output	$9.87	$13.40	$17.24
GDP	$5.57	$7.31	$9.43
Employment	55.78	71.67	85.59

Source: NZIER

TTRL forecasts that NZ$44 million per annum will be spent on inputs to the operation in the South Taranaki and Whanganui Districts. The increase in direct GDP as a result of this is estimated to be NZ$19 million per annum, and an additional 103 people will be employed (see Table 9).

Direct employment measures are replaced for each contributing sector where there is available information (see Table 5). This is applied at all levels and flows into the Type I and Type II impacts.

When we account for Type II impacts, the initial direct expenditure of NZ$44 million is expected to result in an increase of NZ$37 million in GDP per annum and 224 jobs (as measured by headcount).

Table 9 Economic impact of operational activity at a local level

Millions of dollars (NZD, per annum) and headcount

	Direct	Direct + Indirect	Direct + Indirect + induced
Output	$43.92	$65.61	$80.64
GDP	$18.62	$28.78	$37.08
Employment	103.00	169.85	224.43

Source: NZIER

3.2 Impacts at a regional level

TTRL forecasts that NZ$30 million will be spent on capital for the initial setup of the Project. This expenditure results in a NZ$27 million increase in GDP and an addition of 211 jobs (measured by headcount) when accounting for Type II impacts (as seen in Table 10).

Table 10 Economic impact of the setup phase at a regional level

Millions of dollars (NZD) and headcount

	Direct	Direct + Indirect	Direct + Indirect + induced
Output	29.76	45.79	57.45
GDP	13.25	20.31	26.63
Employment	123.42	170.16	210.63

Source: NZIER

TTRL forecasts that NZ$234 million per annum will be spent on inputs for the operation in the Taranaki Region and Whanganui District. The increase in direct GDP as a result of this is estimated to be NZ$102 million per annum and additional employment of 356 people.

When we account for Type II impacts, the initial direct expenditure of NZ$234 million (in 2024 New Zealand dollars) per annum is expected to result in an increase of NZ$222 million in GDP per annum and 1,123 jobs (as measured by headcount).

Table 11 Economic impact of operational activity at a regional level

Millions of dollars (NZD, per annum) and headcount

	Direct	Direct + Indirect	Direct + Indirect + induced
Output	$233.97	$385.37	$478.55
GDP	$101.88	$171.13	$221.76
Employment	355.83	798.99	1,123.10

Source: NZIER

3.3 Impacts at a national level

TTRL forecast that NZ$55 million will be spent on capital for the initial setup of the Project. This expenditure results in a NZ$62 million increase in GDP and an additional 459 jobs (measured by headcount) when accounting for Type II impacts (as seen in Table 12).

Table 12 Economic impact of the setup phase at a national level

Millions of dollars (NZD) and headcount

	Direct	Direct + Indirect	Direct + Indirect + induced
Output	$55.04	$96.27	$127.74
GDP	$25.81	$45.53	$62.21
Employment	221.48	357.48	459.11

Source: NZIER

TTRL forecasts that NZ$238 million per annum will be spent on inputs to the operation across New Zealand. The increase in direct GDP as a result of this is estimated to be NZ$103 million per annum and an additional 359 people.

When we account for Type II impacts, the initial direct expenditure of NZ$238 million per annum is expected to result in an increase of NZ$265 million per annum in GDP and 1,365 jobs (as measured by headcount).

Table 13 Economic impact of operational activity at a national level

Millions of dollars (NZD, per annum) and headcount

	Direct	Direct + Indirect	Direct + Indirect + induced
Output	$237.65	$443.79	$567.69
GDP	$103.50	$199.57	$265.24
Employment	359.15	965.26	1,365.41

Source: NZIER

4 Export earnings

According to TTRL's proposed plan for the Project, it will export all 4.9 million tonnes of the iron ore concentrate produced from iron sand mining to global markets. Based on our assumed long-term average iron ore price (US$90 per metric ton), V_2O_5 price (US$5.45 per pound) and the 2024 average exchange rate (NZ$=US$0.58), the Project is expected to generate a total export revenue of NZ$854 million per annum. Within this total, about NZ$658 million per annum will be from exporting iron ore concentrate, and NZ$196 million will be from exporting V_2O_5.

