



University
of Otago
ŌTĀKOU WHAKAIHU WAKA

Climate & Energy
Finance Group
(CEFGGroup)

FINAL REPORT

Effectiveness Evaluation of the Aotearoa New Zealand Climate Related Disclosure Framework

July 2026

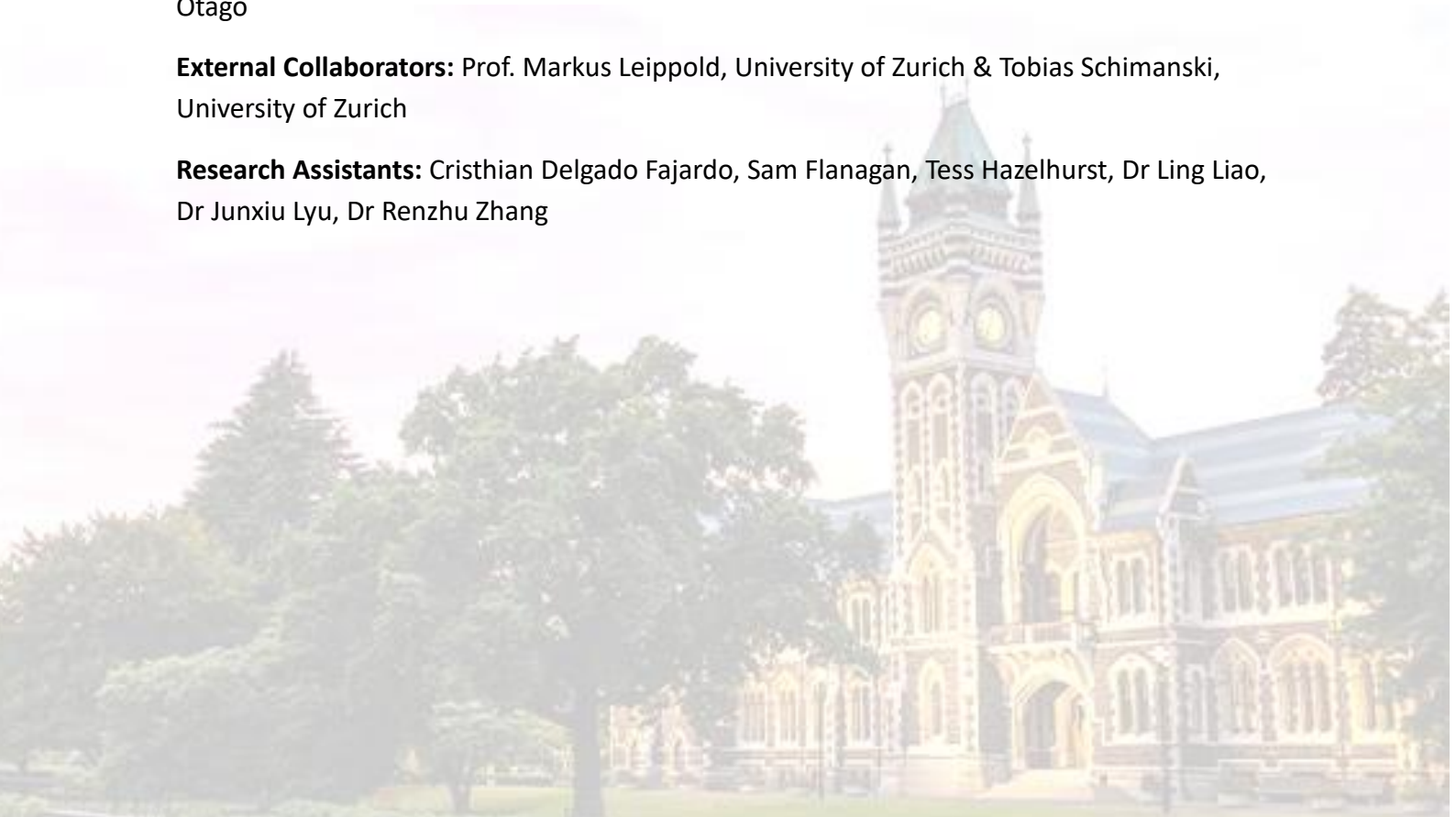
Prepared for the External Reporting Board

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Executive summary

This report details the findings of the *Effectiveness Evaluation of the Aotearoa New Zealand Climate-Related Disclosure Framework* conducted from mid-2023 to the end of 2025. The focus was on the three purposes of climate standards and climate-related disclosures in [section 19B](#) of the Financial Reporting Act 2013.¹

We established comprehensive methodologies and corresponding datasets to evaluate the framework's effectiveness. This included:

- Two surveys (n=70 in 2023; n=48 in 2025)
- Two rounds of interviews (n=20 in 2023; n=18 in 2025)
- Analysis of over 700 climate-related disclosures (FY2015–FY2024)
- Portfolio analysis of 673 New Zealand managed funds (2015–2025)

This initial evidence shows that Aotearoa New Zealand Climate-related Disclosure Framework is improving business decision making, disclosure quality, and investor practices toward a low emission climate resilient future economy. The framework is reshaping governance and internal processes, however substantial hurdles remain in capability building, data quality, methodological consistency, and the translation of disclosed information into meaningful financial and strategic decisions.

Data and methodology

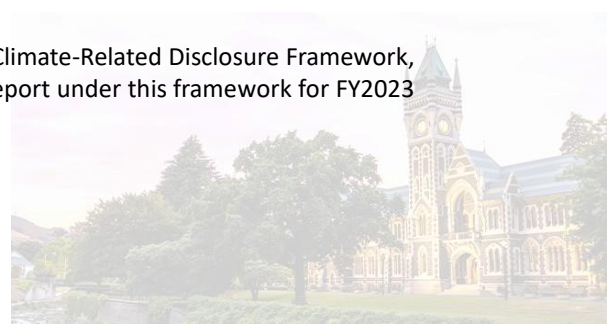
Surveys and interviews

Our first approach includes surveys and interviews pre- and post- mandate (in 2023 and 2025) to understand decision making, organisational practices, and the challenges and costs of reporting.

AI climate-related disclosure analysis system

In collaboration with researchers at the University of Zurich, we deployed a state-of-the-art AI analysis system to quantify the reporting by New Zealand (NZ) climate reporting entities (CREs) from the 2015 to 2024 Financial Year (FY). This allows us to explore the effects of the framework on reporting and the relationship between reporting and firm outcomes. The system is designed to avoid hallucinations, biases and inconsistencies, which are common when using off-the-shelf Large Language Models (LLMs). We quantify climate-related

¹ In this report, 'framework' refers to the overall Aotearoa New Zealand Climate-Related Disclosure Framework, while 'mandate' refers to the effective legal requirement for entities to report under this framework for FY2023 reporting onward.



reporting in terms of compliance (breadth) and the richness of the information provided (depth).

Fund manager portfolio analysis

Finally, we produce the most comprehensive dataset of NZ fund manager equity investments from 2015-2025, accounting for layers of investment in other funds.

Purpose 1: Entity decision making

Interviewees and survey respondents state improved internal decision making and processes

The interviews, supplemented by the survey results, show that the framework is already improving governance visibility of climate-related risks and opportunities, supported more coherent internal practices, and encouraged organisations to engage with long-term climate-related risks and opportunities.

Climate-related disclosure is associated with improved liquidity for experienced reporters

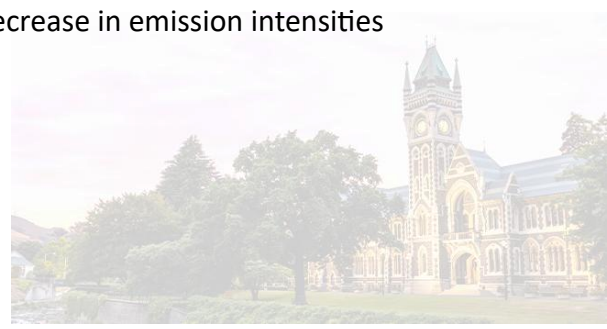
Improved climate-related reporting by CREs is associated with improved liquidity of the firm on the New Zealand Stock Exchange. This relationship is dominated by firms who were already reporting more information before the framework, as the market likely deems their reporting as more credible. These findings are consistent with international evidence, which shows that (early-phase) climate-related reporting mandates improve firm liquidity.

Framework implementation leads to improved ESG profiles of CREs

Improved reporting is positively related to higher following-year ESG ratings and the framework implementation is associated with improved Environmental, Social and Governance (ESG) ratings of CREs. These third-party ESG ratings are an evaluation of the ESG performance of the firm and are commonly used by investors to assess this. These evaluations are significantly influenced by the information reported by the relevant entity. Critically, the framework levels the playing field, as now all CREs must report the information valued by ESG rating providers and therefore boosts ESG scores for CREs across the market. This enhances the competitiveness of NZ companies in global capital markets. Before the framework was implemented broader and deeper reporting related to improved ESG scores. Demonstrating leadership in ESG performance, relative to other CREs, now requires actions beyond disclosure.

Emissions Intensities not yet related to reporting

Lastly, we find no immediate link between reporting breadth or depth and following-year emission intensities, which likely reflects the long-term investment required for operational decarbonisation. However, there is a gradual market wide decrease in emission intensities over the last 10 years.



Purpose 2: Foresight and responsibility

The framework has substantially improved the depth and breadth of disclosures, fostering greater foresight and responsibility among CREs while catalysing improved climate-related information flows within the broader supply chain of CREs.

Climate-related reporting has improved across all components

The most marked improvements were seen in the governance and strategy components with metrics and targets lagging. Notably, risk management disclosures saw the greatest lift, moving from the component with the least information provided in FY2021 to one of the most comprehensive by FY2025.

Survey results indicate an active commitment by CREs to enhance the quality and reliability of their disclosures. This is more pronounced for early reporters relative to those that started in FY2023 (first mandatory reporting year), and corporate relative to non-corporate (investors, creditors and insurers) respondents.

Framework improves the broader information environment

From the interviews we mostly heard about the positive effects of the framework on improving comparability, transparency and consistency for decision-useful climate-related information. This is driving learning, cross-functional collaboration and the interoperability with global standards is appreciated.

Survey data showed a spillover effect of the disclosure framework to non-mandated companies, as most respondents request climate-related information from their value chains. The focus of these requests was dominated by GHG emissions and climate-related targets and their progress. Early Reporters are more likely to ask for such information from their value chain.

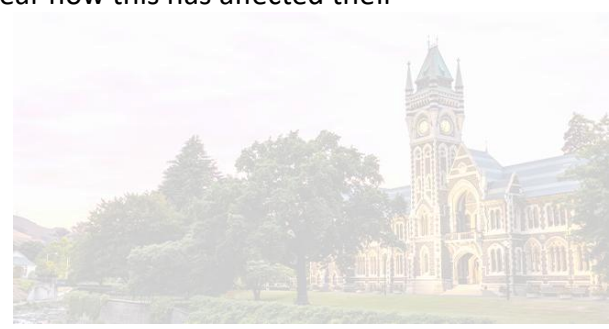
Purpose 3: Capital allocation

Framework is supporting internal business case for climate initiatives

Interviews conducted in 2023, before the mandate, indicated that it was not yet clear whether the framework would affect capital allocation. However, by 2025, participants stated that it is supporting the business case for climate initiatives.

Growing integration of climate considerations in capital allocation

As decarbonisation and the integration of climate-related risks and opportunities into capital allocation are much more immediately executable for primary users, we focus on their capital allocation decisions. In the interviews, primary users stated that the framework is improving transparency and comparability, but it is not yet clear how this has affected their investment decision making.



Through the broader sample of survey responses, we understand that most investors are integrating climate change considerations into most of their portfolios and the proportion of portfolios considering climate change considerations has increased from 2023 to 2025. This is done predominantly through exclusions and engagement and is predominantly motivated by financial incentives such as expected outperformance, lower risk and client demand.

NZ fund manager portfolio non-financial performance is improving

Beyond the interviews and surveys, we can directly observe investor behaviour by analysing their portfolios, which they are required to report regularly. Developing a complete dataset of NZ fund manager equity investment exposures we statistically test the impact of the mandate on fund-level non-financial outcomes.

We observe a market-wide elevation in ESG and carbon performance among all NZ funds, not just CRE funds that were mandated to report, since the framework's implementation. While the trend is broad, the relationship **is more pronounced** among mandated funds (CREs) across specific metrics. This likely reflects a shift in industry practice.

Cost and challenges of climate-related reporting

Internal capability gaps and reliance on consultants continues

From the interviews, we understood that internal capability and reliance on external consultants were a continuing challenge, especially for integrating complex scenario analysis. This further shaped challenges in developing internal capabilities and was driven by concerns around fiduciary duties by senior management and board members.

Persistent disclosure challenges include regulatory uncertainty, scenario analysis and data reliability

In both surveys, respondents expressed concerns around costs, lack of reliable and comparable data, and regulatory uncertainty.

Since the framework was implemented, concerns around multiple reporting frameworks/standards have been reduced, but challenges with lack of comparable data and climate-scenario difficulties remain. In the 2025 survey and interviews respondents, especially investors, signalled a lack of stakeholder demand for their disclosures.

Costs highest for later reporters

As disclosure costs are a major concern, in the 2025 survey we asked respondents directly about their estimated costs of climate-related reporting. Most respondents selected costs of less than \$250,000 for both internal and external costs, with some selecting \$250-500,000. Very few entities stated costs over \$500,000. Those that did were mostly entities that started reporting after the mandate (Later Reporters). Costs are expected to reduce and stabilise as entities gain experience with the framework, which is supported by interviewees' statements around the experience-cost relationship.





Acknowledgements

We gratefully acknowledge the project initiation and financial support of the External Reporting Board (XRB), with special thanks to Dr Amelia Sharman, Geoff Connor and April Mackenzie.

A special acknowledgement must go to the significant contributions of my esteemed colleague Professor Sara Walton and the rest of the extensive University of Otago research team.

The system for quantifying climate-related reporting was made possible through the expertise of Professor Markus Leippold and Tobias Schimanski at the University of Zurich.

We extend our sincere gratitude to all survey and interview participants. Their valuable time and willingness to share their perspectives and experiences regarding the framework were instrumental to this research. While anonymity requirements preclude individual identification, if you are reading this, thank you very much for making this research possible.

Lastly, we want to thank all the participants at various conferences and seminars, where components of this research were presented. Thank you for the valuable feedback and discussions at the Department of Accounting and Finance (University of Otago), Department of Finance (University of Zurich), Department of Finance (University of Tübingen), the 2025 European Union Joint Research Council Sustainable Finance Summer School, Climate & Energy Finance Group 2025 Sustainable Finance and Reporting Symposium, 38th Australasian Finance and Banking Conference, 2025 Sydney Banking and Financial Stability Conference, and the 2025 NZ University Finance Conference.



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1. Introduction

Over the last three decades, global regulations to mitigate and adapt to climate change have grown substantially. This trend began with the formation of the United Nations Framework Convention on Climate Change (UNFCCC) and the accompanying Conference of the Parties (COP). The annual COPs have heralded many significant international agreements such as the Kyoto Protocol (COP 3, 1997), later replaced by the Paris Agreement (COP 21, 2015), under which 196 parties agreed to target global warming of 1.5°C and limit it to 2°C above pre-industrial levels.

Global surface temperatures have risen by approximately 1.5°C since the late 19th century largely due to increased greenhouse gas (GHG) emissions, and atmospheric carbon dioxide levels have surged to over 430 parts per million, the highest in 800,000 years.² The risks of climate change will be experienced heterogeneously, but all jurisdictions, nations and organisations face climate-related physical and transition risks.

Achieving the global transition to a net-zero economy and mitigating the most severe impacts of climate change necessitates significant changes to business decision-making and capital allocation. The two principal policy mechanisms currently employed and considered to incentivise this transition are GHG emissions pricing and mandating climate and broader sustainability-related reporting. Emissions pricing creates a direct economic incentive for emitting entities to transition or reduce their carbon intensive activities. On the other hand, reporting mandates enhance market transparency, enabling investors, creditors and insurers to incorporate climate-related risks and opportunities into their capital allocation and insurance decisions.

New Zealand has been a notable early adopter in the climate policy space, launching world's second Emissions Trading Scheme (ETS) in 2008, shortly after the European Union's ETS was launched. The New Zealand ETS currently prices nearly half of the nation's total emissions and has undergone continuous evolutions since inception.

