

Tonkin+Taylor

Anticipated Financial Impacts: Putting numbers to climate risk

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Contents

00 | Executive summary

01 | The underlying value of AFIs

02 | What physical risk engineering brings to the table

03 | From damage estimate to financial consequences

04 | What credible AFIs look like

05 | Why Tonkin + Taylor is well positioned to help

06 | Five questions for your executive and board





01 | Executive summary

Executive summary

Calculating the anticipated financial impacts of climate hazards is new territory for many companies; but not for engineering consultants.

Companies increasingly need to explain how climate change could affect the assets, operations and markets on which their earnings depend. An anticipated financial impact (AFI) assessment provides a disciplined way to connect climate drivers with business consequences and financial outcomes. Fundamentally, the purpose is to improve decisions about capital, resilience, insurance, operations, transition planning and disclosure; rather than to develop precise financial estimates of potential loss.

The most useful AFI assessments are cross-functional. They combine climate and hazard information with asset knowledge, operational dependencies, financial assumptions and management judgement. The result should be understandable to executives and boards, transparent to financial stakeholders, and proportionate to the circumstances or decision at hand.

For sustainability leaders, this means building a defensible evidence base for climate disclosures and transition planning. For CFOs, it means translating that evidence into financial measures, investment choices, risk appetite and capital allocation.

Engineering consultants are well positioned to do this work because they are qualified to explain how a hazard affects a real facility, what could fail and how recovery or adaptation could change the outcome. All of this is relevant to the AFI calculation process.

This paper explains how the process works in practice when combined with climate scenarios. The aim is to help companies understand the logic behind established anticipated financial impact assessment practices.

Whilst new territory for many companies, calculating anticipated financial impacts resulting from climate-driven hazards is familiar territory for engineering companies like T+T.



