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Economic Assessment of Marine Carbon Dioxide Removal Activity in New Zealand's EEZ

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Disclaimer regarding OPEX

This assessment has been prepared under the assumption that New Zealand legislation and associated regulatory settings from 2026 onwards will permit Gigablue's planned marine carbon dioxide removal activities. The findings and conclusions of this report are contingent upon the existence of this enabling legislative and regulatory framework.

Disclaimer regarding COGS and CAPEX

These expenditures may occur in New Zealand, subject to government support and the issuance of permits to operate in the EEZ.

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Glossary of Terms

The following table defines commonly used acronyms and abbreviations in this document.

Term	Definition
AR	Afforestation/Reforestation
AU/AUD	Artificial Upwelling/Downwelling
BECCS	Bioenergy with Carbon Capture and Storage
CAPEX	Capital Expenditure
CBC	Coastal Blue Carbon
CDR	Carbon Dioxide Removal
COGS	Cost of Goods Sold
CRUs	Carbon Removal Units
DACCS	Direct Air Carbon Capture and Storage
DOCCS	Direct Ocean Carbon Capture and Storage
EEZ	Exclusive Economic Zone
ERP	Emissions Reduction Plan
ERW	Enhanced Rock Weathering
ETS	Emissions Trading Scheme
EU CRCF	EU Carbon Removal Certification Framework
FTE	Full-time Equivalent
GDP	Gross Domestic Product
HNLC	High Nutrient Low Chlorophyll
MCFS	Marine Carbon Fixation and Sequestration
MRV	Monitoring, Reporting and Verification
NDC	Nationally Determined Contribution
NIWA	National Institute of Water and Atmospheric Research
OAE	Ocean Alkalinity Enhancement
OPEX	Operating Expenditure
SCS	Soil Carbon Sequestration
VCM	Voluntary Carbon Market

1. Executive Summary

Context

Gigablue Aotearoa South Pacific Limited (**Gigablue**) proposes to establish a marine carbon dioxide removal (**CDR**) operation within New Zealand's Exclusive Economic Zone (**EEZ**) using its patented Marine Carbon Fixation and Sequestration technology. This process involves the deployment of engineered nutrient substrates that float for a short period to promote phytoplankton growth in the upper ocean before sinking below the thermocline, sequestering carbon to the deep ocean for long-term storage.

Operations would likely be serviced from South Island ports (such as Dunedin or Timaru) and supported by local manufacturing, research, and monitoring activities. The project will generate verified carbon removal units (**CRUs**) for sale in the international voluntary carbon market (**VCM**). At the global level, the sale of CRUs into the VCM will help corporate and government buyers alike meet their net-zero commitments and enable increased demand for hard-to-abate energy production. At the national level, the proposal has the potential to position New Zealand as a leader in an emerging carbon-removal market projected to grow to over USD \$100 billion annually by 2040. Additionally, there is potential for CRUs generated by the proposal to be incorporated into New Zealand's Greenhouse Gas Inventory in future, contributing directly towards New Zealand's Nationally Determined Contribution under the Paris Agreement.

The activity is regulated under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (**EEZ Act**). Under section 33(3)(g) of the EEZ Act, the environmental effects assessment must describe the economic benefit to New Zealand of the activity, defined in section 20(2)(f) as *"the deposit of any thing or organism in, on, or under the seabed"*.

Quantified Economic Impacts

The proposal is expected to generate material direct and indirect economic activity at the national level, both as a one-time impact during the development phase and as a recurring impact during ongoing operations. Table 1 summarises the estimated impacts.

Table 1: Estimated National Economic Impacts of the Proposal¹

	Development Phase (one-time, total)			Ongoing Operations (2030 scale, annual)		
	Direct	Indirect	Total	Direct	Indirect	Total
FTE-years FTEs	9(2)(b)(ii)		5,128	2,226	1,717	3,943
Wages and salaries (\$m)			\$465	\$193	\$155	9(2)(b)(ii)
GDP (\$m)			\$818	\$280	\$305	\$585

9(2)(b)(ii) is estimated to support 5,128 FTE-years of work nationally, generate around \$465 million in wages and salaries, and contribute \$818 million to GDP. These totals comprise both direct activity (the on-site and off-site work directly attributable to the project) and indirect activity in the supply chain. The

¹ Development figures are FTE-years over the entire development phase. Ongoing figures are annual FTEs at the 2030 operating scale. Figures may not sum exactly due to rounding.

figures are presented as totals over the full development phase, since the duration and phasing of development is a matter for Gigablue's project planning rather than this assessment; spread over a multi-year ramp-up, the annual employment requirement at any one time would be a proportion of the total.

At its assumed 2030 operating scale, the proposal is estimated to sustain approximately 3,943 full-time equivalent jobs each year, generate around 9(2)(b)(ii) in wages and salaries annually, and contribute an estimated \$585 million to national GDP each year. 9(2)(b)(ii)

The figures above are presented as gross national impacts, excluding induced consumption or wider secondary market effects. The work is concentrated in industries that are distributed across New Zealand's major industrial centres rather than localised to the proposal's South Island operational base. The portion of total employment located in the immediate vicinity of the operational base will therefore be considerably smaller than the national totals reported here.

In addition, the estimates above are based on multiplier analysis using Stats NZ official data. The methodology is widely used and consistent with comparable assessments in New Zealand, but it has known limitations: it assumes fixed inter-industry relationships, does not capture price or capacity constraints, and excludes broader economy-wide feedback effects. Taken together, these limitations are more likely to overstate than understate the net economic impact, particularly the indirect (supply-chain) component. The figures above should therefore be read as indicative of the scale of economic activity associated with the proposal, rather than as precise forecasts.

Wider Economic Impacts

Beyond the direct and indirect economic activity quantified above, the proposal also delivers broader strategic and economic benefits:

- **Contribution to New Zealand's Emissions Targets:** If marine CDR removals come to be recognised internationally and by the Ministry for the Environment, verified CRUs could contribute directly to New Zealand's greenhouse gas inventory and progress towards future Paris Agreement commitments and net-zero targets.
- **Acceleration of the Blue Economy:** The project strengthens New Zealand's position in ocean-based innovation, building capability in marine science, engineering, and monitoring systems.
- **Efficient Use of National Assets:** Leverages New Zealand's vast EEZ, scientific expertise, and existing port infrastructure, while minimising competition for onshore land and resources.
- **Value-added Manufacturing Activity:** Supports domestic manufacturing, integration, and deployment of specialised substrates and marine carbon-removal systems.

- **Knowledge Generation:** Extensive monitoring and verification, validated by NIWA, will improve New Zealand’s understanding of ocean carbon dynamics and provide valuable data for future marine management.
- **Global Climate Leadership:** Supplying high-integrity, durable CRUs positions New Zealand as a credible leader in emerging carbon markets, attracting investment into advanced climate technologies.
- **Investment Signal Effects:** Demonstrates confidence in New Zealand’s science and regulatory frameworks, which can catalyse further investment in ocean-based carbon removal.

Conclusion

Gigablue’s proposal would establish a new ocean-based carbon-removal industry in New Zealand, with material direct and indirect economic activity at the national level both during the development phase and in ongoing operations. Beyond the quantified impacts, the proposal would contribute to New Zealand’s emerging blue economy, support domestic capability in marine science and monitoring, and position New Zealand within an internationally significant carbon-removal market. On the question posed by section 33(3)(g) of the EEZ Act — the economic benefit to New Zealand of the activity — our assessment is that the proposal would generate clear and quantifiable economic benefits, subject to the methodological limitations described above and to the realisation of the operating conditions assumed in this report.

2. Introduction

2.1. Purpose

Gigablue Aotearoa South Pacific Limited (**Gigablue**) seeks to establish a marine carbon dioxide removal operation within New Zealand’s Exclusive Economic Zone using its patented Marine Carbon Fixation and Sequestration (**MCFS**) technology (the **proposal**). Operations are expected to be supported from South Island ports and associated onshore activities, including manufacturing, research, monitoring, and verification. The proposal is intended to generate verified carbon removal units (**CRUs**) for sale into the international voluntary carbon market, contributing to both global decarbonisation efforts and, potentially, New Zealand’s future emissions accounting frameworks.

The activity is regulated under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (**EEZ Act**). Under section 33(3)(g) of the EEZ Act, an environmental effects assessment must describe the economic benefit to New Zealand of the activity, which is defined in section 20(2)(f) to include *“the deposit of any thing or organism in, on, or under the seabed”*. This report has been prepared to meet that statutory requirement by providing a high-level assessment of the economic benefits associated with the proposal.

For clarity, our assessment distinguishes between one-time development impacts and ongoing operational impacts. Capital expenditure (**CAPEX**) represents the one-off investment associated with establishing the project and is assessed as a development-phase impact. The quantified operational metrics, including operating expenditure (**OPEX**), cost of goods sold (**COGS**), employment, GDP, wages, revenues, and tax contributions, are representative of a steady-state operating year of 2030. This reflects Gigablue’s intended scale of operations once fully established.

The assessment does not present a year-by-year forecast beyond 2030. Instead, impacts beyond that point are discussed qualitatively with reference to independent market evidence on the expected evolution of durable carbon dioxide removal activity. Accordingly, the quantified results presented in this report should be interpreted as indicative of the scale and nature of economic activity that could be sustained over time, subject to market conditions, regulatory settings, and the maturation of carbon removal markets.

2.2. Structure of this Document

The remainder of this document is structured as follows:

- **Section 3** provides an overview of the carbon dioxide removal market.
- **Section 4** describes the key elements of the proposal.
- **Section 5** estimates the one-time impacts of development.
- **Section 6** estimates the ongoing annual impacts of operations.
- **Section 7** considers a range of wider economic impacts.
- **Section 8** summarises the likely economic benefits of the proposal to New Zealand.