Beyond emissions pricing, New Zealand became the first country to mandate comprehensive climate-related financial disclosures through mandatory reporting standards. In 2021, the Financial Sector (Climate-related Disclosures and Other Matters) Amendment Act 2021 established this reporting framework.³ It applies to approximately 170 large entities, including listed companies, banks, insurers and investment managers, and requires mandatory disclosures annually, effective for financial years commencing on or after January 1, 2023.

² For a summary of the state of climate change visit the NASA website: <https://climate.nasa.gov/>.

³ The Financial Sector (Climate-related Disclosures and Other Matters) Amendment Act 2021 amended the Financial Markets Conduct Act 2013, the Financial Reporting Act 2013 and the Public Audit Act 2001. The framework requires certain FMC Reporting Entities to publish climate-related disclosures annually.



There are three main stated purposes for climate-related reporting (as outlined by the Ministry of Business, Innovation and Employment⁴):

Purpose 1: Entity decision making: ensure that the effects of climate change are routinely considered in business, investment, lending, and insurance decisions

Purpose 2: Foresight and responsibility: help climate reporting entities better demonstrate responsibility and foresight in their consideration of climate issues

Purpose 3: Capital allocation: lead to more efficient allocation of capital, and help smooth the transition to a more sustainable, low emissions economy.

These three purposes establish the fundamental criteria against which the effectiveness of the framework is evaluated in this report. This multi-year evaluation programme involved the development of a robust evaluation methodology and the implementation of the first cycle of research, spanning late-2023 through to the end of 2025. This research relies upon a comprehensive range of primary and secondary data sources, a novel methodological design and execution, and the specialised contributions of an international cross-disciplinary team of academic experts.

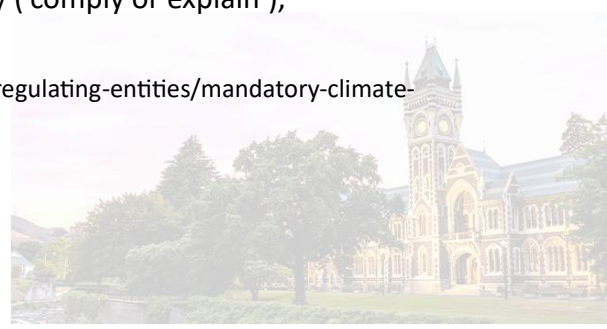
2. Global climate reporting landscape

New Zealand was the first country to mandate comprehensive climate-related reporting in accordance with binding standards covering large financial market participants. However, voluntary frameworks for non-financial disclosures and earlier, narrower, mandates have been evolving since the 1990s.

Figure 1 summarises global developments in mandatory and voluntary climate-related and broader non-financial disclosure frameworks and standards. Over time, voluntary disclosure frameworks have consolidated into two major frameworks. The International Sustainability Standards Board (ISSB) standards focus on sustainability-related risk and opportunity by way of investor-focused financial materiality (single materiality). The Global Reporting Initiative (GRI) standards require reporting of the entity's impact on the environment and society (double materiality).

Globally, regulated financial reporting is evolving as regulators implement comprehensive mandatory climate-related reporting, following New Zealand and the EU. This current regulatory era of comprehensive climate-related financial reporting marks a significant evolution from the earlier phase of non-financial disclosure mandates (Krueger et al., 2024). The earlier phase of disclosure mandates was often voluntary ('comply or explain'),

⁴ <https://www.mbie.govt.nz/business-and-employment/business/regulating-entities/mandatory-climate-related-disclosures>



inconsistent, and qualitative, allowing companies excessive flexibility and lacking standardised metrics. Some early phase mandates required specific GHG emission disclosures, but beyond that, comparability was limited. For example, France introduced Article 173 of the Energy Transition Law in 2015, requiring institutional investors to disclose climate-related risks. Similarly, the UK's Climate Change Act 2008 mandated specific GHG reporting for certain large companies. While important early steps, both were narrow in scope compared to the broad, standardised and integrated climate-related reporting required under the ANZCDF.

The Aotearoa New Zealand Climate Standards (NZ CS) focus on financial risk and opportunity, with the intention of serving primary users, defined as existing and potential investors, lenders and other creditors.⁵ The structure of NZ CS aligns with the Task Force on Climate-related Financial Disclosures (TCFD) recommendations, while maintaining strong interoperability with the ISSB standard on climate-related reporting (IFRS S2).⁶

IFRS S1 and S2 standards are positioned as the best practice for large multinational entity climate and sustainability-related financial disclosures, with the ISSB absorbing many of the voluntary frameworks, including the TCFD. For example, the UK is transitioning its reporting requirements from the TCFD (comply or explain) to IFRS standards for reporting from FY 2026. Australia has recently mandated climate-related disclosures under Australian Sustainability Standard AASB S2, which is based on IFRS S2. Reporting is being implemented in three phases, beginning with the largest entities for financial years commencing on or after 1 January 2025.

Of New Zealand's five largest export partners in 2024 (China, the United States, Australia, the European Union, and Japan), all but the United States have implemented or plan to implement mandatory climate-related reporting in the near future. The U.S. state of California introduced a phased mandate starting in 2026 for some large companies, but one key pillar of the package has been effectively paused by the Ninth Circuit Court.⁷

On 16 December 2025, the European Parliament agreed the text of a provisional agreement it made with the European Council a week earlier in relation to the Corporate Sustainability Reporting Directive (CSRD) under the 'Omnibus I' package. The changes will simplify rules, cut administrative burden and reduce the number of in-scope companies from approximately 50,000 to approximately 10,000.⁸

⁵ <https://www.xrb.govt.nz/dmsdocument/4770/>

⁶ IFRS ISSB standards comparison with the NZ CS: <https://www.xrb.govt.nz/dmsdocument/5006/>

⁷ More information on the effective pause of Californian mandate is available at <https://corpgov.law.harvard.edu/2025/12/03/california-climate-disclosure-law-sb-261-implementation-halted-ninth-circuit-grants-injunction-pending-appeal/#more-177965>

⁸ For more information on the Omnibus I reform see: <https://www.consilium.europa.eu/en/press/press-releases/2025/12/09/council-and-parliament-strike-a-deal-to-simplify-sustainability-reporting-and-due-diligence-requirements-and-boost-eu-competitiveness/>





Domestically, in October 2025, the New Zealand Government announced major changes to the climate-related disclosure framework. The threshold for mandatory reporting by listed issuers will rise from NZD \$60 million to NZD \$1 billion. This change lifts the threshold to almost double Australia's group/phase 1 threshold equivalent and is far higher than the options consulted on by the Ministry for Business, Innovation and Employment in December 2024.⁹ Further, Managed Investment Schemes will no longer be required to report under the framework, and director and company liability settings will be adjusted. These changes will reduce the number of climate reporting entities (CREs) by more than half, from around 170 to fewer than 80.

Although some research exists on the effects of early-phase non-financial reporting mandates, evidence on the impacts of comprehensive climate-related reporting mandates remains extremely limited. The findings of this report are therefore valuable not only to New Zealand policymakers but also to regulators and stakeholders globally who are implementing or considering similar mandates.

⁹ For a comparison of Australian group thresholds with New Zealand market capitalization equivalents see table 2 of the discussion document: <https://www.mbie.govt.nz/dmsdocument/29947-adjustments-to-the-climate-related-disclosures-regime-discussion-document>

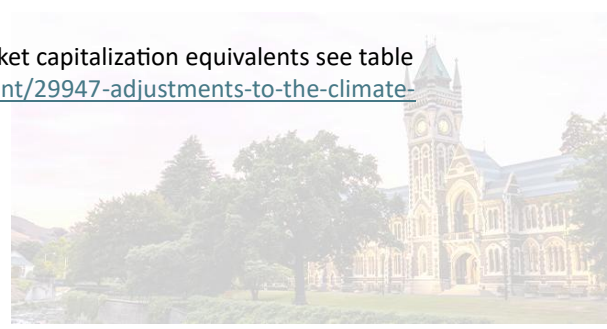
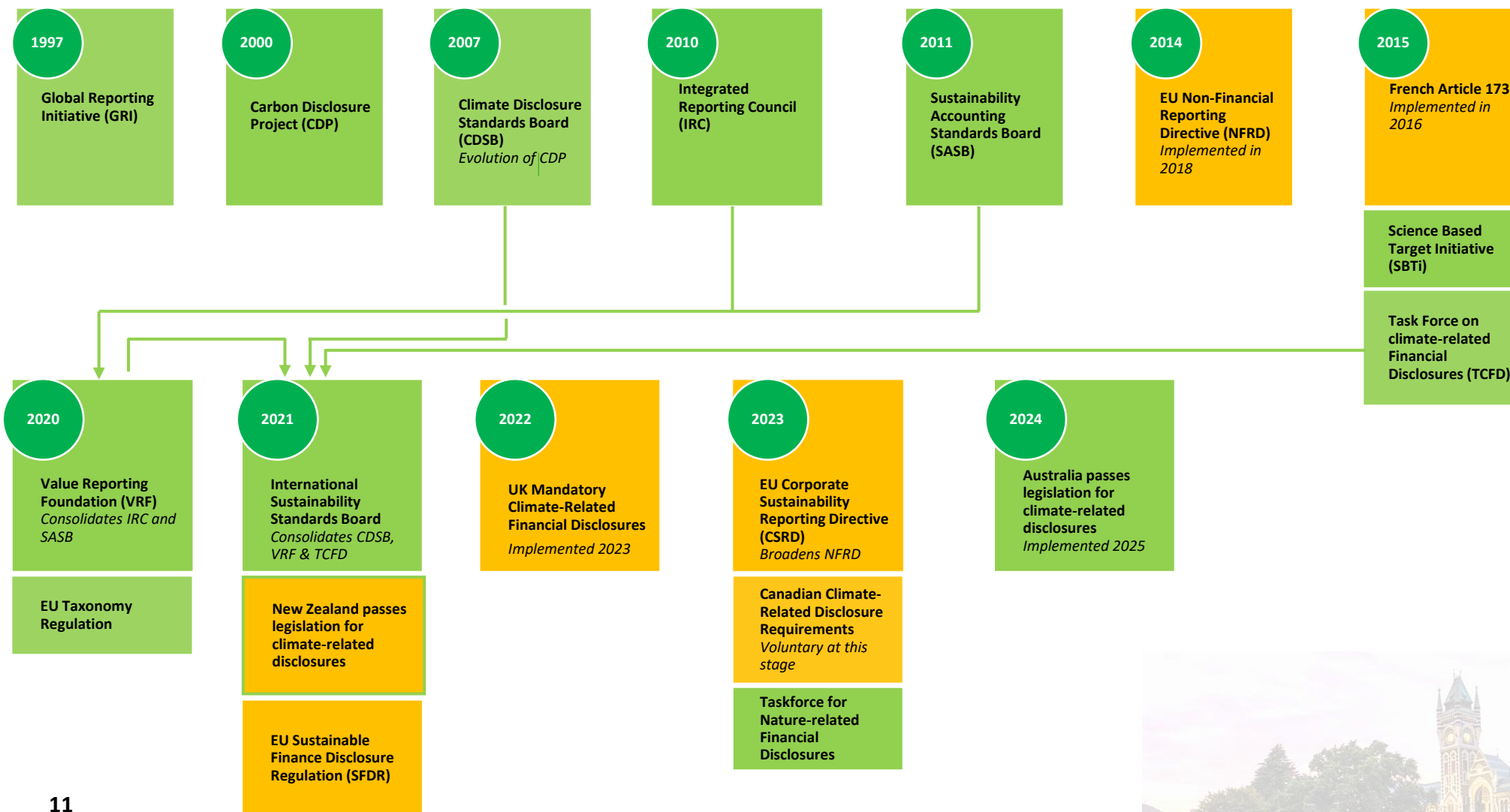


Figure 1. Non-financial reporting frameworks and regulations

This figure presents a timeline of the major global voluntary and mandatory non-financial reporting standards and frameworks. Green boxes indicate voluntary standards or frameworks, while the orange boxes indicate mandatory standards. The arrows indicate when a standard or framework was merged or subsumed.



3. Data and methodology

To evaluate the effectiveness of the framework across its three core purposes (Purpose 1–3), we employed an integrated mixed-method approach combining qualitative and quantitative techniques. Primary data is sourced via targeted surveys, in-depth interviews and direct analysis of the published climate-related disclosures (CRDs) from reporting entities. Furthermore, the evaluation leverages extensive secondary data, including New Zealand fund manager investment holdings data (Morningstar), company level financial data (Compustat) and non-financial data (LSEG, Bloomberg, RepRisk, Sustainalytics, S&P). These sources enable a robust analysis of disclosure practices and both financial and non-financial outcomes.

Further details and extended results are available in Appendix as follows:

- A1. *Interview question framework*: outlines the semi-structured interview design and thematic focus areas.
- A2. *Survey flow*: presents the survey question pathways for different respondent types.
- A3. *Report classification logic*: explains how voluntary disclosures were identified and categorized.
- A4. *Extended survey results*: provides multiple additional survey result tables.
- A5. *Portfolio analysis results – Limited sample*: presents the Difference-in-Difference (DiD) results for fund manager non-financial performance using a smaller dataset of fund level metrics directly available from Morningstar.

3.1. Interviews

Semi-structured interviews were conducted to capture a deep understanding of the disclosure process, its implementation, and its outcomes. Interviews were administered pre- and post-mandate with 20 entities in 2023 and 18 in 2025 to assess changes following the mandate. To recruit interview participants the research team used multiple channels including email and LinkedIn invitations to senior leaders (targeting those likely involved in disclosures), inviting survey respondents, reaching out through the researchers' networks and with support from the XRB team. The goal was to get mostly corporate issuers but also have representation from other entity types. Table 1 below presents a breakdown of the interviewees.

Table 1. Interviewee breakdown

Type of entity	2023	2025
Corporate issuer	13	11
Registered bank or building society	1	1
Managed investment scheme	2	2
Crown financial institution	3	3
Insurer	1	1
Total	20	18

Interviews were conducted via a video call and averaged around 60 minutes. Each interview adopted a semi-structured interview approach; questions were asked to capture participants' perspectives and understanding of the process of disclosing climate risks as well as its impacts and outcomes. The interviews began with an open question asking participants about their story and process of preparing climate risk disclosures. Using a narrative approach enabled participants to tell their own story at the level of detail they were comfortable with. This approach allowed flexibility for the participant to mention aspects that they considered important, while also enabling probing from the interviewer. The interview questions focused on several aspects of the disclosures and related outcomes (See in A1 in the Appendices).

3.2. Surveys

The initial survey was developed using insights from the first round of interviews and grounded in established literature (Amel-Zadeh & Serafeim, 2018; Krueger et al., 2020; Diaz-Rainey et al., 2025; Ilhan et al., 2023; among others). The survey aimed to capture non-public information on the perceived importance of climate-related risks, current reporting practices, and the usefulness and quality of disclosed information.¹⁰

The survey was conducted pre-mandate, at the end of 2023 (n=70), and post-mandate, Q3 of 2025 (n=48), to capture changes following the first year of reporting¹¹. Survey respondents were recruited through various channels including email invitations to senior leadership likely involved in climate-related reporting at the entities, LinkedIn posts and messages and support by the XRB team. Respondent demographics and characteristics are detailed in 0. The demographic distribution across both surveys was broadly consistent in terms of entity type, organisational size, respondent role and Industry spread.¹²

Response rates for the second survey were likely affected by a major policy announcement by the Government during the collection period, to substantially reduce the number of CREs

¹⁰ The survey flow-chart is presented in A2 of the Appendices.

¹¹ It is important to note that for some results the number of responding entities will drop for several reasons. Firstly, not all questions were asked of all respondents as they were not eligible (e.g. asking a manufacturing company about the impact of climate risks on portfolio allocation). Further, some respondents did not answer all questions.

¹² It is important to note that in Table 2 the total number of valid responses are not the same for each variable, because some questions are not appropriate for all respondents (i.e. we do not need industry classification for a Bank, Investor or Insurer) and for some questions not all respondents answered it.

from the 2025 FY onward, discouraging some potential participants from engaging because they would no longer be CREs. Some entities contacted us acknowledging this reluctance.

