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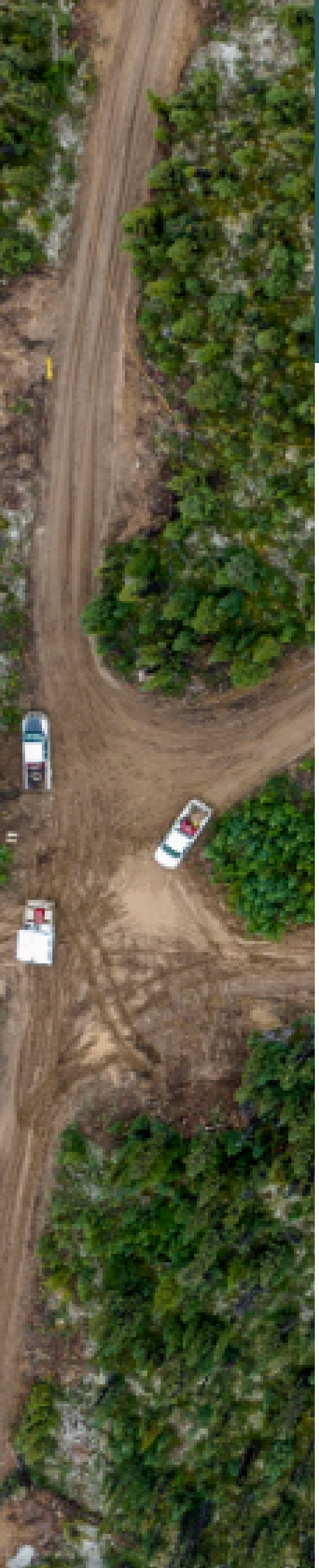
# Climate Resilient Transition Plans in the Metals and Mining Sector (Extended)

PRESENTED BY

Climate Sense and Satarla



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# List of Contributors

The authors comprise key contributors to Metals & Mining TPT guidance and ISO 14090 climate adaptation guidance, and so can provide deep subject matter expertise in climate change transition and adaptation. All authors have extensive experience in navigating the complex and dynamic challenges that entities globally face both today and tomorrow.

In partnership, Satarla bring deep expertise in risk management, sustainability, and operations, especially across metals and mining, while Climate Sense brings adaptive climate risk management, monitoring-evaluation-learning, and capability assessment methods that can be embedded into mining clients' existing risk, planning, and governance processes.

**Climate Sense** is a consultancy enabling clients to strengthen climate change adaptive decision making at organisational and system levels. It protects long term interests through the decisions made today; managing risk, ensuring compliance, increasing competitiveness, strengthening returns on investment, reducing social and environmental impacts, getting the most from stakeholder engagement and enhancing license to trade through strategic monitoring evaluation and learning.

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**Satarla** is a consultancy of experts that bridges sustainability and risk management through consulting, training, research, and effective communication, with deep expertise and experience within the metals and mining sector. Satarla has a passion for enabling more responsible exploration, extraction, and use of raw materials, and lead on the drafting of the TPT Metals & Mining Sector Reporting Guidance.

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# Preface

Our near-future global warming trends are clear: climate science indicates that global mean temperatures are likely to stay at or near record levels over 2025–2029, with each year projected to be 1.2°C -1.9°C above average[1]. Depending on how the world addresses the drivers of climate change and the rate at which the world acts however, a range of longer-term futures remain possible.

At both the global and entity levels, the choice of actions in the next 20 years can set up, or hinder, success beyond 2050. To successfully keep pace with changes both expected and unexpected, entities need to take decisive action. Emissions reduction targets and plans have commanded a lot of attention in recent years – and rightly so. However, this is no longer enough. The climate today is decidedly different to what it has been before; in other words, the context in which we operate has shifted materially. With this change comes a range of different conditions, and a raft of new risks. To successfully navigate the future, entities need to embed resilience into "business-as-usual" through well-designed adaptation.

While the future is uncertain, we can have a high level of confidence in the effectiveness of expert-informed adaptation to climate change over the next couple of decades. Beyond that, different approaches are required to manage higher levels of uncertainty. Whatever the degree of uncertainty, effective adaptation demands robust, flexible strategies that allow entities to move beyond reliance on static forecasts, prepare for a range of possible futures, and pivot as needed. As such, adaptation provides a structured response to uncertainty, volatility, complexity, and ambiguity, embedding flexibility into strategic planning, operations, and investment decisions[2].

In the mining context, these investments are typically directed at modifying mining operations, processes, or infrastructure to better withstand or respond to identified climate hazard risks and avoid losses that would be caused by inaction or a lack of organisational capabilities to develop and execute plans that are fit-for-purpose. The mining sector is uniquely placed with regards to adaptation in the sense that operations have always had to think on and plan for timescales well into the future – often much longer than needed in other sectors. However, as regulations and expectations evolve, and the impacts of climate change compound, it is essential that entities within the sector continue a positive trajectory to remain future-ready.