01 | The underlying value of AFIs

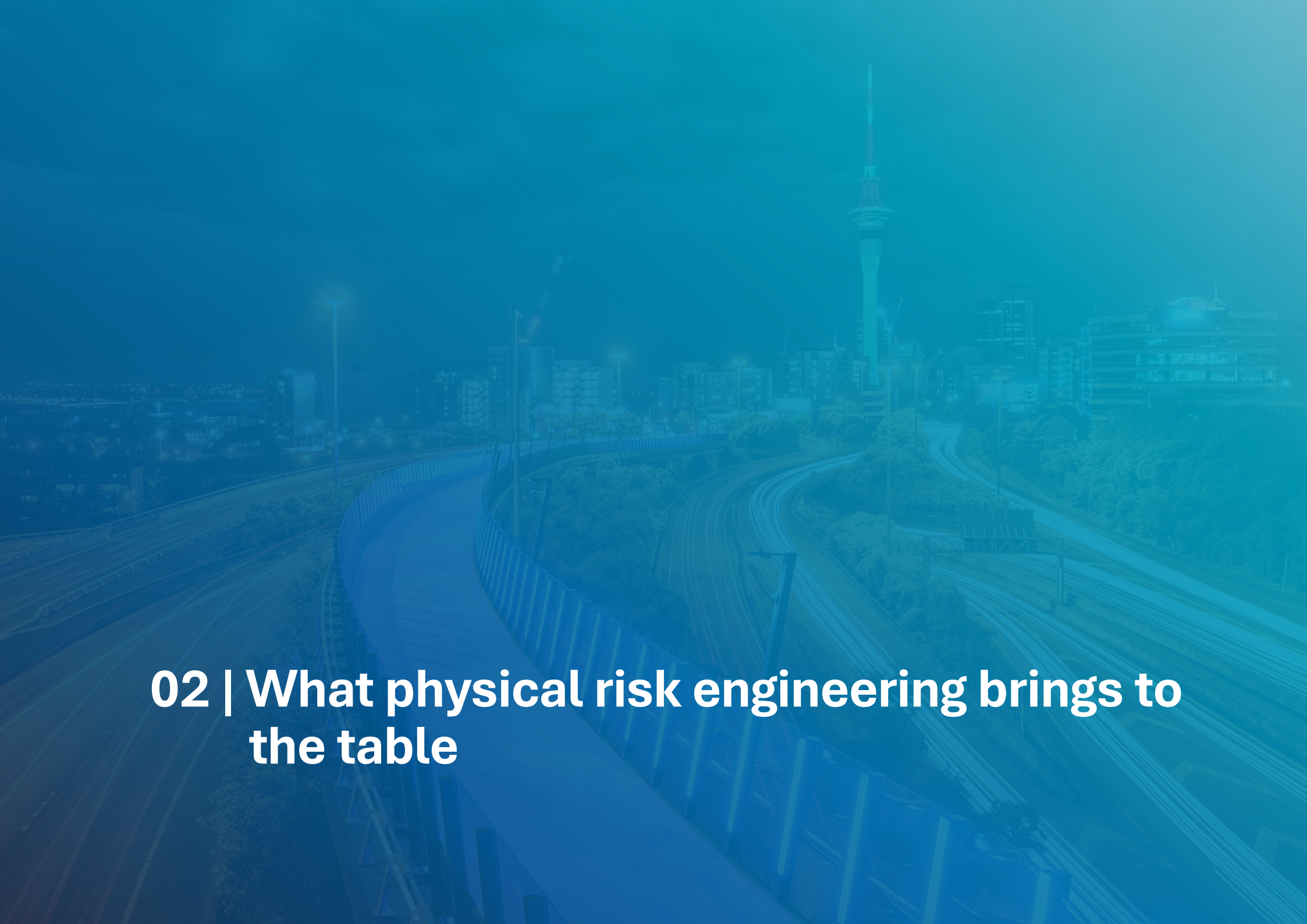
The underlying value of AFIs

Understanding the anticipated financial impacts of climate driven events is all about good financial governance; and disclosure to financial stakeholders makes sense.

An investment in a facility, a supply agreement or an adaptation project commits a business to assumptions about its future operating conditions. Climate change can alter those conditions during the life of the investment. A useful AFI assessment helps executives examine what climate-driven impacts could mean for earnings, cash flow and capital needs, so they can compare the cost of reducing exposure with the consequences of leaving the risk unaddressed.

This gives sustainability managers and finance teams a shared basis for decisions that otherwise often sit in separate conversations. A facility may appear highly exposed on a flood map, yet a modest change to the height of critical equipment could materially reduce potential losses. Equally, a site with limited physical damage could face a prolonged shutdown if its access road or electricity supply fails. Understanding those differences helps a company direct adaptation spending to its most material financial consequences.

New Zealand's climate disclosure requirements formalise this need under NZ CS 1 paragraph 15 with a requirement for entities to disclose anticipated climate-related impacts, their anticipated financial impacts and the relevant time horizons. However, the underlying analysis is equally relevant to companies outside the mandatory regime. That is because it can support capital allocation and insurance decisions, and test whether transition planning is feasible and properly financially resourced.



02 | What physical risk engineering brings to the table

What physical risk engineering brings to the table

Engineering professionals have been quantifying physical damage potential for decades.

The approach combines an understanding of hazard, exposure and vulnerability with damage and loss estimation. These four connected steps provide the foundation for assessing how physical climate risks could affect a business.

Hazard characterisation establishes the conditions an asset could face and how often they might occur. For flooding, models translate rainfall and river flows into the depth, velocity and duration of water at a specific location. Like a weather forecast, the hazard map describes conditions the business may need to withstand. Coastal flooding, heat, drought and wind require their own models, but the commercial question remains how those conditions would affect the company's ability to operate.

Exposure mapping connects those conditions to the business. Analysts start with a verified asset register, giving each asset a location, identifier and operational role. Addresses are converted to coordinates and checked against building footprints in a geographic information system (GIS). Overlaying that inventory with hazard maps for selected event probabilities, scenarios and time horizons identifies which assets are exposed and to what conditions.

For material sites, mapping may need checks against terrain and surveyed floor or equipment levels. Water half a metre above the ground has different consequences for a raised building than for one at ground level. Operations staff can also identify exposed access routes, utilities and critical suppliers, because the business may be unable to operate even where its own facility remains usable.

Vulnerability assessment asks how the exposed asset or operation would respond. Depth-damage curves relate flood depth, usually measured relative to floor level, to the expected cost or proportion of damage to buildings, equipment and contents. A curve is a guide to the repair consequences of different water levels; construction and occupancy determine which curve is suitable.

