

ASSESSING ORGANISATIONAL CLIMATE CHANGE RISK

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ABSTRACT

Strategy and risk are two sides of the same coin. Hindsight has proven that risk from a global pandemic was underestimated; Coronavirus forced organisations to re-evaluate their strategy. Furthermore, sophisticated assessments of risk are not only the trend, but they are also prudent and opportune. For organisations, the growing move to assess climate change risk is important from a mitigation perspective, but vitally, as an opportunity gauge as well. This paper will be a summary review of risk from an organisational climate change assessment perspective using traditional risk matrix traffic lights and risk dashboards, to more fine-tuned technologies. This paper will also examine changing, nascent trends in climate change risk assessment as well as opportunities that can be manifested by adapting now and responding with a longer-term view of strategy within a global economy. Currently many organisations are sentient to the rewards afforded to practitioners of sustainability. They are investigating and revising their risk management processes and risk appetite to form a culture more aligned to the imperatives that climate change action will require, given diverse stakeholder demands and expectations. This paper looks at leading organisations that are becoming more receptive and agile in a future that adapts alongside climate change. The conclusion recommends a strategy for climate change risk assessment and anticipates the world-leading disclosure requirements under The Financial Sector (Climate-related Disclosure and Other Matters) Amendment Bill.

Keywords: climate change, climate change risk, risk management, risk strategy, risk dashboard

INTRODUCTION

Climate change is the overarching concern of our modern era; the earth and humanity are at a tipping point. The effects of climate change are global and unprecedented in scope, ranging from fluctuating weather patterns that threaten food production to rising sea levels that escalate the risk of catastrophic flooding. Furthermore, if substantial action is not taken now, adapting to these impacts will be arduous and expensive in the future.

Climate change is a long-term (decades or longer) climate change that is identifiable which could be because of natural variability or because of human activity (IPCC, 2018). Furthermore, Scientists have assessed global warming and attributed this to an increased accumulation in the atmosphere of glasshouse gases, causing changes in weather patterns and the frequency and severity of extreme weather events, such as heavy rain, heatwaves, and droughts (AghaKouchak et al., 2020).

Climate change is already affecting New Zealand, and it is very likely that it will pose constraints and challenges to the New Zealander way of life in the coming decades. Over the last 50 years, rising Greenhouse Gas (GHG) concentrations have resulted in rising average New Zealand temperatures (Harrington, 2021). The warming of the global climate system is unmistakable, and many of the observed climate changes have been unprecedented in both short and long timescales (Bäck, 2020). The influence

of anthropogenic climate change has emerged beyond a doubt (Swain et al., 2020). For organisations, the risks are now impacting the bottom line. New Zealand has become the first country in the world to introduce legislation requiring mandatory climate-risk reporting for the financial sector. Climate change leadership is being forced by rising climate-risk and statutory requirements.

The primary objective of this research is to prototype a framework that will reveal organisational emissions risk based on carbon emission consumption within a dynamic business environment. This report was inspired by the National Climate Change Risk Assessment (NCCRA), which encourages people to act and contribute to long-term sustainability. The research method was led by the NCCRA, considering the opportunities and risks of taking a leading stance on emissions mitigation; topics were explored in depth for various perspectives on climate change, from a stance that increasingly, regulation will force organisations to reduce emissions.

A scanning review of nascent scholarly literature from 2020 onward was undertaken using Google Scholar; the Coronavirus pandemic altered views regarding urgency of emissions mitigation initiatives. It became evident that assessing what firms continued to measure (or not) and what organisations such as the Climate Leaders Coalition were reporting, was an indicator of how climate change risk was being side-lined in the uncertainty of a pandemic environment. Reports from organisations such as the Sustainable Business Council, Sustainable Business Network, Toitū Envirocare and New Zealand Green Building Council set a tone and pathway for focus. Large firms, corporations and SMEs committed to the Climate Leaders Coalition, released reports regarding emissions. The interplay with government statements regarding emissions and climate change was often in the news and helped shape discussions on the dynamic nature of risk, discussed via Institute of Directors papers.

This paper looks at leading organisations that are becoming more receptive and agile in a future that adapts alongside climate change. Additionally, the overall purpose is to consider visual representation of key emission factors, to support organisational emissions targets. Knowing what to measure, monitor and how to mitigate a carbon footprint is complex, but is the basis for environmental sustainability. This paper recommends a strategy for climate change risk assessment to anticipate the world-leading disclosure requirements under The Financial Sector (Climate-related Disclosure and Other Matters) Amendment Bill.