[1] World Meteorological Organization (2025) Global Annual to Decadal Climate Update 2025–2029. Geneva: World Meteorological Organization. Available at: https://wmo.int/sites/default/files/2025-05/WMO_GADCU_2025-2029_Final.pdf (accessed 25 March 2026).
[2] Adaptation investments are targeted measures (e.g., actions, technologies, or infrastructure upgrades) intended to reduce vulnerability to specific or anticipated physical climate risks. By contrast, resilience investments are broader investments in the assets, systems, capabilities, and governance that enable an entity or system to withstand, adapt to, recover from, and create value amid climate-related disruption.

# Purpose of this white paper

No matter what decarbonisation trajectory the world takes in a dramatically changing climate, without thoughtfully planned and well-executed adaptation, climate-adjusted returns for businesses are likely to be lower. In this dynamic business environment, entities need to ensure they are resilient to both a changing climate (often through “adaptation”) and a low-carbon economy (often through “transition planning”).

This paper is the first in a series focused on sectors that are key to a low carbon, advanced technology-enabled economy. The series is designed to provide a starting point for the practical development and implementation of climate resilient transition plans, and to push boundaries in taking a long-term holistic approach to tackling climate change as a core business strategy. It guides operational adaptation planning, implementation, and iterative improvement at the site / project and entity levels, using monitoring, evaluation and learning to refine decisions over time. Concurrently, this paper introduces the practice of using organisational maturity and adaptive capability as key components of adaptive capacity.

Using the structure of the Transition Plan Taskforce (TPT) framework, this paper provides practical insights, tools, and guidance to addressing physical climate-related risks for Metals & Mining entities[1]. To ensure the TPT-produced guidance provided a meaningful starting point for all entities, working groups were established to develop sector-specific guidance alongside sector-neutral documentation. Recommendations from industry were supplemented by consultation with working groups on essential topics including Nature, Just Transition, and Adaptation[2] to ensure they were not overlooked and that recommendations did not come at a cost to those aspects. However, their incorporation did not go so far as to produce fully integrated recommendations. To address gaps, the International Transition Plan Network (ITPN) in 2025 included Adaptation and Resilience amongst their priorities for further work.

This paper is intended to help Metals & Mining entities get started and/or improve quickly and efficiently, using experts' lived experience inclusive of application and evolution of practices aligned with international standards, i.e., the Task Force for Climate-Related Financial Disclosures (TCFD), International Sustainability Standards Board (ISSB), and International Standards Organization (ISO). With respect to integrating adaptation, this paper looks to established international standards: ISO 14090 provides a broad framework for integrating adaptation into organisational planning and decision-making, whilst ISO 14091 offers detailed guidance for assessing climate-related risks, impacts, and vulnerabilities to inform that adaptation process. These frameworks continue to evolve through expert contributions and serve as mechanisms for cross-functional and multidisciplinary learning. Key components of these standards include context analysis (such as climate risk identification), vulnerability assessment (covering sensitivity and adaptive capacity), development and evaluation of adaptation options, and the definition of thresholds that trigger specific adaptation actions.

[3] Transition Plan Taskforce (TPT) (2024) Metals & Mining sector guidance: interpreting the TPT disclosure framework for the metals & mining sector. London: IFRS Foundation. Available at: https://www.ifrs.org/content/dam/ifrs/knowledge-hub/resources/tpt/metals-mining-sector-guidance-apr-2024.pdf (Accessed: 25 March 2026).

[4] TPT Adaptation Working Group (2024) Building climate-ready transition plans: Including adaptation and resilience for comprehensive transition planning approaches. A primer for preparers. Available at: https://itpn.global/wp-content/uploads/2024/11/Adaptation-1.pdf (Accessed: 25 March 2026).

They also emphasise avoiding maladaptation and ensuring robust governance throughout the process.

By providing a standardised and replicable process, this paper for the Metals & Mining sector bridges the gap between high-level disclosure and investor frameworks for climate-related risks and opportunities at the entity level[1] and technical sector guidelines for adaptation at the site or project levels[2]. It also builds on the Adaptation Working Group's guidance targeting investors interested in quantifying the financial impacts of physical risks on their portfolios (i.e., Physical Climate Risk Appraisal Methodology, PCRAM) and aims to sit alongside the IPTN's work on Adaptation and Resilience.

# Introduction

Climate risk is business risk, and climate resilience is a competitive advantage. Due to climate change, the operating environment is rapidly evolving, imposing new risks and opportunities[1] on businesses, sectors, and global markets. The World Economic Forum's (WEF) Global Risks Reports consistently rank environmental risks — especially climate-related ones — among the most severe long-term threats to global stability, ahead of many economic or geopolitical risks. It emphasises adaptation and resilience to climate change as critical — encouraging investment in infrastructure, workforce health, supply-chain robustness and risk management practices. The case for integrating climate adaptation into risk frameworks, development and growth strategy is clear: opportunities will benefit those already acting, and positions will be strengthened as the maturity of action develops.

Entities need to ensure they are resilient to a changing climate through adaptation planning and to a low-carbon economy through transition planning. Each is distinct and interdependent on the other. Transition planning focuses on how a business will evolve and thrive in a low-carbon economy, typically addressing transition risks[2]. Adaptation planning ensures it can withstand and thrive amidst intensifying physical risks[2]. Both approaches must work in tandem to de-risk a business, benefit its value chain, comply with regulations, and future-proof value.