Table 2. Survey – Respondent demographics

Organisation type			Respondent position		
	2023	2025		2023	2025
CRE/CFI only	34	27	Lower or operating management	8	9
Voluntary reporting entity only	4	1	Middle management	33	22
Primary user only	6	3	Top management	27	17
Both CRE/CFI and primary user	21	16	Governance-level	2	0
Both VRE and primary user	5	1	Total	70	48
Total	70	48	Climate Initiative signatories		
Investor	25	17		2023	2025
Creditor	7	3			
Insurer	3	4	No	22	17
Corporate	35	24	Yes	48	31
Total	70	48	Total	70	48
Assets under management (Investors)			Total assets (Non-investors)		
	2023	2025		2023	2025
Less than NZ\$100m	0	1	Less than NZ\$100m	3	1
NZ\$100m-500m	5	0	NZ\$100m-500m	5	7
NZ\$500m-1b	3	4	NZ\$500m-1b	5	7
NZ\$1b-20b	13	9	NZ\$1b-20b	29	13
NZ\$20b-50b	3	1	NZ\$20b-50b	0	2
More than NZ\$50b	1	2	More than NZ\$50b	3	1
Total	25	17	Total	45	31
ANZSIC Industry of Corporate respondents					
	2023	2025		2023	2025
Agriculture, forestry and fishing	7	4	Manufacturing	3	1
Construction	0	1	Professional, Scientific and Technical Services	2	1
Electricity, Gas, Water and Waste Services	5	3	Rental, Hiring and Real Estate Services	4	4
Financial and Insurance Services	3	3	Retail trade	1	2
Information Media and Telecommunications	1	1	Transport, Postal and Warehousing	5	5
Healthcare and Social Assistance	1	0	Other	3	0

3.3. Communication patterns of CREs

The analysis of reporting by CREs is executed via a state-of-the-art automated system specifically designed to quantify the communication patterns of CREs against the NZ CS. The system was developed in collaboration with researchers from the University of Zurich and full technical details are provided in Gehricke et al (2026). A similar methodology has recently been adopted by Forster et al (2025) to describe sustainability-related disclosures by the largest 600 European Union companies.

Collecting disclosures

To analyse reporting patterns of CREs we collected reporting documents for before and after the mandate as follows:

- *Voluntary Disclosures (FY2015–FY2022)*: All voluntary climate and broader sustainability-related disclosures (standalone or within the annual report) from CREs for the FY 2015 to 2022 were collected.¹³
- *Mandatory Disclosures (FY2023–FY2024)*: All disclosures for the first two mandatory reporting periods (as of 31 October 2025) were collected via the Companies Office Climate-related Disclosure Register.

The resulting full dataset of reporting entities' climate-related reporting from FY2015 to FY2024 is summarised in Figure 4 (Section 5).

Automated analysis of reports

To quantify the reporting by CREs, before and after the mandate, we adopt a Retrieval Augmented Generation (RAG) system.¹⁴ A schematic of the system is provided in Figure 2. The system processes each report by segmenting it into paragraphs. An LLM-based annotation module evaluates the relevance of each paragraph. Relevant paragraphs and their corresponding indicators are then passed to a second LLM, which generates a Yes/No response (was that specific element of the disclosure standards disclosed or not) with justification, source citations, and page references for each indicator. Lastly employ the generated data to calculate two metrics, the Disclosure Index and the Information Richness.

In the first step a set of yes/no indicators were created from the NZ CS (e.g., Does the entity explain which governance body is responsible for climate-related risks or opportunities?), resulting in 58 yes/no indicators across the Governance, Strategy, Risk Management, and Metrics and Targets sections.¹⁵

In the second step, a Qwen based LLM, decides which paragraphs of the climate-related disclosure document are relevant to the specific indicator resulting in a collection of relevant text and associated confidence in that relevance by the model (probability the model determined for the decision to include the paragraph).

In the third step these extracted paragraphs, alongside additional context (definitions or specific instructions designed by researchers to improve accuracy during validation tests) and the indicator questions (yes/no questions), are provided to another LLM (ChatGPT 4o).

¹³ A breakdown of the report classifications is given in A3 of the Appendices.

¹⁴ In RAG, the LLM is relying on a provided context to produce answers rather than internal knowledge seen during training, reducing errors such as hallucinations.

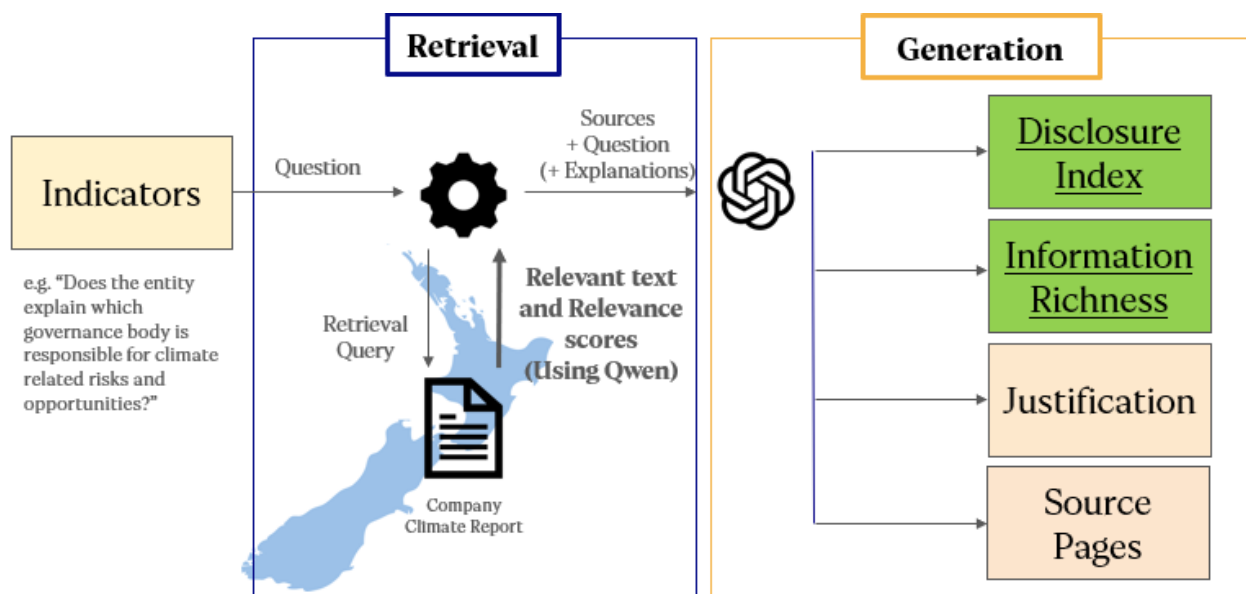
¹⁵ A full list of the indicators is provided in Table A4 of the Appendix.

This LLM then generates the yes/no indicator verdict, an explanation for how the yes/no conclusion was reached (including page references to the document) and the model's confidence in the verdict (the model probability of the yes or no verdict).

In the fourth step, we use these outputs to create two metrics (scores out of 100) to assess each full report against the NZ CS:

- *Disclosure Index (DI)*: measures how well the report addresses the requirements of NZ CS by calculating the proportion of indicators that are met, while accounting for the LLM's confidence in each verdict.
- *Information Richness (IR)*: measures the richness of information that the report provides in addressing each requirement of the NZ CS, while accounting for the systems confidence in the relevance of each paragraph. Specifically, it is average number of relevant text chunks (paragraphs) per disclosure indicator, adjusted for the confidence of the model in its relevance, across the 58 indicators.

Figure 2. Method – Retrieval augmented generation system diagram



The model outputs were compared to manually annotated reports, which were used to validate and refine the system, with a final mean accuracy of 92.2% (correct verdicts per report across five estimation runs). Further manually annotated reports were used for out-of-sample testing with the model achieving a 91% accuracy. This accuracy is exceptionally high and likely to outperform, or at least match, a human annotation-based system over large datasets, such as New Zealand company reporting histories. Comprehensive technical specifications and empirical analysis of the automated system are available in Gehricke et al. (2025).

Empirical evaluation of reporting and effects

After compiling the reports and computing the Disclosure Index (DI) and Information Richness (IR) scores, we assessed changes in these metrics over time visually and employing Interrupted Time Series (ITS) regression analysis. This approach evaluates the impact of the mandate on reporting practices and tests the statistical significance of observed changes.

Beyond the analysis of the reporting practices over time, we tested the relationship of the DI and IR metrics with company level outcomes, including Liquidity, Environmental, Social and Governance (ESG) scores and Carbon Emission Intensities (CEIs). This analysis includes firm and year fixed effects so the results are not driven by firm-specific factors (such as credit ratings) or timing effects. This was executed through a panel regression model, accounting for firm, industry and year fixed effects as well as common company characteristic control variables established in the literature (Krueger et al., 2024). This model allows us to test the effect of the disclosure mandate on subsequent firm outcomes as well as the relationship of DI (or IR) and firm outcomes.

3.4. Fund manager capital allocation

To evaluate the mandate's impact on capital allocation by New Zealand fund managers, detailed fund-level ESG and emissions performance data was required. Initially, we relied on Morningstar's portfolio-level non-financial performance data, with preliminary results presented in Appendix A8. This analysis produced mixed findings, but overall, the mandate appeared to enhance fund managers' ESG performance and reduce portfolio carbon emission intensities (CEIs).

However, this analysis had two key limitations. First, Morningstar's coverage of fund-level metrics for New Zealand funds was limited, particularly for periods prior to 2020. Second, this analysis relied exclusively on Sustainalytics non-financial data, which is limiting as robust non-financial performance analysis requires ESG data from multiple providers (Berg et al., 2022). Consequently, fund-level ESG and emissions performance metrics were constructed from raw holdings data combined with company-level ESG and emissions datasets.

The comprehensive dataset of New Zealand fund manager ESG and emissions performance, resulted in coverage for 673 managed funds with observations starting in 2015 following three steps. First, the regular fund holdings disclosure by New Zealand domiciled funds were downloaded from Morningstar for all available quarters.

Second, a full Look-Through-Analysis (LTA) was performed in order to capture each fund's complete equity investment exposure accounting for indirect exposure through investments in other funds.¹⁶ This required the downloading and cleaning of seven layers of holdings data resulting in 25 million (18 million once aggregated by equity investment) full look-through equity holding-year observations. These holdings are spread across 39,071 unique

¹⁶ Look-Through-Analysis (LTA) refers to the process of replacing investments by a fund in another fund, with the latter fund's holdings. This process is repeated through several layers until there are no fund investment holdings left in the data.

companies (invested in by at least one fund at one time in the sample). This represents the most comprehensive dataset of New Zealand fund manager equity investments compiled to date.

Lastly, the final fund holdings, from the LTA were matched with ESG scores (LSEG and RepRisk) and Carbon Emission Intensities (CEI; LSEG) data using their International Securities Identification Number (ISIN) identifiers.¹⁷ These metrics were then aggregated at the fund level using a weighted average and adjusted weighted average.¹⁸ Funds with less than 60% of their assets under management (AUM) covered by available non-financial metrics were excluded from the analysis of that metric, to minimize bias from missing data.¹⁹

Employing this dataset, a DiD model of portfolio level non-financial performance was estimated, accounting for several fund level control variables as well as year and fund fixed-effects.²⁰ The focus of this analysis is to explore how New Zealand investment funds capital allocation, with respect to ESG and CEI exposure, is affected by the mandate and how funds required to report under the framework are affected relative to others.

4. Purpose 1: Entity decision making

4.1. Existing international evidence supports disclosure mandates

Longstanding literature show the effects of financial reporting regulations and practices on firm behaviour (Kanodia & Sapra, 2016; Leuz & Wysocki, 2016; Roychowdhury et al., 2019; Roychowdhury & Srinivasan, 2019). The nascent literature on non-financial reporting regulations is limited to the effects of early phase non-financial disclosure mandates²¹, which have been in place for some time as opposed to the more recent comprehensive climate-related disclosure mandates. Evidence from this literature supports the theory of change for the framework, that mandated climate-related disclosures can affect corporate behaviour and outcomes. A summary of key studies is presented in Table 3.

Research on more recent, comprehensive climate-related reporting regulations remains limited, underscoring the importance of evaluating the New Zealand framework as the first of its kind globally.

¹⁷ Many holdings (over 4,000) did not have ISINs in the Morningstar database and ISINs had to be identified manually through internet searches of the respective company names and tickers, which were then cross-validated using LSEG data.

¹⁸ The adjusted weighted-average scales available weights by the total available weights for the specific fund in order to make fund level metrics comparable across funds with different data coverage.

¹⁹ The summary statistics of the full portfolio data is available in A7 of the Appendices.

²⁰ The full DiD model is presented in the description for Tables 5-7.

²¹ The earlier phase of disclosure mandates was mostly semi-voluntary ('comply or explain'), inconsistent, and qualitative, allowing firms excessive flexibility and lacking standardised metrics. Further, they often covered only subsets of the economy, be it specific sectors or only the largest firms, and focussed on specific metrics such as emissions.

Table 3. Literature – Effects of early phase disclosure mandates

Sample	Regulation	Year of mandate/s	Evidenced effect	Citation
Global	Early-phase mandates	2002-2020	(Positive*) Liquidity	Krueger et al (2024)
Global	Early-phase mandates	2000-2016	(Positive*) Investment in long-term innovative projects (Positive*) Raise equity capital	Gibbons (2024)
Global	Early-phase mandates	2002-2020	(Negative*) Voluntary disclosure to the Climate Disclosure Project	Oesch & Reinhart (2025)
United States	U.S. GHG Reporting Framework	2009	(Negative*) Carbon Emission Intensities (CEI) (No effect*) Gross emissions	Bauckloh et al (2023)
European Union	Directive 2014/95	2014	(Positive*) CSR activities	Fiechter et al (2022)
United Kingdom	Companies Act 2006 (Strategic Report and Directors' Report) Regulations 2013	2013	(Negative*) Emissions	Tang and Demeritt (2018); Joucenot & Krueger (2019)

* The parentheses show the direction of the relationship, i.e. Krueger et al (2024) show that the early phase mandates improve liquidity.

4.2. Survey and interview findings

Interviews

Interview evidence shows that, at this early stage, the framework is influencing business, investment, lending, and underwriting decisions in uneven and primarily indirect ways. Its most pronounced effects are in internal governance, organisational learning, and the framing of climate risk, rather than in immediate shifts in capital allocation or pricing.

Within CREs, the CRD Framework is strengthening procedural aspects of decision-making, including long-term risk assessment, scenario analysis, cross-functional engagement, and board-level scrutiny.

In assessing climate-related risks and opportunities, CREs generally integrate climate considerations into established risk management processes. Although many entities struggle to translate global scenarios into sector-specific insights, scenario work is prompting deeper reflection on uncertainty and the financial implications of climate impacts. Some organisations are also pursuing opportunities in decarbonisation through pilot projects and emerging technologies, while those already experiencing climate impacts are embedding physical risks into both operational and strategic planning.

The positive effects are more pronounced in organisations with prior non-financial reporting experience or strong internal leadership, where the NZ CS are viewed by some interviewees as a logical extension of existing practices. In these cases, the framework enhances organisational coherence, elevates climate issues to the board, and supports capability

building through structured analysis, cross-functional engagement, and proximity to data and expertise.

The framework's impact is less consistent where organisations face resource constraints, competing priorities, or rely heavily on consultants. Sector-specific limitations (such as unavailable low-emissions technologies) continue to shape what is feasible. While scenario analysis is challenging, organisations acknowledge its contribution to long-term strategic thinking. Integration into core commercial strategy remains variable and often constrained by capability gaps and heavy reliance on consultants. Overall, the framework functions as an enabling infrastructure that strengthens internal learning, governance processes, and long-term thinking within CREs. However, less-resourced organisations tend to approach disclosures reactively, focusing on compliance rather than leadership. Interviewees also expressed a heavy reliance on consultants with mixed perceptions of the value they provide.

Surveys

Table 4 presents the respondents' direct assessments regarding the framework's impact on decision-making. The results indicates that the disclosure framework exerts a notable influence on internal processes and strategic planning. Across all assessed decision-making categories, respondents reported a moderate perceived impact in both 2023 and 2025.

Notably, the perceived impact across general strategic areas (5.4 in 2023 and 4.8 in 2025) closely rivalled the average perceived effect for disclosure practices and transparency (6.3 in 2023 and 6.7 in 2025), which recorded the highest overall impact. This narrow margin was unexpected, as a more pronounced difference between disclosure-specific outcomes and broader operational impacts was anticipated. Following disclosure practices, the areas experiencing the most significant effects were the integration of climate-related risks into core decision-making (5.4 in 2023 and 4.6 in 2025), followed by carbon reduction initiatives(4.4 in 2023 and 4.1 in 2025).

