New Zealand Cleantech Report 2024

Profiling the New Zealand Cleantech sector

> Ultimately the Nilo ambition is to generate a CO_2 emission reduction of 3 million tonnes initially, and enable repurposing of 2 million metric tons of soft plastic waste which is currently not recyclable.
>
> Glen Willoughby
> **CEO, Nilo**

> We're looking to replace cement in concrete, reducing CO_2 embodied in construction and reduce global carbon emissions by 1% and re-engineer the worlds building block.
>
> Matt Kennedy-Good
> **Co-founder and President, Neocrete**

Prepared by NZ Cleantech Mission working group and sponsored by the MacDiarmid Institute and Callaghan Innovation

Foreword: Dr Will Barker, Co-founder and CEO of Mint Innovation

In the landscape of global innovation, New Zealand occupies a unique position—a fertile ground for the seeds of clean technology. Yet, despite its promising environment for development, the domestic market does not fully capture the potential of these emerging clean technologies and the longer-term impact they could have on the New Zealand economy.

As annotated in this report, for New Zealand's clean technology innovators to achieve economic viability and generate significant environmental impact, more companies will need to extend their reach beyond New Zealand borders. Given the prolonged development cycle of clean technology, it can take a long time to market; these companies require long-term and consistent support from investors and the Government.

Over the past several years, we have witnessed a maturation in private investment in clean technology within our shores. However, the journey towards achieving a level playing field with more established markets remains arduous. New Zealand's clean tech companies must leverage the 'halo effect' of trailblazers such as LanzaTech, Mint Innovation, and Geo40 who have paved the way for emerging companies by enhancing investor confidence and interest in the sector from local and foreign investors and our Government to provide greater access to resources as discussed in this paper.

Reflecting on my own experiences, my hope is that this document serves as both a reflection on Mint Innovation's journey so far and a roadmap for the future, encouraging a continued commitment to innovation and sustainability, and positioning New Zealand not just as a creator but also as a global leader in the clean technology arena.

Our sponsors and Cleantech Mission partners

The Cleantech Mission was established in 2021 by Callaghan Innovation[1], and is a cross-agency partnership formed as a response to findings in the New Zealand Climate Tech for the World Report[2]. The objective of the partnership is to deliver, partner with and advocate for initiatives to bolster New Zealand's cleantech ecosystem.

With support from NZTE

Disclaimer: The views expressed in this report generally reflect those shared by the companies surveyed and interviewed, and may not necessarily be shared by all partners within the Cleantech Mission.

[1] https://www.callaghaninnovation.govt.nz/stories/nz-cleantech-mission-making-it-happen-for-new-zealand/
[2] https://www.callaghaninnovation.govt.nz/assets/documents/NZ_Climate_Tech_For_The_World_report.pdf

Executive Summary

The world faces multiple challenges in supporting a population of 8 billion people and if expectations of a high quality of life are to be met, new technologies are required to replace dirty and damaging processes that provide our homes, transport, energy, computers, food and many of the goods that are associated with modern developed societies.

New Zealand has a role to play in developing some of the technologies needed for a sustainable world and the local companies that successfully deliver on this promise will also support a step change in our local economy.

The New Zealand cleantech sector is made up of over 130 companies and has attracted at least $535 million private investment to date. Over the last two financial years it has generated a total of $291 million revenue $112 million in R&D expenditure, $87 million expenditure on capital items, and employs over 1190 people (896 FTE locally and 293 offshore).

We surveyed 135 companies and interviewed 29 company founders and leaders, receiving survey responses from 66 companies.

The companies surveyed in this report identify a range of initiatives that would accelerate the pace, scale and impact of this emerging sector and the New Zealand Cleantech Mission aims to kickstart work on these suggestions by setting up an industry-government working group to prioritise and plan implementation of these suggestions.

Companies would value support in the following areas to enhance their ability to contribute to global sustainability impacts while boosting the New Zealand economy and de-risking our international supply chains.

- Raising investment from New Zealand
- Infrastructure and facilities
- Regulatory settings
- Access to quality talent
- Ability to generate revenue while operating from New Zealand (access to markets)

The report focuses exclusively on companies who are developing an advanced technology and acknowledge that a wider view including existing manufacturing, construction, consulting, engineering and other firms who include sustainability products, processes or services would provide a far larger market size estimate. The industry groups represented are: Agriculture & Food Energy & Power Materials & Chemicals Resources & Environmental Management Transportation & Logistics Waste & Recycling

The sector is poised for rapid growth both in the intended ambitious capital raises indicated by companies for the year to March 2025 of $440 million as well as the revenue growth rate between 2023 and 2024 years being 29%.

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Introduction - Exploring the cleantech sector globally and in New Zealand

The world faces multiple challenges in supporting a population of 8 billion people and if expectations of a high quality of life are to be met, new technologies are required to replace dirty and damaging processes that supply our homes, transport, energy, computers, food and many of the goods that are associated with modern developed societies.

The International Energy Agency, (IEA) identifies that many of the technologies needed to provide energy in a world that is consistent with below 2 degrees of warming are not yet market-ready and that these need support to scale-up and more private and Government investment. Alongside energy, the technologies to ensure sustainable resource use, water quality, biodiversity, transport, and to minimise industrial waste all need scientific and scale-up support if humanity is to continue to thrive. New Zealand is well placed to contribute to developing some of the technologies essential to a sustainable world and generate the economic returns of being a technology exporter. The time is ripe for New Zealand to drive a green industrial revolution leveraging the excellent scientific, engineering and entrepreneurial talent that our cleantech company leaders believe we possess.

The cleantech sector is a rapidly emerging global investment category of sustainability focused technology companies. These companies aim to disrupt existing industries that pose major risks to humanity's ability to thrive with problematic waste, pollution, and negative climate footprints. Cleantech companies operate across the major industry verticals and include technologies relevant to the energy transition, water quality, circular economy and waste recycling, transport and construction. These companies typically have a B2B business model and most rely on some form of complex scientific or engineering breakthrough, making them also deep tech companies.

New Zealand has previously launched cleantech companies onto the global stage that have gone on to be billion-dollar companies, but in order for cleantech to really support a step change in our local economy we need a wider and deeper base of successful entrepreneurs to scale into globally relevant offerings. The New Zealand Cleantech Mission was established to support companies to pursue this ambitious growth and achieve the sustainability impact that their technologies promise. The IEA and Larry Fink of Blackrock agree on the size of the opportunity being immense in terms of potential for developing unicorn companies and the market being larger than the Oil and Gas industry by 2030[3].

> "The next 1,000 unicorns won't be search engines or social media companies, they'll be sustainable, scalable innovators – startups that help the world decarbonize and make the energy transition affordable for all consumers,"
> BlackRock CEO, Larry Fink

The New Zealand Cleantech Mission surveyed the New Zealand cleantech sector to develop this report and provide quantitative and qualitative information on the current size and the impact ambitions of the cleantech companies operating from New Zealand as well as the

[3] https://prod.iea.org/reports/clean-energy-innovation?mode=overview

opportunities and challenges they identify. The research delves into capital raised, revenue, R&D spending, employment, quality of talent, capital equipment purchased as well as the impact on sustainability areas targeted by local companies competing in global markets.

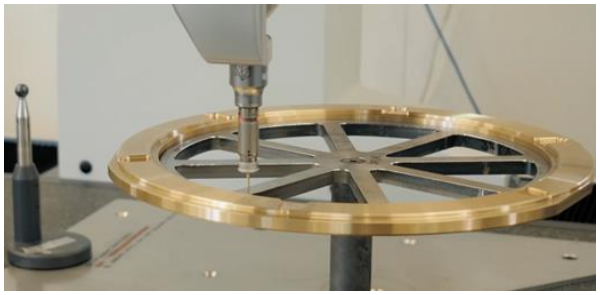
The NZ Cleantech sector[4] is made up of over 130 companies registered in New Zealand and survey respondents (N = 65) reported at least $535 million private investment to date. Over the last two financial years it has generated a total of $291 million revenue $112 million in R&D expenditure, $87 million expenditure on capital items, and employs over 1190 people (896 FTE locally and 293 FTE offshore).

Our data provides insights into a limited subset of the much larger overall "green economy" which includes sustainable energy (e.g. solar and wind farms) engineering and construction, manufacturing improvements, farming practices, finance, insurance and consulting work that is contributing to the global efforts to turn modern industrial and agricultural economies into sustainable ones. We have chosen narrow inclusion criteria that aims to avoid duplicating metrics across New Zealand's emerging Aerospace, Biotech, AI and Agritech domains although we note there is often overlap. While we do include a number of hybrid companies, they are chosen for their primary sustainability focus.

The cleantech sector is recognised as being at an early stage of development locally and internationally, with the average age of local companies being 6.8 years (median 5 years) and 48% of respondents being pre-revenue. While the emerging sector is relatively new, New Zealand has had many successful pioneers operating for around 20 years (Lanzatech 2005), MSL (1999), Fabrum (2004), Wood Engineering Technology (2003) and AW Fraser has operated since 1939. We don't include international companies in our data (e.g. Lanzatech, Ethique or Allbirds), but the local ecosystem has the benefit of their globally pioneering work and ongoing engagement from their founding teams.

Case Study: AW Fraser, one of New Zealand's earliest Cleantech pioneers

Recycling scrap metal from New Zealand and the world is at the core of the AW Fraser mission. This has been the case since the Fraser family opened their first foundry on Tuam Street, Christchurch in 1939, ever since, the business has sought to grow on this legacy and push the sustainability boundary in all aspects of the business. From installing the first induction furnace in the 1970s and achieving full electrical melting in the mid-2000s, to waste recovery with slag processing in the 2010s and installation of solar panels in 2023, sustainability will always be one of our driving forces.
We are the copper alloy supplier of choice to global manufacturing companies such as; Caterpillar, Komatsu, Liebherr, Hitachi, Mercury Marine, Yamaha Marine and General Electric. We have parts in service in every country on planet earth.



[4] Defined here as NZ registered technology companies with a primary focus of actively pursuing Sustainability goals related to SDGs 6, 7, 9, 11, 12, 13, 14, 15 with locally developed technology.

The sector is poised for rapid growth, indicated both by the intended ambitious capital raises that companies are planning for the year to March 2025 of $443 million (n = 44) as well as the achieved revenue growth rate between 2023 and 2024 of 29%.

Local investors are developing enthusiasm for the sector as the latest Startup Investment (Autumn 2024) report by PWC, NZGCP and the Angel Association looking at early-stage New Zealand start-ups, has seen cleantech receive the second largest amount of capital invested into the deep tech category (cleantech and climate tech combined at 31% vs 40% into Medtech)[5].

For this report, the NZ Cleantech Mission project group identified 135 companies operating across 6 Industry groups[6] registered in New Zealand and developing their technology locally with a primary focus on having an impact on at least one area of sustainability across the UN Sustainability Development Goals of SDG 6, 7, 9, 11, 12, 13, 14, 15. We invited them to participate in an online survey, with a subgroup invited to participate in interviews. We received survey responses from 65 companies and interviewed 29.

Recent progress in the ecosystem

The NZ Cleantech Mission has become a well-connected clearing house for information, resources and insights for cleantech companies and respondents have commented on how valuable many aspects of this function have been. A particular highlight for companies has been the facilitated "Cleantech Treks" led by Callaghan Innovation with the support of Cleantech Mission partners that take a group of company leaders to facilities or related companies locally to share perspectives and learn from each other, as well as to international conferences (including the Cleantech Forums in Singapore and US in the last 2 years) and applied research facilities like the Lawrence Berkeley National Laboratory in California and Ecolabs in Singapore.

While companies report good progress across investment, partner engagement, talent and other areas, we still have a very long way to go if the aspiration of becoming one of the top 10 innovative cleantech countries is to be achieved. The gap between our aspirations and achievements is particularly confronting, when looking at the recent cleantech investment data on deals in small advanced economies discussed below in our capital raising section.