Transition plans should include identified short-term actions and controls for implementation, as well as strategic long-term initiatives, particularly recognising the decisions being taken today that determine long-term vulnerabilities to climate impacts not yet experienced. To address the gap in guidance for transition plans (as called for by the TCFD in 2015) and set the “gold standard”, the TPT was launched by the UK government in 2022 (see Figure 1). Its endorsement by the IFRS ensures relevance to and alignment with an international framework now and in the future.

[5] such as those housed under the International Financial Reporting Standards (IFRS)
[6] e.g., the International Council on Mining and Metals (ICMM)
[7] Although “risks and opportunities” as used in this paper is aligned with IFRS guidance and terminology, it is noted that in risk management, a risk itself can be a threat or an opportunity. By contrast, the Intergovernmental Panel on Climate Change (IPCC) uses a specific framework to define risk from climate change as arising from the interaction of hazards (e.g., drought, heavy precipitation), exposure (to hazards), and vulnerability (a function of sensitivity and adaptive capacity). See the Glossary section for more detail.
[8] as per the TCFD recommendations.

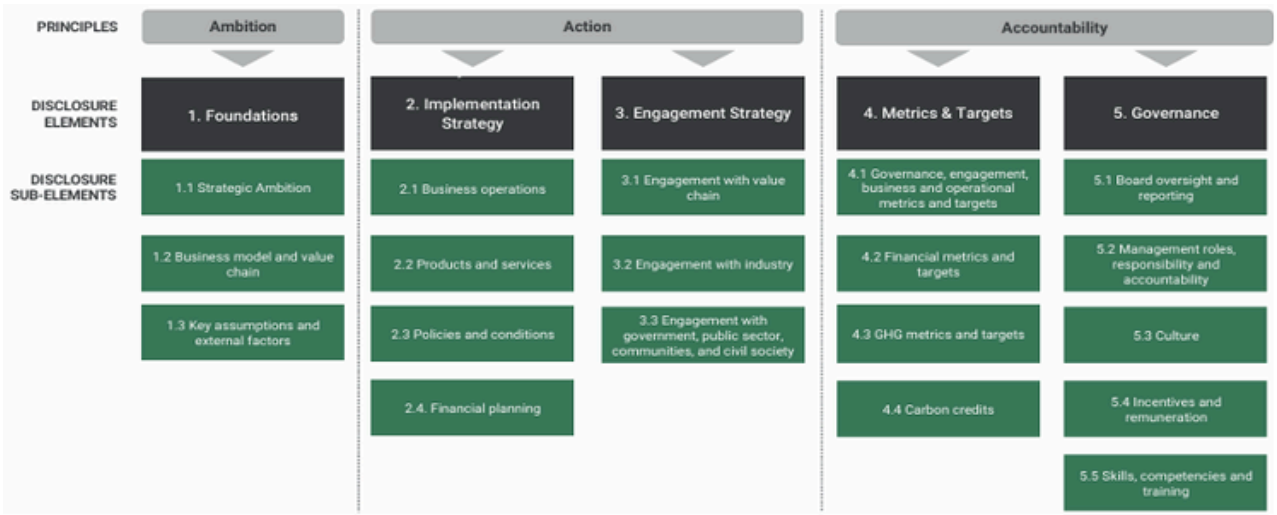


Figure 1: The principles, disclosure elements, and disclosure sub-elements which make up the framework of TPT recommendations.

Adaptation planning is the structured process of assessing climate risks, identifying and prioritizing adaptation options, and formalizing them in an adaptation plan for a sector, place, or organization. As such, adaptation plans should set out multiple pathways to resilience so that entities can remain viable and create value across a range of plausible futures under uncertainty. They should also distinguish clearly between climate hazards and the risks that arise from the interaction of hazard, exposure, and vulnerability[1]. This paper introduces an approach that focuses on reducing vulnerability, and therefore risk, in large part by strengthening adaptive capability.

Building adaptive capability typically looks like progressing an entity from its "business-as-usual" to practicing adaptive climate risk management. A "mature" entity has the capability to embed adaptation into core planning, enterprise risk management, and capital allocation processes; actively use adaptation pathways, thresholds, and triggers to guide decisions over the life of assets; systematically feed data from operations, monitoring systems, and past events back into strategy and design; and, put in place governance structures that explicitly recognise uncertainty and resource adaptive capability as a strategic asset. In this way, an entity is able to develop climate resilient transition plans.

When considered in tandem, both transition and adaptation planning enable comprehensive and effective climate risk management. Starting with integration in mind can result in climate-aligned capital investments, better access to climate finance, reduced capital expenditures and operating costs, synergistic governance and performance metrics, and improved stakeholder confidence.

Climate resilient transition plans provide a key opportunity to evolve risk management from the design and implementation of controls within an entity’s sphere of influence, to a broader strategy of developing adaptation pathways that leverage an entity’s capabilities to build lasting resilience in a dynamic operating context.

[9] IPCC (2022) Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge and New York.