3. Carbon Dioxide Removal Market Context

3.1. Overview of the Carbon Dioxide Removal Market

Carbon dioxide removal (CDR) refers to a range of technologies and approaches that extract CO₂ from the atmosphere and store it durably in terrestrial, geological, or ocean-based reservoirs. Unlike emissions reduction, which prevents future emissions, CDR targets residual emissions that are difficult or impossible to eliminate at source. It also offers the potential to reverse past emissions by drawing down atmospheric CO₂ levels. As such, most global decarbonisation models, including those developed by the Intergovernmental Panel on Climate Change (IPCC), identify large-scale CDR as essential for meeting net-zero and net-negative emissions targets. According to the IPCC, *“the deployment of carbon dioxide removal (CDR) to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO₂ or GHG emissions are to be achieved.”*²

The voluntary carbon market (VCM)³ is currently the primary mechanism for financing CDR, with corporate buyers purchasing carbon removal units (CRUs),⁴ also known as carbon credits, to neutralise residual emissions or to meet broader climate commitments. CRUs differ from conventional offsets, such as avoided deforestation, by focusing on the physical removal and long-term storage of CO₂. As scrutiny of carbon credit quality intensifies, buyers are increasingly prioritising solutions that offer high durability, additionality,⁵ and robust monitoring, reporting, and verification (MRV). According to a 2023 survey conducted by the Boston Consulting Group (BCG),⁶ carbon credit quality is the primary purchase driver for most buyers. Among the leading indicators of quality, 78% of respondents ranked the permanence of CO₂ removal in their top five, while 77% did the same for the robustness of the MRV.

This has led to growing demand for high-integrity removal credits, particularly those with the potential for >1,000-year storage lifetimes. In parallel, the VCM has been advancing new certification and integrity initiatives to strengthen confidence in carbon removals. Frameworks such as the Integrity Council for the Voluntary Carbon Market (ICVCM) and its Core Carbon Principles (CCPs) set out clear benchmarks for identifying high-quality CRUs. Consistent with these principles, Gigablu’s operational model has been developed and independently verified under the Puro.earth carbon removal standard, which provides third-party auditing and certification of issued carbon removal units.

² Intergovernmental Panel on Climate Change (IPCC). (2022). *Climate Change 2022: Mitigation of Climate Change – Summary for Policymakers*. Contribution of Working Group III to the Sixth Assessment Report of the IPCC. Page SPM-40, Section C.11.

³ A marketplace where organisations and individuals buy carbon credits on a voluntary basis, outside of government-mandated emissions trading schemes, such as the New Zealand Emissions Trading Scheme, to offset their emissions or meet corporate climate targets.

⁴ Tradeable credits representing a verified quantity of carbon dioxide removed from the atmosphere or ocean. The duration of storage depends on the method and standard applied: some methods, such as mineralisation or deep-ocean sequestration, are considered highly durable (hundreds to thousands of years), while others, such as forestry projects, store carbon temporarily and carry a risk of reversal unless actively maintained. One unit typically represents one metric tonne of CO₂ removed.

⁵ In this context, “additionality” means that the carbon removal would not have occurred in the absence of the project. To qualify, credits must demonstrate that they represent genuine, extra climate benefit beyond what would have happened under business-as-usual conditions.

⁶ BCG Durable CDR Market Study Buyer Survey (July 2023).

Recent global market assessments conducted by McKinsey highlight the scale of the challenge.⁷ They estimate that durable carbon dioxide removal is a necessary component of net-zero pathways, with demand expected to rise rapidly to 2030 and continue expanding thereafter. Their analysis identifies a substantial and widening gap between contracted demand for durable removals and the volume of removals currently delivered, reflecting both the early stage of the sector and constraints on scalable supply.

3.1.1. Carbon Dioxide Removal Market Size

The global CDR market is still in its infancy but has expanded rapidly in recent years in response to rising global demand for high-integrity climate solutions. As at August 2025, cumulative purchases amount to around 38 million tonnes of carbon dioxide equivalent (**Mt CO₂-e**) valued at approximately USD \$9.9 billion.⁸ These purchases typically represent forward offtake agreements for delivery over several years, meaning that much of the reported market size reflects future commitments rather than removals already achieved. In fact, only a very small share (2.4%) of contracted tonnes has so far been delivered, highlighting a significant gap between demand and verifiable supply.

Looking ahead, the market opportunity is significant. Recent modelling by BCG⁹ suggests that annual demand for durable removals could reach 40-200 Mt CO₂-e by 2030, with a corresponding market value of USD \$10-\$40 billion. By 2040, this could grow to 80-870 Mt CO₂-e, worth USD \$20-\$135 billion annually.¹⁰

According to BCG, this projected growth will be driven by several converging forces: a rapid increase in corporate net-zero commitments and voluntary demand; growing buyer preference for high-integrity, durable credits; early signs of regulatory alignment between the voluntary and compliance markets; and anticipated cost reductions as technologies mature and scale. As supply expands and prices fall, durable CRUs are expected to become accessible to a broader range of industries, though near-term demand will likely remain concentrated among voluntary purchases from early movers prioritising credit quality and long-term climate credibility.

3.2. Overview of Carbon Dioxide Removal Technologies

CDR encompasses a broad range of approaches that physically extract CO₂ from the atmosphere and store it in a durable form. These can be grouped into three broad categories:

1. **Nature-based conventional CDR:** Established methods such as afforestation/reforestation (**AR**) and soil carbon sequestration (**SCS**), which store CO₂ in vegetation and soils. These are low-cost and mature technologies but generally offer lower durability (less than 100 years of carbon sequestration) and face higher reversal risks from fire, pests, and land-use change.

⁷ Report accessible here: [Carbon removals: How to scale a new gigaton industry](#)

⁸ According to [CDR.FYI](#)

⁹ Available here: [The Time for Carbon Removal Has Come](#)

¹⁰ The broad ranges reflect scenario-based modelling that accounts for uncertainty in future carbon prices, the pace of regulatory adoption, and the extent to which corporate net-zero pledges translate into durable CDR procurement.

2. **Technological CDR:** Engineered systems such as direct air carbon capture and storage (**DACCS**). These can achieve higher durability (over 10,000 years of carbon sequestration) via geological storage but often involve high capital costs, substantial energy requirements, and complex infrastructure.
3. **Ocean-based CDR:** Methods that enhance or accelerate ocean carbon uptake, such as ocean alkalinity enhancement (**OAE**), enhanced rock weathering (**ERW**), and emerging marine carbon fixation techniques such as the proposal. These approaches have high durability potential but vary widely in readiness level, cost, and monitoring feasibility.

Table 2: Summary of CDR Technologies in the Voluntary Carbon Market (Source: IATA)

Technology ¹¹	TRL ¹²	Cost	Type of storage	Durability (years)
DACCS	2 - 8	High	Geological storage	10,000+
DOCCS	6	High	Geological storage	10,000+
BECCS	9	Moderate	Geological storage	10,000+
OAE	6	High	Dissolved minerals in water bodies	10,000+
ERW	4 - 6	Moderate	Dissolved minerals in water bodies	10,000+
Biochar	8 - 9	Moderate	Soil and vegetation	100s to 1,000s
AU/AUD	4	High	Marine sediment	100s to 1,000s
Ocean Fertilisation	4	High	Marine sediment	100s to 1,000s
CBC	9	Low to Moderate	Soil and vegetation	10s to 100s
AR	8 - 9	Low to Moderate	Soil and vegetation	10s to 100s
SCS	8 - 9	Low	Soil and vegetation	10s to 100s

As demonstrated above, a wide range of carbon removal pathways are available or under development, each involving trade-offs between cost, durability, and technological maturity.

3.2.1. Positioning MCFS within the CDR Technology Market

MCFS is a relatively recent marine-based CDR approach that combines natural oceanic carbon uptake processes with engineered control and monitoring systems. The methodology was formally recognised by Puro.earth in 2025.

While MCFS shares the broad objective of enhancing oceanic carbon fixation, it differs fundamentally from conventional ocean fertilisation. Ocean fertilisation involves the dispersal of loose nutrients into the open ocean to stimulate large-scale phytoplankton blooms, with limited control over their spatial or temporal extent.

By contrast, MCFS uses engineered substrates that contain a fixed nutrient formulation and a controlled buoyancy cycle. Each substrate promotes localised phytoplankton growth within a defined micro-environment before sinking below the thermocline, transporting captured carbon for long-term

¹¹ DACCS = Direct Air Carbon Capture with Storage; DOCCS = Direct Ocean Carbon Capture and Storage; BECCS = Bioenergy with Carbon Capture and Storage; OAE = Ocean Alkalinity Enhancement; ERW = Enhanced Rock Weathering; AU/AUD = Artificial Upwelling/Downwelling; CBC = Coastal Blue Carbon; AR = Afforestation and Reforestation; and SCS = Soil Carbon Sequestration.

¹² Technological Readiness Level (TRL) is a standard scale that measures how close a technology is to full market adoption, ranging from TRL 1 (basic principles and initial idea defined) to TRL 9 (solution is commercially available). Higher TRL scores indicate technologies that are closer to market readiness, while lower scores reflect early-stage concepts still in lab or prototype development.

storage. In functional terms, MCFS is best understood as a form of DOCCS, a hybrid between ocean-based and technological CDR approaches.

As the approach is designed to operate within marine environments it avoids reliance on terrestrial land availability, but requires careful site selection, monitoring, and staging to manage potential ecological risks. The methodology therefore sets specific requirements for environmental safeguards and phased deployment. If implemented in accordance with these requirements, MCFS has the potential to be the first avenue for gigaton-scale removal and sequestration.