In the survey before the mandate, where only early reporters, that is those entities which voluntarily engaged in climate-related reporting before the framework, could answer this questions, the perceived effect between corporate respondents and non corporate respondents was minimal, while in the 2025 survey the perceived impact was lower for non-corporate respondents.²² The 2023 (Panel A) and 2025 (Panel B) results are not directly comparable as in 2023 only those voluntarily engaging in climate-related reporting before the mandate could answer this question, while in 2025 all mandated entities had started reporting and therefore were eligible to respond to the question. However, the 2025 results set a nice baseline for the next cycle of evaluation in 2028.

²² It is important to note that in the 2023 survey only early-reporters (entities voluntarily disclosing before the mandate) answered these questions. If a respondent does not perceive any impact they would select 0, while for a significant impact would select 10, therefore scores of 4-6 represent moderate perceived impact.

Table 4. Survey – Impact of reporting on decision making

This table shows the mean response to the question on the impact of the Disclosure Framework on entity decision making for reporting entities. Please note that the 2023 results, reported in panel A, are only for early reporters, that is those reporting on climate-related risks and opportunities before the framework became effective, and in the 2025 results, presented in panel B, all eligible entities are included. Differences in the number of useful responses for the full sample (Table 2), the general effect and the areas of effect, are driven by the number useful responses to the respective questions. The table shows the mean of the response values from the question using a 0-10 scale (0 = no impact at all; 10 = significant impact).

<i>Panel A: 2023 Survey – Early Reporting Entities</i>			
General Effect	Non-Corporate	Corporate	All early reporters
Internal decision-making processes and strategies related to climate change	5.4	5.2	5.2
Number of entities	11	20	31
Areas of effect	Non-Corporate	Corporate	All early reporters
Disclosure practices and transparency	6.3	6.7	6.5
Integration of climate considerations into decision making (e.g., strategic planning, investment/lending/insurance decisions, risk management process)	5.4	5.3	5.3
Implementation of carbon reduction initiatives	4.4	4.3	4.3
Stakeholder engagement and collaboration, for addressing climate-related concerns and developing collaborative solutions	4.6	5.1	4.9
Integration of climate-related considerations into product and service offerings	4.1	4.1	4.1
Implementation of climate change adaptation and resilience measures (e.g., infrastructure improvements, diversification of supply chains)	1.9	5.1	4.0
Adoption of more sustainable business practices	4.6	4.3	4.4
Number of entities	10	20	30

<i>Panel B: 2025 Survey – All Reporting Entities</i>			
General Effect	Non-Corporate	Corporate	All entities
Internal decision-making processes and strategies related to climate change	4.8	5.7	5.3
Number of entities	20	24	44
Areas of effect	Non-Corporate	Corporate	All entities
Disclosure practices and transparency	6.5	6.9	6.7
Integration of climate considerations into decision making (e.g., strategic planning, investment/lending/insurance decisions, risk management process)	4.6	5.7	5.2
Implementation of carbon reduction initiatives	4.1	4.9	4.6
Stakeholder engagement and collaboration, for addressing climate-related concerns and developing collaborative solutions	4.1	4.9	4.5
Integration of climate-related considerations into product and service offerings	3.1	4.3	3.8
Implementation of climate change adaptation and resilience measures (e.g., infrastructure improvements, diversification of supply chains)	2.7	4.5	3.7
Adoption of more sustainable business practices	2.4	4.7	3.7
Number of entities	18	22	40

We further asked respondents about the relative importance of the component sections of the NZ CS and find that across both surveys risk management, driven mostly by the climate risk and opportunities and transition plan aspects, is the most impactful category. All sections of the NZ CS are similarly “somewhat important” across both surveys.²³

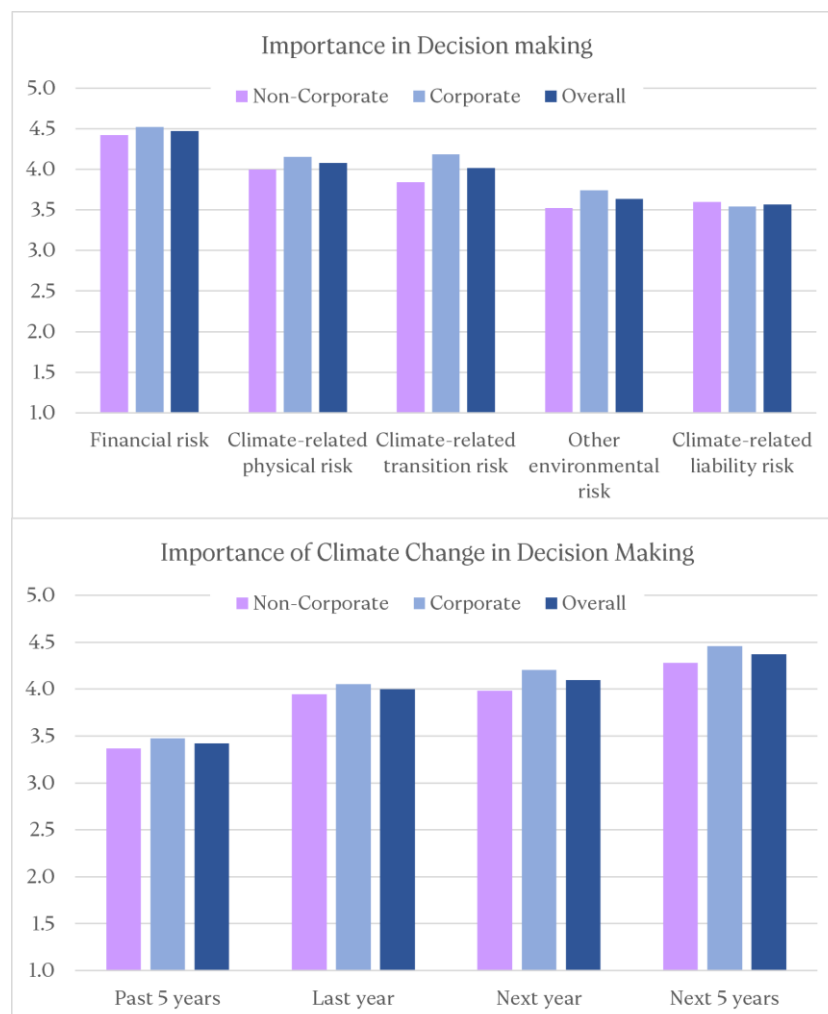
²³ These results are presented in A4 of the Appendices.

Lastly, Figure 3 shows the relative importance of financial and climate-related risk priorities from both the 2025 and 2023 surveys. Financial risks are deemed as most important climate-related physical and transition risks only marginally less important. Importantly, respondents believe climate-related risks will become more important in the next 5 years, relative to recent years.

Overall, the interview analysis, supplemented by the survey results, shows that the framework has already improved governance visibility of climate-related risks and opportunities, supported more coherent internal practices, and encouraged organisations to engage with long-term risks and opportunities, even as questions around methodological robustness persist. Climate-related risks are important in business decision making and already influencing decision making processes, especially at the governance and strategic level, while further impacts of the framework are still emerging.

Figure 3. Survey – Relative importance of climate change in decision-making

This Figure shows the average (mean) results for questions related to the importance of climate-related risks and opportunities in entities' decision making, for survey responses from 2023 and 2025. The first graph explores the relative importance of climate, environmental and financial risks, while the second graph explores the timing of importance of climate-related risks. Both graphs use a 5-point Likert scale where a response can range from 1 = completely unimportant to 5 = extremely important.



4.3. Reporting and firm outcomes

The analysis of climate-related reporting by CREs is presented in Section 5. In this section we present results of how climate-related reporting by CREs relates to their financial and non-financial outcomes. We analyse our reporting metrics (DI and IR) for corporate CREs in relation to the following years firm level outcomes, starting with market liquidity.²⁴

Enhanced climate reporting improves market liquidity for credible firms

We first analyse the effects on firm-level liquidity as this is a first-order stock characteristic of importance for investors, firms and regulators because it is a significant driver of real and financial outcomes such as reduced cost of capital, reduced volatility and increased corporate investment (Amihud and Levi, 2023), which are difficult to measure directly (Krueger et al., 2024).

In Table 5 we can see that illiquidity has been increasing in recent years, as indicated by the large and significant coefficients for 2022, 2023 and 2024 across all models. Further in this table we analyse how climate-related reporting, measured by DI (proportion of disclosure elements disclosed) and IR (average depth of disclosure across elements), relates to following-year market liquidity. In the baseline model, DI (column 1) and IR (column 4) are both negatively related to a firm's following-year Amihud Illiquidity, the benchmark for assessing firm liquidity in Finance and Financial Economics research.²⁵ This shows that more comprehensive and richer climate-related reporting relates to improved market liquidity of listed companies in New Zealand and improved reporting seems to partially offset recent liquidity deterioration. These results on liquidity need to be taken with some caution as New Zealand generally has a relatively illiquid market, which may cause some distortions, however the statistical relationships uncovered in this analysis are robust to several model specifications.

Next, when exploring the effect of the mandate on this relationship (columns 2 and 5) we can see the relationship between climate-related reporting and liquidity, only takes hold after the mandate.

²⁴ Summary statistics for these analyses are available in A5 of the appendix. From the summary statistics we can see that the Illiquidity measure is likely not normally distributed, which motivates the metric being log-transformed.

²⁵ The Amihud (2002) Illiquidity is the annual average of a ratio of daily absolute stock return to daily trading volume, measuring how much a stock price moves for a given amount of trading activity, on average over one year.

We estimated a model with a triple interaction term (column 3), showing that those firms that were in bottom half of DI in the FY2022 reporting have a positive relationship between disclosure and liquidity after the mandate, while those that were in the lower half exhibit a negative relationship. The liquidity improvements are concentrated among firms with strong early (pre-mandate) reporting. This relationship is economically significant, as a company that has a 10 point (out of 100) higher DI score, on average, completely offsets the negative liquidity shock of the recent market downturn in NZ.²⁶ Finally, this benefit of climate-related reporting is only experienced by those firms that were already in the top half of reporters (DI) before the mandate, as their reporting is likely seen as more credible by the market.

Overall this shows that post-mandate, firms with strong pre-existing disclosure practices experience significant liquidity gains, indicating that credible climate reporting enhances market confidence. These benefits to reporting can offset the NZ market-wide reductions in liquidity of recent years.

Table 5. Reports – Climate-related reporting and firm liquidity

This table presents the results of the estimated panel regression model:

$$Illiquidity_{t+1} = \beta_0 + \beta_1 DisclosureScore_t + \sum_{j=1}^J \gamma_j X_{i,j,t} + \alpha_i + \delta_t + \epsilon_{i,t} ,$$

where $Illiquidity_{t+1}$ is the one year ahead Amihud (2002) Illiquidity measure and $DisclosureScore_t$ is either the DI or IR reporting metric. $X_{i,j,t}$ are firm level control variables, following the literature (Krueger et al., 2024), including firm size (log of total assets), leverage, return on assets and market-to-book ratio. α_i and δ_t denote the firm and year fixed effects, respectively. Standard errors are clustered at the firm level to account for serial correlation.

The baseline model estimation is presented in column (1) for the DI metric. Columns (2) and (4) add an interaction $DisclosureScore_t \times Post_{2022}$ which allows us to examine how the relationship between the disclosure metric and illiquidity changes post mandate. Column (3) adds a triple interaction term $DisclosureScore_t \times Post_{2022} \times DI_t^{Low}$, where DI_t^{Low} is a dummy variable indicating if firm i was in the lower half of $DisclosureScore_t$ before FY2023. The *, ** and *** indicate the statistical significance of the estimated coefficients at the 10%, 5% and 1% level of significance, respectively.

Dependent Variable	<i>Illiquidity_{t+1}</i>			
Model:	(1)	(2)	(3)	(4)
DI_t	-47.3	29.1	-33.89	
$DI_t \times Post_{2022}$		-177.9**	-115.6*	
$DI_t \times Post_{2022} \times DI_t^{Low}$			130.4**	
IR_t				-86.72
$IR_t \times Post_{2022}$				-1,032.0**
<i>Year Fixed Effects</i>				
2016	793.0	649.2	723.8	650.5
2017	602.0	351.5	565.3	426.4
2018	1,718.3	1,223.3	1,633.7	1,428.2
2019	797.7	35.56	648.4	393.9
2020	1,141.0	189.4	945.4	687.7
2021	2,936.5	1,478.7	2,667.4	2,203.8
2022	7,513.7*	5,651.1	7,246.58*	6,674.2*
2023	10,858.0**	5,651.1	13,830.3**	15,491.6***

²⁶ 58 disclosure indicators make up the DI metric, so a 10-point increase in DI is equivalent to reporting 5.8 additional disclosed indicators (requirements of the NZ CS).



2024	31,704.6*	17,471.6**	14,147.38*	17,101.6***
Controls	Yes	Yes	Yes	Yes
Firm-fixed effects	Yes	Yes	Yes	Yes
Observations	739	739	739	739
R ²	0.41	0.41	0.42	0.42

Mandatory disclosure elevates ESG scores across all reporting entities

The mandate lifts ESG ratings for all CREs levelling the playing field, in terms of ESG performance, in attracting international capital.²⁷ Richer disclosures no longer predict ESG scores post-mandate. While disclosure quality improves markedly, reductions in carbon intensity remain modest, reflecting the long-term investment required for operational decarbonisation.

Table 6 presents the estimated relationship between our DI and IR metrics and the following years LSEG ESG score. All models indicate that over recent years ESG scores are increasing across all CREs, with this increase becoming statistically significant once the mandate is announced. This shows that the mandate lifts ESG scores of all CREs. Looking at model (1), (2) and (3) we can see that DI is positively related to the following years' LSEG ESG score, but this relationship disappears after the mandate takes effect. Model (3) shows that there is no significant difference in the relationship between DI and year ahead LSEG ESG scores for those CREs that were in the lower half of DI before the mandate. Model (4) presents a similar relationship for IR.

Overall, Table 6 shows that before the mandate, broader (DI score) and richer (IR score) disclosures are related to increases in following year ESG scores. This is expected as a component of how ESG data providers judge ESG performance includes a disclosure element, often focussed on existence rather than substance of disclosure. Therefore, firms disclosing more of the expected elements will attain better scores. Then as the mandate comes into effect all CREs are required to report a large portion of the expected information, therefore lifting ESG scores and levelling the playing field, although better reporting no longer predicts ESG scores.

Table 7 explores the analysis of S&P ESG risk score, Bloomberg ESG score, and LSEG CEIs. ESG scores have risen significantly after 2020 following the mandate's announcement, while the relationship between the disclosure scores (DI and IR) and ESG is statistically insignificant. This finding confirms that the mandate lifts ESG scores across all CREs, improving New Zealand's competitiveness in global capital markets. However, limited coverage of New

²⁷ In this evaluation we measure the ESG performance of companies using ESG ratings from third-party providers. Specifically, the providers are London Stock Exchange Group (LSEG), Standard & Poors (S&P) and Bloomberg. According to the providers, LSEG ESG ratings measure ESG risk and impact, S&P scores measure ESG risk and Bloomberg scores measure ESG performance.

Zealand firms for the Bloomberg and S&P scores constrains the implications of the respective results (columns 1-4).

Columns (5) and (6) of Table 7 examine the relationship between disclosure metrics and subsequent CEIs. Neither DI nor IR scores show a significant effect on CEIs, although the mandate's announcement and implementation years exhibit some evidence of reductions. This modest impact likely reflects the time required for firms to decarbonise operations, as replacing or upgrading physical assets involves substantial investment and planning. By contrast, fund managers can adjust portfolio exposures almost immediately by allocating investments away from high-emission and low ESG performing investments, a dynamic explored further in Section 6.3 of this report.