## *A Note on Vulnerability-Centred Adaptation*

*Most attention typically is paid to hazards and exposure; this paper shifts the focus to vulnerability instead. Hazards and exposure indicate where and how climate risk may become an issue. Vulnerability indicates where and why impacts are severe, who will be affected and what an entity can do about it. By focusing on vulnerability, entities are empowered to actively - not just reactive - build long-term resilience.*

*By focusing on vulnerability, this white paper also shifts the emphasis from external threats to internal capacity, enabling proactive, and tailored resilience strategies such as diagnosing organisational weaknesses, building organisational capabilities and focusing on factors within an entity's control.*

*The strategic value of vulnerability-centred adaptation is that it enables context-specific, inclusive planning and action that are informed by 'good enough' climate projections and demonstrates to investors and regulators that resilience is being built from the inside-out, in a forward-thinking, controllable approach.*

# Metals & Mining

Mining operations frequently occur in already climatically sensitive, water-stressed, or remote environments, with equally vulnerable supply chains. They often face hazards that may change over time, with impacts which may evolve over operating lifetimes to encompass some which have not been seen before.

Ensuring climate-related risks and opportunities are identified and managed over the near, medium, and long terms is key to the success of projects. Transition planning is especially relevant to the Metals & Mining sector, where projects often span several decades and are owned and operated by different entities at different stages. The mining sector also faces urgent adaptation needs based on a high current and future level of risk and opportunity associated with climate change[1] and the presence of co-benefits to further action in the next five years over and above what is already planned[2].

Their exposure is shaped by the location of deposits, while their vulnerability is a function of physical sensitivity to risks and the ability to apply the new capabilities required to understand and address these developing risks to the operations themselves, the supply chain, the site's local stakeholders, and entity-level stakeholders (including investors).

Some of the most common climate-related risks across the industry include:

- **Water-related risks:** Changes to water availability and quality may impact or halt operations, impact ground stability, and impact community access to potable water, resulting in challenges to social acceptance.

- **Community and social acceptance:** Physical climate impacts may reduce social acceptance and opportunities to generate shared value between stakeholders, particularly when local livelihoods, subsistence living, water and food sources, or biodiversity are affected.

- **Tailings storage facility (TSF) failure:** Investors, regulators, and communities now demand stronger oversight and integration of climate considerations into TSF and closure planning. Increasing extreme weather may heighten the risk of structural failure, ground instability, and environmental damage.

- **Health and safety risks:** Changing hydrological conditions, extreme weather, exposure to extreme heat, and changing working conditions may affect workforce wellbeing, and have knock-on effects to local communities.

[10] i.e., the potential for a perceived significant shortfall in adaptation measures and pathways in place relative to the scale and dynamism of these risks.
[11] see Figure 7 in TPT Adaptation Working Group (2024)

- **Ecosystem services disruption:** Negative changes to fishery health, water source quality or availability, or biodiversity can trigger conflict with external stakeholders, reputational risk, or regulatory intervention.

- **Energy scrutiny and emissions:** The remote locations of operations can heighten the potential impacts of rising energy costs and increase complexity in securing a reliable energy supply. Challenges to securing a reliable energy supply in remote locations may be greater for low carbon energy solutions.

- **Supply chain disruptions, rising costs, and operational complexity:** Limited access to critical inputs or services due to the changing geopolitical climate and physical challenges due to climate change may delay projects and increase costs. These pressures may increase costs associated with logistics and compliance.

- **Extreme weather and heat impacts:** Wildfires, storms, flooding, drought, and rising temperatures may damage infrastructure, disrupt operations, and pose health and safety risks.

- **Strategic misalignment:** Disconnects between site-level risks and corporate strategy may reduce resilience, especially where operations are more exposed than headquarters.

- **Lost opportunity value:** Failure to invest in climate resilience may reduce social return on investment and long-term social acceptance.

**Co-benefits across the industry include:**

- **Improved trust & shared value:** Adaptation demonstrates commitment to the wellbeing of local communities and ecosystems, which is essential to earning social acceptance. Proactive engagement with local stakeholders, especially Indigenous and frontline communities, can produce co-designed, measurable, and context-specific adaptation.

- **Accountability & de-risking:** Embedding adaptation and resilience into project design signals that the entity is de-risking assets, enhancing the credibility of transition plans, and aligning with climate-resilient finance.

- **Continuity, compliance, & value:** Adaptation actions can result in strengthened operational continuity, especially in high-risk environments; reduced risk of regulatory non-compliance; alignment with host country expectations, disclosure frameworks, and stakeholder demands for transparent, forward-looking climate action; and value creation.

- **Improved long-term resilience:** Adaptation can contribute to “triple resilience dividends” (WRI, 2025) through avoided losses and damages (e.g., reduced downtime, lower repair costs); economic co-benefits (e.g., increased productivity, access to finance; independent of actual loss or damage); and, social and environmental co-benefits (e.g., biodiversity protection, water stewardship; also independent of actual loss or damage).

The mining sector cannot afford not to adapt – or to adapt in a manner that worsens vulnerability and/or carbon emissions (i.e., maladaptation). Adaptation and resilience investments in mining may also have a broader scope and impact, improving the overall capacity of the mining company's ecosystem (such as assets, workers, supply chains, and surrounding communities) and enabling them to manage operational disruptions, protect critical supply chains, safeguard ecosystem services, and sustain both planning returns and social acceptance amid evolving climatic and regulatory conditions.