4. About the Proposal

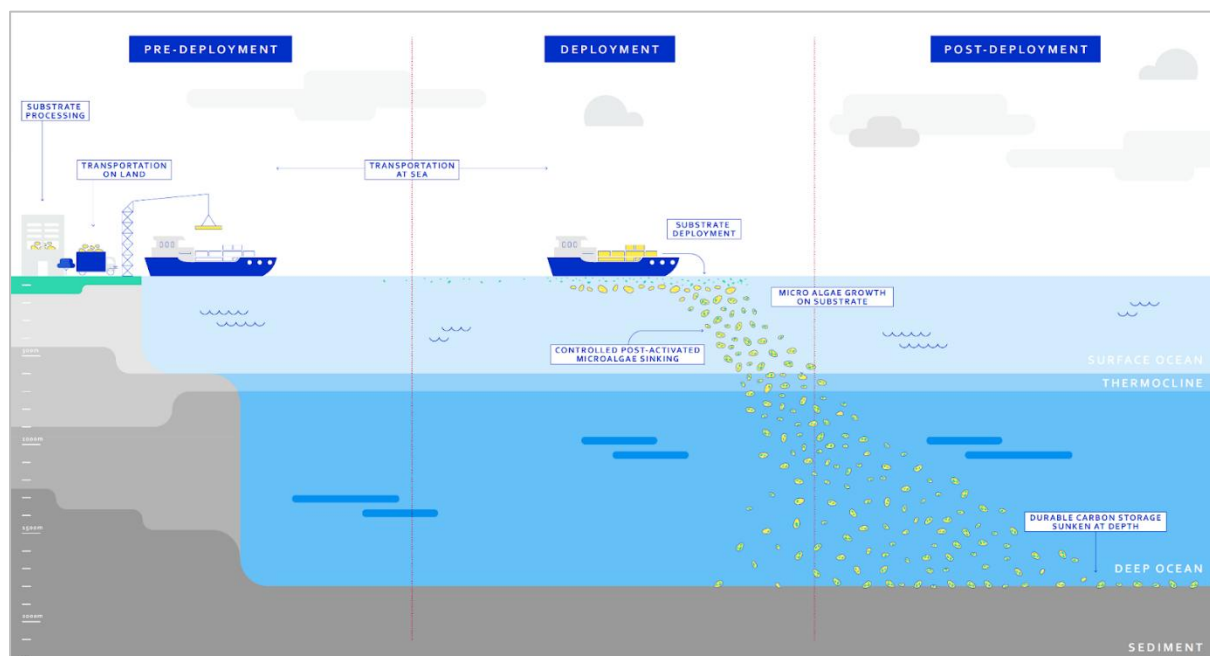
This section outlines the key elements of the proposal and the intended location of operations.

4.1. Project Description

The proposal involves the establishment of a marine CDR operation within New Zealand's Exclusive Economic Zone (EEZ), using Gigablue's patented MCFS technology. As described in the previous section, this process aims to stimulate phytoplankton growth in the upper ocean and subsequently transport captured carbon to the deep ocean for long-term storage.

Gigablue's MCFS technology uses engineered substrates designed to float in the upper water column for a controlled period, typically around 18 days. Each substrate contains a nutrient mixture formulated to promote the growth of naturally occurring phytoplankton. As the phytoplankton grow within and on the substrate, they utilise carbon dioxide from the surrounding seawater through photosynthesis with the carbon being converted to organic carbon inside the cells of the phytoplankton. After the floating phase, a built-in mechanism triggers the substrate to sink rapidly, carrying the captured carbon below the thermocline¹³ to depths where it is expected to remain sequestered for hundreds to thousands of years. Figure 1 below illustrates the overall MCFS process, as presented by Puro.earth.¹⁴

Figure 1: Schematic Illustration of the MCFS Process



Compared with conventional land-based methods such as AR and SCS, MCFS offers greater durability and lower reversal risk. At the same time, it aims for significantly lower costs than energy-intensive

¹³ The boundary layer in the ocean where water temperature changes rapidly with depth, separating the warmer surface water from the colder deep water. Below the thermocline, water is generally more stable and isolated from surface mixing.

¹⁴ Available here: [Puro.earth](https://puro.earth)

engineered approaches like DACCS or BECCS, while operating at a relatively higher technology readiness level.

Deployments are undertaken in defined offshore areas during seasonal “pulses” to coincide with optimal environmental conditions. To reduce the carbon footprint of offshore operations, Gigablue plans to use existing shipping partners and established routes. This approach avoids the need for dedicated voyages, enabling net-positive carbon removal and providing economic incentives for participating vessel operators.

The operational model anticipates repeated deployments over time, supported by an ongoing MRV programme. This MRV protocol, developed by Gigablue and validated by the National Institute of Water and Atmospheric Research (NIWA),¹⁵ includes baseline surveys, water sampling, physico-chemical analysis,¹⁶ and tracking of substrate sinking behaviour. Independent auditing is then undertaken under the Puro.earth carbon standard¹⁷ before carbon CRUs are issued. The business model is to register and sell the resulting CRUs into the international VCM.

Gigablue has indicated that all production processes are expected to be carried out in New Zealand, including preparation of raw materials, manufacturing substrates, engaging subcontractors, and registering carbon credits.

4.2. Project Location

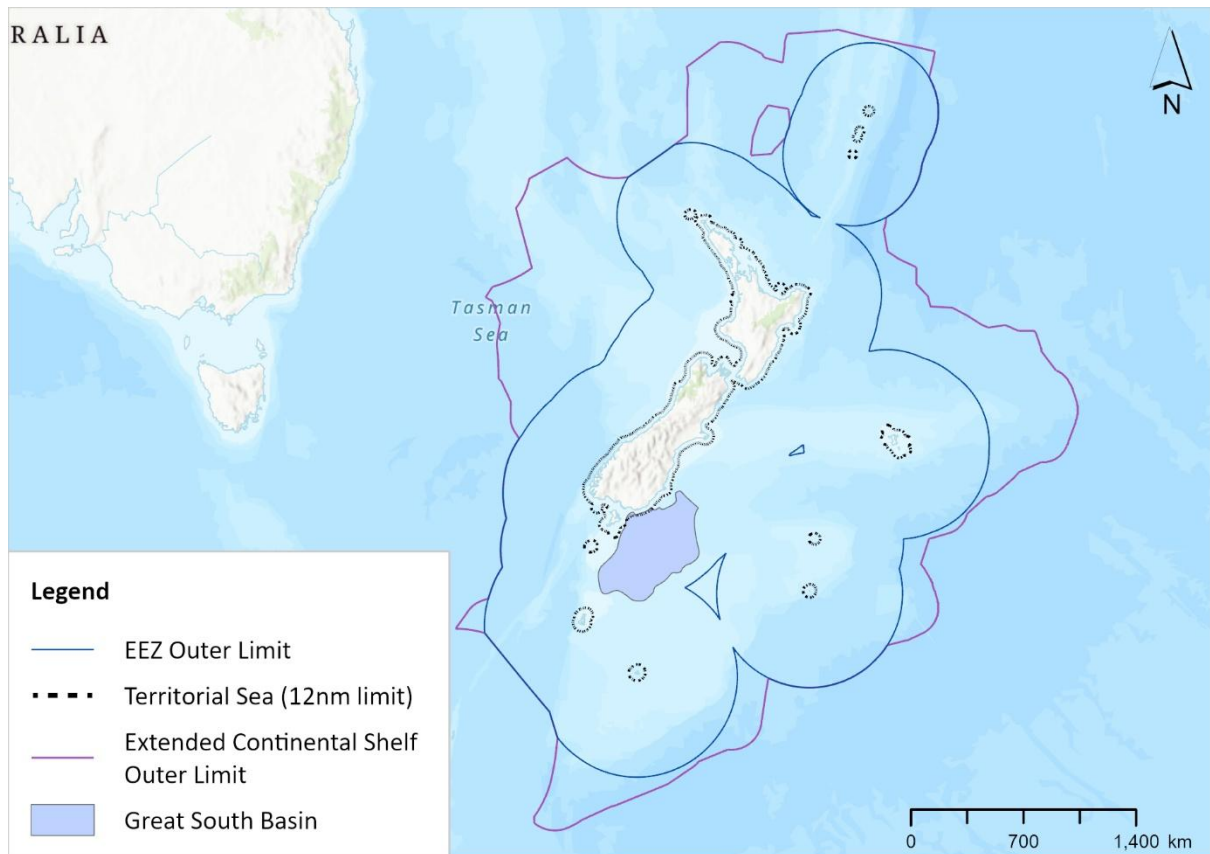
Gigablue proposes to establish operations in New Zealand’s EEZ and on the extended continental shelf. The EEZ begins at the outer limit of New Zealand’s territorial sea, which extends 12 nautical miles from the coast. Beyond this boundary, New Zealand has sovereign rights to explore, exploit, conserve, and manage natural resources out to 200 nautical miles from shore, as provided for under the United Nations Convention on the Law of the Sea. Where the continental shelf extends beyond the EEZ, New Zealand retains sovereign rights over the seabed and subsoil.

¹⁵ On 1 July 2025, NIWA merged with GNS Science to become [Earth Sciences New Zealand](#).

¹⁶ Physico-chemical analysis refers to the measurement of both the physical and chemical properties of water samples, such as pH, salinity, temperature, dissolved oxygen, and nutrient concentrations.