We summarise the views of company leaders on how to enhance the support for local companies into a set of suggestions that provide options for Government, research and private groups to consider implementing. The NZ Cleantech Mission partners and the cleantech companies we've surveyed are well placed have input to the implementation of these suggestions over time. We note that while this work is independent of the groups that put together the Upstart Nation[7] report there are overlaps in the recommendations and that many of these would be relevant to all deep tech sectors, not only cleantech.

[5] https://www.pwc.co.nz/insights-and-publications/2024-publications/startup-investment-autumn-2024.html#Introduction
[6] Consistent with Cleantech Group taxonomy
[7] https://www.mbie.govt.nz/assets/upstart-nation.pdf

Nilo Ltd is an example of a rapidly emerging cleantech company that demonstrates some of our national strengths and ambition, as well as what can be achieved while operating from New Zealand.

Case study: Nilo Ltd - From concept to global partner

Technology developed at Nilo's first R&D site in Silverdale showed sufficient promise, back in 2018 the company was called Technomancy LP. In 2021 Technomancy LP opened a new R&D facility in Silverdale. This enabled growth of the R&D team to over 20 engineers and chemists and in 2022 the company changed their name to Nilo Ltd.

A collective of more than fifty Māori whānau from many different Hapū/Iwi, called Te Hono (the collective), made the initial investment in the Nilo technology as contributors, alongside a range of New Zealand and international private citizen and institutional investors.

Nilo have recently partnered with IKEA and received Corporate Venture Capital investment that supports the deployment of their technology with a longer-term view to support IKEA's global sustainability objectives.

The deployment of the technology depends on 5 patent families, registered in 11 countries, extensive technical know-how and an ambitious scale up development to meet IKEA's requirements.

Nilo's first product provides a wood adhesive for the furniture industry as the first application. The raw material for the adhesive is soft plastic waste that otherwise would go to landfill.

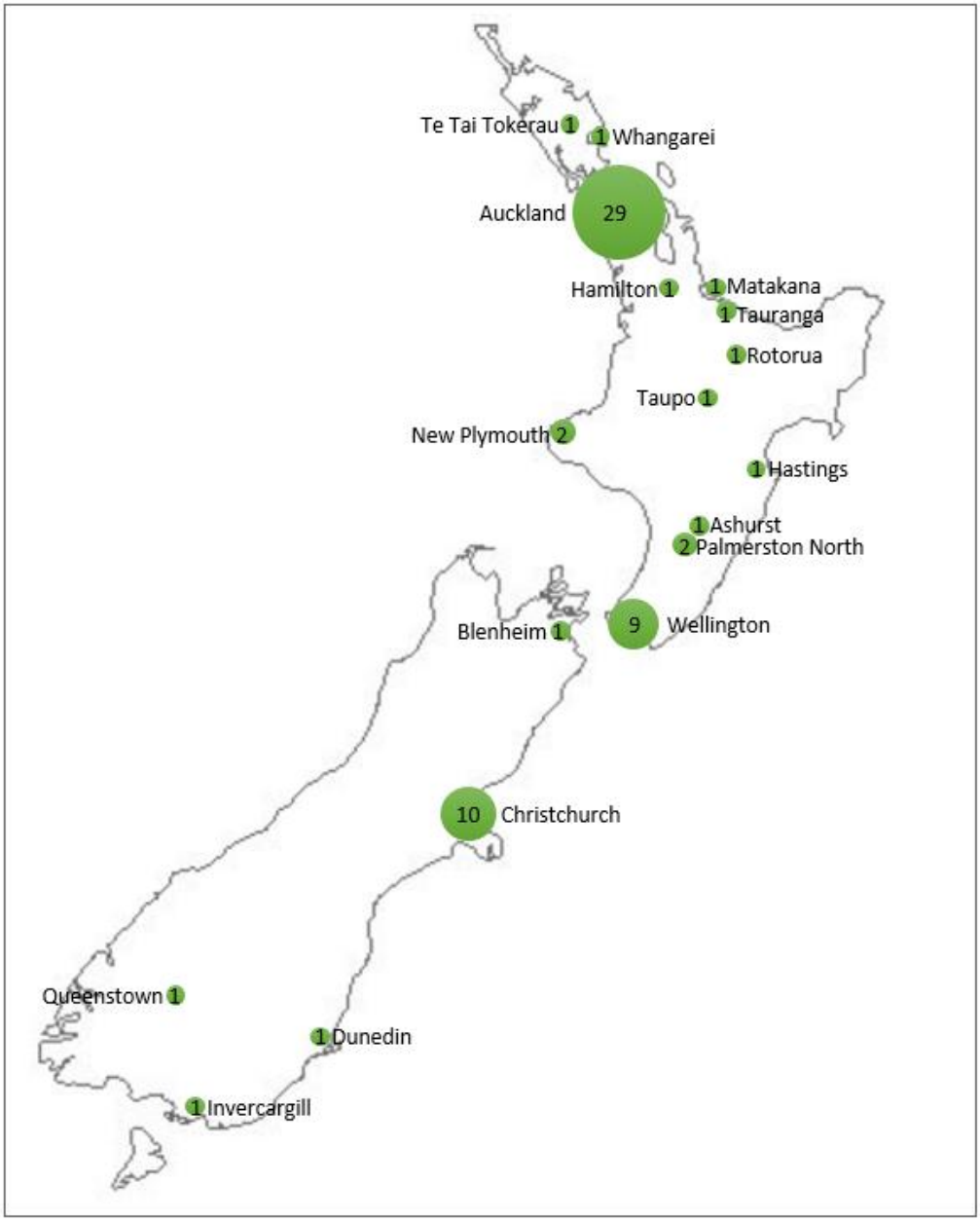
Ultimately the ambition is to generate a CO2 emission reduction of 3 million tonnes initially, and enable repurposing of 2 million metric tons of soft plastic waste which is currently not recyclable.

The investors, corporate partner and environment all benefit from the Nilo technology at a time when the EU is aiming to regulate products (including furniture) that can release formaldehyde from adhesive used in their manufacture.

Company data – Historic and FY to March 2024

We received survey responses from 65 cleantech companies operating across New Zealand. Companies are located throughout the length and breadth of New Zealand, making cluster formation and network effects difficult to achieve for some of those outside of the main centres. These companies are not operating in isolation however as they demonstrate connectivity to other deep tech networks, such as Universities, Crown Research Institutes, private facilities (e.g. Outset Ventures premises at Future House) and the MacDiarmid Deep Tech Network. They are in many instances also well connected internationally to their industrial and corporate partners (e.g. Carbonscape received investment from global forestry company Stora Enso[8]).

Figure 1: Geographic distribution of companies within New Zealand



[8] https://www.storaenso.com/en/newsroom/news/2023/9/sustainable-biographite-with-carbonscape

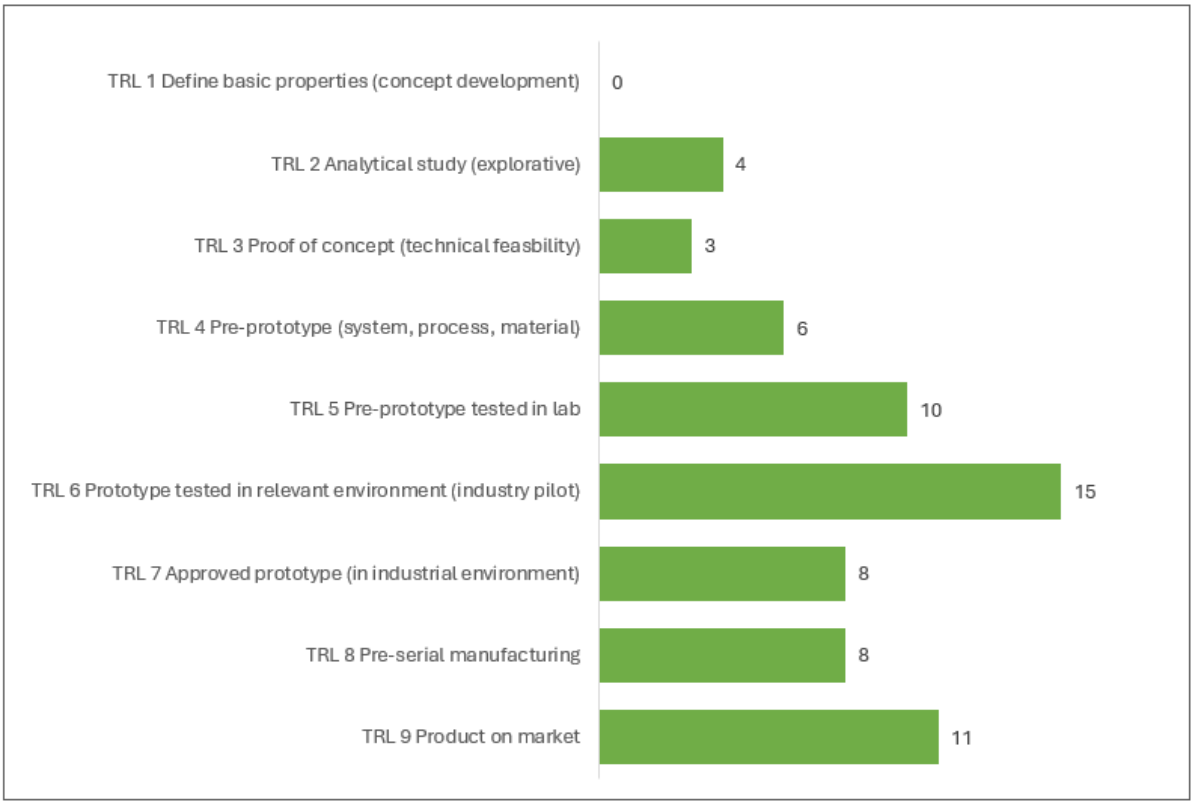
Maturity of the cleantech sector and local companies

The concept of a cleantech sector is relatively new, with the term being used by the US venture capital community from the 1990s onwards but becoming widely used internationally from the 2000s through being popularised by the US Cleantech Group founded in 2002.

Deep tech startup developers and investors routinely use the Technology Readiness Level (TRL) as a marker of the maturity and commercial readiness of technology under development (see Figure 2 for TRL stages), originally developed by NASA and adopted widely, it enables a quick description of how far a technology has come and also a sense of how much further it still needs to be developed. Deep tech companies typically take over 7 years and often up to 12 or more to reach full commercial scale. With the cleantech sector being a new category, the fact that 42 companies have progressed to TRL 6 and beyond (65% of respondents) is testament to the strength of the local entrepreneurs' ability.

The companies were spread across TRLs 2 to 9, with a reasonable pipeline of companies between levels 6 and 9, (65%) noting that the pipeline is less than would be expected in the earlier stages, but his may be because earlier stage companies (35% at TRL of 5 and below) were not as easy to identify, or may not be resourced to respond to our survey.

Figure 2: Number of companies that have reached each Technology Readiness Level



There are 19 companies reportedly operating at TRL's 8 and 9, while still headquartered locally which may indicate the potential for much of the IP to remain in NZ utilising sophisticated business models while addressing global markets. Interviewees from more mature companies indicated optimism that it is possible to run cleantech companies effectively from NZ while accessing capital and markets internationally, but that this is on a case by case basis and requires a sophisticated leadership team, well connected to global markets and may at times require trade-offs in speed of deployment.

Companies visiting Berkley Laboratories on the US Cleantech Trek identified that NZ tends to spin out companies at an earlier stage of development, something also observed by Singapore VC firm Trirec when visiting in 2023. The higher risk faced by companies at earlier stages may be a contributor to the lower capital raises compared to international peers.

Awards and accolades

Local companies achieved recognition and awards from a wide range of local and international corporate, government, consulting, not-for-profit and industry association groups.

From being named as top emerging companies to watch in Asia Pacific and globally, through to international chemistry awards for innovation and sustainability, 29 companies received a total of 26 local and 32 international accolades that recognise excellence in commercial, innovation or impact areas.