## *A Note on Adaptive Capabilities*

*This white paper focuses on adaptive capabilities, a key sub-set of adaptive capacity.*

- ***Adaptive capacity** refers to the underlying priorities, resources, and systems within an entity that establish its potential to recognise and address climate risks as impacts intensify. While many initially question the necessity of adaptive capacity, entities often become more clear-eyed and critical of their own abilities as they progress and gain experience.*

- ***Adaptive capability**, in contrast, is about the concrete skills, evidence, and expertise, together with the authority for decision-making and implementation, that an entity has which enable it to effectively deploy its adaptive capacity. It determines what is being done—or is prepared to be done—to ensure that the right adaptation measures are delivered at the optimal time, thus avoiding the pitfalls of responding either too early or too late. The action-focused nature of adaptive capability is gaining prominence in technical standards, monitoring frameworks, and practical tools for implementation, reflecting a shift towards measuring and achieving tangible adaptation outcomes.*

*To support entities setting and delivering achievable adaptation goals and milestones, this white paper emphasises the use of adaptive capability metrics as a practical basis for capability assessment. These metrics help entities identify where gaps exist and prompt exploration across its broader value chain and systems.*

*Building adaptive capability should be viewed as an ongoing journey rather than a fixed endpoint. Along the way, entities are likely to encounter periods of flux, shifting norms and expectations, both data gaps and information overload, and evolving insights about who should be engaged. Regardless of the specific standard or framework applied, it is valuable for entities to periodically revisit their starting assumptions and validate their next steps to ensure adaptive learning and continuous improvement.*

*This white paper presents a structured yet flexible, fit-for-purpose adaptive climate risk management approach that ensures adaptive actions remain coherent and appropriately scoped within any chosen methodology, with monitoring, evaluation and learning used to revisit assumptions, pathways and thresholds as conditions change. This approach also provides a pathway for progressing from existing adaptive capabilities to those needed to effectively manage future climate risks.*

# TPT Framework

***Throughout the following sections, we utilise the framework of the TPT (Figure 1), exploring the intent of each Disclosure Element and how adaptation planning and action can be embedded for strategic resilience.***

## Ambition

In the TPT framework, the principle of “Ambition” is designed to ensure that entities set clear, strategic, forward-looking climate transition objectives that go beyond compliance. It requires entities to align plans with the latest climate science and policy expectations, and their own broader sustainability outcomes, enhancing climate resilience across the entire value chain. By considering the wider impacts and interdependencies of their transition strategies, entities are encouraged to drive meaningful change at both the sector and economy-wide levels. In short, establishing a credible type and level of ambition is fundamental to the overall integrity and effectiveness of a transition plan.

**1. Foundations**

“Foundations” establishes the starting point for credible transition planning by requiring entities to disclose their overarching objectives or ambitions for managing climate-related risks and opportunities. This section of a transition plan describes the strategic direction, operational scope, and context for a transition to a low-carbon, climate-resilient entity. It sets the tone for stakeholders, aligns internal and external expectations, and ensures that both mitigation and adaptation are recognised as essential and interconnected. Specifically, the TPT expects that ambition-related statements transparently set out high-level objectives, including emissions reduction and resilience commitments which are grounded in an assessment of material climate risks and opportunities. Ambitions should not only align with international climate goals, but also reflect the entity's specific risk context, operational footprint, and broader transition dependencies.

Importantly, the foundational ambition must be supported by disclosures on key assumptions and external factors, making explicit how it connects to underlying climate risks, business dependencies, and transition opportunities. This integrated approach ensures that preparedness and strategic flexibility are embedded into transition planning.

**How do adaptation and resilience come in?**

The core objective of adaptation planning is to manage risks and opportunities related to physical climate impacts that have either not yet been experienced but are likely to occur over a project’s life, or are currently considered rare and will become increasingly the norm. The key risk is that, if inadequately addressed, plans may be needlessly and expensively derailed, both operationally and strategically, from the near-term through to the long-term. Adaptation involves an informed, flexible, and proactive approach to strengthening climate resilience across an entity's assets, operations, supply chains, and the communities in which it operates, to better withstand and adapt to the increasing frequency and severity of climate-related disruptions.

### 1.1 Strategic Ambition

Entities seeking to achieve lasting low-carbon resilience define and position their strategic ambitions accordingly. As such, an entity's strategic direction is indicated by actionable adaptation objectives alongside decarbonisation goals; priorities are shaped by vulnerability and risk assessments as well as by emissions hotpots and value chain analyses; and clear, time-bound targets are set for both reducing emissions and enhancing climate resilience across operations and value chains. This dual focus ensures that entities not only meet net-zero targets but also build the capacity to withstand and recover from the physical impacts of climate change.

### 1.2 Business model and value chain

Entities may begin their climate resilience journeys by setting a baseline for their business models and value chains. For adaptation specifically, this should include vulnerability assessments, structured adaptive capability assessments, and climate risk assessments. Effective prioritisation is essential. To effectively address the many types of climate-related risks, not merely exposure to hazards, an entity should develop adaptation pathways that use vulnerability thresholds by mapping decision systems and establishing triggers for action. This shift from risk identification to proactive risk management is central to embedding resilience within transition planning.

A strategic approach involves assessing and selectively enhancing adaptation capabilities throughout the business model and value chain, which strengthens long-term resilience at operational, organisational, and systemic levels. This enables a more agile and action-oriented form of risk management, particularly for emerging climate risks that may fall below conventional thresholds to triggering action.