The report acknowledges that organisations throughout New Zealand are keen on reporting and reducing their emissions, with the bonus of attaining positive brand exposure. As a result, this report will introduce a prototype that will aid in measuring, monitoring, and visualising organisational Greenhouse Gas (GHG) emissions and progress towards their mitigation. Estimates of Greenhouse Gas emissions from the energy sector, industrial processes, and other product use, waste, and land use change will be revealed by this prototype. These data will incorporate the most serious emissions risks based on priority and urgency. As our organisations and data analytics progress, technological improvements to the dashboard can make it more efficient and effective, and more attuned to reducing carbon emissions.

THE NATIONAL CLIMATE CHANGE RISK ASSESSMENT

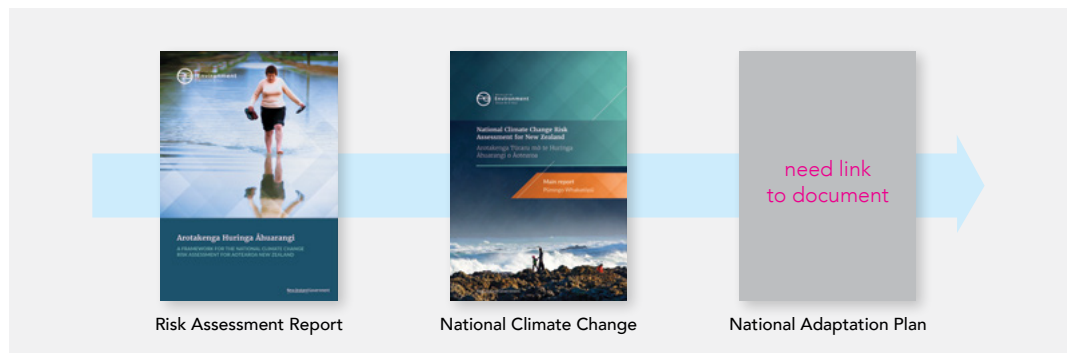
New Zealand's first National Climate Change Risk Assessment (NCCRA) was commissioned by the Ministry for the Environment to identify the most significant risks the nation faces from climate change (Ministry for the Environment. 2020). Five domains are assessed (Human, Built/ Natural Environment, Governance, Economy) for the Government's national adaptation plan. The NCCRA is based on Arotakenga Huringa Āhuarangi (AHĀ), a framework, for systematic comparison of a broad range of risks (Ministry for the Environment. 2019).

While many of the risks are interlinked, these groups can help recognize 'owners' of risk i.e., those who have a role to play in managing the risk over time. The NCCRA, is not positioned within a Māori framework; the relationship of Mātauranga Māori is not domain appropriate with data issues (Cherrington et al, 2020c, 2020d).

The AHĀ framework is useful for local government, iwi/hapū and other organisations to undertake their own climate change risk assessment or procuring new evidence on climate risks. Key initiatives must enable mitigation of emissions. The framework is a means to evaluate climate change opportunities and risks in terms of their nature, severity, and urgency from a wide range of information sources, based on a three-stage approach to assessing and comparing risks. Templates and guidance materials assist users in assessment and methodology. The relationship between documents is in figure 1 (Ministry for the Environment. 2020).

- It provides an approach to assess/compare national risks
- 5 Domains used - Economy, Human, Built Environment, Natural Environment, Governance
- Outlines a Governmental approach to improve resilience to climate change effects

Figure 1 – Process for Risk Assessment, NCCRA and National Adaptation Plan



Using a broad variety of information sources, the system offers the means to determine climate change risks and opportunities in terms of their existence, magnitude, and urgency. It encompasses:

- A three-stage approach to risk assessment and comparison
- Templates to be used in the completion of the different evaluation measures
- To support users in adopting the technique, instruction materials

The first step towards producing a National Climate Change Risk Assessment (NCCRA) is this framework. The framework makes it possible to systematically compare a wide range of climate change risks, using a panel of experts in a variety of relevant specialities. A handful of climate change opportunities were also identified.