Most recently, the Cleantech Group which analyses global cleantech innovation named three local companies in their annual APAC top 25 to watch 2024 report: Aspiring Materials, Geo40 and Zincovery. That's alongside 5 each from Singapore and China, 4 each from Australia, India, 2 from Japan and 1 each from Korea and Vietnam.

Raising Investment and finance

We received survey responses from 65 cleantech companies who reported a combined amount of capital raised since company formation of $535 million till 31 March 2024, with $132 million of that being from deals closed in FY2024.

The vast majority of companies (83%, n = 60) reported they consider that operating from New Zealand generates challenges raising capital and this view remained consistent in TRL-9 companies (80%). A small group (16%) were also able to identify some advantages in raising capital from New Zealand, noting these questions were not mutually exclusive.

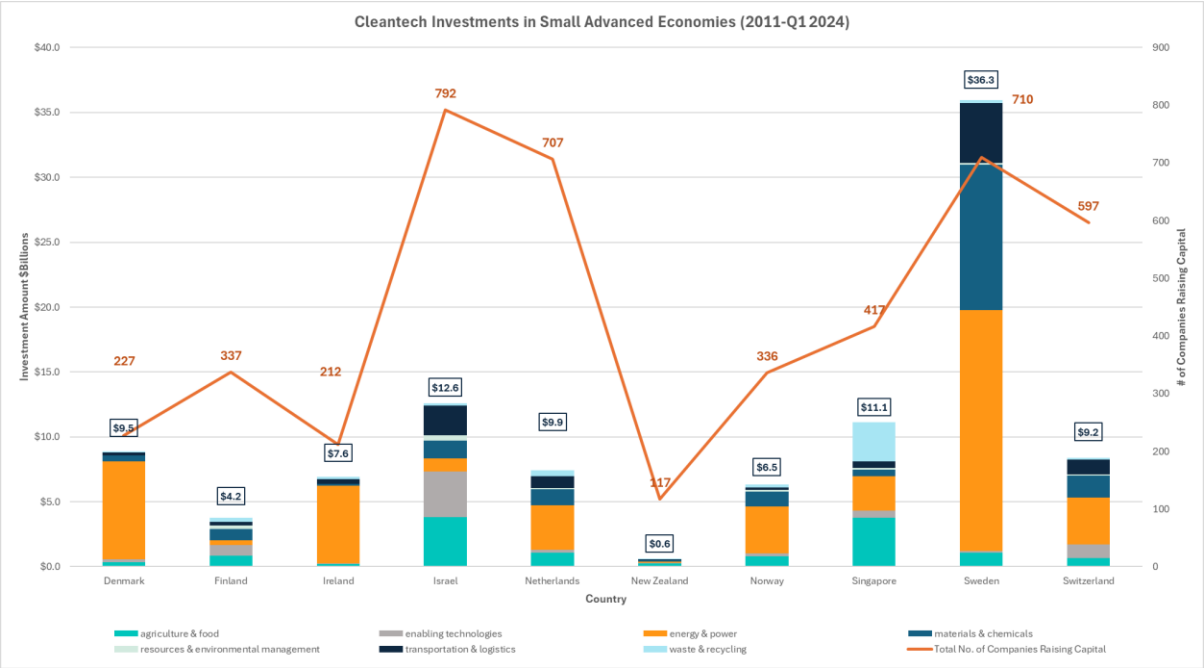
Companies also ranked capital raising as the most important issue to be addressed in order to enable them to progress their commercial and impact ambitions.

> "Accessing the international VC network, debt and large-scale grants are difficult unless we have an operating subsidiary in the other country. While it is possible to get overseas funding (as we have), it requires significantly more effort than a local [offshore] company at the same stage and scale."
> Company that has raised in excess of $20 million total capital

The common company perception that it's challenging to raise capital in the local market, from both local and international investors is borne out by a recent analysis by the Cleantech Group[9], where New Zealand has fallen further behind other small advanced economies in both cumulative capital raised and number of companies successfully raising capital since analysis done in 2021. We have grown in the number of companies (54 in 2021 to 136 now) and total capital raised, but far less rapidly than the small advanced economies to which we are sometimes compared. So, although New Zealand companies continue to grow and raise capital, we need to overcome many of the challenges in order to truly compete globally as a nation.

[9] Data provided by the Cleantech Group

Figure 3: Cleantech Group - cleantech investments in small advanced economies



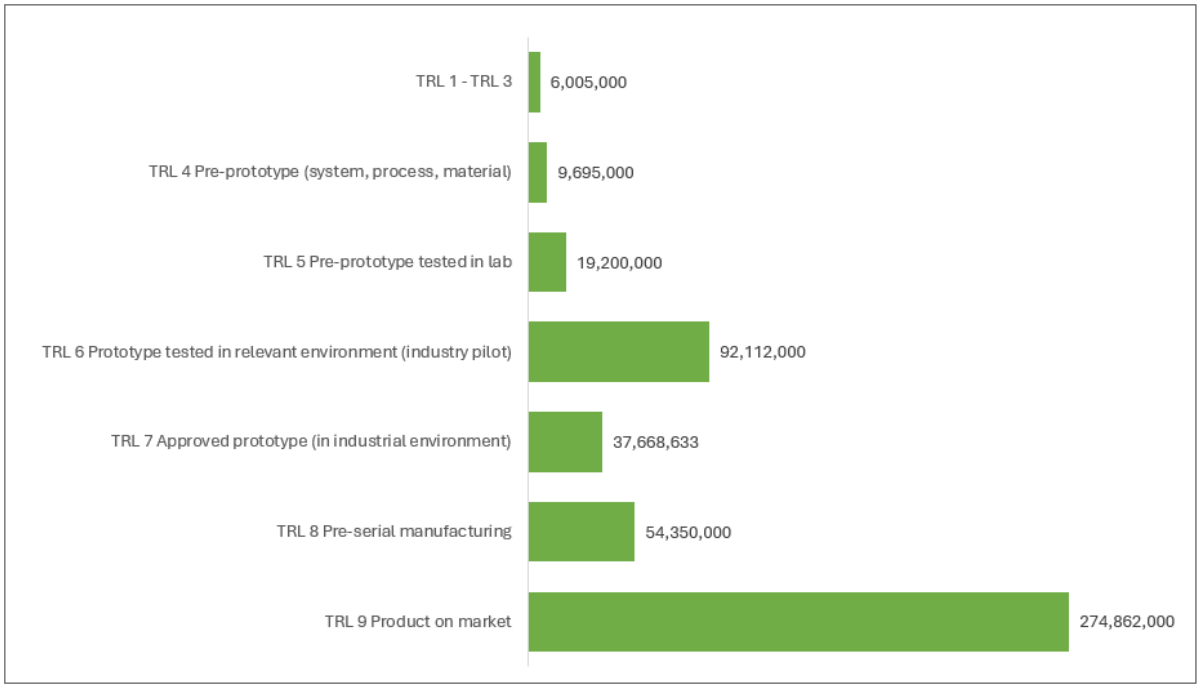
Company leaders identified the advantages and disadvantages of raising capital from New Zealand and these are summarised in Table 1.

Although it is recognised as being challenging, companies have still manged to raise meaningful amounts from both local and international investors and with further support this is likely to grow. The amounts of cumulative capital raised by companies at each TRL in March 2024 is listed in Figure 4.

Table 1: Advantages and disadvantages of raising capital from New Zealand

Advantages	Disadvantages
• US Investors enjoy interacting with local entrepreneurs, while operating in a highly competitive manner • Close contact with the Australian customer base enables good linkages to investors in the Australian market • Being seen as capital efficient and without the overpriced US valuations (noting that there are also countervailing concerns that NZ companies are often undervalued by local investor community) • New Zealand's international reputation as a trusted place to do business • Having bespoke Māori funds for Māori entrepreneurs • Friendly and interconnected local investment community • Stable investment and political environment.	• Lower amounts of capital available in the local VC market • Offshore investor preference to be located in their own jurisdiction, and reluctance to invest outside of these (specifically US and EU) • Lack of appetite of US investors to invest in NZ companies • Investors with appetite for, and expertise in the technology or industry vertical being offshore in US, China and EU • Limited interest to the long-term capital-intensive projects from local investors • New tax rules that the US mean it is less advantageous for US investors to invest in NZ domiciled companies • NZ has enough VC's to support seed investments in cleantech. NZ does not have sufficient capital to lead a competitive Series A cleantech round • Higher cost of raising capital from offshore (professional fees and travel expenses) • Low level of competition between investors, leading to lower valuations and more challenging terms • Difficulty getting support from overseas renewable energy business incubators • Limited strategic and technical capabilities of many local VCs considering how specialised cleantech often is • Problematic tax treatment of ESOPs • Problematic initial founder equity on emerging from research institutions that set them up poorly for engaging with international investors • Small amount of non-dilutive capital available to support R&D intensive start ups, which investors could then leverage • Valuations discounted compared to foreign peers. • Relative lack of investment into private asset classes by institutional investors such as KiwiSaver funds, compared with other countries.

Figure 4: Cumulative amount of capital raised by TRL on March 2024



Company CEO that has raised in excess of $20 million to date

"We are always looking to improve inbound capital to New Zealand, I think that it's definitely improved in the last ten years but we're by no means a mature market for investment, and there's not many companies out there [in NZ] who can get strong inbound capital from the US.
That's a problem, I've got great contacts, we've got a great proposition and I still can't get money from there because, to them, NZ is just such an unknown quantity, it's not considered a safe investment.

We need the support because it's not straightforward to get the capital we need."

The company leaders we interviewed discussed the range of challenges related to the size, focus, capability, approach to valuation and awareness of international drivers of the cleantech niche areas by local investors. The more advanced companies (TRL 8 and 9) had raised capital locally and offshore and would value being able to work with local investors to grow the NZ returns from these investments. They expressed enthusiasm for initiatives that would enhance the local market, and we have distilled their suggestions into the list of policy and other interventions at the end of this report.

Solutions suggested by interviewees included the need for "strategic investors" that would include corporate venture capital, both attracting offshore entities as well as enabling local corporates and legacy industries to better engage with innovation through tax mechanisms. Leaders considered that these groups are likely to be more knowledgeable about the techno-economic aspects, connections to market, manufacturing, supply chain and other crucial

aspects needed to develop technology partnerships with the B2B customer base locally and globally.

Superannuation investment was identified as a likely source of larger amounts of patient, growth capital and while some deals already include superannuation funds[10][11], these are generally at a late stage of company development[12] with lower associated risk, and these are not yet undertaken routinely by most providers in the higher risk, earlier growth stages of local cleantech companies.

A 2024 report for the Centre for Sustainable Finance[13] identified that "Less than 2% of the $97 billion in total value of KiwiSaver funds in New Zealand are invested in unlisted shares, far less than retirement savings scheme providers in other jurisdictions and out of step with leading investors globally, which typically invest in a diverse range of asset classes. By comparison, 18% of Australian superfunds are invested in private assets." A legal opinion provided for the report said there are three main barriers discouraging this form of investment:

- The need for sufficient liquidity to meet KiwiSaver account portability obligations and member withdrawal entitlements;
- The requirement for daily pricing of assets; and
- Lack of clarity around the requirement for fees not to be "unreasonable".

The report went on to suggest ways in which these barriers may be overcome, in order to help build investment from the growing pool of KiwiSaver funds under management into private asset classes, including clean tech.

The fact that we already have a well-functioning investment taxation market between our two countries was identified as a reason to engage more with Australian VC and Superannuation groups who already know some of the opportunities locally, but don't appear to recognise the extent of our local offering. Australian investment is considered as "basically the same as NZ money", while people investing from the US may be taxed via NZ withholding tax and again on capital gains, making their investments here much less attractive.

The view was expressed that Government could do more to invite and attract investors here, including for cohort, conference, cluster or industry vertical offerings, acknowledging that having visibility of numerous investment opportunities helps grow confidence of the quality of the ecosystem.

Numerous leaders commented about the value of the Cleantech Trek activities, both offshore and in NZ as a relatively low cost mechanism to link cohorts of companies to international markets, R&D facilities (including for pilot and demonstration scale deployment) and partner companies.