Table 6. Reports – Climate-related reporting and LSEG ESG scores

This table presents the results of the estimated panel regression model:

$$ESG_{i,t+1}^{LSEG} = \beta_0 + \beta_1 DisclosureScore_t + \sum_{j=1}^J \gamma_j X_{i,j,t} + \alpha_i + \delta_t + \epsilon_{i,t} ,$$

where $ESG_{i,t+1}^{LSEG}$ is the one year ahead LSEG ESG score for firm i . $X_{i,j,t}$ are firm level control variables, following the literature (Krueger et al., 2024), including firm size (log of total assets), leverage, return on assets and market-to-book ratio. The baseline model estimation is presented in columns (1) for the DI metric. Columns (2) adds and interaction term which allows us to examine how the relationship between the disclosure metric and the LSEG ESG score changes post mandate. Column (3) adds a triple interaction term $DI_t \times Post_{2022} \times DI_t^{Low}$, where DI_t^{Low} is a dummy variable indicating if firm i was in the lower half of DI_t before FY2023. Lastly, column (4) repeats the analysis of column (3), but using the IR as the reporting metric. The *, ** and *** indicate the statistical significance of the estimated coefficients at the 10%, 5% and 1% level of significance, respectively.

Dependent Variable	<i>LSEG ESG_{t+1}</i>			
Model	(1)	(2)	(3)	(4)
DI_t	0.08***	0.11***	0.11***	
$DI_t \times Post_{2022}$		-0.06**	-0.06**	
$DI_t \times Post_{2022} \times DI_t^{Low}$			-0.01	
IR_t				0.76**
$IR_t \times Post_{2022}$				-0.68**
<i>Year Fixed Effects</i>				
2016	2.22	2.18	2.18	2.17
2017	3.45**	3.38**	3.37**	3.30**
2018	4.36**	4.20**	4.19**	4.23**
2019	5.00***	4.76**	4.74**	4.98***
2020	5.57***	5.26***	5.24***	5.54***
2021	5.97***	5.48***	5.44***	6.09***
2022	5.53**	4.91**	4.87**	5.48**
2023	3.00	5.44**	5.57**	7.27***
2024	3.67	6.74**	6.87**	8.69***
Firm-fixed effects	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Observations	691	691	691	691
R ²	0.95	0.95	0.95	0.95

Table 7. Reports – Climate-related reporting and non-financial performance

This table presents the results of the estimated panel regression model:

$$ESG_{i,t+1} = \beta_0 + \beta_1 DisclosureScore_t + \beta_2 DisclosureScore_t \times I_{2023} + DisclosureScore_t \times I_{2024} + \sum_{j=1}^J \gamma_j X_{i,j,t} + \alpha_i + \delta_t + \epsilon_{i,t} ,$$

where $ESG_{i,t+1}$ is the one year ahead S&P ESG score, Bloomberg ESG score or LSEG CEI for company i . $X_{i,j,t}$ are firm level control variables, following the literature (Krueger et al., 2024), including firm size (log of total assets), leverage, return on assets and market-to-book ratio. The model estimation with the interaction terms for DI and IR are represented in alternating columns for each metric. The *, ** and *** indicate the statistical significance of the estimated coefficients at the 10%, 5% and 1% level of significance, respectively.

Dependent variable	S&P ESG _{t+1}		Bloomberg ESG _{t+1}		CEI _{t+1}	
Model	(1)	(2)	(3)	(4)	(5)	(6)
DI	0.17**		0.00		-1.81	
DI × <i>Post</i> ₂₀₂₂	-0.06		-0.00		-2.27	
IR		1.26		0.01		-25.69
IR × <i>Post</i> ₂₀₂₂		-0.99		-0.01		-12.87
<i>Year Fixed Effects</i>						
2016	-4.11	-3.52	0.22	0.23	-15.34	-13.70
2017	-0.82	-0.30	0.44*	0.45*	-22.86	-16.87
2018	0.64	1.54	0.67**	0.69**	-36.54	-27.94
2019	3.80	5.46	0.83***	0.87***	-40.38	-32.41
2020	15.05***	16.46***	1.18***	1.20***	-58.19	-46.15
2021	13.71**	15.67***	1.44***	1.49***	-100.3*	-87.86*
2022	23.46***	25.23**	1.62***	1.68***	-189.3	-165.4*
2023	24.51***	29.64***	1.89***	1.71***	18.45	23.07
2024	24.89***	30.03***	1.94***	1.75***	NA	NA
Firm-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	339	339	327	327	652	652
R ²	0.88	0.88	0.88	0.88	0.79	0.79

5. Purpose 2: Foresight and responsibility

5.1. Existing international evidence – Need for mandatory reporting

International evidence shows that while voluntary climate-related disclosures are influenced by internal and external drivers, they remain inconsistent and incomplete. This highlights the need for mandatory reporting to ensure comprehensive, comparable, and decision-useful reporting.

A significant driver of voluntary disclosure is engagement by investors (Reid & Toffel, 2009), particularly institutional investors (Flammer et al., 2021). Further, significant pressure for climate-related disclosure can also come from governments, regulators and other stakeholders (Liesen et al., 2015; Reid & Toffel, 2009). Chithambo et al. (2022) show that companies' emissions disclosures, not comprehensive climate-related disclosures, are most

affected by capital providers, then government regulators, then internal stakeholders and lastly by broader stakeholders such as NGOs, media and competitors.

Further, many internal factors have been shown to increase voluntary reporting of climate-related information including higher climate-related risks (Dawkins & Fraas, 2011; Siddique et al, 2021), higher sustainability performance (Christensen et al., 2021), membership of a high polluting industry (Gamerschlag et al, 2011; Grougiou et al, 2016), larger firm size (Hahn & Kühnen, 2013; Thorne et al, 2014; Qiu et al, 2016), better financial performance (Thorne et al, 2014), certain manager characteristics (Haniffa and Cooke, 2005, Adams and McNicholas, 2007; Parker, 2014; Lewis et al, 2014; Peters and Romi, 2015; Cronqvist and Yu, 2017; McCarthy et al, 2017; Davidson et al, 2019; Daradkeh et al, 2023) and board diversity (Ben-Amar & McIlkenny, 2015; Cordeiro et al, 2020).

Although voluntary climate-related disclosures are increasing, entities can choose under which framework to report and which components of the framework to adopt. For example, globally, in both 2022 and 2023 only 11% of companies examined by the ISSB reported on climate-related scenario analysis (ISSB, 2024). Although reporting toward the TCFD has increased to 82%, only 2% of monitored entities disclosed against all 11 recommendations in 2023 (ISSB, 2024).

There is growing evidence on the lack of quality, and even greenwashing, in voluntary climate-related reporting (Pitrakkous & Maroun, 2020; Wedari et al, 2021; Elliott & Löfgren, 2022. Bingler et al 2024) show that firms' support for the TCFD is mostly 'cheap talk' as most supporting firms disclose mostly non-material climate-related information.

These findings reinforce the rationale for New Zealand's mandatory disclosure framework, which aims to overcome the limitations of voluntary reporting.

5.2. Reporting by NZ CREs

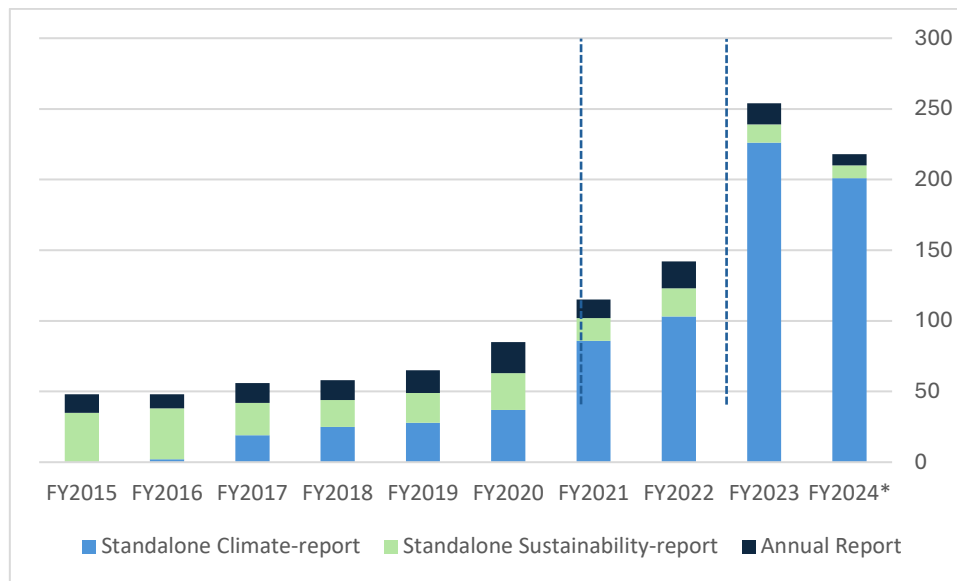
Climate-related reporting growing over time

The number of CREs disclosing climate-related information has increased steadily, with a sharp rise following the introduction of mandatory reporting in FY2023.

Figure 4, shows that the number of CREs that engage in some form of climate-related reporting has been increasing, even before the mandate was announced. However, there is a substantial increase in the number of firms reporting climate-related information in FY 2023, the first mandatory reporting period.

Figure 4. Reports - Reporting by Climate Reporting Entities

*Note that FY2024 reports were collected on 31st October 2025, so this year is not complete.



Significant disclosure breadth and depth improvements

Analysis employing our automated system (described in section 3.3) shows significant improvements in both the Disclosure Index (DI) and Information Richness (IR), particularly in Governance and Risk Management components.

0 summarizes the results of our automated analysis of CRE climate-related reporting (described in section 3.3). Both metrics reveal a consistent upward trend in the breadth and depth of climate-related reporting across all sections of the NZ CS. Notably, there is a distinct surge in scores following the implementation of the mandate. The average IR score increases more than tenfold from 2020 to 2023, exhibiting the expected effect the mandate is having on disclosure practices.

To formally assess the framework's impact on disclosure practices, beyond visually observing 0, Interrupted Time Series (ITS) regressions were employed. The results indicate a statistically significant upward trend in both DI and IR over the sample period. More importantly, the data reveals a substantial and significant effect attributable to the mandate's implementation, which holds across all entity types and all categories of the NZ CS. This provides further support to the conclusion that the mandate has significantly improved the climate-related reporting practices of CREs.

Governance leads, metrics and targets lag

Regarding the Disclosure Index (DI), Governance requirements were fulfilled most frequently following the mandate's implementation, followed closely by Strategy and Risk Management. Conversely, Metrics and Targets continue to lag other sections likely reflecting the inherent technical complexity and data requirements of this NZ CS section.

Across the full sample of both voluntary and mandatory reporting, the Strategy section consistently yields IR scores more than double those of other categories. While Governance was initially the second most discussed section, Risk Management overtook in 2023. Risk Management rose from the least discussed category prior to the FY 2021 mandate announcement to the second most prominent by FY 2023.

5.1. Survey and interview findings

Challenges in disclosure requirements

CREs face significant challenges in meeting climate risk disclosure requirements, including capability gaps, methodological uncertainty, and data limitations.

Complementing the quantitative analysis of CRE reporting presented above with qualitative results from the interviews in 2023 and 2025. CREs explained that they face a set of significant and interrelated challenges in meeting climate risk disclosure requirements, arising from capability constraints, methodological uncertainty, data limitations, and difficulties integrating climate considerations into core decision-making. Challenges with the framework are explored in more depth in Section 7.

Framework supports comparability, learning and cross-team collaboration

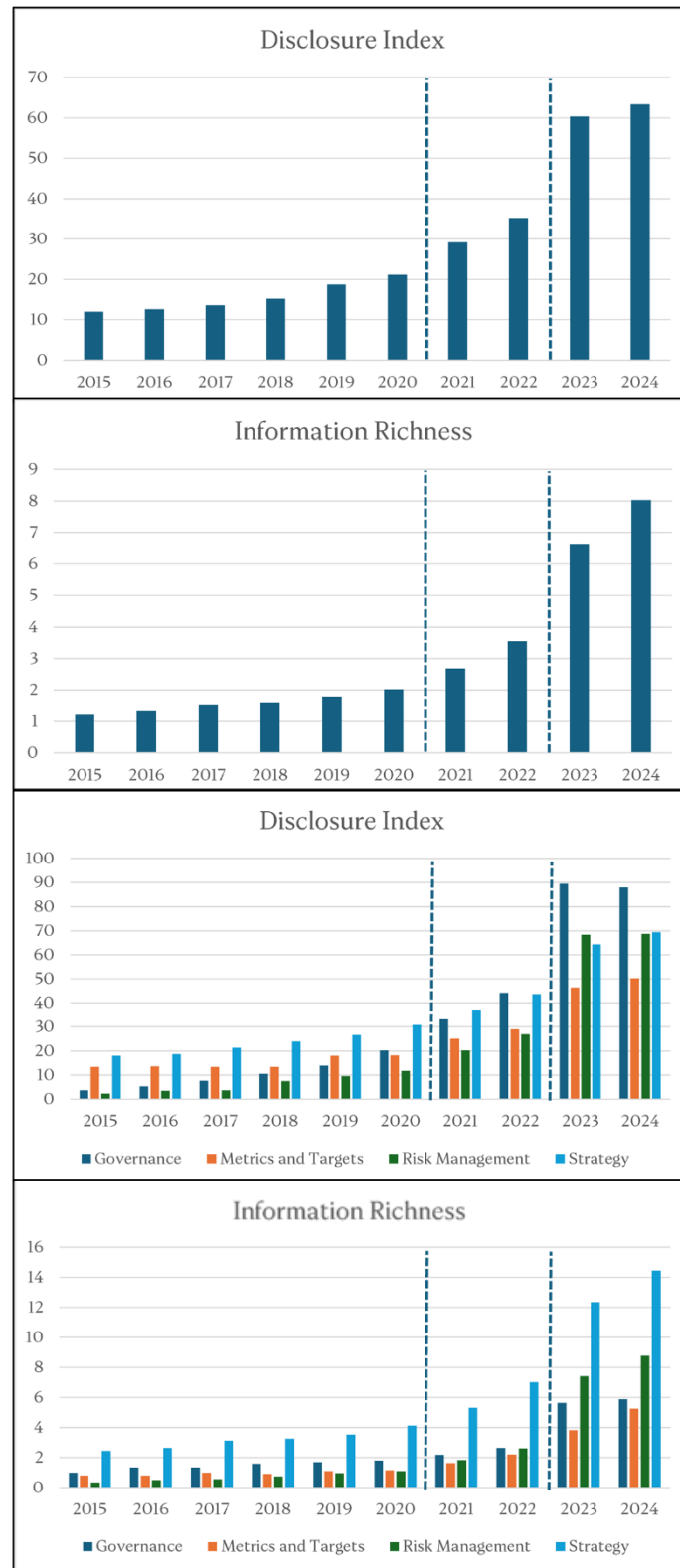
Interviewees stated that the mandate improves transparency and comparability, enabling more consistent and decision-useful climate information. Particularly scenario analysis promotes engagement with plausible climate futures, improving foresight despite methodological challenges. Further, the now systematic considerations of climate-related risks and opportunities drive organisational learning, cross-functional collaboration, and capability building. Interviewees appreciated the alignment with TCFD and global standards as it improves international compatibility and credibility of the disclosed information for investors.

Actions taken to improve reporting quality

In both surveys (2023 and 2025) we asked respondents about the actions they take to improve the quality of their reporting. The most popular approaches were developing a process for regular updates to Governance, defined roles for management, limited assurance over emissions and sector level collaboration on climate scenarios. Early reporters and corporates are more likely to engage in all the improvement actions.

Figure 5. Reports – Disclosure index and information richness

This figure presents the Disclosure Index (DI_t) and Information Richness (IR_t) disclosure metrics, defined in Section 3 of the sample. The top left presents the average DI_t and the bottom left presents the average IR_t , while the figures to the right present the metrics broken down by NZ CS category.