The system would also be useful for local governments, iwi/hapū and other organisations to carry out their own assessments of the risk of climate change or to provide new information on climate risks. For example, risks to the built environment are of particular concern to the infrastructure of business, with eight priorities from extreme weather events, drought, changes in rainfall, temperature, sea-level rise, fire weather, snow, or wind (Ministry for the Environment, 2020):

- B1 – Risk to potable water supplies (Currently = Major Risk, 2050 = Extreme Risk);
- B2 – Risk to buildings (Currently = Major Risk, 2050 = Extreme Risk);
- B3 – Risk to landfills and contaminated sites (Currently = Moderate Risk, 2050 = Major Risk)
- B4 – Risk to wastewater and stormwater systems (Currently = Major Risk, 2050 = Extreme Risk);
- B5 – Risk to ports and associated infrastructure (Currently = Minimum Risk, 2050 = Moderate Risk);

- B6 – Risk to transport networks (Currently = Major Risk, 2050 = Major Risk);
- B7 – Risk to airports (Currently = Major Risk, 2050 = Major Risk);
- B8 – Risk to electricity infrastructure (Currently = Moderate Risk, 2050 = Moderate Risk).

These risks expose our vulnerabilities and should be prompting alternate action. Extreme flood events are expected to increase around NZ, with estimates of up to an 11% increase in the 1 in 10 year, 1-hour duration storm by 2040 and up to 34 percent by 2090 (Building Research Association of New Zealand Build, 2021). Continuous sea level rise also greatly contributes to both coastal and inland flooding, exacerbating coastal storm tides, which in turn leads to more regular and extreme flooding in coastal areas. Extreme sea levels, predicted to be reached just once per 100 years are projected to occur at least annually (on average) by 2050-70 (Pearce et al., 2019).

Drought is already affecting the availability of water in New Zealand. Recent droughts, especially those in Auckland and Northland, have had significant impacts on water sources around NZ. The Annual Performance Reports of Water NZ indicate that about 50% of Councils (on average) say that they have introduced some form of water restriction since 2014 (Zealand, 2017). This significant proportion highlights the seriousness of this risk to Councils, businesses, and communities (Building Research Association of New Zealand Build, 2021). This is further compounded by the fact that water supply schemes in many councils are underfunded; because household metering is not mandatory for a variety of supplies, the ability to handle leakage and demand levels effectively is inhibited.

ORGANISATIONAL CLIMATE CHANGE RISK

For organisations, risk and reward are always in play; they can be balanced with sound strategy. The Covid-19 pandemic has shown us how disruptive under-estimated risk can be and how strategy can be blind-sided. Recently, the risk from climate change has moved from a remote possibility to the category of observable and likely. Of course, the sector or industry concerned is a highly relevant factor in assessing climate change risk for organisations. New Zealand organisations are preparing for climate-related disclosure, but you cannot manage what you do not measure, but for many of New Zealand's small businesses an emissions toolbox is a start (Impact Report, 2021). For example, measuring, monitoring, and mitigating emissions will be vital if financial disclosures are mandatory. The risks in the five domains are assessed by urgency as well as by value domain. For organisations, governance and economic risk are pivotal (Ministry for the Environment, 2020):

- G1 – Risk of maladaptation to climate change (Urgency = 83rd percentile, Consequence = Extreme)
- G2 – Risk from unfit adaptation arrangements (Urgency = 80th percentile, Consequence = Extreme)
- E1 – Risk to govt (economic cost ex productivity) (Urgency = 90th percentile, Consequence = Extreme)
- E2 – Risk to financial systems from instability (Urgency = 80th percentile, Consequence = Extreme)

Human costs are urgent and extreme in consequence and will begin to affect staffing and labour markets. Only four opportunities were identified with limited organisational implication (Ministry for the Environment, 2020):

- EO1 – Increased primary sector productivity due to warmer temperatures (NIWA, 2016).
- EO2 – Adaptation-related goods and services (Channell et al, 2015), (Airehrour et al., 2019).
- HO1 – Lower cold weather-related mortality (Dunn et al., 2021).
- BO1 – Lower winter heating demand (Ministry for the Environment, 2017).

Audit and risk committees report to boards and assist in producing accurate financial statements in compliance with all applicable legal requirements and accounting standards; in particular, they review activities of a company to ascertain the exposure to financial and other risks (Institute of Directors, 2020).