The scope of this analysis encompasses an entity's business model, supply chains, and surrounding communities and ecosystems, ensuring a holistic view of risk. Crucially, entities can stress-test their resilience strategies by applying multiple climate scenarios based on the latest and most credible science[1]. These scenarios inform adaptation planning[2] and highlight areas of both risk and opportunity across the value chain (e.g., upstream suppliers, downstream customers).

### 1.3 Key assumptions and external factors

Many climate-related and -unrelated external factors are dynamic, with limits to their predictability. They cannot always be fully foreseen, managed, or captured within traditional risk registers. Where residual climate risks remain after feasible adaptation measures, entities can design adaptation pathways—sequenced decisions and actions over time—to shift toward more resilient strategies as conditions change and existing options reach their limits. A successful strategy focuses on what can be influenced, intentionally cultivates key attributes such as flexibility and agility across the entity, and identifies opportunities for collaboration and risk transfer.

[12] https://unfoundation.org/what-we-do/issues/climate-and-energy/climate-science/whats-happening-at-the-ipcc/

[13] Adaptation planning and adaptive planning as referred to in this paper are related but distinct. Adaptive planning is the iterative, flexible method for making decisions under uncertainty, while adaptation planning is the climate-specific process that uses those methods to design and deliver adaptation actions.

## Maturity Journey for Foundations

The Foundations maturity journey describes how entities move from incidental consideration of physical climate risks toward the deliberate design of strategic intent, assumptions, and decision frameworks that make climate-resilient action possible. At this stage, the emphasis is on establishing clarity of ambition, scope, and governance expectations so that subsequent implementation, metrics, and accountability mechanisms are coherent and adaptation ready.

The following overview helps an entity locate itself on this journey (see the IFRS and TPT Supplements for more detail).

**An entity may already:** incorporate climate considerations into permits, plans, and technical studies using climate scenarios; engage stakeholders actively, but primarily around shared value rather than explicit climate risk and resilience; respond to weather-related incidents reactively.

**As first steps moving forward an entity may:** discuss climate risk at Board and senior management level in line with TCFD expectations; acknowledge climate risks in corporate reporting, with adaptation secondary to mitigation; use scenarios (e.g. Network for Greening the Financial System, NGFS) to support near-term disclosure and strategic framing; apply qualitative, non-standardised risk assessments that are largely defined at corporate level; engage on climate risk through compliance and disclosure processes.

**As an entity matures it may:** develop strategic assumptions about future climate conditions and material risks; apply ISO 14091-aligned concepts to consistently define exposure, sensitivity, and thresholds across sites; articulate high-level adaptation intent and decision principles, informing later pathway design; support cross-site dialogue and early learning.

**A mature entity may:** treat physical climate risk as a strategic design constraint; establish a clear, portfolio-wide adaptation intent aligned with ISO 14090 and ISO14091; provide a stable foundation on which implementation, metrics, and governance systems can operate coherently over the asset life cycle.


## Tangible Tools and Tips for Foundations

The following practical actions can help entities translate climate ambition into tangible steps across governance, strategy, and risk management irrespective of their size or stage.

- **Engage diverse opinions in climate risk assessments.** These can be carried out through interactive workshops to engage a full diversity of business lines, roles, and functions, identifying and prioritising climate-related risks and opportunities. This can foster entity wide acceptance of adaptation and resilience efforts, and emphasise links demonstrating that climate risk is business strategy risk.

- **Define and align on organisational boundaries for risk assessment.** Align all roles on the scope for the risk assessment, using tools such as the Extended Enterprise to identify core activities, inputs, outputs and external influences that could be impacted by climate risks and opportunities.

- **Use a holistic risk identification (enterprise risk management) scope.** Extend risk identification beyond immediate climate hazards and include broader systemic or business-related risks that affect exposure. This can be achieved through risk network activities, where the interrelationships between risks and opportunities are mapped, highlighting central nodes and potentially compounding risks.

- **Define risk appetite, thresholds, and triggers.** Define risk tolerance levels for climate risks and apply them to set clear prioritisation criteria and decision triggers. This can be especially useful in ensuring climate-related risks are not consistently treated as individual weather events but recognised as medium- and long-term risks where appropriate, helping to ensure that action is taken when needed and most impactful.

[14] BSI (2021) BS 8631:2021. Adaptation to climate change. Using adaptation pathways for decision-making. Guide. British Standards Institution, London.

- **Establish decision points that reflect risk tolerance values**, e.g., “when the temperature reaches x, we shall carry out action y”. Each action should be linked to decision triggers informed by climate risk assessments and unhooked from climate projections and dates (e.g., 2035)[1]. This approach allows adaptation to be implemented at the pace that climate change unfolds and enables entities to work with confidence amidst uncertainty, exploring a diversity of responses and opportunities.

- **Prioritise risks using approaches which best suit the entity**, e.g., impact-action mapping. While likelihood may be considered essential in understanding physical hazards, other tools such as impact-action mapping can help to navigate difficult conversations regarding how likely climate change events may be. Climate change is an emotive topic, and scientific models vary in their likelihood values for certain events. As a result, conversations surrounding likelihood are a common sticking point that hampers cross-functional buy-in when designing resilience and adaptation programmes.