[10] https://fisherfunds.co.nz/news-and-insights/suncatcher-fisher-funds-backs-new-zealands-solar-powerhouse-lodestone-energy
[11] https://pathfinder.kiwi/impact-stories/Mint_innovation/
[12] https://nzsuperfund.nz/news-and-media/nz-super-fund-and-copenhagen-infrastructure-partners-to-explore-development-of-offshore-wind-energy-in-aotearoa-new-zealand/
[13] https://www.sustainablefinance.nz/private-assets

Non-dilutive funding

Forty companies reported receiving a total of $55million in non-dilutive funding over their lifetimes (excluding Research and Development Tax Incentive (RDTI), and conventional science grant funding e.g. Endeavour grants). The sources of this funding included Callaghan Innovation Grants, Breakthrough Energy Fellowship programme, Partner development fees, Ara Ake, NZTA, NZTE, Agmardt, Bioresource Processing Alliance, KiwiNet, SfTI, MPI, The Climate Response Accelerator, EECA and MFE.

Companies identified a gap in the funding available between science grant funding for early-stage research and the capital markets for pre-revenue companies. Looking at the total amount of non-dilutive funding available, and the 10 times larger private investment raised, it's likely that further non-dilutive funding could leverage the vast amounts of international capital through getting companies to more advanced TRLs relatively faster.

The availability of tax-related incentives, while being available to pre-revenue companies can at times establish a liability on the company balance sheet which can become a drawback for future capital raising.

There appeared to be a disconnect between a few founders' perceptions and the intent of the Tech Incubator programme, which provides a non-diluting grant alongside an incubator's investment. This was reflected in the sometimes conflicting opinions of founders surveyed, and in some cases may reflect experiences that pre-date recent changes to the programme.

The intent of the Tech Incubator programme is to fund early stage, high risk opportunities with complex technologies that by nature and risk profile will have a low valuation. These are opportunities that the private sector would not invest in without Government intervention.

Research and Development spending

Companies developing cleantech solutions, particularly those that are also deep tech companies typically spend a lot of time and money on their R&D.

Companies (n=40) reported spending a total of $46 million in the year to March 2023 (mean $1.15 million), ranging from $20,000 through to $10 million, and spent $66 million in 2024 (mean $1.7 million).

Of these 40 companies, 19 were operating as pre-revenue companies with the need to finance all R&D costs from investment or grant funding. Pre-revenue companies included five that were each spending over $2 million annually on R&D. A minority of companies (nine) reported revenue in excess of their R&D spend.

Companies are budgeting spending a further $102.5 million in the coming financial year, with the average increasing to $2.38 million.

The cleantech and deep tech path to market is recognised as needing deep investor pockets and despite NZ having a reputation for being capital efficient, we need to ensure companies can progress their technical path and de-risk the technical aspects of their IP as rapidly as possible.

The survey and interviews identified numerous strengths and challenges related to undertaking R&D which we summarise under the “Access to R&D Infrastructure and Facilities” section.

Access to R&D infrastructure and facilities

To undertake effective and capital efficient scientific and engineering R&D, companies need access to institutions with the appropriate premises, advanced equipment, capable teams and which are linked to wrap-around professional services (health and safety, IP, design, engineering, regulatory etc). This form of infrastructure exists across New Zealand in research institutions (Universities, CRIs and private laboratories), but is difficult to access on favourable terms (IP and costs) as well as often challenging to identify the right facility or team for the work.

Access to these facilities may be through tenancy, fee-for-service testing, collaborative project work, workshops or any form of technology development, prototyping and preparation for pilot or manufacturing.

A substantial number of companies (39% overall and 60% for TRL9 companies) identified clear competitive advantages enabled by access to local R&D infrastructure, while 57% also identified disadvantages[14] (increasing to 77% for TRL9 companies). The higher proportions related to TRL 9 may reflect their increased awareness of both local and international facilities.

Table 2: Advantages and disadvantages related to company access to New Zealand R&D infrastructure and facilities

Advantages	Disadvantages
• Access to local industry (e.g. aluminium smelter) • Regulations taken care of (e.g. Health and safety, HSNO exemption status, discharges etc) • Repurposed (brownfields) labs and workshops that were previously Govt run e.g.Level Two becoming Outset and then Future House) including repurposed Lanzatech facilities: "now arguably one of the most sophisticated hydrometallurgy and crystallisation labs in the Southern Hemisphere" • Gracefield site has a lot of the capabilities we need for pre-pilot scale • Co-location with SCION and good access • Good access to natural resources for energy production. e.g. Geothermal, with particularly good relationships with Māori which helps with international deployment on US and Canadian indigenous groups • Large volume of under-utilised resources including wood and waste	• Many facilities not suited to scale up (physical and personnel limitations), numerous challenges finding premises suited to scale up chemical and hazardous material processes and industrial prototyping • IP settings within CRIs and Universities are a major obstacle to the access arrangements, including where collaborative funding is available, or where students would benefit from working in company-related projects • Limited access to industry-friendly scientific hubs, particularly with access to specialised equipment, including micro and nano-fabrication • Science equipment in our universities often older or lower quality, meaning the resolution of characterisation can be limited • Funding for these institutions to work with industry and startups is limited or non-existent • Very limited manufacturing and waste re-processing or recycling capability and

[14] Responses were not mutually exclusive.

• Localised industry clusters (e.g. "Whangarei has international fame for its Marine industry expertise and commercial build capability") • Easy access to industrial emission sites to conduct trials • Available renewable energy • Ease of doing business and welcoming of collaboration	lack of sustainable recycled raw materials • Recycling education and infrastructure is poor across numerous waste streams including e-waste • Limited transport infrastructure, including access to electrified rail freight • Supply chain infrastructure limited, resulting in long lead times for equipment, spares and maintenance, often with higher costs • Cost of meeting regulatory compliance, particularly where regulations underdeveloped. Limited set of capable consulting groups for this

Different companies reported differing access benefits and challenges (e.g. easy, well-priced access to University labs vs the inability to access University facilities at all), indicating that the pathways to access and institutional arrangements are not uniformly company-friendly or transparent. We identified that improving networks within cleantech are likely to enhance access to established facilities that are already set up to collaborate with industry.

Virtual infrastructure

> "A community of people doing the same thing, particularly when you're a small start-up. Having networks to help advise on so many of the challenges, connections, resources – makes all the difference."
>
> "There are major benefits of being connected in-person rather than via a CRM, needs physical connections over extended time and repeat events with a specific focus on deep tech and cleantech."

Interviewees identified numerous approaches to enhancing the connectivity and access to infrastructure that rely on network effects. The communities that already exist around legacy sites (e.g evolved from IRL facilities like Level Two, now Future House and the Hotlime Labs shared space in Petone that was previously Coal Research Limited) are held up as an example of these communities' ability to increase the pace, quality and variety of deep tech and cleantech start-ups.

Connection to peers and technology clusters is highlighted as an imperative that supports knowledge and resource sharing, motivation, sophistication and ability to deliver complex solutions into highly regulated, and competitive global market niches.

Leaders view workshops, conferences, and related information sharing and networking events as highly valuable and consider they make a big difference in the absence of specific co-location hubs, specially working with multiple agencies and institutions like those in the Cleantech Mission.

Well focused events, with intentional focus on the advanced aspects of deep tech are seen as a way to scale the impact of initiatives like “Beyond IP, Better by Lean, etc” support from Callaghan Innovation.

The Blue Green Conference in 2022, hosted by Auckland University and supported by Cleantech Mission partners, was raised by numerous founders as an excellent way to develop high value local and international relationships, investor exposure, and knowledge to overcome technical barriers.

> “I’ve found those offshore visits incredibly valuable, trips like that where you find a reason that resonates with 20 or so companies where there’s an aligned conference plus an investor event in market. Those companies should be funding themselves because the hook you’ve created is big enough to make them want to go. You get more value than bringing investors here where you can present at conferences and large investor groups offshore.”
>
> TRL9 company CEO

Plant and Equipment - capital expenditure including pilot facilities

Companies reported having spent a total of $87.1 million on capital items in the two financial years ($41.9 million in FY2023 and $45.2 million in FY2024), with the ratio of capital item expenditure to investment raised being 34.3% in the 2024 year. The ratio of capital item spending to R&D budget was 91.1% in FY2023 year and 68.1% in FY2024 reinforcing the highly capital intensive path to market for cleantech companies.

Part of the reason for capital expenditure is the need to develop first-of-a-kind process facilities (pilot and demonstration plants), noting that these are not able to operate at commercial scale, in part due to unit cost not being close to competitive, but also due to quality, reproducibility, labour intensity and not having offtake/ customers at that scale.

Setting up pilot and demonstration plants is best done in partnership or close contact with downstream customers (demand owners) and even where these exist in New Zealand, companies report there is still a high level of risk aversion by partners, in some cases coming from a lack of any perception of demand to change legacy industries. In other countries it is often seen as a mechanism to drive corporate growth and innovation where major partners work enthusiastically to incorporate, experiment with or adopt and acquire innovators. The pharmaceutical industry model of outsourced innovation, appears to be growing more widespread across other industry verticals including in cleantech internationally, but not yet in New Zealand.

Intellectual property and the related competitive edge

Cleantech companies, particularly those that are also deep tech companies tend to rely heavily on formal and informal Intellectual Property. Survey respondents from 43 companies reported having at least one patent, with 30 of those companies having two or more patents and 11 companies having five or more patent families registered.

A total of 167 national phase entry patents have been granted to 34 companies across 29 jurisdictions, with a strong focus on US, China, EU, Australia, New Zealand, India and Japan.

Figure 5: Patents granted across international jurisdictions (for survey respondents)

While recognising the importance of IP as a means of protecting the company's competitive advantage, some also highlighted that speed to market is one aspect that can enhance or erode competitive advantage. With such a highly competitive international race to lead the new green economy and generate the returns that will accrue, local companies need to move as fast as possible and the supporting agencies, investors and professionals do all that they can to support this pace.

With companies indicating the importance of trade secrets and know-how as being higher than patents (although not mutually exclusive), investors should consider whether this view is shared and if not how any discrepancy can be bridged or accommodated. Particularly if a company is confident of being able to manage its trade secrets in a sophisticated manner, investors should be able to consider the risks and potential benefit (exclusivity may last longer than the patent term in theory). Being first to market can provide 10 years of exclusivity before others copy you, so speed to market "being first and staying first" can be far more important than formal IP.

Numerous company leaders discussed the IP settings at research institutions (both Universities and CRIs) as being unhelpfully restrictive, with a focus on short term transactional aspects rather than the more strategic opportunity to grow both global companies and the research institute's appeal as a development partner. These views were shared by companies who are independent from these institutions as well as by science entrepreneurs who emerged from them.

International and Local Regulations and Incentives (carrots and sticks)

Companies ranked the need for appropriate regulatory settings as the third most important aspect supporting or hindering their ability to do business. While regulation can at times be seen as restrictive of business practices, there are times where clearly defined regulatory settings and signals are needed to drive innovation and support investment and business models to drive sustainable impact.

Companies reported that there is some form of support for the uptake of their technology related to regulatory settings in the majority of cases (81%). These regulatory settings ranged from the widely familiar Emissions Trading Schemes, and ESG reporting requirements through to banning of single use plastics, and specific recycling requirements (e.g. for zinc) and a number of highly specific and targeted regulations, such as a California regulation requiring zero tailpipe emissions in all short run ferries.

Regulatory barriers were identified by 50% of companies, but for 17 of these companies, the barrier was related to the absence of standards or regulations that had not kept pace with evolving technologies, mostly reported as a challenge in the New Zealand market.

Where new industries are developing around emerging and established technology, any new regulation and standards should leverage existing regulation, while also adding relevant new guidance in a transparent way. The fact that New Zealand is not developing regulatory pathways as fast as early mover countries means we should ensure our regulation and standards are aligned with these markets, or even simply reference these. Markets that are rapidly developing regulations and standards to enable new cleantech industry approaches include Germany for hydrogen, EU for biofuels, and Australia for phasing out single use plastics or recycling e-waste.