“The Board needed to have a company-wide risk framework and keep its eye firmly on health and safety risks. It should have ensured that good risk assessment processes were operating throughout the company. An alert board would have ensured that these things had been done and done properly” (Wellman, 2012).

With documents such as the National Climate Change Risk Assessment and statutes such as the Climate Change Response (Zero Carbon) Amendment Act 2019 and upcoming Financial Sector (Climate-related Disclosure and Other Matters) Amendment Bill, “all boards should ensure they are aware of the potential impact that climate change could have to their organisations and take action to mitigate climate risks, including physical, transition and liability risks” (Institute of Directors, p. 1. 2021). Risks can be inherent (gross risk) as a measure of exposure and inherent, as a measure of risk after controls/mitigations have been introduced; thus, risk can be ranked by priority.

A board’s primary interest from a risk perspective is those that threaten the achievement of the entity’s strategic objectives (a link that is often missing); this focus is often counter-intuitive to broader environmental far-sightedness. In setting strategy, ‘risk appetite’ must balance risk with reward; this may change as an organisation attains longevity. Risk management is maintained with ‘three lines of defence’ throughout an organisation (Luburic, 2015); see figure 2.

Figure 2 – Three lines of defence for organisational risk management



Risk can be stated as a combination of the consequences (severity/impact) of an event and likelihood of its occurrence. Recently, risk velocity has established itself as a measure of risk, as risks that develop more slowly can be managed differently. Consequence and likelihood can assess risk; velocity is needed to manage risk. For organisations, this third measure can radically change risk perception and stress the need to view risk as a highly inter-connected construct; ‘risk domains’ may restrict strategy and limit more holistic, interactive views.

Risk management should not be undervalued. Prioritising risk allow organisations to minimise exposure to risk versus strategic objectives; it improves performance and addresses compliance to enhance decision-making. Typically, a risk matrix is used to assess risk (see figure 3):

Figure 3 – A two-dimensional likelihood and consequence risk graph

	REMOTE LIKELIHOOD	UNLIKELY LIKELIHOOD	POSSIBLE LIKELIHOOD	LIKELY LIKELIHOOD	NEAR CERTAIN LIKELIHOOD
catastrophic consequence					
major consequence					
moderate consequence					
minor consequence					
insignificant consequence					

ORGANISATIONAL CLIMATE CHANGE RISK

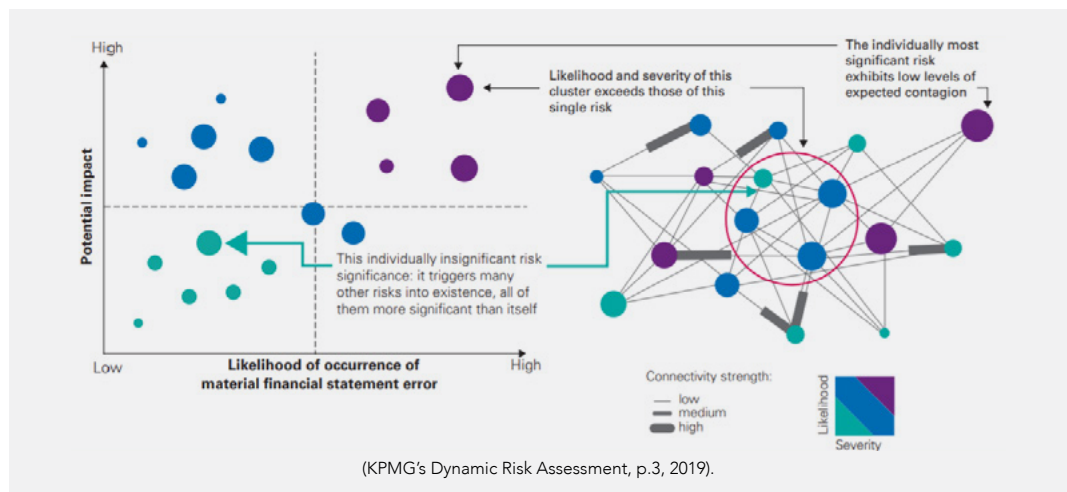
Is a 2x2 depiction sufficient as velocity and interaction play an increasingly weighty role in our global economy?

Risks affecting organisations are seldom insular; the two dimensions of likelihood and consequence are restrictive and worse, they can be misleading (Williams et al., 2006). Approaches such as Quantitative Risk Assessment (QRA) have changed little since the 1980s, yet in applied fields, these techniques have been refined to be more specific to situation and circumstance. Risk assessment methods as multidimensional and are vital in process design, safety systems functions, as well as operation management (Villa et al., 2016).