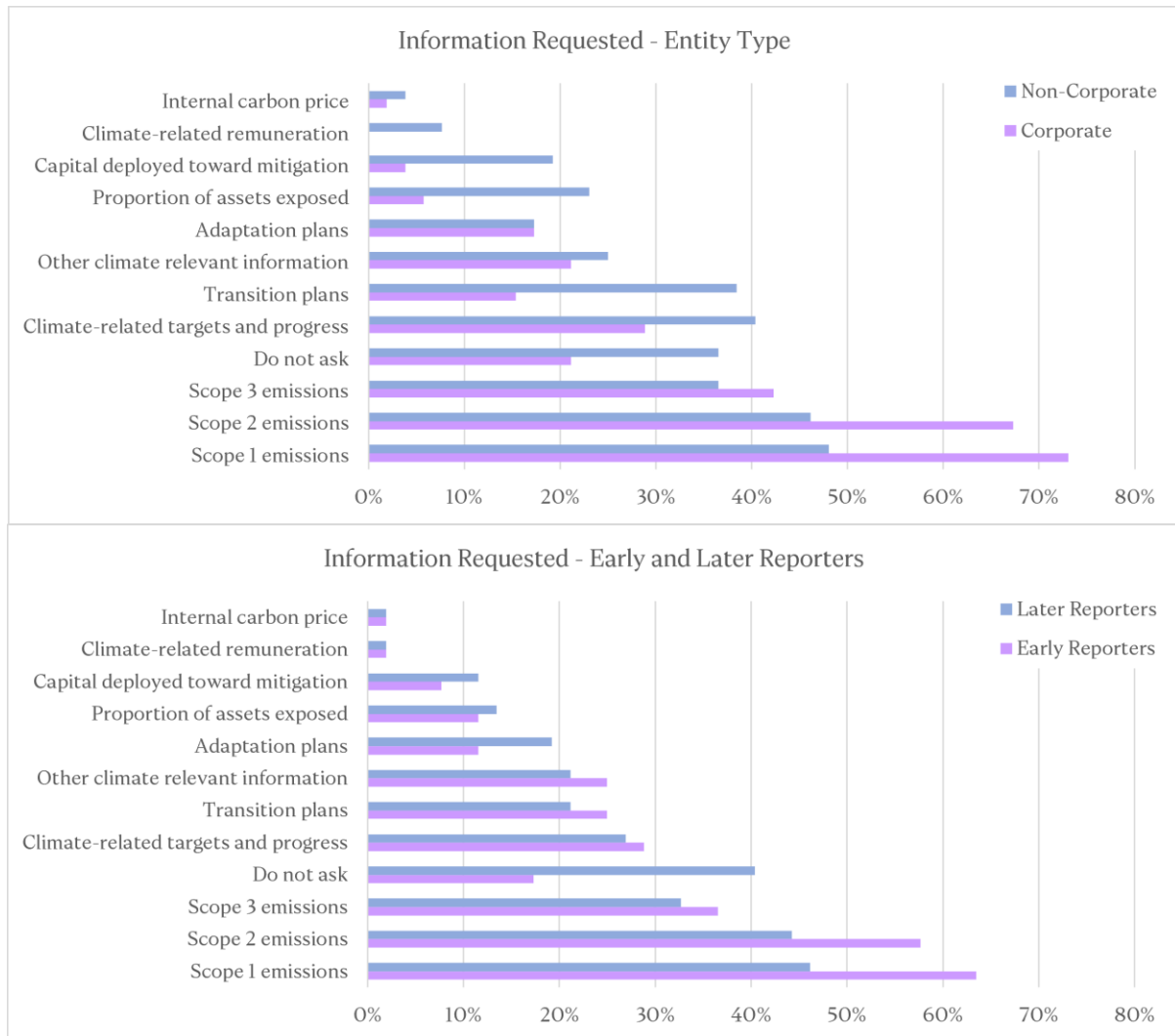
Information flows improve beyond CREs

To get an indication of how the framework affects CRE value chains beyond the direct effects, we asked respondents what kind of information they request from their investees, customers and suppliers, borrowers and insurers. Figure 6 summarises the responses. Most of the CREs ask for climate-related information from their value chains, with a focus on scope 1 and 2 emissions, but also scope 3, climate related targets and progress toward these.

While corporate respondents focus heavily on emissions, non-corporate requests are more broadly distributed across various climate metrics. Early reporters were more likely to ask for information from their value chains. Interestingly, non-corporates are less likely to request information directly from their value chain. This likely stems from their reliance on third-party data providers, particularly for investors managing portfolios with thousands of assets that extend beyond New Zealand.

Figure 6. Survey – Flow-on disclosure requests

This Figure presents percentage of survey respondents that ask for each type of climate-related information from their value chains from both the pre- and post-mandate survey responses combined.



6. Purpose 3: Capital allocation

This section evaluates the mandate's impact on capital allocation decisions. Evidence from interviews, surveys, and portfolio analysis indicates that while effects are still emerging, the framework is supporting climate-aligned investment strategies and improving non-financial performance across New Zealand funds.

6.1. Existing international evidence – Investor demand for and impact of climate information

Global investor demand

International evidence indicates a strong demand for climate, and broader sustainability-related disclosures from global capital markets. Institutional investors, in particular, highly value and actively demand climate risk disclosures (Borghei, 2021; Ilhan et al, 2023; Cohen, et al, 2023; Heath et al, 2023). This demand stems from the recognition that these risks are material and are beginning to materialize, with particular emphasis placed on transition risks (Amel-Zadeh & Serafeim, 2018; Krueger et al, 2020). Furthermore, institutional investor ownership is related to ESG performance of companies, further making the point that institutional investors are using this information in their capital allocation decision making (Gillan et al, 2021; Dyck et al, 2019).

Asset managers may be greenwashing

A nascent and growing stream of literature has been investigating asset manager 'greenwashing', or lack of capability, where institutions overstate their commitment to responsible investing to profit from the increased demand (Gibson Brandon et al, 2022). Specifically, investor commitments, such as adherence to the United Nations Principles for Responsible Investing (PRI), have been shown not to correlate strongly with portfolio level sustainability outcomes (Gibson Brandon et al, 2022; Kim & Yoon, 2023). Similarly, the labelling of funds as "responsible" or "sustainable" often fails to translate into superior portfolio sustainability performance (Raghunandan and Rajgopal, 2022). Recent evidence from the New Zealand retail investment market mirrors these international findings, suggesting potential gaps between claims and investment outcomes (Diaz-Rainey et al, 2025).

Capital allocation is impacted by early-phase disclosure mandates

More directly relevant to this evaluation is the developing literature around the effect disclosure mandates have on capital allocation decisions by investors. Mésonnier & Nguyen (2020) showed that the French Article 173 (2016) led to reduced fossil fuel financing by regulated investors. Miller et al. (2025) show that insurance company investment funds required to disclose fossil fuel investments, under the 2016 Californian mandate, reduced their fossil fuel investments by 20% relative to non-mandated funds. Lastly, Dai et al. (2025) show that the European Union's Sustainable Finance Disclosure Regulation (SFDR), which

requires disclosures from funds which self-classify by sustainability commitment, reduces such funds' average carbon emissions.

6.2. Survey and interview findings

Internal legitimacy

Interview evidence suggests that while the effects on capital allocation remain emergent, there is a notable shift in sentiment between 2023 and 2025. Early participants described the impact as "too early to tell", but by 2025 participants reported that disclosures are supporting internal business cases for climate initiatives and helping to channel capital towards mitigation and adaptation efforts. This effect is pronounced for organisations already engaged in such efforts, by enhancing visibility and legitimising climate-aligned investments.

Primary users state that the NZ CS is improving transparency and comparability but has not yet produced consistent, measurable changes in investment, lending, or underwriting decisions. This is due to low readership, methodological inconsistencies, data challenges, and the relatively limited weighting of climate risk compared with other financial metrics.

Overall, from the interviews we glean that the disclosure framework is best understood not as an immediate driver of capital reallocation but as an emerging infrastructure that is beginning to reshape how climate-related risk is governed, interpreted, and debated. One interviewee summarises this sentiment well in stating that the CRD process has "set us up for strong conversations to reallocate capital," even though material shifts have not yet occurred.

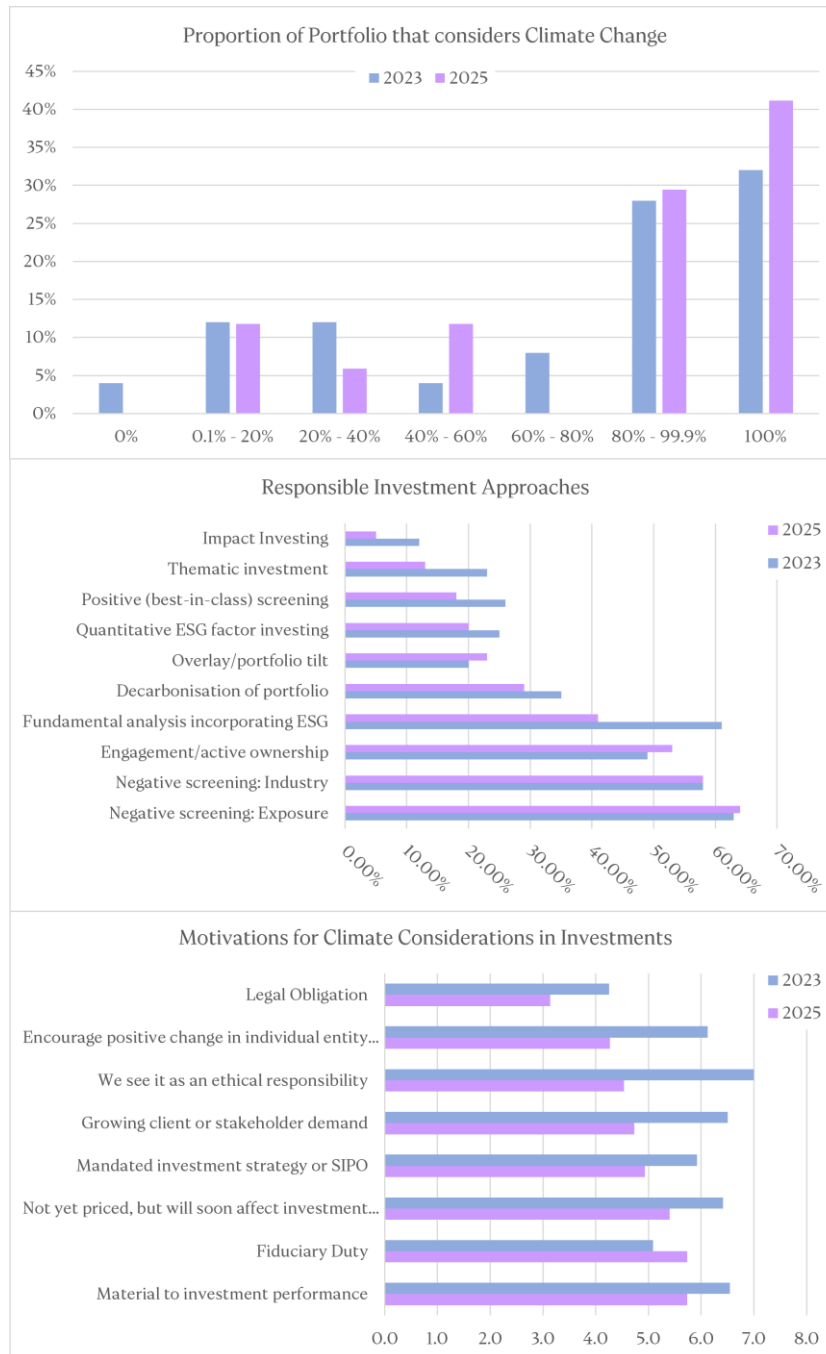
Broad integration by asset managers motivated by value

In the surveys we asked investors various questions around why and how they integrate climate-related risks and opportunities into the investment process. Figure 7 summarises the responses. We can see that most investors integrate climate-related risks across most of their portfolios (80-100%), with 41% of 2025 respondents integrating these risks across all investments. This has increased across funds from the 2023 to 2025 surveys, hinting that the mandate may be affecting portfolio allocation by New Zealand investors.

The most popular responsible investment approaches by respondent investors are negative screening and engagement, in line with previous findings in New Zealand (Diaz-Rainey et al, 2025) and the international literature. Lastly, Figure 7 shows what motivates investors to integrate climate change considerations into investment decisions, led by value (financial materiality, fiduciary duty and client demand) rather than values (ethical responsibility and to encourage positive change). This was stronger in 2025 than in 2023, showing that the mandate, and changing economic circumstances, may be focussing fund managers on the issues that are financially material.

Figure 7. Survey – Investor motivations and approaches

This Figure presents investor motivations for and approaches to integrating climate-related risks into the investment process, from survey responses. For more detailed results please see A6.



6.3. Analysis of fund manager capital allocation

The model

To assess the mandate's impact on capital allocation, we examined the portfolios of New Zealand fund managers (both CREs and non-CREs) from 2015 to 2025. This analysis is important for ascertaining capital allocation effects because while corporate issuers require significant time to transition physical assets and business processes, fund managers can adjust portfolio emissions and ESG performance almost immediately as they can buy and sell their mostly liquid investments on stock exchanges. Consequently, the mandate's effects are likely to manifest in investment portfolios before they appear in the non-financial performance of corporate issuers.

This analysis employs a Difference-in-Differences (DiD) model to examine how the climate-reporting mandate affected portfolio-level non-financial performance of NZ fund managers. By comparing climate-reporting funds (required to report under the framework) against non-reporting entities. Here, we evaluate whether NZ fund managers restructured their holdings in response to the Framework's announcement and implementation.

Importantly, while the underlying portfolios mostly include international entities not directly bound by New Zealand law, this study focuses on the aggregate portfolio performance managed by New Zealand based fund managers. We are testing if the mandate incentivized managers to shift exposure of their entire portfolio, regardless of where those individual entities are incorporated.

Table 8 summarises these results for portfolio level LSEG (ESG scores, Environmental scores, and Carbon Emissions Intensity) and RepRisk (ESG risk scores) data.²⁸

Mandate improves non-financial performance of New Zealand fund managers

Firstly, we can deduce that treated (CRE) funds tend to have better non-financial performance across the full sample, except for portfolio CEIs, which are lower but not statistically significantly so.²⁹ The announcement and implementation of the regime improves some of the metrics for treated, relative to non-treated, funds. Specifically, we can observe a significant attributable effect for LSEG ESG scores, driven by the Environmental pillar. This shows directly that NZ fund managers that have a reporting obligation significantly improved their non-financial performance, through asset allocation, relative to fund managers without such obligations.

Notably, the mandate dummy exhibits a highly significant positive coefficient across all portfolio level non-financial performance metrics studied. As the model includes controls,

²⁸ LSEG and RepRisk provide company level ESG data, which we aggregate at the portfolio level. The LSEG ESG score is stated to measure ESG risk and impact, while RepRisk is focussed on ESG risk of companies.

²⁹ It is important to note that RepRisk ESG risk scores measure the ESG risk of companies. Therefore a higher score is a negative indicator, i.e. more ESG risk.

fund fixed effects and year fixed effects, this indicates a significant, upward baseline shift in non-financial performance across the New Zealand fund market, after the mandate. This market-wide upward shift points to a systemic elevation in performance across the entire NZ fund management sector coinciding with the framework's announcement and mandate (implementation). This market-wide improvement holds for all tested portfolio variables. For RepRisk ESG risk scores, both the announcement and the mandate significantly reduced ESG risk. Conversely, improvements in LSEG ESG scores and carbon intensity were primarily driven by the mandate (implementation) rather than the announcement.

Collectively, this evidence suggests that the mandate is already reshaping capital allocation decisions throughout the New Zealand investment landscape, with a slightly stronger effect observed among treated funds, that is those with reporting obligations.

Table 8. Portfolios - Mandate effect on capital allocation

This table presents the results of the estimated DiD model:

$$ESG_{f,q} = \beta_0 + \beta_1 Post_q^{Announce} + \beta_2 Post_q^{Implement} + \beta_3 Treated_f + \beta_4 (Treated_f \times Post_q^{Announce}) + \beta_5 (Treated_f \times Post_q^{Implement}) + \sum_{j=1}^J \gamma_j X_{j,f,q} + \alpha_f + \epsilon_{f,q}$$

where $ESG_{i,t}$ is the portfolio-level ESG metric of interest for fund f in quarter q , calculated using the full look-through equity holdings of the funds (described in Section 3). $Treated$ is the treatment indicator, that equals one when the fund is part of a CRE and zero otherwise. $Post_q^{Announce}$ and $Post_q^{Implement}$ are the indicators for the policy announcement and implementation date. $X_{j,i,t}$ represents our various control variables, namely the fund's market value, quarterly return and age, following the literature (Alda, 2020; Raghunandan & Rajgopal, 2022; Diaz-Rainey et al, 2025). The model is estimated as a panel regression with fund clustered standard errors. The sample runs from mid-2002 until the first day of 2025. Observations where the fund-level ESG metric covers less than 60% of the fund's AUM are removed, as these cannot be seen as representative of the invested portfolio, as is common practice. The *, ** and *** indicate the statistical significance of the estimated coefficients at the 10%, 5% and 1% level of significance, respectively.