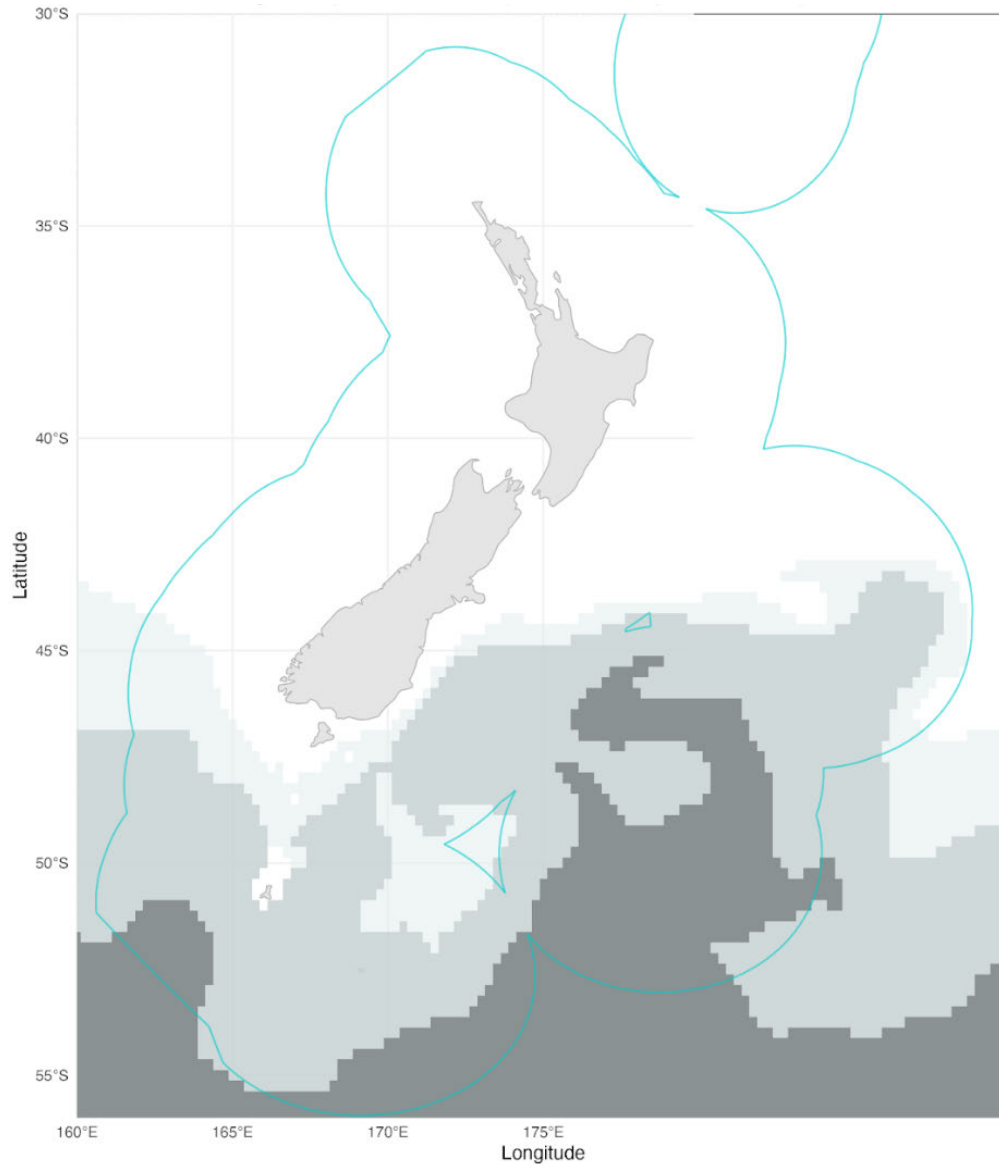
¹⁷ An independent, international standard and registry for verified carbon dioxide removal. It sets measurement and verification requirements for durable CDR methods and issues tradeable carbon credits once compliance is confirmed. Additional information available here: <https://puro.earth/>

Figure 2: New Zealand's Marine Area



Gigablue proposes to undertake marine carbon removal activity within suitable High Nutrient Low Chlorophyll (**HNLC**) waters in the EEZ. HNLC regions provide the optimal environmental conditions required for the MCFS technology, as they contain high concentrations of macronutrients but limited natural phytoplankton productivity. These areas occur across parts of the southern EEZ and adjacent offshore waters, as illustrated in Figure 3 below, which identifies the broad HNLC water masses (in grey) that form the potential marine area for future operations. These areas extend across parts of the Campbell Plateau and neighbouring offshore regions. The final operational area will likely be determined through ongoing scientific assessment, seasonal conditions, engagement with marine users, and regulatory requirements.

Figure 3: High Nutrient Low Chlorophyll (HNLC) Waters in the Southern EEZ



Gigablue has already undertaken preliminary scientific studies in the South Pacific Ocean under an EPA pre-activity notification. Future deployment activities are expected to be serviced from a South Island port, most likely Dunedin or Timaru. These locations would support both the offshore deployment of substrates and associated MRV activities.

4.3. Anticipated Carbon Dioxide Removal

At its intended operating scale, Gigablue estimates that its MCFS operations could remove up to 7 Mt CO₂-e in a representative year around 2030. This is based on repeated seasonal deployments in designated offshore “sequestration fields” and assumes the large-scale production and distribution of substrates.

Recent analysis by McKinsey¹⁸ suggests that global demand for durable CRUs could reach around 100 Mt CO₂-e per year by 2030, 9(2)(b)(ii). This estimate is derived from a review of the sustainability commitments of more than 10,000 companies and governments, identifying approximately 400 firms with commitments that either imply or explicitly require durable removals to compensate for residual emissions. Demand to date has been concentrated in the technology, finance, and professional-services sectors, with aviation and other industries now entering the market, and purchases dominated by companies in North America and Europe.

However, meeting projected demand in 2030 would still represent only a small step towards what is ultimately required. Global modelling indicates that six to ten gigatonnes of CDR annually will be needed by 2050 to align with a 1.5°C pathway,¹⁹ of which 20-60% is anticipated to be from durable removals like the proposal,²⁰ equating to roughly 1.2-6 GtCO₂ per year. Against this backdrop, Gigablue's projected capacity of 7 Mt CO₂-e annually is globally significant at a project level - roughly equivalent to around seven percent of estimated global demand for durable removals in 2030 - yet remains a small fraction of the scale required by mid-century.

4.4. Estimated Carbon Unit Pricing

9(2)(b)(iii)²¹ 9(2)(b)(ii)

The pricing model is structured to decline annually in line with projected cost efficiencies resulting from economies of scale, bulk procurement, operational refinements, and reduced MRV uncertainty buffers.

For context, modelling by BCG²² found that average durable CDR prices in today's market are around USD \$350 per tonne, with demand projected to expand significantly if prices decline toward USD \$150 per tonne. Their modelling also shows that once prices fall below USD \$200 per tonne, more emissions-intensive industries are willing and able to participate, thereby broadening the overall market for durable removals.

9(2)(b)(ii)

¹⁸ Available here: [Matching durable carbon removals supply and demand by 2030](#)

¹⁹ Refers to a scenario of greenhouse gas emissions reductions and climate mitigation strategies aimed at limiting global warming to 1.5°C above pre-industrial levels, as outlined in the Paris Agreement.

²⁰ *The state of carbon dioxide removal: 1st edition*, University of Oxford's Smith School of Enterprise and the Environment, 2023. Available here: <https://oceanrep.geomar.de/id/eprint/60326/1/SoCDR-1st-edition-2023-V9.pdf>

²¹ 9(2)(b)(ii)

²² Available here: [The Time for Carbon Removal Has Come](#)

4.4.1. Sensitivity to Global Carbon Prices and Policy

Gigablue's revenue model is tied to international voluntary and emerging compliance-linked carbon markets, rather than the New Zealand Emissions Trading Scheme (ETS) or any other domestic carbon price. The project's economic performance is therefore influenced by two main factors:

1. **Price:** Demand for durable carbon removals is highly sensitive to price. As noted earlier, modelling suggests that current durable CDR prices of around USD \$300-350 per tonne limit the range of potential buyers. If prices fall toward USD \$150-200 per tonne, demand expands significantly as more emissions-intensive industries find it cost-effective to participate in removals purchasing. As Gigablue currently offers high durability credits in the mid USD \$200 range, it has quickly become the largest supplier of MCDR credits, positioning itself as a hyper-scale energy enabler.
2. **Policy:** Trends in international policy are gradually creating stronger links between voluntary markets and compliance regimes. For example, the EU Carbon Removal Certification Framework is developing pathways to link certified removals with the EU's ETS,²³ while Japan's GX-ETS already allows certain voluntary credits to be used for compliance.²⁴ These developments mean that buyer behaviour is likely to be shaped not only by price, but also by whether credits meet jurisdiction-specific regulatory requirements. Companies subject to binding obligations may prefer credits that count towards compliance, while others may continue to purchase high-integrity voluntary credits for corporate net-zero commitments.

²³ [More information available here.](#)

²⁴ [More information available here.](#)

5. One-Time Impacts of Development

This section estimates the one-time impacts of the proposal.

5.1. Introduction

This section assesses the one-time economic impacts associated with establishing the proposal. These impacts reflect capital expenditure incurred prior to operations commencing and relate to infrastructure development, manufacturing capacity, and associated equipment and systems required to enable Gigablue's marine carbon removal activity.

These development impacts are treated as a discrete, upfront investment and are distinct from the ongoing operational impacts assessed in Section 6. They represent temporary economic activity during the establishment phase of the project.