The value of New Zealand's exports in the year to June 2024 totalled about NZ$66 billion. This means that TTRL's iron ore exports of NZ$854 million from the Project would contribute 1.3 percent of New Zealand's total exports[6] if it had been operating in 2024, and it would be one of the top 12 of New Zealand's principal export categories (see Table 14 below). Earnings from iron ore and V_2O_5 exports combined will double New Zealand's exports in the broader iron and steel and articles of iron and steel category, adding up to a value of around NZ$1.69 billion, which would be about 2.6 percent of the total exports.

These results illustrate that TTRL's VTM Iron Sands Project will contribute to the Government's goal of doubling the value of New Zealand's exports over the next 10 years.

Table 14 New Zealand's principal exports, year ended June 2024

Millions of dollars, NZD

Export category	Export value
Dairy Produce: Total	18,991
Total Meat and Edible Offal	8,616
Forest Products: Total	5,705
Fruit and Nuts	4,010
Fish, Crustaceans and Molluscs	1,958
Machinery and Mechanical Appliances	1,919
Aluminium and Articles of Aluminium	1,560
Casein and Caseinates	1,557
Electrical Machinery and Equipment	1,106
Precious Stones, Metals and Jewellery	970
TTRL VTM Iron Ore[7] and V_2O_5[8] Concentrates	**854**
Iron and Steel and Articles of Iron and Steel	837
Mineral Fuels	778
Vegetables	520
Plastic Materials and Articles of Plastic	482
Wool	448

[6] FOB value of exports (excluding re-exports).

[7] Based on projections, our assumed long-term average iron ore price and average NZD/USD exchange rate.

[8] Based on projections, our assumed long-term average V_2O_5 price and average NZD/USD exchange rate

Export category	Export value
Raw Hides and Skins and Leather	268
Live Animals	208
Fabrics, Textiles and Apparel	140
Tallow	100
Sausage Casings	87
Carpets and Other Textile Floor Coverings	76
Printed Books, Newspapers etc	27
Methanol	Figure not available

Note: the TTRL exports of iron ore and V_2O_5 are based on TTRL's projections of export volumes, our assumed long-term average prices and the 2024 average NZD/USD exchange rate.