Companies are pleased to see the Government is moving rapidly to develop transparent and pragmatic regulations that enable genetic modification under appropriate risk-benefit frameworks. Having seen the benefits of a fast, transparent and industry-supporting set of regulations for the Aerospace industry, we would recommend that a similar process be considered for other emerging technologies.

Where regulations do exist it is important for the agencies that administer them to have expertise that is familiar with emerging technologies, e.g. Worksafe should have capability around hydrogen and biofuels.

> "NZ should try to exactly mirror regulations and standards in other big markets, where possible - especially where they are performance-based. This makes it easier for NZ to be a test-bed for bigger markets (and of course it increases competition domestically lowering costs - and lowers cost to create regs and standards)."
>
> Matt Kennedy Good, President and co-founder Neocrete

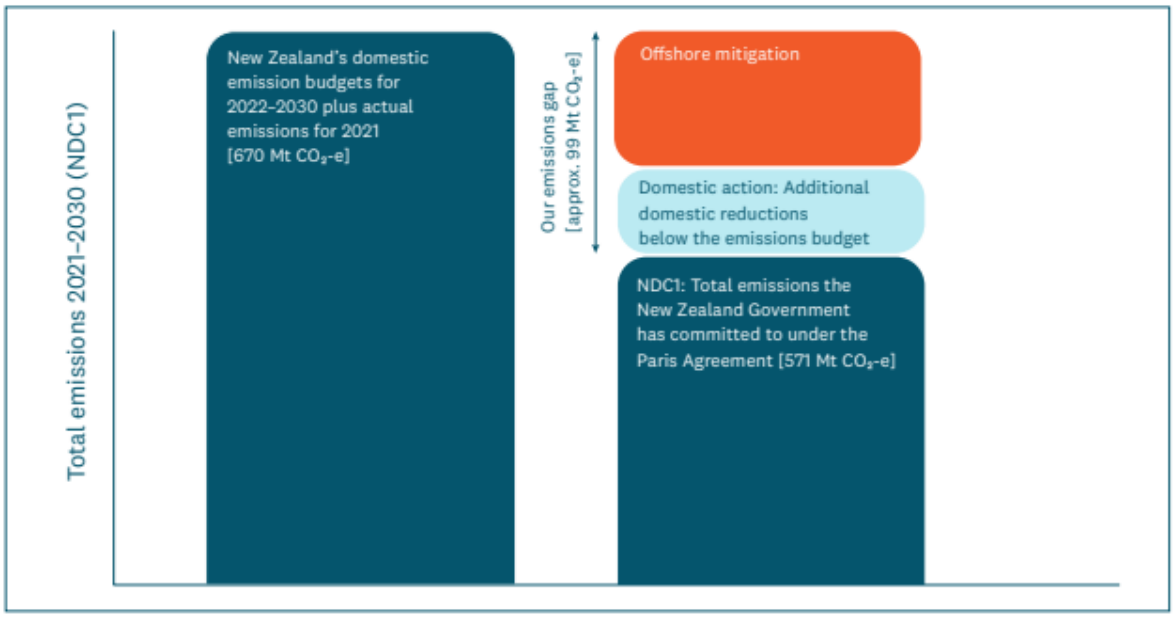
We don't list the specific regulatory policies and incentives named by the companies in this report as they are relatively vast and wide-ranging, however the NZ Cleantech Mission is able to raise these with the new Ministry for Regulation and other agencies involved in regulating the relevant industries.

For policy and incentives to work we need cross parliament support and long-term stability of these so that investors and companies with over a 10-year path to market can confidently get on with the job for local and offshore markets.

Incentive schemes

The countries putting in place incentive schemes, including regulatory requirements for change and financial incentives to deploy new, cleaner technologies, are doing so partly to support their own commercial competitiveness and supply chains, but also as a way to ensure their future liability is reduced for the cost of cutting or offsetting their own emissions under the Paris agreement. The NZ liability for offsetting CO2 emissions by 2030 is estimated to be between $3 billion and $23 billion and is not currently budgeted in the Government accounts (the gap between what we've committed as a country to reduce, called Nationally Determined Contributions (NDC) and what we're likely to achieve by 2030).

Figure 6: New Zealand's NDC Strategy for the period from 1 January 2021 to 31 December 2030[15]



[15] Mcguinness Institute, Discussion Paper 2024/01Risks hiding in plain sight: Does a commitment under the Paris Agreement to purchase offshore carbon credits create a requirement to report that commitment in the financial statements of the New Zealand Government?

Talent pool and employment – highly motivated and capable

The cleantech companies surveyed currently employ 1189 people (FTE) in total, made up of 896 in New Zealand and 293 offshore with much of the workforce in these companies being high-value employment utilising highly trained employees.

A separate MacDiarmid Institute survey of its affiliated deep tech startups found that a third of the employees in these start-ups were trained to PhD level[16].

We sought further information about the quality of talent available to the cleantech companies and this was mostly seen as an area of strength that New Zealand can leverage and build on. In order to sustain numerous rapidly growing start-ups however, we need to ensure further graduates are trained and that companies can access internationally experienced talent seamlessly.

> "NZ has an extraordinary can-do, jack of all trades ability - So for example "Wanted - PhD Chemist who can weld and code" literally is available here!
> What we're finding in the US is the polar opposite of that, where we need 5 different people to do what one of our Kiwis can do.
>
> Offshore resources are highly specialised but often not nearly as useful in those critical piloting stages, when you really have to be able to do it all."
>
> Company CEO operating pilot plant in the US.

At survey, 30% of companies identified aspects of local talent that gives them a competitive advantage, while 55% reported challenges accessing the right talent from New Zealand and these were broadly consistent across TRLs.

Table 3: Advantages and challenges related to accessing skilled talent in New Zealand

Advantages	Challenges

• Highly advanced "world renowned" research groups within Universities, often with unique expertise in a niche area of science; providing grads and advisory services e.g.
  ○ Light Metals Research Centre – even though disestablished, the people are still available
  ○ Maritime engineering
  ○ High temperature superconducting
• Reputation of NZ executives "ex. NASA Singularity, LanzaTech, RocketLab, F&P"
	• Some scientific and engineering disciplines are not widely available in New Zealand, or are in short supply (e.g. electrochemistry, chemical and process engineers).
	• Science system doesn't seem to target emerging technology to boost numbers of available talent (e.g. semiconductor chip design and manufacture).
	• Advanced talent in research institutes difficult to identify and access.
	• Lack of companies located on campus means skills are slower to be developed

[16] Details available on request.

• High quality education and availability of PhD graduates with versatile skillsets (more generalist vs specialised) • Legacy industry in strong supply and motivated to move into emerging fields ((e.g. Oil and gas experts moving into hydrogen) • Relatively cost effective to employ early career graduates including postgrads • Motivated and hardworking people, keen to make an impact	• Risks associated with start-ups makes it difficult to attract mid-career and experienced people if competing for corporate talent • Very limited pool of qualified people across STEM, high-quality leadership and commercial roles (including professional sales) • Many industries not represented in New Zealand, so employing offshore people essential and costly (competing with global industry and particularly Australia) • Competition for software and other engineering candidates extremely high and expensive • Visa process is prohibitively long even for high priority immigrants and for postgrads already in country (i.e. who have studied in New Zealand)

While many of the required skills for success are available or accessible from New Zealand, this is not consistent across all skill types, with an example of one company struggling to find a recent graduate with the right skills for relatively straightforward techno-economic analytic skills.

Callaghan Innovation Experience Grants and Career Grants have been incredibly valuable, but access to these is sometimes capped, meaning that many small start-up companies that could leverage the value are not able to. The Callaghan Innovation Fellowship Grants had also provided robust value and companies would benefit from this type of scheme being re-introduced.

Some companies report no or low value in forming long term collaborative projects with Universities as a mechanism to generate industry-relevant talent mainly due to IP settings being perceived as heavy handed and not realistic for the commercialisation of the company's IP.

CEO's expressed the opinion that local companies are still operating on a lower operational budget compared to international peers, including for CEO and leadership level salaries, and are at times they are limited in the ability to pay internationally competitive salaries for technical and commercial team members.

<u>Immigration</u>

"Use the NZ brand to attract innovators, investors and PhDs rather than tourists. Outset where I work is full of brilliant, highly trained foreigners lured here by the lifestyle. They're building the Rocket Labs of tomorrow. We should be attracting more of them and making it super easy for them to spend a few years having a crack at building a business" – Matt Kennedy Good, Co-founder, President, Neocrete

Companies currently employ 131 people (both foreign and New Zealand passport holders) who they have recruited from offshore.

Companies that had become Accredited Employers (n=20) under the Accredited Employer Work Visa Scheme reported that while the accreditation for companies was a simple and rapid process, the decisions on specific employees had in some cases been problematically slow (including one company that was accredited but took six months to receive a decision). Of the companies that had successfully recruited staff under the AEWV scheme (n=16), 50% reported having experienced immigration barriers, mostly in the form of delays. One company reported losing a candidate, while another company reported having had 90 applicants for a role with a six figure salary requiring international chemical industry experience, but experienced a further delay of 90 days to approve the selected candidate's visa.

Partnerships from research to cultural and industry

One of the major aims for a cleantech company is achieving acceptance by a partner company in order to co-develop, or test the technology, as a step towards full-scale adoption and commercial deployment or sales. While companies making a kilogram of a novel material may be interesting, industrial partners and customers need confidence that the company's technology can deliver reliable, safe, economic outputs, often at the scale of tons or megatons per day.

Potential partner companies may be able to identify promising emerging technologies through literature, conferences, awards, and networks, but require confidence that the technology is able to deliver in a reliable and safe manner at scale, often alongside their own industrial plant. To gain the confidence of customers in the B2B environment, one path to market includes signed partnership agreements for co-development or proof of concept pilot deployment.

"Our world is already feeling the effects of climate change, and there's an opportunity for faster, bolder action. At PepsiCo, we not only aim to reduce our greenhouse gas (GHG) emissions for the benefit of society—it's also important for the resiliency of our business, as we are already experiencing the impacts of climate change directly within our own value chain. The challenges in the journey to our net zero goal by 2040 are significant and complex.

We remain focused on driving change through our pep+ (PepsiCo Positive) agenda and striving to reduce the linkage between our business and emissions growth.