The evidence behind these curves comes from two complementary approaches. Curves based on observed damage draw on flood surveys, repair costs and, where accessible, insurance claims. Other curves use engineering assessments of which components would be damaged and what it would cost to repair or replace them. Published libraries, including the Federal Emergency Management Agency's (FEMA) Hazus and the European Commission's Joint Research Centre (JRC), provide curves for different asset types. Library curves describe average behaviour; overseas data need scrutiny before application to a New Zealand site.

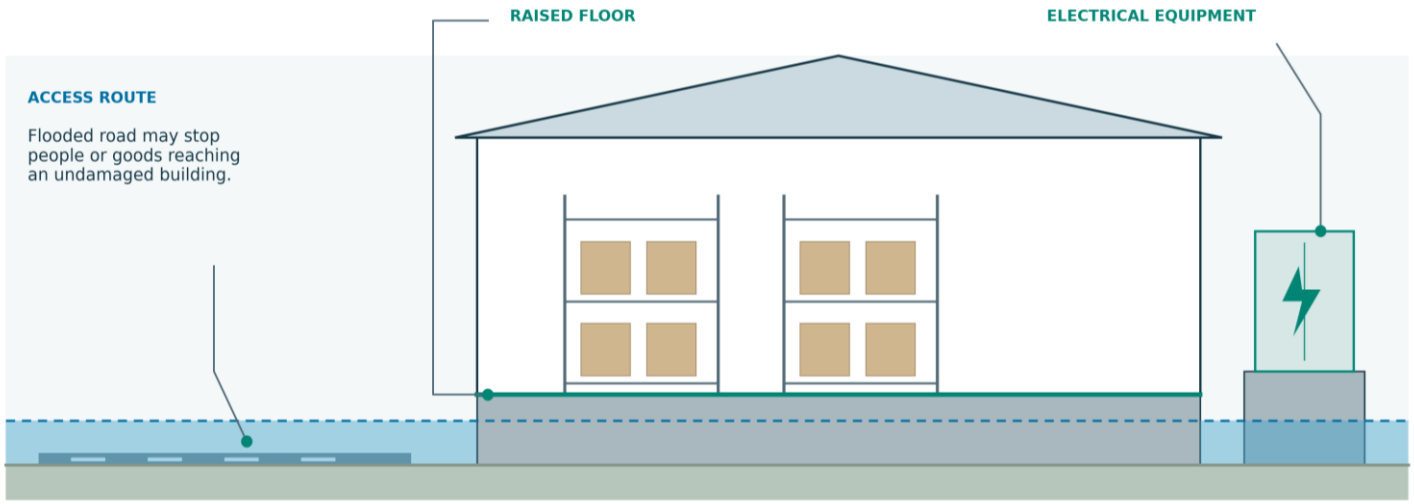
What physical risk engineering brings to the table

To turn a damage ratio into a dollar estimate, the analyst applies it to an asset value using the curve's valuation basis, informed by replacement valuations or local repair costs. An illustrative 30% damage ratio applied to NZ$4 million gives NZ$1.2 million of damage. Buildings, equipment and stock may need separate calculations because their values and responses differ.

A business should be able to see the curve's source, its suitability for the assets and flood conditions, the valuation basis, cost date and local adjustments. Floor heights, sensitive equipment, flood velocity and duration can all affect the result. Comparable past losses help check estimates, allowing for differences in insurance limits and preparedness. Distinguishing observed, assumed and site-verified inputs, and testing alternative assumptions, makes the result easier to assess.

A flood map is only the starting point

Asset details and operational dependencies determine what an exposed business could lose.



HAZARD

How deep, fast and long could the flooding be?

EXPOSURE

Which assets, access routes and utilities are affected?

VULNERABILITY

What could fail, and how long would recovery take?

What physical risk engineering brings to the table

Damage and loss estimation brings consequences and event probabilities together. It produces individual-event estimates and, where sufficient data are available, average annual damage (AAD): the probability-weighted annual average across a range of events. A business may experience several years without a flood followed by a substantial loss. AAD helps compare long-term exposure and adaptation options, while severe-event estimates show the loss the business might have to absorb at one time.

Climate scenarios extend this analysis by changing the hazard inputs. Analysts select warming pathways and time horizons, use regional projections to adjust rainfall, sea level or other variables, and rerun the hydrological and hydraulic models. High Intensity Rainfall Design System (HIRDS) rainfall estimates and national flood guidance support this translation in New Zealand. The outputs help test whether assets or existing protection would remain adequate over their intended lives.