5.2. Methodology

We quantified these one-time economic impacts using a technique called multiplier analysis, which traces the impacts of additional economic activity in one sector – such as construction services – through its supply chain to estimate the overall impacts, including flow-on effects. These comprise two parts:

- **Direct impacts** – which capture all on-site and off-site activities directly related to the proposal's development, such as building the substrate manufacturing infrastructure.
- **Indirect effects** – which capture additional (supply-chain) impacts arising when businesses working directly on the project source goods and services from their suppliers, who in turn may need to source goods and services from their own suppliers, and so on.

These economic impacts are measured in various ways, including:

- **Contributions to GDP (or value-added)** – GDP measures the difference between a business' inputs (excluding wages and salaries) and the value of its outputs. It captures the value that a business adds to its inputs to create its own outputs, hence the term "value-added."
- **FTE-years** – which equals the total volume of labour supplied over time, expressed as the number of full-time equivalent (**FTE**) workers employed for one year. For example, one worker employed full time for three years equals three FTE-years.
- **Job-years** – the total number of positions filled over time, counting each job held for one year as one job-year. This includes both full-time and part-time roles. For example, ten part-time and five full-time workers employed for one year equal fifteen job-years.
- **Total wages and salaries** – which equals the total amount paid in wages and salaries.

For example, when an engineering firm wins a new project, they will subcontract elements of the work to other companies, such as fabricators or electricians. Those subcontractors, in turn, will typically

need to source additional materials, components, or technical services from their suppliers, who may also source inputs from further upstream. Multiplier analysis enables the impacts of these supply chain interactions to be captured to estimate the overall impact of the new building project, including its direct and flow-on (supply chain) effects.

The multipliers used in this analysis are derived by Insight Economics from official Stats NZ source data, including the National Accounts Input-Output Tables, the Annual Enterprise Survey, the Linked Employer-Employee Data, and the Quarterly Employment Survey. **Appendix A** sets out the data sources and derivation in full.

A note on induced effects: some applications of multiplier analysis also report induced impacts, which capture the additional economic activity generated when workers employed directly or indirectly by a project spend their wages and salaries in the wider economy. While such spending does create some additional demand, much of it would have occurred regardless, since many workers – particularly those with specialist skills – would likely be employed elsewhere in New Zealand absent the proposal. Induced effects therefore tend to overstate genuine economic benefits, and including them can produce implausible results, such as suggesting that every dollar of expenditure generates more than one dollar of GDP. In practice, the economy cannot expand indefinitely, as firms face limits on available labour and resources. Accordingly, this assessment reports only direct and indirect effects.

5.3. Limitations

While multiplier analysis is a widely used tool for estimating the broader economic effects of industry activity, it has several limitations that should be borne in mind when interpreting results:

- **Fixed input-output relationships:** The model assumes fixed ratios between inputs and outputs across industries, and does not capture technological change, input substitution, or efficiency improvements over time. In a long-lived project, this assumption is more likely to *overstate* indirect effects toward the end of the period, as supply chains are likely to evolve and become more efficient than the snapshot embedded in the IO tables.
- **No price or capacity constraints:** The framework assumes supply can expand to meet increased demand without affecting prices, wages, or resource availability. In reality, capacity constraints, particularly in skilled labour markets, may dampen the scale of impacts. This assumption tends to *overstate* indirect effects, particularly during periods of tight labour markets, where some of the activity attributed to the project would in practice draw labour from other activities rather than expanding total employment.
- **Average industry structure:** Input-output coefficients are based on national industry averages. Where a project's cost structure differs materially from the industry norm, results may diverge from actual outcomes. For a project with a relatively high import content of specialised equipment — as is plausibly the case here — the multiplier may *overstate* domestic value-added relative to a project structure that is more typical of the mapped industries.
- **No feedback effects:** Broader economy-wide feedback loops, such as exchange-rate adjustments, inflationary pressures, and crowding-out of other investment, are not captured.

In a small open economy these feedbacks would, in general, dampen the scale of impacts, meaning their omission tends to *overstate* effects.

Taken together, these limitations point in the same direction more often than not: standard multiplier analysis is more likely to overstate than to understate the net economic impact of a project, particularly when the project is large relative to the host economy or operates in capacity-constrained sectors. The figures in this report should accordingly be interpreted as indicative of the upper-end scale of economic activity associated with the proposal, rather than as point estimates of net economic benefit. Future work, including a regional-level impact analysis once siting is finalised, could partially address these limitations.

5.4. Development Assumptions

Our analysis incorporates a set of assumptions about the likely scale and composition of development expenditure. Because reliable information on expected costs was provided by Gigablue, we began with those figures. 9(2)(b)(ii)

5.5. Summary of Development Costs

Table 3 summarises the estimated distribution of development expenditure across the two major activity categories, based on information provided by Gigablue and our assumed allocation.

Table 3: Summary of Estimated Development Costs

9(2)(b)(ii)

The CAPEX above was mapped to the relevant NZSIOC industries based on the nature of the activity, and the corresponding multipliers were applied. Table 11 in **Appendix A** sets out the mapping. Where an activity spans multiple industries (for example, infrastructure development includes both civil works and building construction), the cost was allocated proportionally based on the expected composition of work.

5.6. Estimated Impacts on GDP, Jobs, and Wages

Table 4 presents the one-time impacts of the proposal's development based on the methodology, inputs, and assumptions described above.

Table 4: National One-Time Economic Impacts of the Proposal by Activity

	Infrastructure Development	Machinery and Equipment	Total Development Impacts
Job-years	9(2)(b)(ii)		
Direct			
Indirect			
Total			
FTE-years			
Direct			
Indirect			
Total	9(2)(b)(ii)		5,128
Total Wages \$m	9(2)(b)(ii)		
Direct			
Indirect			
Total	9(2)(b)(ii)		\$465
Total GDP \$m			
Direct	9(2)(b)(ii)		
Indirect			
Total	9(2)(b)(ii)		\$818

In summary, the proposal's development phase is estimated to:

- 9(2)(b)(ii)
- 9(2)(b)(ii)

Overall, the proposal's development is estimated to provide full-time work for 5,128 FTE-years, generating approximately \$465 million in wages and salaries, and boosting GDP by \$818 million.²⁵ As noted above, these figures should be interpreted as indicative of the scale and distribution of economic activity associated with the proposal, rather than as precise forecasts.

5.7. Top 10 Industries by FTEs Employed

To better understand the likely impacts of the proposal's future development, Table 5 reveals the 10 industries likely to experience the greatest employment boosts. Those top 10 industries account for more than two-thirds of all full-time employment generated by the proposal's development, with the balance spread across numerous other sectors.

²⁵ Readers may note that the estimated total GDP impact (\$818m) 9(2)(b)(ii) This is because GDP measures value-added — that is, the difference between an industry's output and its intermediate inputs — rather than total expenditure. A significant share of CAPEX flows to imported equipment and materials, which contribute to the GDP of supplying countries rather than to New Zealand, and a further share is consumed as intermediate inputs in the production process. The GDP figure represents the New Zealand value-added that remains after these leakages, comprising \$313m of direct value-added and \$505m of indirect (supply-chain) value-added.

Table 5: Top 10 Industries by FTE-years Generated during Development

Industries	FTE-years	Shares
9(2)(b)(ii)		
Top 10 Subtotal	9(2)(b)(ii)	
All Other Industries		
Total FTE-years (all industries)	5,128	100%

5.8. Interpretation of Results

The figures in Table 4 are presented as totals over the development phase, not annual rates. We use FTE-years (a stock-of-labour measure) rather than annual FTEs (a flow measure) because the duration and phasing of development is a matter for Gigablue's project planning rather than this assessment, and the underlying multiplier methodology is duration-agnostic. The 5,128 FTE-years should be read as the total volume of labour required across the entire development phase. Spread over a multi-year construction and equipment-procurement programme, the annual employment requirement at any point in time will be a proportion of that total.

In addition, figures are presented at the national level. As Table 5 indicates, work is concentrated in several industries — construction services, machinery and fabricated metal manufacturing, electronic and electrical equipment, scientific and engineering services — that are distributed across New Zealand's major industrial centres rather than localised to the proposal's South Island operational base. Equipment manufacture in particular is likely to occur predominantly in larger industrial centres outside the South Island. The portion of total development employment located in the immediate vicinity of the operational base will therefore be considerably smaller than the national totals reported here.

Finally, the estimated indirect employment effects exceed direct employment for infrastructure development (around 2.1 indirect FTE-years per direct FTE-year). This reflects the deeply integrated nature of construction supply chains in New Zealand. Construction is a relatively labour-light activity at the direct level, but draws heavily on labour-intensive upstream sectors — including fabricated metal products, machinery manufacturing, electrical equipment, transport, and scientific and engineering services. This pattern is observed in the official Stats NZ multipliers for both Building Construction and Heavy and Civil Engineering Construction at the NZSIOC Level 4, and is consistent with results reported in comparable economic impact assessments of large infrastructure investments in New Zealand.

6. Ongoing Impacts of the Proposal

This section estimates the ongoing impacts of the proposal once at full operational capacity.

6.1. Introduction

In addition to the one-off effects of establishing the project, Gigablue's operations will generate enduring economic activity once established. This section assesses the ongoing economic impacts associated with operation of the proposal at scale. The analysis focuses on a representative steady-state operating year of 2030, which reflects Gigablue's intended level of activity once the project is fully established.

6.2. Methodology

The ongoing economic impacts of the proposal were estimated using the same multiplier analysis approach applied in Section 5 and with multipliers derived as set out in **Appendix A**. All quantified impacts in this section, including operating expenditure, cost of goods sold, employment, GDP, wages, revenues, and tax contributions, are expressed in 2025 prices for consistency with the one-time impacts section. These results are intended to illustrate the scale and composition of economic activity associated with ongoing operations at maturity, rather than to provide a year-by-year forecast.