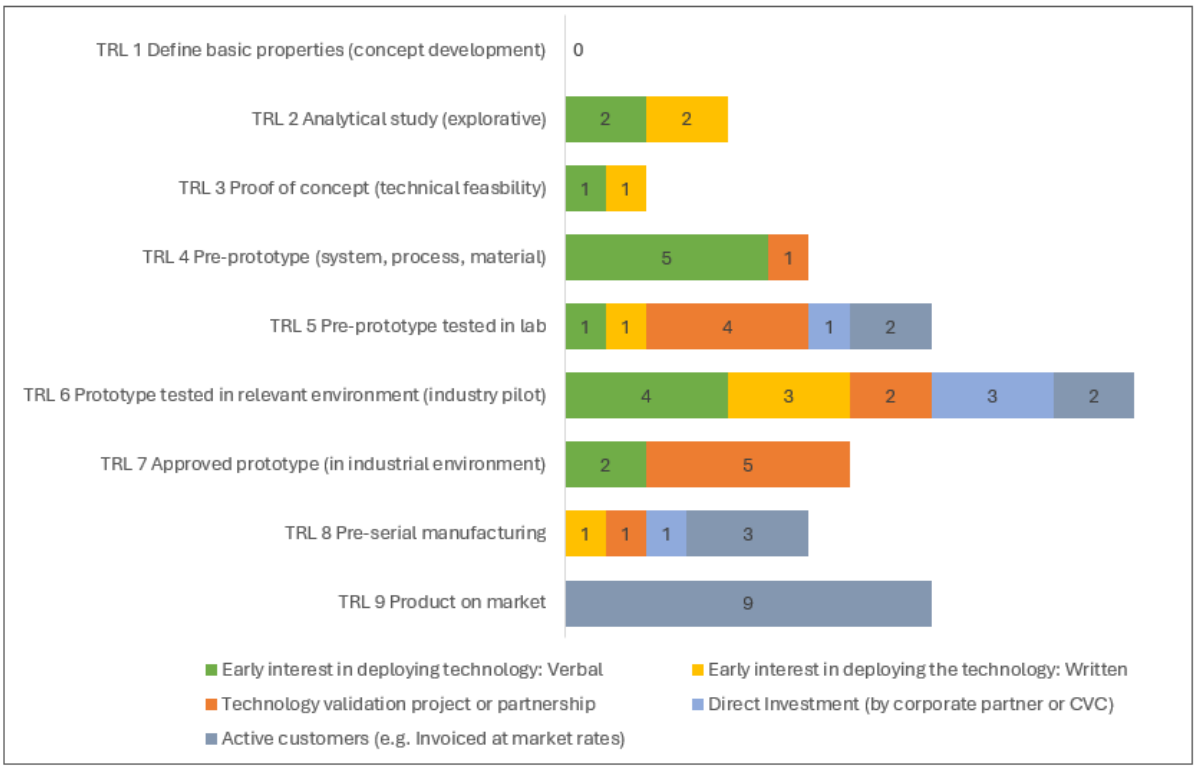
In New Zealand, we're seeing best-in-class innovation and technology emerging in the cleantech and deep tech space. On our end, we're aiming to drive scalable solutions through programs like the PepsiCo APAC Greenhouse Accelerator, which has supported two New Zealand companies to date, in developing tangible solutions that align with our pep+ agenda and GHG reduction goals"

Nicholas Jenks
Director of Global Climate Solutions
Pepsico

The majority of survey respondents reported some form of written agreement with partners to progress their relationship. See Figure 7.

As a measure of the relative commercial traction that companies are achieving, we show here the level of commitment companies report from their partner companies (B2B customers) ranked from early discussion under NDA through to active customer sales.

Figure 7: Graph of TRL reached and highest level of B2B customer commitment achieved



The benefits of partnerships to deploy innovation are not just one-sided, they directly offer larger partners the opportunity to de-risk their future business if they are exposed to international supply chains and markets as well as many of the local supply chains. Responsibility for emissions and other negative environmental and sustainability impacts is now being tracked and reported throughout global supply chains, making a supplier responsible for any products their outputs affect (e.g. fertilizer footprint in agriculture, waste footprint in packaging for export, GHG emissions in dairy). If New Zealand is to develop or maintain any competitive edge in global markets across almost any industry, it needs to address the Environmental, Social and Governance (ESG) aspects robustly and fast as reported in a recent Aotea Circle report[17]. Now is the time to invest in future-proofing existing industries and emerging new clean ones.

Aotearoa Circle commissioned report by Chapman Tripp

"With 80% of New Zealand's exports by value going to markets that have mandatory ESG reporting in force or proposed, [and 40% of markets have Carbon Border Adjustment Mechanisms in force or proposed] businesses who want to proactively manage ESG trade risk would do well to stay attuned to these developments.

New Zealand may be a long way from its major markets, but it is not an island in the regulatory sense. To meet customer expectations and government-imposed trade requirements, we need to understand what other countries are doing around ESG reporting standards and what they, in turn, expect from us"

[17] https://www.theaotearoacircle.nz/reports-resources/protecting-new-zealands-competitive-advantage

We need to build a culture where large incumbents are more embracing of emerging technology, currently large corporate groups are perceived as actively blocking or unhelpful.

Interviews identified that start-ups find the potential partners (industry and large corporates) are mostly very difficult to engage with and report that these potential partners struggle to grapple with how best to incorporate new technology. Companies report relatively poor perceived motivation for larger incumbent companies to take risk on emerging technology companies despite ESG reporting requirements and clear export risks relating to export emissions profiles.

Company leaders expressed the view that their larger potential partners (industry and corporates) would benefit from a cross party political agreement on any policy and incentive regimes driving sustainable outcomes in New Zealand in order to enable robust long term decision making with confidence. Stacking political or policy risk on top of the existing combination of technical and market risk generally leads to inertia.

Company leaders identified a clear advantage of working with Māori and on Māori land which teaches us about how to engage with indigenous groups internationally, including some of the community requirements of setting up facilities in the US and Canada to access incentives like the Inflation Reduction Act, and related energy decarbonisation schemes.

Multiple companies commented that New Zealand needs a critical mass of related technology companies (possibly seen as clusters) and an ecosystem that supports cleantech innovation - innovation parks could link industry and innovators.

The onshore Cleantech Trek industry visits (e.g. by company leaders and support agencies to Mint Innovation, Aquafortus, NZ Steel, Neocrete and Outset Ventures) were consistently identified as a good way to identify potential local linkages that innovators were not aware of and gain insights about potential larger companies.

Māori cleantech innovators

The impact and sustainability focus of cleantech aligns well with Te Ao Māori and we identified a small but active group of Māori entrepreneurs who are pursuing ambitious impact and commercial goals. Companies led by Māori are operating in the circular economy (Circlr), decarbonising concrete (Taurus Concrete), nuclear fusion (OpenStar), sustainable heat management (Ice Solutions) and bio-forestry (NZ BioForestry).

Innovators shared insights about challenges aligning their impact focus with what traditional investors were wanting to see in technology companies. Companies mentioned an appreciation of the support provided by groups like Te Puni Kokiri, Poutama Trust, Akina Foundation, The Climate Accelerator and others, while noting that the expense of developing cleantech solutions is likely to need substantially more funding if we are to compete with global businesses (one company had received $100,000 from the support agencies but requires many millions to deploy at scale).

There are bespoke funds for Māori entrepreneurs which is very positive, but seeking capital from venture capital funds, including those labelling themselves as “climate funds” reportedly seemed to focus almost exclusively on the financial return rather than having any preferential focus on the positive impact potential.

Māori innovators were able to tap into scientific institutions in most cases, but at times could have been better supported by the various accelerators and scientific groups that could collaborate on R&D under IP settings that are beneficial to companies rather than the science institutions which are publicly funded.

Impact areas across the Sustainable Development Goals

The companies we surveyed operate across a vast number of sustainability domains, from new processes and chemistry for cement, an industry that currently contributes 7% to 8% of global CO2 emissions[18]; to improved zinc, aluminium and other metals processing; carbon emissions trading and offsetting; or biomaterials to replace leather and petro-chemical-based plastics.

Each of the companies is narrowly targeted at a specific niche, but the overall breadth and depth of the impact of successful companies is likely to have globally meaningful impact on the way products are made, buildings constructed, raw materials are extracted from waste and energy is generated, stored, transported and used. The scale of the industries being targeted means that the technologies, if successful, offer sustainability and economic impacts beyond what New Zealand has traditionally seen itself as capable of delivering in the industrial economy.

Companies making claims about their technology's impact recognise the need to validate those claims and many of the later stage companies (n=15) reported varying types and stages of validation of their technologies by third parties including:

- Suitability of the technology to meet a multinational company's standards for incorporation into their product,
- Carbon Collective - Feasibility confirmation to trade in Carbon and Plastic Credits,
- Thinkstep validation (including LCA, n=5),
- Toitū Carbon Certification Standard,
- BCorp accreditation and
- ISO standards compliance
- Local and international University LCAs.
- Consulting groups Cement Research LTD, Oxygen Advisory,

Most companies recognise the need to prove out the technology as rapidly as possible and then deploy the technology at scale in international markets. A number of companies believe that sophisticated business models and familiarity with IP management can in some cases enable our companies to thrive in these markets while remaining headquartered in New Zealand.

Onshore vs offshore impact

Deploying technology at scale offshore can mean that much of the economic benefit accrues to local shareholders while much of the sustainability impact does not (at least in the short to medium term). This issue is of particular importance where the origin of CO2 emissions and their reduction or abatement is linked to national liabilities for Nationally Determined Contributions (the country commitments und the Paris Agreement). In some industries, sizeable market opportunities do exist onshore, but the commercial landscape of international market incentives actively pulls companies to pursue the international opportunity at the risk of never deploying locally at scale, or at least not for many years or decades.

The lack of incentives (market or Government) means that almost the inverse of the commonly expressed concern about "carbon leakage" is occurring, in that innovators with the potential to

[18] https://www.weforum.org/agenda/2023/11/near-zero-cement-concrete-net-zero/

have local impact are forced to look offshore sooner and for longer before the impact can be deployed locally.

"There is international incentivisation for zero emission vehicles incentivization for low carbon hydrogen incentivization for low carbon distributed electricity - But New Zealand companies don't need these to be replicated if the aim is to develop tech for the global market, just a way to access the international versions. The only reason to have these incentives locally would be to address New Zealand emissions profiles."

Sean Simpson, Co-founder of Lanzatech

On addressing the local market and potentially achieving onshore emissions reduction:
"We could make it work, but New Zealand is only 0.02 percent of the global concrete market, so tiny. So, if we're going to achieve our objectives, we need to be in big markets. Succeeding in the New Zealand market, that's good as a test but it doesn't achieve the impact we're capable of. We just signed a contract with nine different global cement giants around the world, with six of them are sending materials to us to test"

Matt Kennedy-Good, President and co-founder of Neocrete

The companies that responded to the survey are listed below, within the cleantech taxonomy of industry group. There are not sufficient numbers of companies to break these companies down into further subgroups.

Table 4: Companies and their impact statements[19]

Agriculture and food	
Daisy Labs	Cut cows out of protein production. The technology can reduce greenhouse gas emissions by between 60% and 90%, while reducing land and water use by over 97% per unit of dairy-identical protein
Energy and Power	
Alimentary Systems	Transform 10,000 tonnes of sludge and food waste daily into energy and fertiliser. Saving $650M by investing in Local Water Done Well instead of purchasing offshore carbon credits
Aquila	Supply wireless electrical energy over long range to infinitely extend the range and capabilities of electric aircraft, eliminating reliance on fossil fuels and heavy batteries
Bspkl	Unlock affordable, US$1kg, clean hydrogen by overcoming supply chain barriers in electrolyser manufacturing
Emrod	Accelerate the deployment of renewables and the decarbonization of heavy industry
Fabrum	Enable the energy transition. Our Cryogenic and Composite technologies in the hydrogen and LNG markets will enable the reduction of over 13 million tonnes of CO2 emissions globally over the next 7 years.

[19] Not all companies that responded to the survey provided impact statements for publication.