Nevertheless, a two-dimensional view can be simple enough for organisations to be alerted to changes and risk velocity, especially when dashboards are used to visualise risk alerts or indicate velocity shifts. Analytics can process cumulative and continuous data from data tables for visibility as charts or graphs. Dashboards can embrace the visual analysis of the input data provided by the organization. Colour-coded visualisations, alerts and heat-maps can be assessed in business units. At executive level, prediction analysis can highlight future areas of interest, based on past and present data. Improved data analytics create advances in rich, interactive visual analytics tools with graphical business ecosystem intelligence tools in corporate settings (Basole, 2014).

As evidenced during the Coronavirus pandemic, one extraneous event can result in multiple upshots with different impacts and velocities; a variety of controls and tactics must be employed. Prioritising high consequence risk is not always the best approach. A clearer appreciation of risk interrelationships is needed to position the threat of risks. Furthermore, it is in line with more modern approaches that strategise across a whole spectrum of interests, assets, and activities, especially in the context of climate change and its likely impacts (Saunders et al., 2020). Better audit evidence can be recorded, with better and quality decisions.

Dynamic risk assessment offers enhanced insights using probabilistic and advanced algorithms with data analytics; velocity and risk interconnectedness can be assessed in a multidimensional risk analysis. Critical clusters or contagion triggers can be ascertained. As revealed in figure 4, an interconnected dynamic risk assessment view can change perspective, decision-making and strategic direction, colour-coded for likelihood and severity; the insight garnered is in stark contrast to the likelihood x severity 3-colour, 2D graph shown.



Dynamic risk assessment offers organisations the capability to innovate, evolve and transform risk management processes in rapidly changing organisational environments. Features can be highlighted and magnified using multi-source and multi-view data (Cherrington et al, 2019, 2019b, 2019c). Agility and resilience in risk management processes can be enhanced by dynamic capabilities such as sensing, seizing, managing and transforming (Teece, 2007):

- Sensing and shaping risk to enhance opportunities and mitigate threats.
- Seizing opportunities and capabilities from acquired insights (Cherrington et al., 2021, 2021b, 2021c)
- Managing growing threats and adaptation to changing risk environment (Cherrington, 2019).
- Transformational differentiation and operational reconfiguration capabilities.

We live in a dynamic organisational environment where data is a key source of ; risk assessment should be implemented to prevent or reduce the likelihood of undesirable events from occurring or to decrease the severity of consequence should an event occur. Sensing and responding to risks can transform risk management nature of an organisation (Didi-Quvane, 2019) by turning risk tasks into advanced capabilities by orchestrating skills; organisations that take a leading stance can gain competitive advantage (Teece, 2007).

DIRECTOR DUTIES AND CLIMATE CHANGE

Climate change litigation, regulatory enforcement and other legal action is a source of financial risk; now, the physical risks of climate change adaptation and adaptation capacity are relevant to financial risk assessment. A range of climate-related liability risks to borrower, book, portfolio, or system must be respected as pertinent physical risk occur (Barker, Dellios & Mulholland, 2021). Sustainability investment criteria, climate-related disclosure principles and mainstreaming of climate-related risks into investment decisions can ameliorate adaptation and redirect vulnerable (United Nations Environment Programme, 2021).

Advice regarding director duties relating to climate change is mounting; evolving market expectations have elevated the standard of care required to discharge a directors' duty of due care and diligence (Hutley & Hartford-Davis, 2019). There are liability risks for misleading disclosure, such as greenwashing, or inconsistency between stated position and ambition on climate risk management, and internal strategy, plans and actions.

New Zealand is a leader in legislation requiring disclosure; The Financial Sector (Climate-related Disclosure and Other Matters) Amendment Bill is an omnibus bill that broadens non-financial reporting, requiring/ supporting climate-related disclosures by certain FMC reporting entities; it signals the growing number of risks related to the environment that support a broader approach to sustainable operations (Zhukov & Cherrington, 2020) and rapidly changing ESG decision-making responsibilities for boards (Cherrington et al., 2020, 2020b).