- **Select scenarios carefully and use them to stress-test.** Use decision-relevant scenarios that include both physical and transition risks, such as those presented by NGFS, which can better support integrated planning. Apply at least two contrasting scenarios to test key decisions. A worst-case climate change scenario can help to better consider extreme weather events (tail risks) and possible long-term climatic conditions.

- **Centralise all assumptions in a single list.** Assumptions made are likely to extend beyond climatic variables to include those regarding material demand, global economic trends, international political events, etc. To ensure that the full list of assumptions underpinning climate risk assessments is visible to the entire enterprise and all decision-makers and actors thereafter, a single assumptions list should be stored and updated following any revision to the risk assessment. Identify and challenge which key climate-related assumptions are driving decisions, such as climate projections, material demand, and input costs, and where they may break down.

- **Assess cross-functional governance and any gaps.** Incorporate adaptation considerations across operations, finance, and governance - not only within sustainability teams.

- **Allocate roles, responsibilities and resources.** Mainstream leadership and governance to underpin delivery of this ambition, and ensure those with allocated responsibilities have the competence, capacity, and authority to deliver the ambition.

- **Integrate decision-making and financial planning.** Ensure adaptation priorities, not just emissions targets, are reflected in KPIs and remuneration, decision-making and investment governance, financial forecasting and planning, and capital allocation. This can be especially challenging in joint ventures, but ensuring both parties are aligned can ensure better adoption of key adaptive measures.

- **Consider strategic alignment.** Ensure adaptation, transition planning, and net zero goals are embedded in decision-making, business strategy, budgeting, and financial planning, including alignment with joint venture partners.

- **Prioritise dual-benefit actions, pairing Net Zero with resilience.** Prioritise resilience strategies that include physical risk preparedness, emission reduction targets, and social value outcomes. For instance, land management at sites can provide natural barriers to some physical risks, while also providing a means to offset emissions.

- **Residual risks.** For risks that cannot be fully and completely managed through proactive adaptation, consider enhanced adaptive capability, reactive controls and risk transfer (e.g., comprehensive insurance) to ensure that, should an event occur, its effects are tolerable and within an entity's defined objectives and thresholds.

- **Ensure continuous adaptation updates.** Make sure that adaptation practices are updated based on experience and foresight, applying competent expertise and drawing on science-based evidence.

- **Right-size an entity's ambition.** Set resilience goals that reflect and are aligned with an entity’s context, size, decision lives, maturity, ambitions, and risk profile, applying competent expertise and drawing on science-based evidence.

- **Use international standards to inform and guide.** Leverage well-established standards and frameworks to support internal efforts, even if full compliance is not a goal. For instance, ISO14090 principles can help to define adaptation objectives, while practices outlined in ISO14091 can assist with vulnerability assessments.

- **Undertake an adaptive capability assessment** to understand current strengths and gaps in governance, data, skills, and decision processes, so that adaptation pathways and investments are paced to what the organisation can actually deliver and improve over time.

- **Create local partnerships.** Where relevant, establish mutual benefit agreements or co-created compacts to ensure that adaptation actions can support local ecosystem resilience. Efforts can and should be aligned to local, regional, national, or international programmes and targets.

## Action

The “Action” principle of the TPT Framework and “continuous improvement” principle underlying ISO14090 focus on how entities will deliver their ambitions. This requires entities to move beyond intention, instead demonstrating how climate risks and opportunities will be actively managed – the most important part of climate risk management. This includes how a plan will be implemented and how external engagement will ensure action is inclusive, credible, and effective. Collectively, these components bridge ambition and actual impact, making this a defining element of a low carbon, climate-resilient transition plan.

This disclosure element comprises “Implementation Strategy” and “Engagement Strategy”.

**2. Implementation strategy**

The “Implementation Strategy” disclosure element focuses on how entities can integrate their climate considerations into systems, processes, and decisions that shape real-world outcomes. Moving from ambition to delivery requires more than one-off actions under the impression that an entity can "become adapted”; rather, it involves fully embedding climate resilience into policies, plans, delivery capability and investments to remain “adaptive” as conditions change. To ensure robust, lasting resilience, entities consider climate resilient transition planning when operational and financial decisions are made. Making adaptation part of “business-as-usual” will allow entities to better respond to evolving climate risks, support long-term value creation, and reduce vulnerability.

**How do adaptation and resilience come in?**

Adaptation becomes actionable when entities identify and prioritise measures that are climate-smart, cost-effective, timely, fit for early or iterative implementation, with the capability to deliver. This prioritisation can be informed by capability assessments that clarify current adaptive capacity, governance readiness, and data system maturity, ensuring adaptation pathways are fit for delivery and iteratively mature. Adaptation actions should be embedded into core business systems such as planning and decision cycles, operational risk processes, and standard capital expenditure (or CAPEX) programmes, rather than treated as standalone efforts. Embedding also means integrating adaptation into strategic plans, operational procedures (including Operations and Maintenance), enterprise risk management, risk registers, and investment decisions. A robust low-carbon, climate-resilient transition plan incorporates uncertainty, tipping points and decision thresholds, as well as capability gaps into strategic planning, enabling more informed and adaptive decision-making in the face of evolving climate risks.