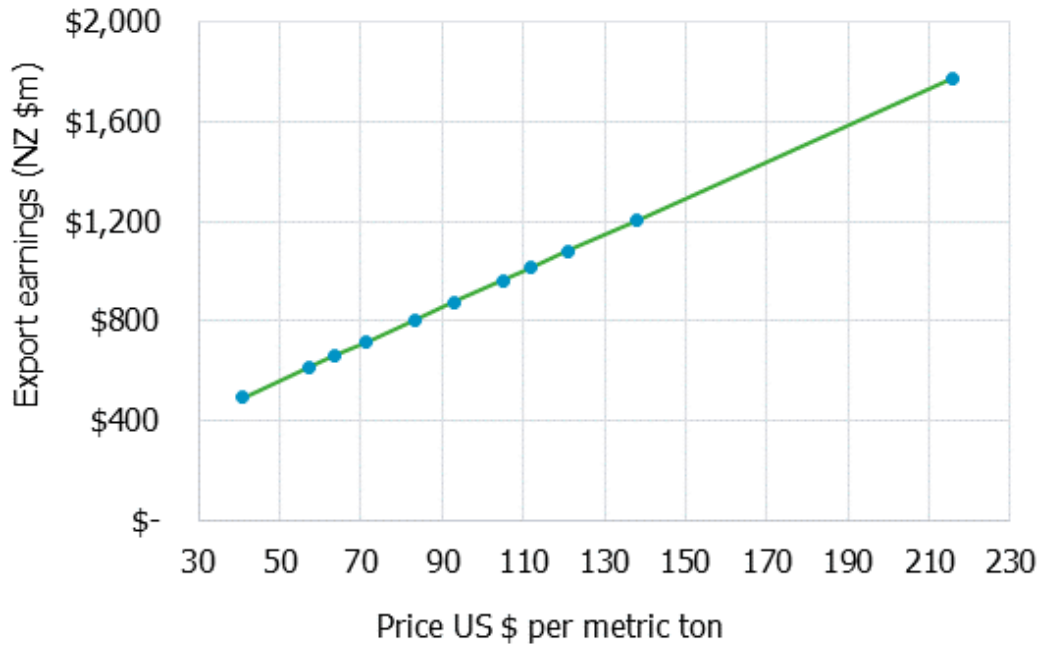
Source: Stats NZ, NZIER estimates

4.1 Price and exchange rate sensitivity

The price and the exchange rate at which the outputs produced from the Project's iron sand mining activity are traded in the global markets will directly impact the revenue TTRL receives from exporting them. Given iron ore concentrate is the main product from the Project TTRL will export, and iron ore prices have been more volatile than V_2O_5 prices over the past few years; we have undertaken analysis to test the sensitivity of expected export earnings to changes in iron ore price and exchange rate, respectively. Note that these sensitivity tests were undertaken by changing only one input at a time and holding all other variables constant.

Figure 5 below points to a strong positive relationship between iron ore price and export earnings. By taking the minimum, maximum and the 10th to 90th percentiles of the 10-year iron ore price series, we calculated a range of the Project's total export earnings between NZ$495 million per annum (when iron ore price is US$41 per metric ton) and NZ$1.8 billion per annum (when iron ore price is US$216 per metric ton).

Figure 5 Sensitivity of total export earnings to iron ore prices



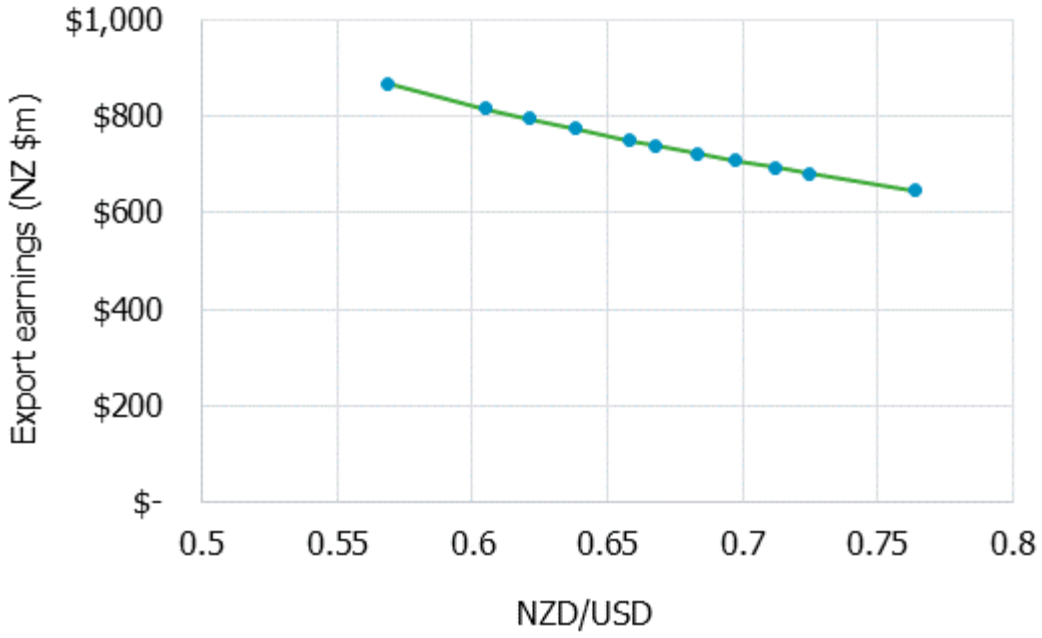
Note: Iron ore price is the only changing variable in this sensitivity test. All other variables are held constant.

Source: NZIER's estimates

In contrast, export earnings are negatively associated with the level of the exchange rate of the New Zealand dollar against the US dollar (see Figure 6 below). Holding all other variables constant, the range of exchange rate over the last 10 years would give total export earnings ranging from NZ$646 million per annum (at NZ$=US$0.76) to close to NZ$869 million per annum (at NZ$=US$0.57).

Comparing the magnitudes of the impact of exchange rate changes to that of changes in iron ore price, our sensitivity analysis suggests that export earnings are more sensitive to the volatility in iron ore prices.