OpenStar Technologies	Supply clean, carbon-free baseload power to the grid by harnessing the power of fusion energy using high-temperature superconductor technologies with reliable magnetic confinement fusion.
Overlay Limited	It will cost $42 billion to keep the lights on; how will the distribution network handle the ever-changing requirements that we place on it? The future is distributed; the future is community energy.
SunRayker	Reduce 70,000 tonnes of CO2 emissions by the generation of 100,000 MWh of dispatchable electricity from each standardised 70MW high temperature thermal energy solar farm.
Tasmanion	Battery materials, safer batteries (non-flammable) for niche applications with sustainable cheap raw materials that can be more easily recycled.
Ternary Kinetics	Move electricity as a liquid, to power electric trucks, trains, planes and industry, with zero emissions renewable power.
Volt Technology Ltd	Reducing single use batteries that end up in land fill. The EU is already mandating against single use batteries when there is a viable rechargeable alternative.
Materials and Chemicals	
Aspiring Materials	Deliver a worldwide answer to point-source carbon capture, targeting an emissions reduction of 10mtpa by 2040 for the hard-to-abate industrial sector for less than $50/tCO2.
Better Packaging Co	Make POLLAST!C packaging by recycling plastic pollution. POLLAST!C has a carbon footprint that is a fraction of the equivalent made from virgin plastic and prevents ocean plastics
Futurity BioVentures	Successfully demonstrated high-value low-carbon substitutes for petro-chemicals with 15-30 times greater export value per tonne when compared to low-grade logs or waste
Liquium	Enable ammonia as the next clean, zero-carbon fuel for heavy industries with a drop-in, low-cost, robust & scalable catalyst for the Haber-Bosch ammonia production process.
Mushroom Material	Replace Styrofoam with home compostable mushroom-based materials, diverting 36,000m^3 of waste and reducing 2,600 tonnes of CO2 with our pilot line, scaling to 200M m^3 and 14M tonnes CO2 globally.
Neocrete	Replace cement in concrete, reducing CO2 embodied in construction and reduce global carbon emissions by 1% and re-engineer the worlds building block.
Permeance	Provide a 15% economic efficiency boost to membrane processes capturing 6,560 tonnes per day of carbon dioxide.
Spherulose	Use renewable, biodegradable, and plentiful cellulose to eliminate the 15 billion kg of petrochemical and palm-oil based surfactants used globally every year.
Taurus Concrete	Divert over 100,000 tons of waste concrete per year and return it to it's constituent parts, enabling it to be used as fresh concrete

Resources & Environmental Management	
Avertana	The technology consumes 5-6 tonnes of waste slag per tonne of TiO2 pigment, with no mining or residual waste. It also emits 60-70% less CO2 per tonne of TiO2 vs current value chains.
Carbonclick	Certified B Corp CarbonClick empowers businesses to offset emissions simply and transparently. Their global team helps organisations make carbon offsetting a cool part of the climate action toolbox.
CarbonScape	CarbonScape's mission is to decarbonize and derisk graphite anode supply for the lithium-ion battery industry.
Ecomerit Technologies Pacific Limited	Precipitor removes atmospheric CO2 as bicarbonate droplets. On the ocean, reduced acidity enables more ocean CO2 removal and improves ocean health. Deployment on wind turbines and ships offers massive scale potential.
Geo40	We are recovering silica, lithium and boron from underground fluids in a sustainable low-impact way, making strategic materials to advance decarbonisation. Our lithium tech will power low-carbon transport.
Hydroxsys	Generate a billion litres of water recovery, reduce chemical pollutants from industrial wastewater discharge, support at least 100,000 tonnes of CO2 reductions and drive technology-based solutions for municipal wastewater treatment.
Transportation and logistics	
Enex Group Ltd	Replace fossil fuel mobile machinery across the global mining sector (33,000 mines) to eliminate over 510 tons of CO2 per year per mine to align to their ESG targets and the UN Sustainable Development Goal #12; responsible consumption and production.
Mackwell and Co	Biomass steam engines for heavy industry vehicles could reduce CO2 emissions by 96% compared to equivalent diesel engines
Red Dwarf Aero Ltd	Eliminate more than 1 million tonnes of annual direct and indirect CO2e emissions from NZ's domestic aviation, marine and land transportation.
Waste and Recycling	
5R Solurions	Divert 55,000 tonnes of glass each year from landfills and creating a circular economy for glass resource recovery. Reused in NZ to make glasswool insulation, new bottles, and filtration systems.
Clevaco	Contribute to the significant reduction in construction waste to landfill and reduce the volume of the contaminant polystyrene entering the environment
Medsalv	Decrease emissions, reduce waste by up to 92%, and offer financial savings of up to 70% while delivering a positive impact through the remanufacturing of single-use medical devices.
Mint Innovation	Pioneering circular green metals from waste to help restore our planet.

Novolabs	Effluent disinfection achieved on liquids normally considered untreatable by UV using chemical free and with lower carbon footprint technology
UsedFULLY	Turn waste clothing and textiles into high value construction products. Increasing capacity to divert 20,000 tonnes from landfill, reducing 525,000 tonnes C02e and conserve 35million litres embodied H20.
Waste to Energy Technologies	Work with Micro Energy of Japan which has proven patented technology to convert most organic wastes to usable syn-diesel and hydrogen gas thereby reducing landfills and carbon footprint.
XFrame	Deployed over 2000m (2km) of demountable and reconfigurable wall framing - eliminating 150,000kg of demolition waste - with a further 3000m of wall due for delivery
Zincovery	Revolutionizing zinc production, reducing emissions by up to 95%.

Market access and revenue generated – time to grow

Companies were asked to report revenue earned in each of the financial years to March 2023 and 2024 and 47 companies provided data. Of these, 21 generated revenue in the year to March 2023 and 24 generated revenue in FY2024, indicating three companies had generated their first income during the period. The 21 companies reporting revenue to March 2023 ranged from generating tens or hundreds of thousands of dollars annually, through to tens of millions in mature companies from local and international sales.

The mean revenue for the top quartile companies was $14.74 million, with the next quartile being $146,609 and the remaining companies all being pre-revenue.

The overall growth in revenue was 29%, with early-stage companies (TRL 2 to TRL8) growing their revenue between 50% and 200%, while more established ones also reported robust growth, ranging from 2% through to 200% in the TRL9 companies.

Between the two reporting years, 7 companies reported in excess of 100% revenue growth including companies with six and seven figure income in the first reporting year. While not being possible to make generalisations from this small number of companies, the rapid revenue growth appears to demonstrate good commercial traction and the opportunity for rapid scale up of commercial operations.

Almost uniformly, companies have reported that accessing international markets and generating revenue from New Zealand operations is challenging, but companies are overcoming these and still succeeding.

Company CEO TRL9

"We specifically designed our technology such that, we don't need things like carbon credits or any sort of incentives in order to make money, we firmly believe that if you are reliant on anything like that as a fledgling growing company, you've got a big uphill battle because policies change, and things are never as straightforward as you think they are.

So we've designed this technology to stand on its own feet without any government support, but we do target countries [markets] that are good at recycling and so there's a reason for us to be there. We look for countries where they have strong policy and infrastructure in place around recycling."

A minority of respondents (28%, n = 60) could identify some form of advantage in generating revenue from New Zealand while 68%[20] identified mainly disadvantages and these are listed in Table 5. These views were broadly consistent across company TRL stages.

[20] Questions were not mutually exclusive, allowing both advantages and disadvantages to be identified.

Table 5: Advantages and disadvantages of generating revenue from New Zealand

Advantages in generating revenue while operating from New Zealand	Disadvantages in generating revenue while operating from New Zealand
• Low opex costs enabling competitive pricing, including competitive wages in some areas • Common standards across NZ and Australia • Ability to tap into NZ sustainability initiatives including decarbonising transport • Early adopter customers in some industry verticals • Perceived sustainable attributes of NZ products in offshore markets – the NZ Brand • Access to large volumes of feedstock in specific industries	• Distance from clients • Manufacturing, materials, labour and logistics costs, particularly competing against incentivised markets (IRA mentioned as supporting competitors) • Size of the local market – in some cases no feasible market at all • Legacy industry inertia in sustainability areas, even where regulations are being breached (e.g. industrial water discharges breaching consents) • Sales profession not at a highly professionalised level (needed for sophisticated international sales transactions) • Long sales cycles and lead times with added expense of maintaining sales teams remotely • Few or no clear sustainability metrics required by local procurement agencies across private or local and national government.

Company CEO (TRL9)
"Where our strengths lie are really around developing technologies, we've got this really strong talent pool who are really interested in developing this type of [cleantech] value
But when you're coupling that technical power with the commercial angle, you need to focus on the larger offshore markets as New Zealand is too small."

Interviewees pointed to the very large trade flow disruptions, incentives and opportunities linked to supply chain resilience, friendshoring, critical materials, energy, and component manufacturing globally, that are an opportunity for local companies to enter markets that were previously inaccessible. This access however requires senior level Government support to achieve recognition that the local sector has a valuable contribution to make. New Zealand companies are eligible for international incentive schemes in many instances under the right conditions

For example, the US Inflation Reduction Act provides $369 billion in funding to reduce US greenhouse gas emissions and New Zealand companies would be eligible under certain conditions, but navigating these schemes is complex, and companies would benefit from having further guidance and support at a Government level that builds on existing NZTE and MFAT work.

Companies see benefit both in Government support to better access international supply chains but also identify network effects and cohort activities (e.g. Cleantech Trek to the US) as helping them understand the pathways and to access these opportunities efficiently.

Company suggestions for enhancing the local cleantech sector

This report aims both to profile the current state of the cleantech sector in New Zealand, but also to present a set of suggestions for strengthening the sector made by cleantech companies.

We have developed a set of policy areas to be further explored by local agencies involved in capital raising, industry regulation, science and its commercial application, taxation, procurement and other domains. These are aimed at initiating policy discussion and by necessity are not fully developed policy objectives as these come directly from the company founders and leaders who see the local and international effects of similar policies or the lack thereof. These have not yet been discussed with the relevant Government agencies but the NZ Cleantech Mission is well placed to raise these with Government in the absence of a NZ cleantech industry association.

The Cleantech Mission recommends that a working group is established in the next 90 days to work through the suggestions and develop a set of prioritised actions.

If we are to achieve some of the global impacts and related commercial benefits that company leaders have identified, we need a deliberate approach to setting plans, and delivering on them to enhance the support for these companies.

Companies ranked the order of importance for the following aspects in needing support to enable them to progress their commercial and impact ambitions:

1) Raising investment from New Zealand
2) Infrastructure and facilities
3) Regulatory settings
4) Access to quality talent
5) Ability to generate revenue while operating from New Zealand (access to market)

We report the suggestions here in the order of importance that companies ranked the need for improvement across these five categories.

1) Investment and funding

<u>Develop mechanisms for local Kiwisaver and Superannuation funds to invest growth capital in local cleantech and deep tech ventures.</u>

Growth stage deep tech companies require large amounts of capital to scale at a competitive pace, and enabling the local superannuation funding schemes to invest in these would enhance the anchoring effect of capital in New Zealand to ensure more of the return on investment provides benefit to New Zealand, even while deploying technologies into offshore markets.

Actively promote New Zealand's capability and companies in Australia

Pro-actively establish linkages with Australian investor groups as their ability to invest in New Zealand companies is already more compatible with our tax law than many other jurisdictions and the commercial, science systems and IP settings are more familiar. They have good access to large amounts of capital, including via their super funds which are mandated to invest some of their money into earlier stage venturing for growth capital. Although the ability of their super funds to invest offshore is capped, the likely growth in cleantech focus for them highlights the potential for these to support New Zealand companies with the right climate and sustainability impacts.

Develop a transparent and budgeted link between New Zealand's Nationally Determined Contribution commitments (NDCs) and New Zealand technology deployment

Many cleantech companies can deliver large amounts of carbon emissions reduction and abatement and these could occur locally if they are able to scale in New Zealand. New Zealand has major liabilities under the Paris Agreement and these would be reduced by any impacts local companies can deliver when scaling onshore. This would enable meaningful plans to deploy technology to decarbonise our economy and provide confidence for the investment community. We note the estimated $3 to $23 billion potential liability that is currently directly linked to NZs requirement to offset approximately 100 million tons of CO2 under the Paris agreement that comes due in 6 years.

To support onshore technology deployment, consider CO2 offset advance payments as part of funding of New Zealand's NDCs.

Develop or extend hybrid funding mechanisms (beyond the current RDTI) for companies that remain pre-revenue due to long technical development pathways.

Funding mechanisms Kānoa (loan with equity option), Ara Ake (repayable grant) Ārohia Trailblazer Grant, EECA grants and NZGIF investments are effective at supporting pre-revenue tech companies, but each of these has limitations that mean the potential scale of impact is limited. Companies recommend there should be more founder-friendly terms, interest rates, decision timeframes, flexibility and amortisation rates that would enable companies to better compete internationally, and they have noted the Kānoa version of loan to equity as valuable. Recent changes to the funding available in the 'New to R&D Grant' (40%) have been helpful, but the low threshold of previous R&D spend can limit eligibility. Consider increasing this threshold and investigate opportunities for the 'New to R&D Grant' to complement existing early-stage funding grants like the 'Tech Incubator' scheme.

Companies noted the new Ārohia Trailblazer Grant is a good match for deep tech and cleantech companies. Consider widening the eligibility to include global benefits to the environment to specifically target cleantech companies.