The analysis does not model changes in operational scale, costs, or revenues beyond 2030. Instead, the 2030 results provide a reference point for understanding the nature of ongoing economic effects that could be sustained over time, subject to market and regulatory conditions.

6.3. Limitations

All figures represent the **gross** scale of economic activity that could occur once the project is fully established. A portion of this activity may have occurred elsewhere in the absence of the project — the extent of this displacement has not been quantified. The broader limitations of multiplier analysis discussed in Section 5.3 apply equally to the ongoing impact estimates presented in this section, and the figures should accordingly be interpreted as indicative of the upper-end scale of activity associated with operations rather than as point estimates of net economic benefit.

6.4. Operations Assumptions

The analysis incorporates assumptions about the scale and composition of operating expenditure associated with full-scale operations. 9(2)(b)(ii)

The domestic share includes activities such as research and development, operations, marketing, sales, and general and administration functions.

9(2)(b)(ii)

Table 6: Distribution of OPEX by Activity Category

Activity Category	Cost (NZD \$m)	Share of OPEX
9(2)(b)(ii)		

9(2)(b)(ii)

These costs relate to the operational delivery of marine carbon removal activity, including raw materials, production processes, MRV, vessel operations, and other recurring operational inputs. While they form part of the broader operating structure, they are presented separately due to their distinct cost drivers. Table 7 presents the assumed distribution across these categories.

Table 7: Distribution of Recurring COGS by Activity Category

Activity Category	Cost (NZD \$m)	Share of COGS
9(2)(b)(ii)		

These costs were then mapped to the relevant NZSIOC Level 4 industries (see **Error! Reference source not found.** and **Error! Reference source not found.** in **Appendix A**) and the corresponding multipliers were applied to estimate the ongoing impacts of the proposal, as set out in the following section.

6.5. Estimated Ongoing Impacts on GDP, Jobs, and Wages

Table 8 presents the estimated ongoing economic impacts associated with operation of the proposal at scale, based on the operating cost assumptions described above. The results reflect a representative steady-state operating year of 2030 and illustrate the scale and composition of GDP, employment, and wage impacts associated with ongoing operations, rather than a year-by-year forecast.

A disaggregated set of results, separating OPEX and COGS output by activity category, is provided in **Appendix B**.

Table 8: National Ongoing Economic Impacts of the Proposal by Activity

	Operational Expenditure	Cost of Goods Sold	Ongoing Operation Total
Annual Jobs			
Direct	9(2)(b)(ii)		
Indirect			
Total			
Annual FTEs			
Direct	9(2)(b)(ii)		9(2)(b)(ii)
Indirect			
Total			3,943
Total Wages \$m			
Direct	9(2)(b)(ii)		
Indirect			
Total			
Total GDP \$m			
Direct	9(2)(b)(ii)		9(2)(b)(ii)
Indirect			
Total			\$585

In summary, once fully operational, the proposal is estimated to:

- Sustain approximately 3,943 full-time equivalent jobs;
- Generate around 9(2)(b)(ii) in wages and salaries each year; and
- Contribute an estimated \$585 million to national GDP annually.

As with the development-phase figures, the estimates above are presented at the national level. The breakdown in Table 9 below shows that the largest single component of ongoing employment is in textile and leather manufacturing, reflecting the cotton-based substrate supply chain, which is unlikely to be located at the operational base. A further 11% is in scientific, architectural and engineering services, which are typically concentrated in larger urban centres. The portion of total ongoing employment located in the immediate vicinity of South Island operational ports will therefore be considerably smaller than the national figure.

6.6. Top 10 Industries by FTEs Employed

The proposal's ongoing operations are expected to sustain employment across a broad range of sectors, with the largest impacts concentrated in professional services and maritime industries. As shown in Table 9, the top 10 industries together account for 65 percent of all full-time employment generated during operations, with the balance spread across a wide variety of other sectors.

7. Wider Economic Impacts

This section considers a range of wider economic impacts of the proposal.

7.1. Alignment with Strategic Documents

The proposal aligns with New Zealand's overarching climate commitments and strategic policy direction, which aims to reach net-zero greenhouse gas emissions (excluding biogenic methane) by 2050. These domestic targets are framed through New Zealand's Nationally Determined Contribution (NDC)²⁶ under the Paris Agreement, which is measured against the National Greenhouse Gas Inventory (the **Inventory**)²⁷ prepared in accordance with international guidelines such as the UNFCCC and Kyoto Protocol. Achieving these goals will require not only rapid emissions reductions but also the scaling of high-integrity carbon removal solutions.

At present, marine sources and sinks are not included within the international accounting framework or the Inventory. Only terrestrial sources and sinks – collectively termed Land Use, Land-Use Change and Forestry (**LULUCF**) – are recognised for NDC purposes. Consequently, marine CDR activities such as the proposal are outside the Inventory system and cannot yet contribute directly to New Zealand's NDC.

However, policy and research communities are actively exploring the conditions under which marine CDR could in future be recognised. Demonstrating measurable, verifiable removals at scale is a prerequisite for this recognition. Gigablue's proposal therefore complements national and international objectives by generating the scientific data and operational experience needed to support future inclusion of marine removals within official frameworks.

While not part of the regulated system, the proposal is consistent with the Government's broader objectives of fostering innovation, supporting technology-led climate solutions, and strengthening the scientific evidence base for emerging carbon-removal pathways. In this respect, the proposal contributes to both the second Emissions Reduction Plan (**ERP2**)²⁸ focus on diversification of carbon removal pathways beyond forestry and to the longer-term transition to a sustainable "blue economy".

In addition, Gigablue has signalled its intent to align with the Government's objectives for partnering with Māori in climate action and marine resource management. This includes working with iwi, particularly Ngāi Tahu, through subcontracting, local business partnerships, and research initiatives that create opportunities for Māori enterprises and students. These intentions are consistent with the Government's policy direction, as set out in the first Emissions Reduction Plan,²⁹ which committed to establishing a Māori Climate Action Platform to embed Te Tiriti o Waitangi principles, elevate te ao Māori within the climate response, and fund kaupapa Māori solutions. ERP2 builds on this by continuing the Māori Climate Platform and emphasising Māori-led climate priorities, mātauranga

²⁶ New Zealand's commitment under the Paris Agreement to reduce greenhouse gas emissions to 50 per cent below gross 2005 levels by 2030. The NDC sets national targets and outlines the policies and measures the country will use to meet them.

²⁷ Available here: [New Zealand's Greenhouse Gas Inventory 1990 - 2023](https://environment.govt.nz/assets/publications/new-zealands-greenhouse-gas-inventory-1990-2023.pdf)

²⁸ Available here: <https://environment.govt.nz/publications/new-zealands-second-emissions-reduction-plan/>

²⁹ Available here: <https://environment.govt.nz/assets/publications/Aotearoa-New-Zealands-first-emissions-reduction-plan.pdf>

Māori as a guide to local action, and greater Māori involvement in the design and delivery of climate policy.

7.2. Contribution to Carbon-Removal Pathways

As high-durability CDR activities are gradually being recognised within national and international accounting systems, they represent an important complementary pathway alongside terrestrial removals. Demonstrating that marine CDR can achieve measurable, verifiable, and durable outcomes is a necessary step toward any future recognition under international frameworks. Progress in this area will depend on both international consensus on MRV methodologies and subsequent domestic adoption by the Ministry for the Environment (MfE).³⁰

In the meantime, marine CDR can generate certified CRUs for sale in the VCM. As outlined earlier, Gigablu's operational model is independently verified under the Puro.earth carbon-removal standard, which aligns with international integrity frameworks such as the ICVCM and its CCPs. Operating within these frameworks enables Gigablu to produce high-integrity CRUs that deliver immediate export revenue while building a transparent, verifiable record of carbon-removal performance.

At the same time, large-scale deployment will generate long-term empirical data on marine carbon fixation, sequestration, and storage – evidence that will inform international policy and scientific discussions on how marine removals might eventually be incorporated into official greenhouse-gas inventories.

Marine CDR therefore provides two complementary forms of benefit:

- a direct near-term economic benefit, through the export of verified CRUs to international VCM buyers; and
- a long-term indirect benefit, by creating the data and operational experience required for potential future recognition of marine sinks within international and national accounting systems.

In this way, Gigablu's proposal contributes both to New Zealand's emerging blue economy capability and to the global effort to develop credible, durable carbon-removal pathways.

7.3. Acceleration of the Blue Economy

The Sustainable Seas National Science Challenge defines a "blue economy" as one where marine activities generate economic value *and* contribute positively to ecological, cultural, and social wellbeing.³¹ Moving beyond extractive industries toward sustainable, knowledge-intensive marine activities is a strategic objective for both government and iwi-led marine plans.

³⁰ It is our understanding that, if, in future, removals from the project were to be recognised for use toward New Zealand's NDC while also being sold internationally, a corresponding-adjustment process would need to be in place to prevent double counting.

³¹ <https://www.sustainableseaschallenge.co.nz/our-research/blue-economy/>

Gigablue's operations would support this transition by creating a new, high-value marine export sector based on verified CRUs. These units are a premium product in international markets, with value tied to rigorous measurement, verification, and ecological stewardship. In other words, their production is inherently tied to ecological responsibility, given the requirement for rigorous MRV to maintain certification and market trust.

New Zealand's measurable marine economy currently contributes around \$4.6 billion to GDP³² and employs more than 39,000 people, with activity concentrated in fishing, aquaculture, shipping, and offshore minerals.³³ Gigablue's operations would extend this base by stimulating demand for specialist services such as vessel chartering, engineering, offshore deployment logistics, and environmental analytics, alongside long-term monitoring and scientific research. As production scales, new linkages are expected to emerge between maritime industries, agriculture, and materials science, broadening New Zealand's marine manufacturing and research capacity.