TAKING THE LEAD ON ORGANISATIONAL CLIMATE CHANGE

The number of organisations involved in New Zealand's Climate Leaders Coalition (CLC) decreased by about ten percent in 2020; the immediacy of coronavirus belied the need to reduce emissions and take a longer-term sustainable view within organisations. For example, founding signatory Air New Zealand had a new CEO in February 2020 and the country locked down in March, grounding most international flights until the 'Trans-Tasman travel bubble' in April 2021. For an airline, being 'on a mission to reduce emissions' is not easy in a pandemic. The impact from coronavirus "resulted in Air New Zealand operating significantly fewer flights... which has seen our carbon emissions reduce by 19 percent" (Air New Zealand Sustainability Report, p. 3, 2020). International shipping and aviation are exempt from binding agreements of the Kyoto Protocol, yet still, Air New Zealand sees decarbonising the business as vital to long-term success and key to their business model. "One thing that is absolutely guaranteed is that there will be a far greater sense of urgency in addressing the Climate Emergency" (Air New Zealand Sustainability Report, p. 4, 2020).

Global Goal #17 is 'partnership for the goals'. The CLC and Sustainable Business Council (SBC) believe that the work and advice of the Climate Change Commission to the Government is vital for New Zealand's emissions transition pathway and zero carbon future. A joint CLC/SBC submission to the CLC (Climate Change Commission: 2021) for consultation from 150 businesses, contributing more than a third of New Zealand's GDP recommends:

- low carbon transport investment with a pathway that accelerates fleet transformation
- transitioning out process heat retrofits and conversions and support for energy efficient technology
- establishing accelerated methane and nitrogen reduction technology pathways
- building a New Zealand bioeconomy via major public-private partnership
- incentivising a substantial scale-up of energy efficiency that is effective across the economy (Submission to the Climate Change Commission on 2021 Draft Advice for Consultation, 2021)

The CLC and SBC backed the Government's decision to fast-track a zero-carbon pathway for the public sector using three CLC/SBC briefing recommendations on climate action priorities and advocate use of an electric fleet.

For large enterprises on a zero-carbon journey, Toitū Envirocare launched a new carbon assess platform to collate and track combined carbon emissions of their New Zealand-based suppliers; SMEs have a simple, cost-effective carbon emissions measurement tool also, with benchmarking options (Envirocare, 2020, November).

Summerset is the first retirement village to be Toitū carbonzero certified; it is part of their overall sustainability journey and pledge to reduce their environmental footprint. Certification involved emissions measurement, reduction strategy, with third-party verification for bestpractice. A key benefit will be to reduce operational costs and model eco-leadership. (New Zealand's first Toitū carbonzero certified retirement village, 2020).

Corporate net-zero targets are becoming the norm; science-based framework for emission assessment of net-zero targets requires specific criteria and guidance for transparent and balanced multistakeholder process. It is an unparalleled opportunity to drive global climate change imperatives. The Science Based Targets initiative (SBTi) leads research transforming climate science into climate targets frameworks based on robust criteria and protocols for transparent validation (Science Based Targets Initiative, 2020). SBTi suggests guiding principles:

- the inclusion of emissions of the company and their suppliers and customers within the value chain
- emissions reductions consistent with limiting warming to 1.5°C under the Paris Agreement
- climate-related transition risk considerations for companies to be viable in a net-zero economy

Large businesses in New Zealand must have a good understanding of how climate change will impact them. In September, 2020, the government revealed New Zealand would be the first country in the world to require climate risk reporting. On a comply-or-explain basis, the Task Force on Climate-related Financial Disclosures (TCFD) framework and international best practice. The number of companies, investors, universities, and cities leading the Race to Zero is accelerating, with ambitious carbon mitigation targets or net-zero targets.

CONCLUSIONS

In a fast-moving business milieu with global competition and environmental imperatives, climate change risk management is an essential component of doing business, especially in volatile markets or pandemic-affected sectors. Dynamic risk management as a more informative tool to support organisations in decision making in their value-added product delivery; opportunities can be gleaned and a truer risk profile can be envisioned. Dynamic risk assessment is particularly applicable for climate change risk assessment for

organisations, offering the ability to continuously innovate, progress and transform within the entire risk management process. Climate change risk assessment is no longer an optional 'feel-good' exercise. Global targets and government legislation are forcing organisations to be proactive and achieve significant mitigations towards emission reduction. Assessing climate change risk must lead to proactive action within organisations.

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