Tech Incubators and the Commercialisation of Publicly Sourced IP

It is suggested that Callaghan Innovation share case studies of where cleantech companies have successfully used the Tech Incubator programme to unlock publicly sourced (i.e. University and CRI) IP.

It has also been recognised that in some cases, the universities and CRI's are adopting a more founder friendly equity approach to commercialising of IP. It was suggested this is a good way forward.

Continue regular cleantech treks to important markets

Continue to facilitate specific cleantech focussed trips offshore to conferences in US, EU and APAC (e.g. Cleantech Forum, Hello Tomorrow) that bring together investor pitches (NZTE investor pitch sessions in Singapore and California), as well as partner and testbed introduction and discussion (e.g. Ecolabs in Singapore, Lawrence Berkley Laboratory in California).

Extending company reach towards international investors

Actively loop in the offshore networks (e.g. Kea and others) from New Zealand, particularly kiwis who now occupy leadership positions in corporates to leverage their in-market connections that are aware of the needs for solutions (at a capital and partner level).

Build on mechanisms that attract offshore investors to live and invest in local deep tech companies (e.g. Edmund Hillary Fellowship and Investor Migrant Scheme). Companies may benefit from providing offshore investors with enhanced information about local investment opportunities in cleantech and other deep tech sectors.

Leverage international R&D funding

Develop a mechanism that enables research institutions to support company access to Horizons funding.

Develop incentives that correspond to offshore R&D funding in Australia that directly aims to support friendshoring and supply chain resilience, e.g. Heavy Industry Low-carbon Transition Cooperative Research Centre, fund to Derisk Decarbonisation for Heavy Industry.[21]

Tax treatment of investments by foreign investors

Develop tax policy that enables NZ investments to be seen on an equal footing to US or EU investments. Identify ways that people investing into NZ are not adversely affected in the way that they currently are penalised by the tax settings, e.g. Where US investors may be taxed in NZ through withholding tax and again on their capital gains. E.g. Where moving the company into the US from NZ while maintaining NZ investor stakes in the company has negative tax implications for NZ investors.

[21] https://hiltcrc.com.au/

2) Access to R&D infrastructure and facilities

Cluster development

Support private landlords and investors to provide facilities that can house companies developing their pilot and scale-up technologies. Property investors would benefit from better information about the opportunity (including demand side data on number and type of start-ups needing facilities) of developing facilities to house deep tech companies. The facilities at Future House (previously Level Two) are the envy of cleantech companies across New Zealand due to the community, laboratory facilities and prototyping expertise as well as co-located office space. Regional clusters would enhance the pace at which start-up companies can scale-up and de-risk their technology towards market deployment.

Support better access to collaboration with research institutions

Enhance the ability of scientific institutions to collaborate with cleantech companies by ensuring sufficient commercially targeted funding (with relevant KPIs) in the science labs with a mandate to host industry projects, undertake testing and analysis and contribute to prototyping and IP development. Both research entrepreneurs and start-up companies are eager to collaborate, but funding and administrative barriers prevent this from being a seamless exercise.

Provide clear expectations on the sharing and ownership of IP

Taxpayer funding currently supports IP development across numerous research institutions, through researcher-led or company-led collaborations. Where companies are well placed to commercialise the IP for the benefit of the local economy, a straightforward mechanism to fund or incentivise the transfer of IP to companies should be considered to avoid the current negotiated transactions based on opaque institutional drivers.

3) Regulatory settings, standards, treaties and trade agreements

Regulation for export market entry and compliance

The complex mix of regulation, standards, treaties and trade agreements has the potential according to most companies to support the uptake of cleantech if the settings are appropriate. A unanimous view is that our regulatory settings should closely follow leading offshore jurisdictions to enable seamless access to those markets without having to modify the technology to fit multiple differing markets. In many emerging technology areas, a clear leadership position develops early (e.g. EU and specifically Germany for hydrogen electrolysers) and the New Zealand Government should work to identify the leading regulation setter and then follow closely in implementing these without trying to re-invent the details.

As the research identified a large number of specific regulatory areas for each industry (ranging from health and safety in hydrogen and fuels through to ISO standards and EU mark for manufacturing, monitoring, compliance in CO2 offsetting and numerous others) we propose that:

- Government engages directly with innovators to scan for emerging regulations that support our deep tech export industries (including cleantech)
- Develop a fast-follower process for agencies to engage and adopt international best practice in a rapid manner that gives certainty to companies and investors about the path to scale up and market.
- Communicate the intention early, to adopt specific international guidelines, including while these are still under development.

The authors will make available the specific regulatory settings as supplementary data to this report, including references and recommended regimes, to Government agencies which have the mandate to develop regulation in respective industries on request.

Regulation to drive sustainable outcomes in New Zealand

Government has a role in driving beneficial activity towards sustainable impacts where large industrial incumbents are slow to respond to the three drivers of social license, customer demands and regulation.

Companies recommend that Government:

- approach sustainability in a cross-party manner to ensure longevity of any regulation.
- communicate the intention to regulate specific areas at a pace that ensures we keep up with international peers.
- pro-actively regulate sustainability impacts by industry in a manner that supports or develops local companies' international competitiveness (noting that international competitiveness requires responsible measures to enhance sustainability and not just status quo).

Carbon emissions trading

The climate related regulatory regime is one of the most urgent to get right, to position our economy for the largest disruption in living history. The urgency is reinforced by the fact that 80% of New Zealand exports by value are likely to be impacted by existing or proposed carbon border adjustment mechanisms globally.

A mix of Government mandated (e.g. Emissions Trading Scheme) and private offset mechanisms are required to ensure the price signals related to carbon emissions are incorporated into industry budget and planning cycles rapidly, and in a globally consistent manner. Mechanisms to verify, monitor and cancel credits need to be implemented in a nationally and internationally integrated way.

Once industries recognise their current and clearly defined future requirements around reducing carbon emissions, they have the ability to incorporate some of the world-leading climate innovations and become global leaders in their own fields (examples provided in this report include cement replacements, CO2 capture and sequestration, and fertilizer)

Training and expertise within regulators

Emerging industries and established industries aiming to innovate require responsive regulatory teams to advise on the direction of regulatory planning. New Zealand regulators would be well placed to provide beneficial support to innovator companies if they are up to date with emerging technologies. Companies recommend that Government agencies responsible for the wide range of industry regulation and standards (from workplace health and safety, through to manufacturing standards across multiple industries) ensure they have the competence and mandate to provide guidance to companies efficiently about evolving regulation.

Linking with trade partners

Increase the leverage of our existing trade relationships with advanced economies and other large economies to ensure the sustainability, environmental and climate aspects enhance trade. Our current and developing trade agreements include reference to sustainability aspects which some incumbents see as commercial risks, while cleantech innovators can help de-risk these aspects and help local exporters enhance their international competitiveness. Government has a role to play in linking the innovators to the trade community, both to support incumbents to incorporate new technologies as well as to ensure international trade partners understand the value proposition linked to the New Zealand cleantech sector.

Government activity here has the opportunity to leverage the very large trade flow disruptions, incentives and opportunities linked to: supply chain resilience, friendshoring (including for R&D spending), critical materials, energy, and component manufacturing.

Communication of the opportunities and evolving ESG reporting landscape

Innovators and established companies of all sizes and stages have to work hard to keep abreast of the rapidly changing ESG standards and requirements. Existing groups like the Aotearoa Circle provide excellent information while companies may need help interpreting or accessing the info they need in time to mitigate risks to their supply agreements. Pro-active advisory information is also available on the NZTE website.

4) Access to quality talent

Incentivise and support companies to deliberately develop leadership

The leadership skills required for to deliver on highly ambitious global targets need further development with in-situ structured training in large and small companies. Leadership programmes and the resourcing for these should form part of the review of the science system and any workforce development planning aimed at enhancing New Zealand's economic productivity. Leadership skills are needed across all domains, including technical, commercial and sales areas.

Commercial capability building which includes coaching and mentoring like those provided through the HealthTech Activator programme have proven successful. A similar programme for cleantech would grow capability and accelerate economic impact.

Continue to develop the highly capable technical workforce

New Zealand produces highly versatile and competent technically skilled graduates and this needs to grow substantially at all levels of tertiary training (Polytech, University and Industry courses) to support the emerging industries that will underpin future high value employment in the local and export cleantech economy.

Funding for student grants (for example 'Experience Grants' and 'Career Grants') and similar mechanisms have been great enablers for companies to access R&D talent. Companies suggest increasing this funding, with Fellowship Grants ideally re-introduced.

Advertise and follow-through with improved immigration settings for internationally sought-after skills

The extensive advertising resource currently focussed on bringing in tourists into New Zealand should be leveraged to inform and attract the workforce that cleantech (and other advanced technology sectors) rely on to succeed. Highly capable founders, employees, professional services and technicians have numerous attractive options available to them and New Zealand should stand out as being able to provide excellent technology employment opportunities alongside our high quality of life.

Once high-quality candidates are identified (including by accredited employers) their applications should be processed rapidly and transparently to ensure our ability to attract highly capable and motivated talent is not damaged by opaque processing progress and extended processing times.

Ensure clarity of any changes to the AEWV scheme and ensure that the intent of being able to employ people with in-demand skills with a rapid turnaround. Where people have already undertaken post-graduate studies in New Zealand, the barrier to rapid decisions should be low.

5) Ability to generate revenue while operating from New Zealand

Most of the above recommendations are likely to contribute to an enhanced ability for New Zealand cleantech companies to compete for access and market share in international markets.

The recommendations above with a high impact on the ability to successfully access international markets include:

- Linking with Trade partners
- Continue regular cleantech treks to important markets

Support New Zealand presence in-market

Shared facilities in-market where companies can host events and meetings provide a real boost to the effectiveness of international travel and offer valuable network effects across cleantech and other advanced technology areas. Companies recommend that these facilities or the access to them be extended to markets beyond where they already exist (e.g. The ability to host events and meetings at New Zealand House in London was cited as providing high value

facilities, context (immersion in Brand NZ), and supported the confidence of investors in the New Zealand offering.)

Procurement for sustainable outcomes and export endorsement

Ensuring procurement of New Zealand developed cleantech products and services would provide the double benefit of improving New Zealand sustainability impacts onshore, while also demonstrating to international customers and partners that the solutions meet stringent procurement requirements. This would be particularly effective as an endorsement where procurement agencies require third party validation of sustainability and climate claims.

Innovative, efficient mechanisms for new technology to be included in the large contracts that Government deploys across in infrastructure. The introduction of novel technology in low-risk aspects of projects would enable confidence in the technologies and overcome some of the risk aversion through in-market evidence development (e.g. low carbon concrete bollards in roading by NZTA Waka Kotahi).

Incentivise industry to develop innovator partnerships

Develop incentives for major corporates and industry partners to work towards adopting emerging technology, which could include tax-based incentives, information for industry on international risks and accessible international incentives (e.g. IRA has some aspects that are available to New Zealand companies under the right conditions).

Develop national sustainability plans with clear and measurable targets for high priority sustainability areas such as climate, water quality and waste (or circularity). Noting that the plan for reducing waste to landfill has made relatively good progress in supporting feasibility and pilot initiatives, so a similar approach can be used.

Each plan would need to make transparent linkages to the sustainability challenges, impact areas and known future liabilities arising. These plans are seen as a good mechanism to promote legacy industry collaboration and partnership with innovator firms that benefit both (E.g. how the New Zealand Hydrogen roadmap has contributed to generating momentum and partnerships).

One particularly high priority area is the energy transition, where there is an urgent need for a plan that link our future liability for meeting Nationally Determined Contributions (NDCs) made under the Paris agreement to an anticipated set of carbon emission reduction and abatement measures (see also Carbon Emissions Trading above)

Plans should provide sufficient detailed implementation measures to enable industry and investors to plan accordingly. The plans should also identify the appropriate funding mechanisms, whether these are expected to be Government, private or some form of public - private -partnership.