7.4. Wider Employment Impacts

Beyond the quantified employment numbers presented earlier in this report, ongoing operations are expected to generate broader employment effects that extend beyond employment counts. By anchoring a new marine carbon removal industry in New Zealand, the project will help build capability, diversify the South Island's economy, and develop skills aligned with the growing global blue economy.

- **Skill Development and Training:** Ongoing operations will create demand for specialised training in marine science, offshore vessel operations, environmental monitoring, and carbon accounting. Workers will gain hands-on experience in emerging fields such as oceanographic data collection, biogeochemical sampling, and MRV systems, building transferable expertise in marine technology and related disciplines.
- **Pathways into the Blue Economy:** Operational roles - ranging from crew on deployment vessels to field scientists, data analysts, and MRV technicians - offer entry points into a rapidly expanding international industry. As the OECD projects,³⁴ under a "business-as-usual" scenario, the blue economy is expected to more than double global value-added by 2030, enabling up to 40 million full-time equivalent jobs. Gigablue's operations provide a domestic pathway into this global trend.
- **Stable, Year-Round Employment:** Unlike construction jobs, which are temporary and seasonal, many of the required roles will be ongoing, supporting a base of highly skilled employment in southern New Zealand. This stability is particularly important in regions where labour markets are often seasonal and reliant on tourism, agriculture, or fisheries.
- **Support for Local Service Providers:** Regular vessel operations and scientific monitoring will require ongoing engagement with New Zealand-based subcontractors in shipping, logistics,

³² Excluding indirect value added, i.e., the value added by upstream sectors that provide goods and services to the marine economy, which contributed \$3.06 billion to the economy.

³³ www.stats.govt.nz/information-releases/environmental-economic-accounts-data-to-2023/

³⁴ Available here: [The Ocean Economy in 2030](#)

engineering, and environmental services. This creates recurring business opportunities for local firms and helps sustain a wider network of suppliers.

- **Broader Economic Ties:** The project's operational model encourages spillovers across multiple sectors. For example, collaboration with universities and Crown Research Institutes will strengthen New Zealand's marine science base; demand for ports and logistics services will increase throughput at South Island ports; and the use of natural fibres (such as cotton) in substrate production will stimulate local supply chains.

By embedding advanced scientific, maritime, and monitoring capabilities within New Zealand, the proposal not only provides ongoing employment but also establishes the country as an early mover in a globally emerging and high-value ocean-based economy.

7.5. Utilisation of National and Public Assets

The proposal leverages New Zealand's extensive EEZ – around 15 times the country's land mass and among the largest globally³⁵ – to deliver durable carbon removal at scale without competing for scarce terrestrial resources. By operating entirely in the marine environment, the MCFS method avoids land-use conflicts with agriculture, horticulture, and forestry, enabling climate mitigation without reducing food production or constraining other land-based economic activities.

Recurring offshore activity may also generate ecological co-benefits. In addition to the direct sequestration achieved by the MCFS process, large-scale activities could mitigate regional ocean acidification by reducing the stress caused by CO₂ excess absorbed by the ocean's water. These effects could strengthen the resilience of marine ecosystems, which underpin many other sectors of the blue economy, from fisheries to tourism.

In addition, the proposal has the potential to reduce New Zealand's future fiscal burden for meeting climate targets. If removals from the project are recognised in the Inventory, they could contribute directly to national emissions reduction commitments, reducing the need for Government to purchase offshore mitigation or invest in more expensive abatement technologies. This represents a strategic use of public environmental assets to deliver measurable climate benefits while enhancing the economic returns generated from the EEZ.

7.6. Value-Added Material Inputs and Manufacturing Activity

The MCFS process requires large volumes of engineered substrates to support controlled phytoplankton growth and export for durable carbon sequestration. These substrates are expected to be manufactured using natural fibre materials, such as cellulose.

At present, New Zealand does not produce cellulose fibres at scale, and raw fibre inputs may be sourced internationally. As a result, the primary domestic economic benefit does not arise from agricultural fibre production, but from downstream activities associated with the substrate manufacturing, processing, logistics, and integration within New Zealand.

³⁵ <https://www.doc.govt.nz/nature/habitats/marine/new-zealands-marine-biodiversity/>

If substrate fabrication, assembly, or finishing occurs domestically, this would support value-added manufacturing activity, including textile processing, natural polymer or composite integration, quality control, and specialised fabrication. These activities align with higher-value manufacturing segments rather than commodity fibre production.

The use of natural fibre substrates also aligns with circular-economy and low-emissions principles. Compared with synthetic alternatives, natural fibre products offer high biodegradability and high compatibility in natural environments. Over time, there may also be opportunities to incorporate recycled or recovered textile materials into substrate production, subject to technical feasibility and regulatory approval, further reducing waste streams and embodied emissions.

More broadly, the requirement to manufacture and deploy large volumes of specialised substrates at scale supports the development of domestic capability at the intersection of materials science, sustainable textiles, marine engineering, and climate technology. This includes:

- **Diversified demand** for manufacturing, assembly, and quality-assurance services linked to substrate production;
- **Innovation pathways** for integrating renewable, biodegradable, and low-impact materials in climate-technology products and applications;
- **Growth in logistics, storage, and handling** associated with large-volume marine deployment; and
- **Export positioning** for New Zealand as a supplier of sustainable materials for emerging carbon removal industries.

In this way, the proposal supports New Zealand's economic benefit primarily through downstream manufacturing, integration, and deployment activity, rather than through upstream agricultural fibre supply. This framing remains valid regardless of the specific natural fibre used in substrate manufacturing.

7.7. Enhanced Global Competitiveness and Climate Leadership

By commercialising a nature-based carbon removal technology at scale, the proposal would position New Zealand as an early global leader in marine carbon dioxide removal. Early entry into this emerging field offers an opportunity to establish environmental standards, verification protocols, and operational norms that could shape international policy and market frameworks. Setting these benchmarks can generate enduring first-mover advantages, both in terms of reputation and economic opportunity.

A relevant precedent is Denmark's early investment in offshore wind. In 1991, Denmark launched the Vindeby Offshore Wind Farm, the world's first of its kind. This small pilot project catalysed the development of a national supply chain, supported infrastructure investment such as specialised ports, and facilitated the transfer of skills from related industries into offshore wind. Over time, Denmark captured a significant share of the European offshore wind market, with Danish companies

now holding around 40 percent of the EU's offshore wind sector.³⁶ The first-mover position enabled Denmark to export expertise, technology, and services, while attracting foreign investment and creating high-value domestic jobs.

For New Zealand, early commercialisation of marine CDR could deliver similar benefits. Establishing a proven, high-integrity approach ahead of other nations would not only strengthen New Zealand's credibility as a climate-responsible trading partner but also attract foreign direct investment, research partnerships, and access to emerging international climate finance. By shaping the rules of a new market, New Zealand could secure long-term competitive advantages in the export of verified carbon removal services, reinforcing its leadership in low-emission innovation and its ability to meet domestic and international climate commitments.

7.8. Increased Knowledge of NZ's Marine Environment

The proposal would involve multiple voyages, experiments, and baseline data collection projects, generating detailed information on the physical, chemical, and biological characteristics of New Zealand's EEZ. This activity will enhance understanding of existing marine ecosystems, oceanographic processes, and long-term changes, and will create opportunities for new scientific collaborations. Where appropriate, data collected will be shared with national repositories such as NIWA's databases, contributing to New Zealand's broader ocean science capability.

A core component of the proposal is Gigablue's MRV protocol, which records more than 50 unique data points, and hundreds of time-stamped measurements, for each deployment. These cover, for example, the baseline surveys, physico-chemical sampling, geographical tracing, and biological analyses. As discussed earlier, the MRV protocol was developed by Gigablue, validated with NIWA, and incorporated into a standard methodology with global carbon removal standard Puro.earth.

By embedding this rigorous measurement into each deployment, the proposal will expand scientific knowledge of offshore ecosystems, strengthen New Zealand's position in marine research, and improve the evidence base for sustainable management of the EEZ.

In addition, Gigablue has indicated that engagement with Ngāi Tahu may create opportunities for iwi participation in research, monitoring, and marine operations. These arrangements could contribute to iwi capacity building through involvement in training and skills development activities associated with the project.

7.9. Impact on Other Industries

The proposal's operational footprint and associated activities will influence a range of other industries within New Zealand's emerging blue economy. While most effects are expected to be positive through spillovers and shared use of infrastructure, careful planning will be required to manage potential conflicts and maintain public trust. The most likely positive interactions and spillovers include:

³⁶ <https://investindk.com/set-up-a-business/cleantech/wind-power>

- **Fisheries and aquaculture:** Potential for recovery of fish and oyster stocks by improving the resilience of local marine ecosystems, especially in areas with depleted stocks. This will benefit both commercial and customary fisheries, provided no adverse ecosystem effects occur.
- **Tourism and recreation:** Similarly, the proposal's contribution to ocean health (e.g., by reducing localised ocean acidification) could indirectly support tourism sectors reliant on healthy marine ecosystems, such as diving, eco-tourism, and whale watching.
- **Marine science and technology:** Increased demand for surveys, monitoring equipment, and specialist vessels, driving innovation in sensors, autonomous vehicles, and oceanographic analysis.
- **Ports and logistic:** Recurring vessel deployment and servicing will increase throughput and revenue for regional ports and associated supply chains.