Figure 6 Sensitivity of total export earnings to exchange rate



Note: Exchange rate is the only changing variable in this sensitivity test. All other inputs are held constant.

Source: NZIER's estimates

5 Contribution to royalties and taxes

Figure 7 shows the annual royalties TTRL will potentially pay to the Crown based on the projected output of iron ore from the Project's operation.

At our assumed prices of iron ore, V_2O_5, IFO, shipping cost[9] and exchange rate, TTRL will more likely pay royalties at 10 percent of the Project's accounting profits. Based on TTRL's projected cash flows for the Project, which include interest expense, depreciation and amortisation, we calculated the annual royalty payment to be between NZ$36 million and NZ$39 million in the Project's first seven years of operation, increasing to about NZ$54 million per annum thereafter. After deducting these estimates of royalty payment from the Project's net profit and applying the 28 percent corporate tax rate, we calculated that annual corporate tax paid to the Crown to range from NZ$91 million to NZ$136 million (in 2024 New Zealand dollars. Note that the lower bound of the royalties and corporate tax estimates reflect the higher financing costs in the start-up phase of the Project.

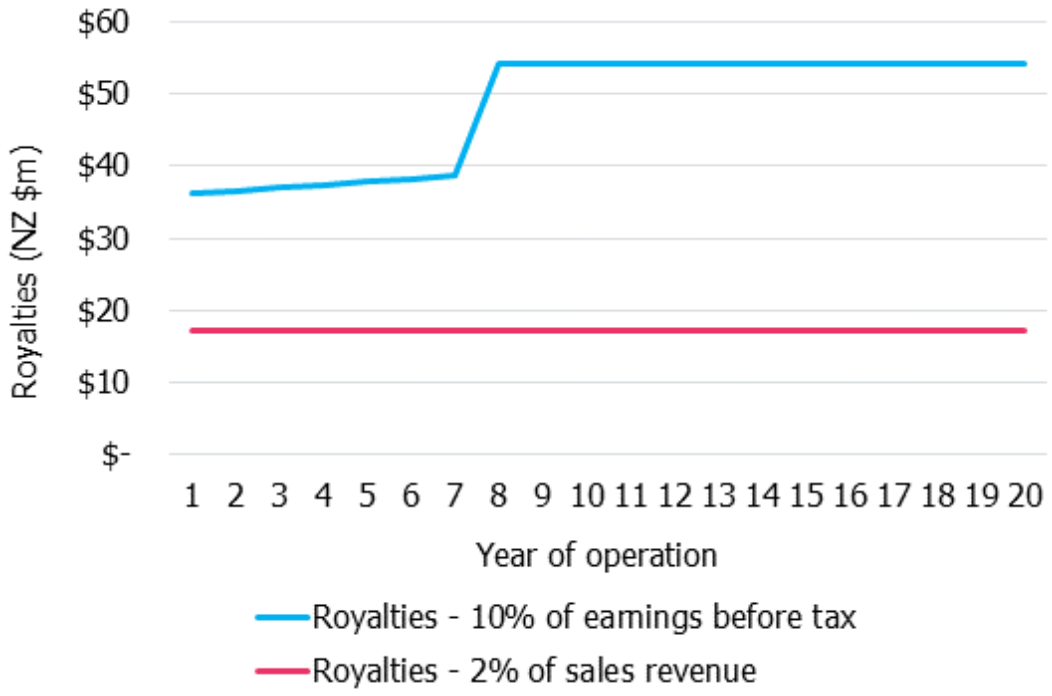
Putting the contribution to royalties into the broader context, data from New Zealand Petroleum and Minerals shows that petroleum, minerals and coal royalties were about NZ$221 million, of which minerals accounted for just over NZ$14 million (6.6 percent). With

[9] Assumed at a long-term average of $10 per tonne drawing on Siecap NZ's analysis of the trends in Capesize vessel shipping costs

the Project in operation, TTRL's royalty payment would increase minerals' contribution to total petroleum, minerals and coal royalties by 20 percent to 25 percent.