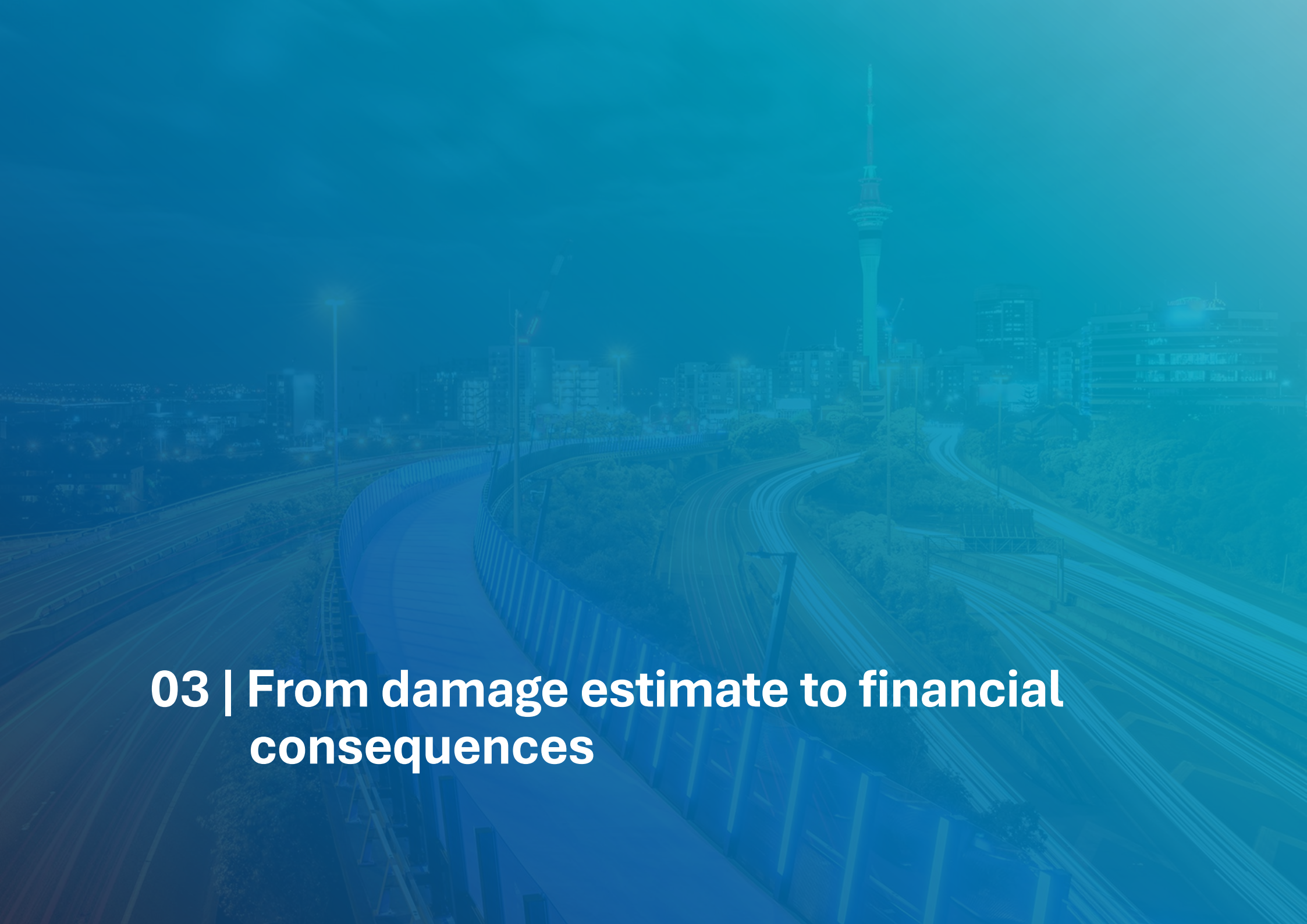
These changes can be expressed through annual exceedance probability (AEP), the chance of a threshold being exceeded in a year. A 1% AEP flood, often called a "100-year" flood, can occur in consecutive years. Analysts can compare future flood depth at a fixed AEP, or the changing AEP of a fixed depth: how severe an event with the same probability could become, or how often a damaging water level could be reached. Meaningful AAD estimates require multiple event probabilities.