Dependent variables	LSEG ESG	RepRisk ESG	LSEG Env.	LSEG CEI (S1 & S2)	LSEG CEI (Tot)
<i>Treated</i>	7.74***	-14.13***	12.86***	-37.11	-558.41
<i>Post_q^{Announce}</i>	0.14	-1.46***	0.24	-6.33	102.24
<i>Post_q^{Implement}</i>	1.31***	-1.82***	2.41***	-32.64***	-310.58**
<i>Treated × Post_q^{Announce}</i>	0.78*	0.85	1.12**	0.15	-61.29
<i>Treated × Post_q^{Implement}</i>	0.73	0.78	1.09*	8.75	98.15
Controls	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
R ²	0.972	0.962	0.968	0.895	0.269
Number of observations (Funds)	2724 (333)	2807 (312)	2723 (333)	2681 (331)	2528 (314)

7. Costs and challenges in climate-related reporting

7.1. Survey and interview findings

Methodology and internal capabilities

Across the interviews, organisations consistently highlight that preparing climate disclosures demands new forms of long-term, forward-looking risk assessment, most notably scenario analysis. Scenario analysis remains difficult to operationalise due to limited internal expertise, sector-specific data gaps, and uncertainty about how to translate global, national and industry level scenarios into firm-level strategy. These methodological issues are compounded by inconsistent approaches across industries, leading to concerns about comparability, robustness, and the credibility of reported information.

A second major challenge, highlighted in the interviews, is organisational capability. Many firms, particularly those without prior experience in non-financial reporting, rely heavily on consultants for scenario modelling and emissions reporting. This reliance can limit internal learning and slow the development of in-house climate literacy, creating uneven quality across entities from firms with greater resources having the ability to purchase higher-quality analysis. This disparity is further shaped by differences in leadership commitment, resourcing, and competing priorities such as fiduciary obligations or short-term financial pressures, which can constrain substantive integration of climate risk into strategic processes.

Challenges with strategy integration

Although the mandate has prompted more board-level discussions and improved internal governance processes, many organisations report, particularly in 2025, that disclosures remain parallel to, rather than embedded within, corporate strategy and financial planning.

Taken together, these challenges indicate that while climate risk disclosures are beginning to reshape governance and internal processes, substantial hurdles remain in capability building, data quality, methodological consistency, and the translation of disclosed information into meaningful financial and strategic decisions.

Cost, data barriers and regulatory uncertainty

Turning to the survey data, Figure 8 shows that the predominant challenges for CREs are costs, lack of reliable and comparable data, regulatory uncertainty and lack of stakeholder demand. Comparing 2023 and 2025 responses shows that the challenge around multiple reporting frameworks has reduced, but the lack of stakeholder demand and regulatory uncertainty have become more pronounced. In 2025, regulatory uncertainty is a challenge for both corporate and non-corporate respondents (75% and 71%) and the increased challenge with a lack of stakeholder demand is more common for corporate respondents (55% vs 75%). The growing challenge with stakeholder demand may be explained by CREs

now having to report, while those that chose to report before the mandate (surveyed in 2023) may have made this choice due to stakeholder demand.

Data and cost issues are the top challenges across both surveys. Lastly, we can observe that the perceived lack of stakeholder demand has vastly increased from the 2023 to 2025 survey. The reasons for this perceived lack of stakeholder demand are unclear from the data, but it may be that the relationship between reporting entity and the information user is indirect. Climate-related reporting fills data gaps for ESG data providers, which then provide better data to investors. Evidence of this is presented in section 4.3 above where we see ESG scores increasing for reporting companies. This could be explored further in subsequent research by, for example, engaging with ESG data providers on the value they get from the improved reporting framework.

Current and expected cost trends

To explore in detail the challenge of costs we asked respondents to share their internal and external costs of reporting in the 2025 survey. Figure 8 illustrates the distribution of current and projected costs. We can observe that the entities that started climate-related reporting before the mandate (Early Reporters) tend to have somewhat lower costs overall (both internal and external). Later reporters dominate the over \$500,000 cost response for both internal and external costs. Those entities with reporting costs below \$100,000 (both external and internal) are expecting costs to increase or stay the same, while those with current costs of \$100,000-250,000 and \$250,000-500,000 mostly expect costs to stay the same or decrease.

This shows that, although not insignificant, the highest costs are concentrated in later reporting entities and expected to decline as entities gain experience with the framework, while average costs are stabilising.



Figure 8. Survey – Climate-related reporting challenges

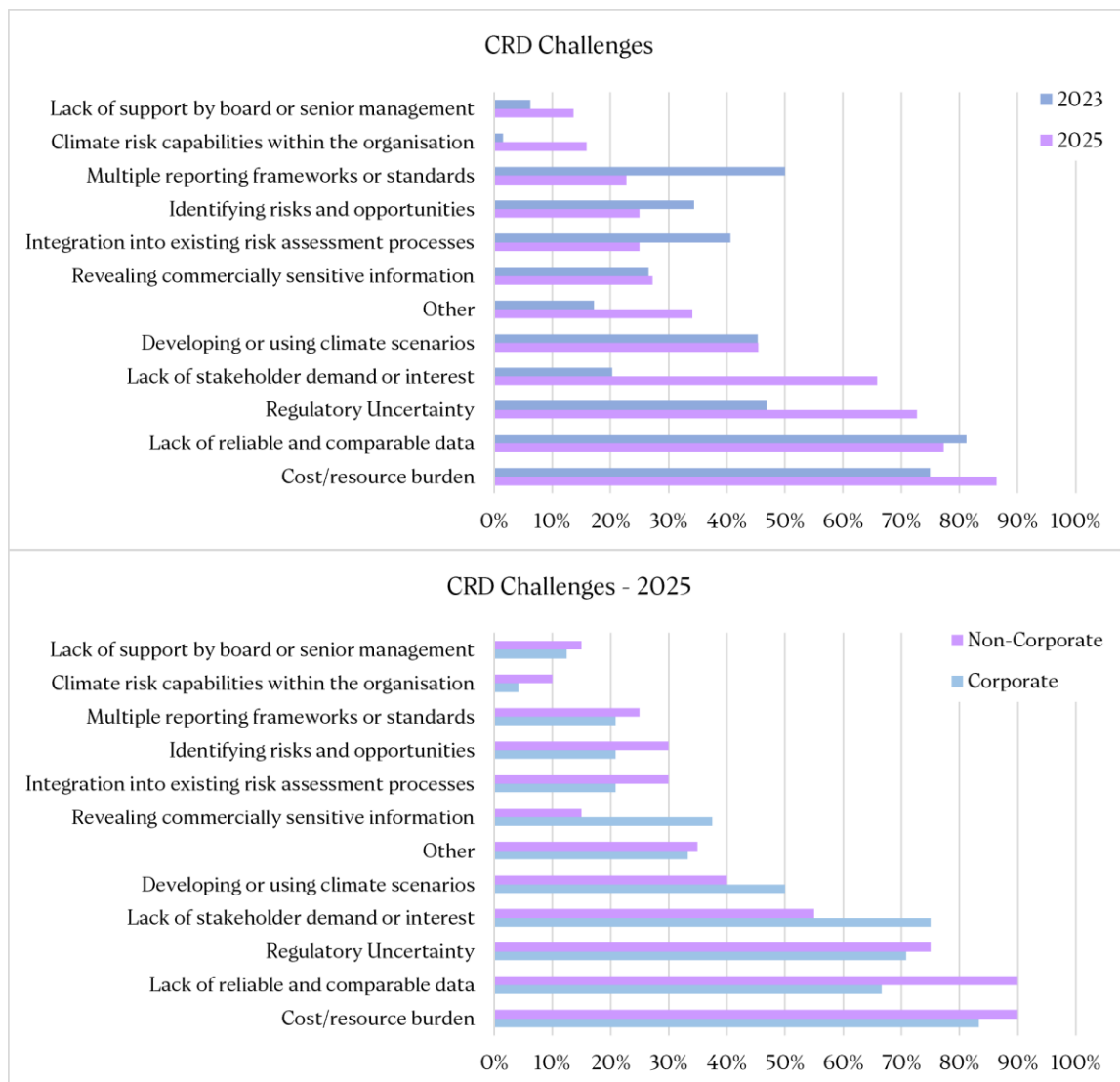


Figure 9. Survey – Current and expected costs of climate-related reporting



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Appendices

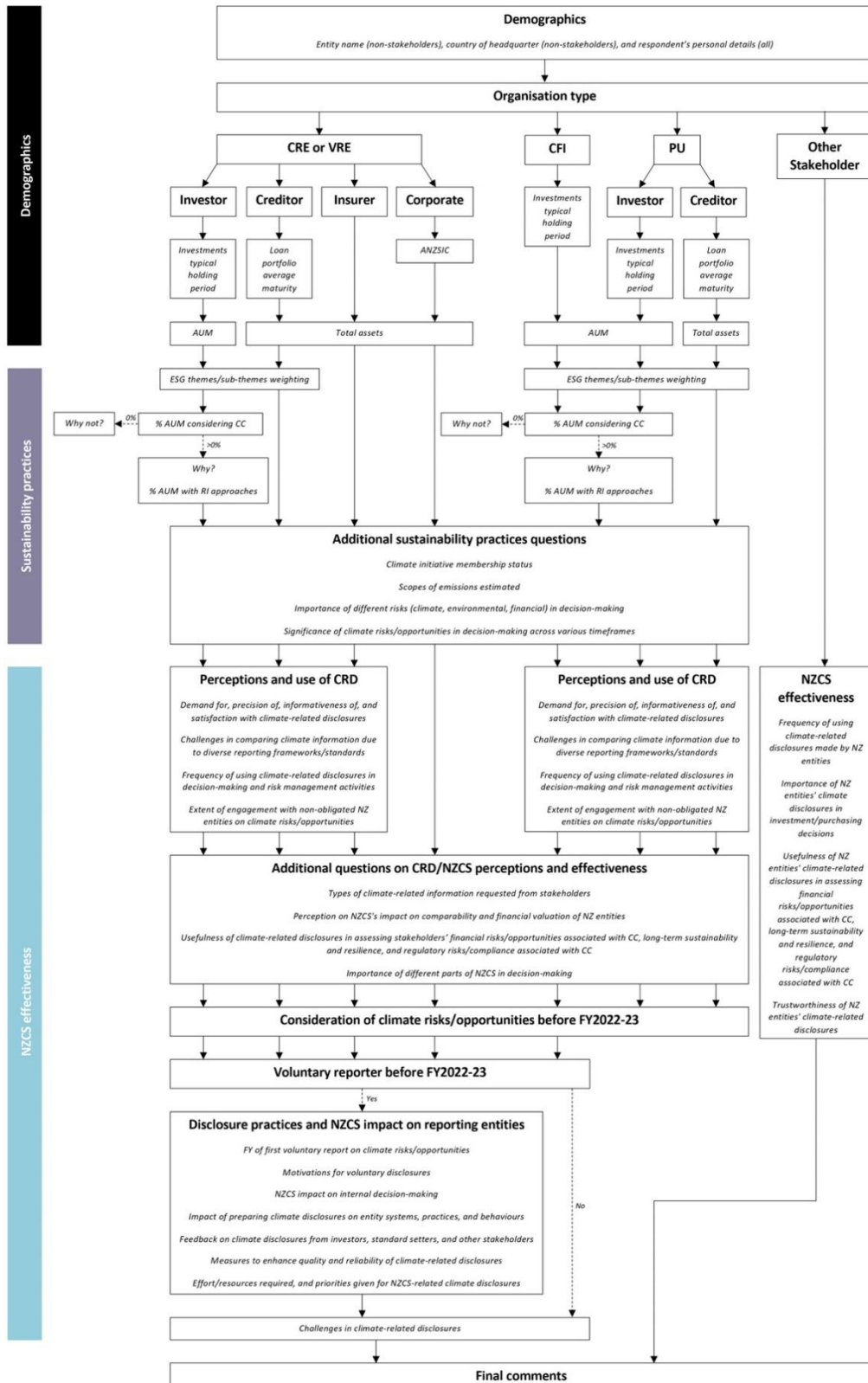
A1. Interview question framework

The interview questions focused on aspects of the disclosures and are copied below:

1. What is the story/process of your climate risk disclosure? When, how and why did you start the process of disclosing?
2. What is your understanding of climate risk?
3. What informs your decision-making around climate risk? Can you give an example of this in practice?
4. What is the perception of the XRB requirements in your organisation?
5. How has creating the climate-related disclosures changed organisational practices and processes?
6. In line with the above question, can you speak to your capital allocation and investment decisions?
7. Has working towards meeting the XRB requirements affected future decision-making in your organisation? How has the process of scenario modelling been for your organisation?

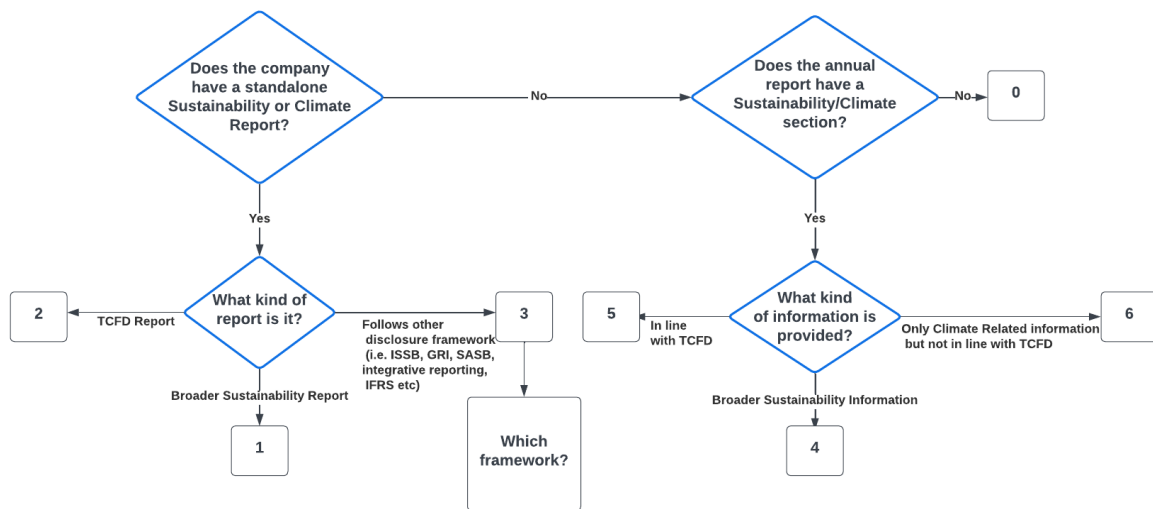


A2. Survey flow



A3. Report classification logic

The below flowchart shows the process for a high level coding of the voluntary non-financial disclosures by CREs for the Financial Years 2015 to 2022. It is important to note that the level of information required for code 4 and 6 relating to broader sustainability and climate-related information in the annual reports is quite low and will vary within that category. Some annual reports will present TCFD information, but also broader sustainability information, in this case it is coded as a 4, as climate-related information is the focus of this research.



A4. Disclosure Index Indicator Questions

This table presents a full list of all the indicator questions used in the RAG system, as described in section 3.3.

#	Indicator
1	Does the entity explain which governance body is responsible for climate-related risks and opportunities?
2	Does the entity explain the process and frequency by which the governance body is informed about climate-related risks and opportunities?
3	Does the entity explain how it ensures that board members have the required skills and competencies to oversee climate-related risks and opportunities?
4	Does the entity explain how the governance body considers climate-related risks and opportunities when developing and overseeing implementation of the entity's strategy?
5	Does the entity explain how the governance body sets, monitors progress against, and oversees achievement of metrics and targets for managing climate-related risks and opportunities?
6	Does the entity provide any disclosure regarding the linkage (or non-linkage) of remuneration and bonuses to metrics for managing climate-related risks and opportunities?
7	Does the entity explain how climate-related responsibilities are assigned to management-level positions or committees?
8	Does the entity explain the frequency and process by which management-level positions or committees engage with the governance body responsible for climate-related risks and opportunities?
9	Does the entity explain where management-level positions or committees with climate-related responsibilities lie in the organisational structure?
10	Does the entity explain the process and frequency by which management is informed about climate-related risks and opportunities?
11	Does the entity disclose its current physical and transition impacts?