TTRL notes the project outputs in this impact assessment are based on only iron ore concentrate sales of 4.9 million tonnes per year and some 19,000 tonnes of V_2O_5 from the VTM concentrate at metallurgical recovery rates of 77 percent. This report does not include any potential revenue credits (sales) for titanium, even though it is contained in the concentrate. TTRL refers to estimates that this potential upside in production amounts to some 327,000 tonnes of titanium dioxide (TiO_2) per annum in the VTM concentrates at metallurgical recovery rates of 77 percent to 79 percent.[10] TTRL notes these additional metal sales have the potential to make a material contribution to the Project's future annual revenue stream, with flow-through effects on foreign exchange earnings, royalties, and corporate tax receipts for the New Zealand Government.

Figure 7 Estimated contribution to total annual royalties from production of iron ore concentrates and V_2O_5



Source: NZIER's estimates based on current assumptions and TTRL's projected cash flows

5.1 Sensitivity of TTRL's royalty payment to iron ore price

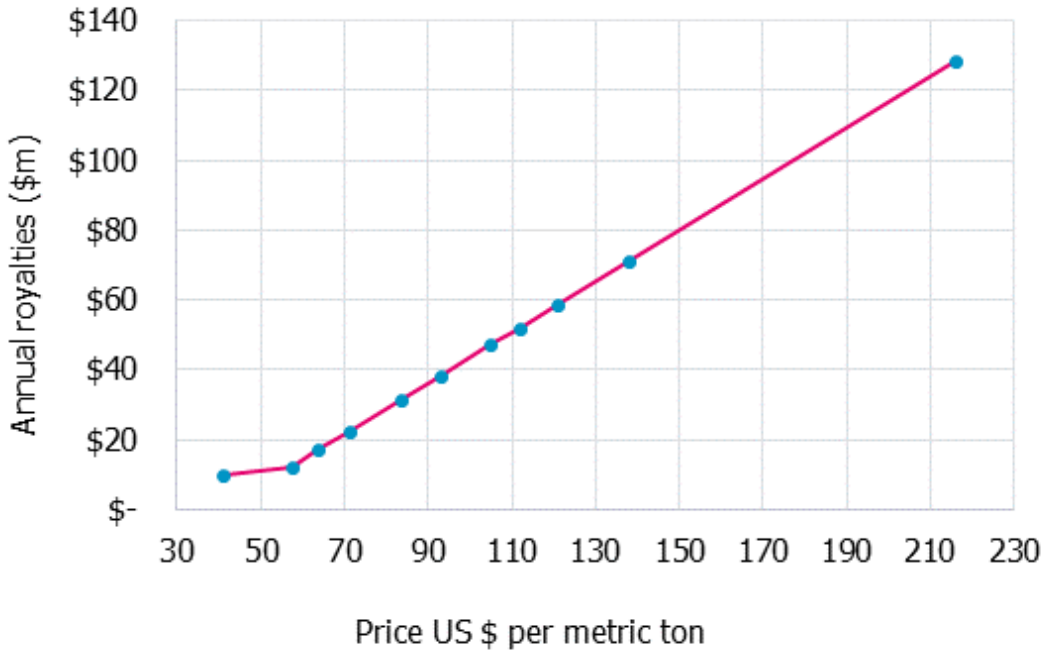
Our sensitivity analysis shows a strong positive relationship between royalties and iron ore prices. This is unsurprising given the relationship between iron ore export earnings and iron ore price illustrated in section 4.1.

Based on the range of the average iron ore price in Figure 3, the Project's minimum annual contribution to royalties can range from NZ$10 million to NZ$128 million. The kinked curve

[10] TTRL internal technical report: TTR Metallurgical Review: Recovery of Vanadium from Taranaki VTM Project, Siecap (NZ) Limited 4 February 2025

shown in Figure 8 suggests that holding all other variables constant, at some iron ore price of below US$58 per metric ton, TTRL's minimum royalty payment will be 2 percent of the sales revenue.

Figure 8 Iron ore price and TTRL's minimum royalty contribution



Note: Iron ore price is the only changing variable in this sensitivity test. All other inputs are held constant.

Source: NZIER estimates

5.2 Sensitivity of TTRL's royalty payment to exchange rate and IFO price

Table 15 below shows the possible range of direct costs and minimum royalty payment using minimum and maximum exchange rates and IFO 380 price shown in Figure 1 and Figure 2.