Some risks will require proactive management to ensure coexistence with established marine uses. These might include:

- **Spatial conflicts:** Deployment planning will need to consider existing marine uses (e.g., fishing grounds, shipping lanes, aquaculture zones) to minimise operational conflicts. It is our understanding that Gigablue is currently engaging with key fisheries and marine stakeholders to identify any potential spatial overlaps or concerns.
- **Public trust:** Early engagement with affected sectors can help identify co-benefits and address concerns over potential ecological impacts or access restrictions.
- **Economic displacement:** Depending on deployment locations, there may be potential for reduced access or higher operating costs for other marine industries (e.g., fisheries, aquaculture, tourism) if activities overlap. While such impacts are likely to be localised, they represent potential economic costs that should be considered alongside the benefits.

By demonstrating that marine CDR can coexist with, and in some cases enhance, other ocean-based industries, New Zealand can demonstrate a model for multi-use, high-value EEZ management.

7.10. Investment Signal Effects

Finally, the proposal will signal that New Zealand is ready to deploy large-scale, science-based marine CDR. Early approval can reduce perceived policy and market risks, increasing investor confidence in similar projects. By demonstrating a clear pathway for consenting, verifying, and commercialising marine CDR, the proposal can catalyse further private investment in infrastructure, research, and supply chains. These investment signals also extend to other low-emission and climate-technology sectors where policy certainty and demonstrated delivery will help unlock new capital flows.

8. Conclusion

This report has assessed the likely economic effects of Gigablue's proposed marine CDR operations in New Zealand's EEZ. The analysis indicates that the project would generate material direct and indirect economic activity at the national level, both during the development phase and in ongoing operations.

During the **development phase**, a one-time investment of approximately NZD \$1.04 billion is expected to generate:

- A boost to GDP of around \$818 million;
- Employment for approximately 5,128 FTE-years; and
- Around \$465 million in wages and salaries.

At its assumed 2030 **operating** scale, the project is anticipated to deliver ongoing impacts of:

- GDP contributions of around \$585 million;
- Sustained employment of about 3,943 full-time equivalent jobs;
- Approximately 9(2)(b)(ii) in wages and salaries each year; and

- 9(2)(b)(ii)

In addition to these quantifiable effects, the project is expected to deliver wider benefits by:

- Strengthening New Zealand's emerging blue economy through diversification into knowledge-intensive, marine-based industries;
- Creating pathways for domestic capability building in offshore operations, marine science, and carbon measurement, reporting, and verification;
- Stimulating demand for local service providers across ports, logistics, engineering, and research;
- Generating new cross-sector opportunities, such as the integration of cotton into substrate production; and
- Positioning New Zealand as a first-mover in international markets for durable, ocean-based carbon removal.

The development-phase figures above are presented as totals over the full development phase using FTE-years rather than as annual rates, since the duration and phasing of development is a matter for Gigablue's project planning. Spread over a multi-year ramp-up, the annual employment requirement at any one time would be a proportion of the total. The figures are also presented at the national level, meaning a significant portion of equipment manufacture and engineering activity is likely to occur in

larger industrial centres outside the South Island, with a portion of total development employment located in the immediate vicinity of the operational base.

The figures in this report are based on standard input-output multiplier analysis, which has known limitations (see Section 5.3). Most of these limitations point toward overstatement rather than understatement of net economic impact. The estimates should therefore be interpreted as indicative of the scale of activity associated with the proposal rather than as precise forecasts. Future work that would improve rigour and reduce uncertainty includes a regional-level impact analysis once siting is finalised, a CGE-style analysis to capture displacement and price feedback effects, and sensitivity analysis on key parameters such as the carbon-unit price path and the share of COGS captured domestically.

Section 33(3)(g) of the EEZ Act requires that the environmental effects assessment describe the economic benefit to New Zealand of the activity. On that question, our assessment is that the proposal would generate clear and quantifiable economic benefits, subject to the methodological limitations described above and to the realisation of the operating conditions assumed in this report.

Appendix A: Multiplier Derivation and Data

This appendix sets out the data sources and methodology used to construct the economic multipliers applied in Sections 5 and 6 of this report.

Overview

The multipliers used in this analysis follow the standard input-output approach, distinguishing between direct effects (the activity directly attributable to a given dollar of final demand in an industry) and indirect effects (the supply-chain activity generated as that industry sources inputs from upstream industries). The methodology is consistent with that used in published economic impact assessments by NZIER, BERL, and other New Zealand consultancies that draw on the same Stats NZ source data.

Multipliers are constructed at NZSIOC Level 4 (approximately 109 industries) as this is more disaggregated than the 55-industry NZSIOC Level 3 published directly by Stats NZ, and allows the cost categories of the proposal to be mapped to industries that more closely reflect the underlying activity. For example, this enables Non-Residential Building Construction to be treated as a distinct industry within the broader construction sector, rather than aggregated into a single category.

Direct Multipliers

Direct multipliers capture the GDP, employment, FTE, and wage impacts associated with one dollar of output in each industry. They are constructed from the following official datasets:

- **Annual Enterprise Survey (AES):** provides industry-level financial structure.
- **National Accounts GDP by Industry:** used as the value-added base for industries not separately reported in AES.
- **Linked Employer-Employee Data (LEED):** provides filled jobs and total earnings, used for employment and wage densities.
- **Quarterly Employment Survey (QES):** used for filled jobs and FTE conversion ratios.
- **Supplementary Stats NZ datasets:** the Manufacturing Survey, Retail Trade Survey, and Wholesale Trade Survey are used to disaggregate certain industries to NZSIOC Level 4 where AES data are reported only at higher levels.

Indirect Multipliers

Indirect multipliers capture the supply-chain effects of activity in each industry. They are derived from the standard Leontief input-output approach. From Stats NZ's latest National Accounts Input-Output Tables,³⁷ we derive the technical coefficients matrix **A**, where each entry a_{ij} represents the dollar value of inputs from industry *i* required to produce one dollar of output in industry *j*. We then compute the Leontief inverse $(I - A)^{-1}$. The columns of this inverse give the total output requirements per dollar of

³⁷ Source: www.stats.govt.nz/information-releases/national-accounts-industry-production-and-investment-year-ended-march-2020/

final demand for each industry, and form the basis of the indirect output, GDP, employment, and wage multipliers reported in this analysis.

Type I Multipliers

Consistent with the discussion in Section 5.2, this analysis reports Type I multipliers – that is, direct and indirect (supply-chain) effects only. Type II multipliers, which additionally include induced (consumption-driven) effects arising from the spending of wages by directly and indirectly employed workers, are not used. Including induced effects can produce implausible results in the New Zealand context, where labour and resource constraints mean that much of the spending captured by the induced multiplier would have occurred regardless of the project. The exclusion of induced effects is therefore a deliberate methodological choice intended to avoid overstatement.

Industry Mapping

The CAPEX, OPEX, and COGS figures used in Sections 5 and 6 were mapped to the relevant NZSIOC Level 4 industries based on the nature of each activity. Where an activity spans multiple industries, the cost was allocated proportionally based on the expected composition of work. The primary mappings are summarised in the table below.

Table 11: NZSIOC Level 4 Industry Allocation by Development (CAPEX) & Activity (OPEX, COGS) Category

Activity	NZSIOC Industries
CAPEX	
Infrastructure Development	Non-residential building construction (EE113); Heavy and civil engineering construction (EE121); Construction services (EE131); Scientific, architectural, and engineering services (MN111); Legal and accounting services (MN112); Advertising, market research, and management services (MN113)
Machinery & Equipment	Basic chemical and basic polymer manufacturing (CC521); Polymer product and rubber product manufacturing (CC531); Fabricated metal product manufacturing (CC721); Electronic and electrical equipment manufacturing (CC821); Machinery manufacturing (CC822); Other manufacturing (CC912)
OPEX	
Operations	Water transport (II122); Transport support services (II132); Warehousing and storage services (II133); Non-residential property operation (LL122); Scientific, architectural, and engineering services (MN111)
Research & Development	Scientific, architectural, and engineering services (MN111); Computer system design and related services (MN115); Tertiary education (PP113)
Sales	Scientific, architectural, and engineering services (MN111); Legal and accounting services (MN112); Advertising, market research, and management services (MN113); Computer system design and related services (MN115)
Marketing	Telecommunications services (JJ121); Advertising, market research, and management services (MN113)
General & Administration	Legal and accounting services (MN112); Advertising, market research, and management services (MN113); Employment and other administrative services (MN212)
COGS	
Production	Textile and leather manufacturing (CC211); Basic chemical and basic polymer manufacturing (CC521); Pharmaceutical, cleaning, and other chemical manufacturing (CC523); Polymer product and rubber product manufacturing (CC531); Fabricated metal product manufacturing (CC721); Electronic and electrical equipment manufacturing (CC821); Machinery manufacturing (CC822); Scientific, architectural, and engineering services (MN111)
Raw Materials	Textile and leather manufacturing (CC211)
MRV & Vessel Operations	Water transport (II122); Transport support services (II132); Warehousing and storage services (II133); Scientific, architectural, and engineering services (MN111)
Other Operational	Transport support services (II132); Advertising, market research, and management services (MN113); Computer system design and related services (MN115); Building cleaning, pest control, and other support services (MN213); Repair and maintenance (RS211)

Appendix B: OPEX and COGS Impacts

This appendix provides a disaggregated presentation of the ongoing economic impacts associated with operating the proposal at scale. The results reflect a representative steady-state operating year of 2030 and are expressed in 2025 prices, consistent with Section 6 of this report. They illustrate the scale and composition of economic activity associated with ongoing operations at maturity and are not intended to represent a year-by-year forecast.

OPEX Impacts by Activity Category (2030 Operating Scale)

The table below reports the economic impacts associated with the domestic share of OPEX. These activities cover research and development, operations, sales, marketing, and general and administrative activities.

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