12	Does the entity disclose the current financial impacts of its physical and transition impacts?
13	Does the entity explain how it has undertaken scenario analysis to help identify its climate-related risks and opportunities?
14	Does the entity explain how it has analysed at minimum a 1.5 degree Celsius scenario, a 3 degree or greater scenario, and a third climate-related scenario?
15	Does the entity disclose its definition of short-, medium-, and long-term horizons for planning, anticipated financial impacts, and risk management?
16	Does the entity disclose how the horizons for considering climate-related risks and opportunities are linked to its strategic planning horizons?
17	Does the entity disclose the physical or transition risk nature of its climate-related risks and opportunities?
18	Does the entity disclose the sector and geography of its climate-related risks and opportunities?
19	Does the entity explain how climate-related risks and opportunities affect internal capital deployment and funding decision-making processes?
20	Does the entity disclose its anticipated impacts from climate-related risks and opportunities?
21	Does the entity disclose anticipated financial impacts of its physical and transition impacts?
22	Does the entity describe its current business model and strategy?
23	Does the entity describe its transition plan?
24	Does the entity explain how its business model and strategy might change to address climate-related risks and opportunities?
25	Does the entity disclose transition activities aligned with its internal capital deployment and funding decision-making?
26	Does the entity describe the tools and methods used to identify and assess the scope, size, and impact of its climate-related transition and physical risks?
27	Does the entity disclose which, if any, components of its value chain are excluded from its climate-related risk management?
28	Does the entity disclose how frequently it assesses its climate-related physical and transition risks for risk management purposes?
29	Does the entity disclose the priority of climate-related physical and transition risks relative to other risks and how this prioritisation is determined?
30	Does the entity describe how identifying, assessing, and managing climate-related physical and transition risks is integrated into the overall risk management process?
31	Does the entity disclose its Scope 1 gross emissions in metric tonnes of CO_2e ?
32	Does the entity disclose its Scope 2 gross emissions in metric tonnes of CO_2e ?
33	Does the entity disclose its Scope 3 gross emissions in metric tonnes of CO_2e ?
34	Does the entity disclose its GHG emissions intensity?
35	Does the entity disclose the definition of its GHG intensity (product, service, or sales-based)?
36	Does the entity disclose which standard(s) it used to measure its GHG emissions?
37	Does the entity disclose which emissions consolidation approach it used (equity share, financial control, or operational control)?
38	Does the entity disclose the source of emissions factors and global warming potential rates used?
39	Does the entity disclose which emissions sources, facilities, or assets are excluded from its GHG measurement?
40	Does the entity provide justification for excluding sources of emissions from its GHG measurement?
41	Does the entity disclose the amount or percentage of assets or activities vulnerable to transition risks?
42	Does the entity disclose the amount or percentage of assets or activities vulnerable to physical risks?
43	Does the entity disclose the amount or percentage of assets or activities aligned with climate-related opportunities?
44	Does the entity disclose the amount of capital expenditure, financing, and/or investment deployed toward climate-related risks and opportunities?
45	Does the entity disclose its internal emissions price per metric tonne of CO_2e ?
46	Does the entity disclose the percentage, weight, or amount of management remuneration linked to climate-related risks and opportunities?
47	Does the entity disclose KPIs used to measure and manage climate-related risks and opportunities beyond GHG emissions?



48	Does the entity disclose specific targets used to manage climate-related risks and opportunities?
49	Does the entity disclose performance against its specific climate-related targets?
50	Does the entity disclose the timeframe for climate-related targets?
51	Does the entity disclose interim targets for managing climate-related risks and opportunities?
52	Does the entity disclose progress toward its climate-related targets?
53	Does the entity disclose GHG emissions reduction targets?
54	Does the entity disclose whether GHG emissions targets are absolute or intensity-based?
55	Does the entity disclose how its GHG targets contribute to limiting global warming to 1.5°C?
56	Does the entity disclose the basis for claiming alignment of its GHG targets with a 1.5°C pathway?
57	Does the entity disclose whether its GHG targets rely on offsets?
58	If GHG targets rely on offsets, does the entity disclose whether offsets are verified or certified and under which scheme(s)?

A5. Firm Outcomes – Summary Statistics

This table presents the summary statistics of the variables used in the reporting and firm outcomes analysis in section 4.3.

Variable	N	Mean	Median	SD	Q25	Q75
<i>Illiquidity</i>	958	2750.93	78.42	11647.58	9.26	665.30
<i>LSEG ESG</i>	903	29.03	28.96	23.98	0.00	45.70
<i>S&P ESG</i>	362	46.91	45.50	25.84	25.00	66.00
<i>Bloomberg ESG</i>	369	3.13	2.94	1.15	2.38	3.98
<i>Scope 1 & 2 CEI</i>	871	168.34	35.26	532.28	14.26	100.39
<i>Ln(Total Assets)</i>	991	6.85	6.679	1.87	5.54	8.07
<i>Leverage</i>	988	0.23	0.23	0.16	0.11	0.33
<i>Return on Assets</i>	861	0.029	0.04	0.12	0.01	0.07
<i>Market-to-Book ratio</i>	798	3.10	1.02	10.40	0.69	2.24

A6. Extended survey results

Table 9. Survey – Actions to improve quality and reliability of climate-related disclosures

This table shows the frequency (#) and proportion (%) of survey respondents that select each measure for improving the quality and reliability for their climate-related disclosures. Differences in number of useful responses for the full sample presented in Table 2 and this table are driven by the number useful responses to the respective questions.

Measures Taken to Increase Quality and Reliability of climate-related disclosures	2023 (Early Reporters)								2025							
	Non-corporate		Corporate		Overall		Early reporters		Later reporters		Non-corporate		Corporate		Overall	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
We have implemented processes on regularly informing the governance body on climate risks and/or opportunities	7	64%	15	75%	22	71%	15	79%	18	72%	14	70%	19	79%	33	75%
We have defined roles and responsibilities for the management of climate risks and/or opportunities	8	73%	13	65%	21	68%	14	74%	19	76%	15	75%	18	75%	33	75%
We have obtained limited assurance over our GHG emissions disclosures	5	45%	9	45%	14	45%	15	79%	14	56%	8	40%	21	88%	29	66%
We have participated in sector-level climate scenario analysis	9	82%	18	90%	27	87%	11	58%	16	64%	12	60%	15	63%	27	61%
We have integrated climate risks and/or opportunities within our overall strategy	7	64%	14	70%	21	68%	14	74%	12	48%	10	50%	16	67%	26	59%
We have hired climate-related disclosure experts	3	27%	14	70%	17	55%	11	58%	13	52%	10	50%	14	58%	24	55%
We have added to our data and information internal audit processes	7	64%	6	30%	13	42%	11	58%	8	32%	6	30%	13	54%	19	43%
We have built capacity on climate risk and/or opportunity identification and management via external training	4	36%	9	45%	13	42%	9	47%	10	40%	8	40%	11	46%	19	43%
We have made changes to the governance body to ensure that it possesses the skills and competencies to effectively oversee climate risks and/or opportunities	4	36%	6	30%	10	32%	7	37%	10	40%	4	20%	13	54%	17	39%
We have obtained reasonable assurance over our GHG emissions disclosures	2	18%	10	50%	12	39%	6	32%	5	20%	3	15%	8	33%	11	25%
We have incorporated climate risks and/or opportunity-related metrics and targets into remuneration policies	2	18%	10	50%	12	39%	8	42%	1	4%	1	5%	8	33%	9	20%
Other	0	0%	0	0%	0	0%	2	11%	4	16%	4	20%	2	8%	6	14%
None	0	0%	0	0%	0	0%	0	0%	1	4%	1	5%	0	0%	1	2%
Total	11		20		31		19		25		20		24		44	



Table 10. Survey – Importance of climate-related risks

This table shows the average (mean) results for questions related to the importance of climate-related risks and opportunities in entities' decision making. Differences in number of useful responses for the full sample presented in Table 2 and this table are driven by the number useful responses to the respective questions. The first panel explores the relative importance of climate, environmental and financial risks, while the second panel explores the timing of importance of these risks. Both panels use a 5-point Likert scale where a response can range from 1 = completely unimportant to 5 = extremely important.

	2023			2025			Diff.
Importance of different types of risks in decision-making	Non-corporate	Corporate	All	Non-corporate	Corporate	All	All
Financial risk (earnings, leverage, pay-out policy, etc.)	4.5	4.4	4.4	4.4	4.7	4.5	0.1
Climate-related physical risk	4.1	4.3	4.2	3.8	4.0	3.9	-0.3*
Climate-related transition risk	4.1	4.3	4.2	3.5	4.0	3.7	- 0.5***
Other environmental risk (pollution, recycling, biodiversity loss etc.)	3.8	3.9	3.8	3.1	3.5	3.3	-0.5**
Climate-related liability risk	3.9	3.6	3.7	3.2	3.4	3.3	-0.4**
Total	35	35	70	22	24	46	
Importance of climate change in decision-making over:							
Past 5 years	3.4	3.6	3.5	3.3	3.3	3.3	-0.2*
Last year	4.1	4.3	4.2	3.6	3.8	3.7	-0.5**
Next year	4.2	4.5	4.3	3.7	3.8	3.7	- 0.6***
Next 5 years	4.6	4.7	4.7	3.8	4.0	3.9	- 0.8***
Total	35	35	70	22	24	46	



Table 11. Survey – Importance of disclosure standard components

This table shows the results from asking survey respondents about the importance of the various components of the disclosures standards required under the framework. The table presents mean survey responses to a range of 5-point Likert scale where a response can range from 1 = completely unimportant to 5 = extremely important. Differences in number of useful responses for the full sample presented in Table 2 and this table are driven by the number useful responses to the respective questions.

Disclosure standard section	2023			2025			Diff. All
	Non-corporate	Corporate	All	Non-corporate	Corporate	All	
Governance	3.9	4.2	4.0	3.1	3.6	3.4	
Governance body oversight	3.9	4.2	4.0	3.0	3.7	3.4	-0.7***
Management's role	3.9	4.1	4.0	3.1	3.6	3.4	-0.6***
Strategy	3.8	4.1	3.9	3.3	3.8	3.6	
Current impacts and financial impacts	3.8	4.2	4.0	3.3	3.7	3.5	-0.5**
Scenario analysis undertaken	3.5	3.9	3.7	3.3	3.4	3.3	-0.3
Climate risks and/or opportunities	4.0	4.2	4.1	3.4	4.1	3.8	-0.3*
Anticipated impacts and financial impacts	3.9	4.1	4.0	3.2	3.7	3.5	-0.5*
Transition plan aspects	3.7	4.1	3.9	3.5	3.9	3.7	-0.2
Risk management	4.1	4.0	4.0	3.0	3.7	3.4	-0.6***
Metrics and targets	3.7	4.0	3.8	3.3	3.6	3.5	
Metric categories	3.6	3.8	3.7	3.2	3.5	3.4	-0.3**
Targets	3.8	4.0	3.9	3.2	3.5	3.4	-0.5***
GHG emissions	3.7	4.1	3.9	3.5	3.8	3.6	-0.3*
Number of observations	35	35	70	22	24	46	



Table 12. Survey – Investor motivations and approaches

This table shows the results from asking survey respondents, specifically fund managers, about their holding period, climate change considerations and motivations for such considerations. The first panel reports the frequency and proportion of respondents that selected each holding period. The second panel presents the number and proportion of respondents that consider climate change across their portfolios, by proportion of portfolio categories. Lastly, the table presents mean survey responses to a range of 10-point Likert scale questions where a response can range from 1 = not a motivating factor to 5 = extremely important motivating factor. Differences in number of useful responses for the full sample presented in Table 2 and this table are driven by this table only presenting responses from investors and the number useful responses to the respective questions.

Average holding period	2023		2025	
	Freq.	%	Freq.	%
No typical holding period; decide on a case-by-case basis	11	44%	11	65%
Less than 12 months	1	4%	1	6%
1 year to 5 years	6	24%	0	0%
5 years to 10 years	2	8%	0	0%
More than 10 years	5	20%	5	29%
Total	25		17	
% assets under management that consider climate change	2023		2025	
	Freq.	%	Freq.	%
0%	1	4%	0	0%
0.1% - 20%	3	12%	2	12%
20% - 40%	3	12%	1	6%
40% - 60%	1	4%	2	12%
60% - 80%	2	8%	0	0%
80% - 99.9%	7	28%	5	29%
100%	8	32%	7	41%
Total	25		17	
Motivation for climate change consideration (0-10)	Average		Average	
We see it as an ethical responsibility	7.0		4.5	
Climate change information is material to investment performance	6.5		5.7	
Growing client or stakeholder demand	6.5		4.7	
Climate change information, although not yet priced, will soon affect investment performance	6.4		5.4	
We believe this will encourage positive change in individual entity climate actions	6.1		4.3	
It is part of our mandated investment strategy or SIPO	5.9		4.9	
Incorporating climate change information in investment decisions is a fiduciary duty	5.1		5.7	
Incorporating climate change information in investment decisions is a legal obligation	4.3		3.1	
Total	24		17	
Average % assets under management that incorporate RI approaches below:	%		%	
Negative screening: exposure based	63%		64%	
Fundamental analysis incorporating ESG considerations	61%		41%	
Negative screening: industry based	58%		58%	
Engagement/active ownership with companies on ESG	49%		53%	
Decarbonisation of portfolio	35%		29%	
Positive (best-in-class) screening	26%		18%	
Quantitative ESG factor investing	25%		20%	
Thematic investment	23%		13%	
Overlay/portfolio tilt	20%		23%	
Impact Investing	12%		5%	
Total	24		17	



A7. Portfolio analysis summary statistics

Outcome variable	LSEG ESG score	RepRisk ESG risk rating	LSEG environmental score	Carbon intensity (S1+2)	Carbon intensity (Total)
Number of treated funds	244	229	244	243	229
Number of non-treated funds	89	83	89	88	85
Total number of funds	333	312	333	331	314
Mean outcome value	62.05	19.88	56.06	139.74	290.73
Standard deviation	9.892	9.605	12.293	142.411	1375.248
Average data coverage	89.3%	83.1%	89.3%	89.6%	83.8%
Mean fund size (\$ millions)	227.71	223.07	227.63	229.25	222.28
Std Fund Size (\$ millions)	441.81	429.04	441.87	444.22	424.13
Mean age (Years)	9.588	8.881	9.590	9.600	9.721
Mean quarterly return (% annualised)	1.086	2.123	1.092	1.135	0.995
Standard quarterly return (% annualised)	7.907	7.292	7.903	7.957	7.584

A8. Portfolio analysis results – Limited sample

This Table presents the estimated coefficients of the Difference-in-Difference (DiD), testing the effect of the CRD Act announcement and implementation on the portfolio non-financial performance of New Zealand investment funds, when using Morningstar portfolio level data. The estimated DiD model is:

$$ESG_{f,q} = \beta_0 + \beta_1 Post_q^{event} + \beta_2 Treated_f + \beta_3 (Treated_f \times Post_q^{event}) + \sum_{j=1}^J \gamma_j X_{j,f,q} + \alpha_f + \epsilon_{f,q}$$

where $ESG_{i,t}$ is the portfolio-level ESG metric of interest for fund f in quarter q , calculated by MorningStar. $Treated$ is the treatment indicator, that equals one when the fund is part of a CRE and zero otherwise. $Post_q^{event}$ is the indicator for either the policy announcement or implementation date. $X_{j,i,t}$ represents our various control variables, namely the fund's market value, quarterly return and age, following the literature (Alda, 2020; Raghunandan & Rajgopal, 2022; Diaz-Rainey et al., 2025). The model is estimated as a panel regression with fund clustered standard errors. The sample runs from mid-2002 until the first day of 2025. Observations where the fund level ESG metric covers less than 60% of the fund's assets under management are removed, as these cannot be seen as representative of the invested portfolio, as is common practice. The *, ** and *** indicate the statistical significance of the estimated coefficients at the 10%, 5% and 1% level of significance, respectively.

Independent variables	Sustainability rating	Carbon risk score	ESG risk exposure	Carbon intensity	Sustainability rating	Carbon risk score	ESG risk exposure	Carbon intensity
	Announcement effect				Implementation effect			
$Treated_i \times Post_t^{Announce}$	0.03***	0.05***	-0.01***	0.12***				
$Treated_i \times Post_t^{Implement}$					0.05***	-0.00	0.02***	-0.13***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.004	0.890	0.953	0.869	0.008	0.887	0.954	0.869