Table 15 Estimated range of direct costs and minimum royalty payment

Millions of dollars, NZD, annual

Estimate	NZD/USD exchange rate		IFO 380 price	
	Maximum exchange rate (NZ$=US$0.76)	Minimum exchange rate (NZ$=US$0.57)	Maximum price (US$680 per tonne)	Minimum price (US$349 per tonne)
Direct costs	$173	$233	$261	$212
Minimum royalty payment	$27	$37	$33	$38

Note: The sensitivity analysis was undertaken by changing one variable only at a time and holding everything else constant.

Source: Stats NZ, NZIER estimates

Holding everything else constant, we calculated that TTRL's minimum annual royalty payment from the Project is NZ$27 million when the New Zealand dollar is at the 10-year maximum of US$0.76 and NZ$37 million when the New Zealand dollar is at the 10-year minimum of US$0.57. Although a lower New Zealand dollar increases the export earnings received (refer to Figure 6), it also leads to an increase in direct costs, in particular, the IFO cost.

Our sensitivity analysis also indicates that at a higher price of the IFO 380 bunker fuel, higher direct costs reduce the Project's contribution to royalties. Holding everything else constant, the minimum annual royalty payment paid by TTRL can range from NZ$33 million to NZ$38 million. This variability in royalty payment is rather small, given how volatile IFO 380 prices have been over the last three years (see Figure 1).

Overall, our sensitivity testing suggests that the Project's contribution to royalties is more sensitive to volatility in the iron ore prices than to the exchange rate or the IFO price.

6 Concluding comments

Our analysis demonstrates that TTRL's VTM Iron Sands Project will benefit the New Zealand economy. TTRL will make a one-off capital investment of approximately NZ$1 billion in setting up the Project, with more than NZ$55 million of this capital investment to be spent in New Zealand. In the Project's operation phase, a total of 303 new FTE jobs will be created which are directly involved in the Project's operation activity in the Taranaki Region and Whanganui District, with 77 of those located in the local area of the South Taranaki and Whanganui districts.

Compared to the current situation where the Project is not in place, we estimate the flow-on economic impacts from the Project's capital investment will:

- Increase GDP by NZ$62 million and add 459 new jobs to the total New Zealand economy
- Contribute NZ$27 to GDP and add about 211 new jobs to employment in the regional economy of the Taranaki Region and Whanganui
- Contribute NZ$9 million of GDP and add about 86 new jobs to the local economy of the South Taranaki and Whanganui districts.

We also estimate the flow-on impacts of the Project's annual operational activities will be:

- An annual GDP contribution of NZ$265 million and about 1,365 jobs to the total New Zealand economy.
- Within that national impact, an annual GDP contribution of NZ$222 million and about 1,124 jobs to the regional economy of the Taranaki Region and Whanganui District
- Within that regional impact, an annual GDP contribution of NZ$37 million and about 224 jobs to the local economy of the South Taranaki and Whanganui districts.

Those economic impacts are estimated based on TTRL's forecast direct expenditure on its activities in New Zealand in the Project's setup and operational phases, as well as a limited range of assumptions on key variables. Our multiplier approach does not account for input

constraints, price changes and effects in other sectors that offset the Project's positive impacts on the economy arising from increased production.

At our assumed long-term average iron ore and V_2O_5 prices and the 2024 average exchange rate, the Project is expected to contribute export earnings totalled around NZ$854 million per annum, making VTM iron ore exports one of the top 12 of New Zealand's principal export categories and doubling New Zealand's exports in the broader iron and steel and articles of iron and steel categories. During the 20-year operation phase of the Project, TTRL will contribute NZ$36 million to NZ$54 million in royalties per year and NZ$91 million to NZ$136 million in corporate taxes per year to the New Zealand Government.

TTRL also estimates that there is upside for TiO_2 sales in the VTM concentrates. These additional metal sales, that have the potential to make a material contribution to the Project's future annual revenue streams, are subject to changes in the price of TiO_2 and exchange rates. Any future TiO_2 sales will have a positive flow-through effect on foreign exchange earnings, royalties, and corporate tax receipts for the New Zealand Government.