National datasets, including New Zealand's flood viewer, support initial screening and may be sufficient for portfolio assessment where coverage, resolution and event probabilities suit the purpose.

Priority sites can then be examined using higher-resolution maps and verified asset and operational data, so the analysis reflects the company's specific facilities and dependencies.

Assessment element	Engineering contribution	Client input required
Hazard and scenarios	Translate climate projections into local hazard intensity and probability	Select relevant scenarios and horizons; disclose assumptions
Exposure and vulnerability	Locate assets and dependencies; assess damage and operational thresholds	Supply asset values, critical functions and business dependencies
Damage and interruption	Estimate repair needs, restoration time and infrastructure disruption	Translate downtime into revenue, margin, additional costs and cash flow
Adaptation opportunities	Assess technical feasibility, avoided loss and option costs	Evaluate investment, funding, timing and residual exposure
Financial connection	Provide evidence and test consequence assumptions	Finance validates line-item treatment and avoids double counting
Transition risks	Engineering and advisory assess technology, infrastructure and emissions options	Integrate policy, carbon prices, markets and strategic assumptions

Table 1: Engineering assessment and corporate AFIs



03 | From damage estimate to financial consequences

From damage estimate to financial consequences

Engineering evidence becomes commercially useful when connected to how the business earns revenue, incurs costs and uses capital.

The New Zealand Society of Actuaries' 2026 white paper describes this as an impact pathway, linking the climate driver to the business impact and financial consequence. Engineers assess failure thresholds, dependencies and recovery times; finance and operations teams supply the business assumptions that determine the financial result.

Consider a distribution facility facing NZ$4 million of estimated direct flood damage. The financial consequences depend on how long operations stop and whether stock, production or orders can move elsewhere. Damage to a readily replaceable component could have a very different effect from damage to equipment with a long lead time. That difference can inform investment in protection, spare equipment or an alternative location.

Finance can then estimate lost contribution margin, meaning revenue lost after allowing for avoided variable costs, together with additional recovery expenditure. Ten days of interruption at NZ$100,000 of lost contribution margin per day would add NZ$1 million before additional recovery costs or insurance. The actual calculation must account for deferred sales and orders fulfilled later or transferred elsewhere. Downtime assumptions can therefore be as important as the repair bill.

Insurance may absorb some costs, subject to excesses, limits, exclusions and payment delays. Damage, potential recoveries and retained exposure need to be identified clearly, because even a covered loss can create working-capital pressure. Future expenditure and asset values are also important. An anticipated loss does not automatically become an impairment or provision: AFI disclosure and financial-statement recognition and measurement are different exercises, although their assumptions should be explained consistently.

Loss breakdown example

The repair bill is only part of the financial impact

Illustrative distribution facility: physical damage and business interruption contribute to the loss.

ESTIMATED LOSS BEFORE OTHER RECOVERY COSTS OR INSURANCE



Repair or replacement of damaged assets

Total: NZ$5 million

HOW THE INTERRUPTION LOSS IS CALCULATED

10 days of interruption × **NZ$100,000** lost contribution margin per day = **NZ$1m** lost margin

Contribution margin allows for avoided variable costs. Account for sales recovered later or transferred elsewhere.

Worked example from the whitepaper; not observed loss data or a typical damage-to-interruption ratio.

From damage estimate to financial consequences

The 2025 Springer study by Abe and Adriaens illustrates the value of business-specific analysis.

The study combined facility-level flood and corporate data for four Japanese companies, modelling property damage and business interruption separately. Loss drivers differed between companies, while damage curves, downtime assumptions and limited facility-level financial data materially affected results. These were modelled exposures, rather than observed losses, supporting close examination of actual sites and business models.

The 2011 Thai floods show why dependencies are so important. The World Bank estimated US$46.5 billion of damage and losses: 44% physical damage and 56% interrupted production, foregone income and higher expenses. These are economy-wide categories. At company level, Toyota's three Thai plants escaped direct flooding yet stopped production because parts supplies were disrupted. Its February 2012 forecast attributed a ¥110 billion reduction in full-year operating income to the floods. This example shows how financial consequences can extend well beyond damaged property.

Transition risks follow the same logic, using different inputs. Carbon prices, regulation, customer demand and technology can affect costs, revenue and the usefulness of existing assets. Engineering and advisory expertise can assess the feasibility and cost of process changes or decarbonisation, while commercial and financial analysis tests implications for margins, capital and strategy. The assessment should also examine opportunities, including adaptation and changes to products or operations.

Across both risk types, shared infrastructure and suppliers may expose several sites to the same event. Portfolio analysis needs to reflect those connections and avoid counting the same financial consequence more than once.

Risk	Climate / transition driver	Business impact	Financial consequence	Possible response
Physical	Flood intensity and frequency; sea-level rise; heat; drought	Asset damage; downtime; loss of access, utilities or supplies	Repair costs; lost margin; additional costs; cash-flow pressure	Flood protection; equipment elevation; alternative sites or suppliers
Transition	Carbon prices; regulation; customer demand; technology	Higher input costs; changing demand; asset or process obsolescence	Margin changes; revenue at risk; capital needs; changes in asset values	Decarbonisation; process conversion; product or market change

Table 2: The AFI impact pathway for physical and transition risks



04 | What credible AFI assessment looks like

What credible AFI assessment looks like

Executives need to understand exposure, compare responses and judge the assumptions behind an assessment. XRB guidance and the NZSA white paper support the following principles.

Informed by scenarios. NZ CS 1 requires analysis using at least three scenarios, including a 1.5°C scenario, a 3°C or greater scenario and a third scenario. All should inform the assessment, although XRB guidance does not require a separate AFI figure for every scenario. Explaining how climate and business assumptions affect the result helps executives judge whether an investment remains useful across plausible futures.

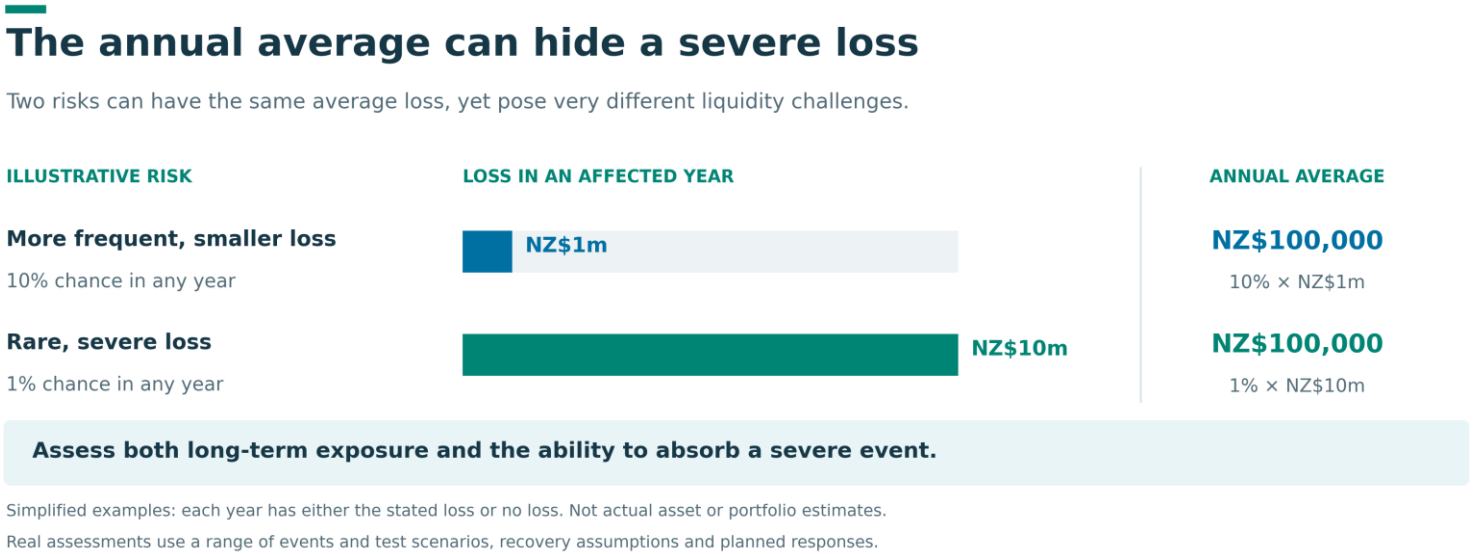
Clear about planned responses. NZ CS 1's Basis for Conclusions says AFIs should be assessed before planned responses to climate change, with their expected effects disclosed separately. Existing operating measures form part of the business being assessed. Separating response costs, avoided loss and residual exposure makes the investment choice clearer, including what remains at risk if a project is delayed or falls short.

Australia uses a different framing. AASB S2 paragraphs 15–16 reflect financial planning and strategy, including planned investment, disposal and funding. Planned responses are included in that framing, whereas New Zealand separates their effects from AFIs. "Net versus gross" is shorthand only for this distinction because otherwise it can be confused with losses after insurance. Neither framework establishes a blanket rule to deduct all recoveries, so the basis and assumptions must be clear.

Transparent about uncertainty. Ranges and sensitivity analysis show how climate inputs, asset behaviour and recovery assumptions affect the result. This can reveal which assumptions change an investment decision and where better data would be valuable. NZ CS 1 does not mandate ranges in every case; estimates need a stated basis and limitations, with an explanation where quantitative information cannot be disclosed.

Attentive to averages and severe events. AAD supports comparison of long-term exposure, while severe-event losses reveal pressure on liquidity and continuity. An annual average may appear manageable even when a concentrated loss would be difficult to absorb. Both perspectives are important where material, with event probabilities and loss definitions made explicit.

What credible AFI assessment looks like



Proportionate to materiality. Start with an evidence-based explanation of how the highest-priority risks affect the business and its finances. Simple calculations or spreadsheets may be sufficient; detailed site modelling is worthwhile where it could change an important decision, such as whether to invest in flood protection.

Where the range of possible losses is material, stochastic modelling can help. It runs a model many times, varying inputs such as flood depth and the time needed to resume operations according to assumptions about how likely different values are. Results estimate potential losses and the likelihood of severe outcomes within a given climate scenario. The standards prescribe no single engineering-to-financial method, so suitable methods and professional judgements need to be documented.

Connected to finance and operations. Agree asset values, margins, downtime, insurance and financial measures early. Distinguish lost revenue from lost profit, cash expenditure from changes in asset values, and individual-site losses from portfolio losses. A common basis makes the findings more useful for investment, continuity and disclosure decisions.



05 | Why Tonkin + Taylor is well positioned

Why Tonkin + Taylor is well positioned

Engineering consultants give physical AFI assessments a credible foundation by investigating how hazards affect real assets and operations.

Site inspection, failure thresholds and infrastructure dependencies inform repair and restoration estimates; whilst assessment of adaptation options tests whether proposed protection would work. Methods that have been used extensively for local government loss assessment already connect physical damage with wider economic consequences, including disruption and income loss.

T+T's finance and insurance services encompass hazard model development, geospatial analytics, catastrophe loss modelling, forensic engineering and claims and recovery support. T+T complements that foundation with scenario planning, physical and transition risk assessment, adaptation, transition planning and climate-related disclosure. Emissions and asset-management capabilities inform the feasibility and cost of response options. Working with client finance and operations teams and specialist financial input where needed, these capabilities connect technical evidence with commercially useful AFI assessments.

An entity can turn that shared understanding into action through four steps:

1. Screen and prioritise material climate risks and opportunities, using scenarios, asset data and business dependencies.
2. Trace the impact pathways and agree the affected business and financial measures with finance and operations.
3. Quantify using proportionate methods, test the assumptions that could change decisions, and distinguish existing measures from planned responses.
4. Decide and disclose: compare response costs, timing and residual exposure; assign ownership; and document the basis, limitations and any quantification gaps.



06 | Five questions for your board and executive team

From damage estimate to financial consequences

These questions help establish whether the company has the evidence and information it needs for its next disclosure and investment decision:

01

Hazard relationship

Have we connected material hazards to asset performance, downtime and financial consequences, including shared infrastructure and supply chains?

02

Sufficient data

Are our asset and operational data sufficient to test the assumptions driving the largest losses?

03

Exposure vs response

Have we separated exposure from planned response costs and benefits, using the correct basis for each reporting jurisdiction?

04

Transition

Have we assessed transition risks and opportunities consistently with our scenarios and business strategy?

05

Accountability

Can we explain our estimates, uncertainty and quantification gaps, and use the findings to guide capital allocation?



Together we create + sustain a better world