Flexibility and agility are essential attributes of resilience that should be intentionally cultivated across the entity. By setting clear thresholds that reflect entity values and risk tolerance, entities can establish triggers for action and key decisions, or at least be prompted to discuss and explore these in greater depth. This approach embeds resilience into the core of transition planning, ensuring that entities remain responsive and adaptive as climate conditions and associated risks continue to shift.

### 2.1 Business operations

Embedding the concepts of transition and adaptation into business operations is key to ensuring that business-as-usual is resilient. Within the Metals & Mining sector, this means enabling decision-makers across technical, operational, and strategic levels to plan, prioritise, and sequence investments that reduce vulnerability and enhance adaptive capability. In an ideal world, these decisions would unfold across sites at the pace that climate change unfolds. While adaptation is essential, acting too early or too late is inefficient and may be costly.

One way to time these investments is using adaptation pathways. Adaptation pathways are sequences of adaptation actions planned over time, designed to address climate risks, with the flexibility to switch or escalate strategies as situations or thresholds change. They help to manage climate change uncertainty, identify triggers for adaptation, and put in place optimal adaptation actions at those trigger points. Often, entities begin by identifying adaptation actions (e.g., retrofitting infrastructure, improving water recycling, enhancing slope stability) and flagging those with potential to add or detract from mitigation actions (e.g., electrifying fleets, renewable power integration, energy efficiency improvements). Similarly, mitigation actions that may lead to maladaptation or synergistic effects on adaptation are flagged for revision or priority, respectively.

Entities with limited time and resources may use a streamlined, high-level approach designed to quickly develop basic or "first pass" adaptation pathways. Instead of using modelling and investment analysis, a Rapid Adaptation Pathways Assessment (RAPA) enables work in a few hours with experts and data, focusing on issues that pose the biggest risks to objectives or to particularly problematic issues needing more quantitative analysis. RAPAs enable entities to start simple and then build, bringing partners together early on to understand a problem and build consensus around one concrete pathway before diving into more technical and costly studies. While this is an effective approach for any entity to get started, it is especially the case for exploration companies, small- and medium-sized enterprises (SME), and those new to adaptation.

### 2.2 Products and services

Entities should assess whether their products and services remain viable in different future scenarios, including a future in which climate change is causing intense disruption, in a world that is fully adapted, and in a low-carbon world. On the flip side, entities should consider whether future scenarios present an opportunity for new products and services.

For mining companies, this goes beyond the commodity. Projects are often large-scale efforts that deliver essential services like roads, water access, and energy infrastructure to local communities. These services extend the entity's role, creating opportunities to support regional resilience and adaptation efforts. Simultaneously, changing climate conditions and local energy transitions may shift patterns in demand (e.g., increased interest in commodities used in green tech or adaptation technologies), open new markets (e.g., the move to metal leasing), or render certain products as less viable (e.g., the phase out of coal).

By embedding climate considerations into product and service strategies, it ensures entities can:

- contribute to local adaptation through resilient infrastructure;
- deliver value under a range of future scenarios; and
- protect long-term relevance and strengthen their social acceptance.

### 2.3 Policies and conditions

Internal policies and operating conditions can enable adaptation to move from a concept to actual implementation. Although strategic intent signals direction, it is the policies that define how that intent is put into practice across all business functions and locations. Integrating adaptation into policies helps embed resilience into standard procedures, whether through site development guidelines, permitting and closure protocols, investment, or procurement requirements. This includes reviewing and updating policies related to social performance, environmental management, and contractor expectations, to ensure they reflect climate-related risks and opportunities. In cases where critical service or supply continuity may be at higher risk, companies may require suppliers to undertake a vulnerability assessment and provide key outputs as part of a more robust due diligence process.

### 2.4 Financial planning

The focus of this sub-element's disclosure should demonstrate whether an entity has integrated transition planning into its financial planning and disclosures. In TPT, this considers elements of both transitioning and adapting to ensure timely implementation of priority measures. Specifically, an entity's risk profile, as determined in its climate risk assessment, may inform budget allocations between mitigation and adaptation. Dedicated budgeting for adaptation should ideally include funding specific measures, as well as build internal capacity and set aside contingency resources for unforeseen climate-related events. Where synergies are flagged, these may be given higher priority. In particular, high-level adaptation pathways should inform the development of adaptation budgets and investment plans, which should be considered as a standard part of financial planning. Where adaptation is embedded within the existing financial planning system (e.g., annual budgets, capital planning cycles, and investment decision-making frameworks), this supports operational continuity, reduces vulnerability, and reinforces overall transition credibility.

## Maturity Journey for Implementation Strategy

The Implementation Strategy maturity journey describes how entities translate foundational intent into execution, moving from ad hoc, compliance-driven responses toward the systematic use of pathways, triggers, data, and decision cycles to manage climate risks in practice. The emphasis is on operationalisation, iteration, and learning as uncertainty increases.

**An entity may already:** address climate risk through compliance-driven sustainability reporting and mitigation objectives, with limited operational focus on adaptation.

**As first steps moving forward, an entity may:** acknowledge weather-related risks at corporate and site levels, typically through policies or post-incident reviews; recognise climate risk at leadership level, but implement actions that remain reactive and weakly linked to decisions; convene workshops to raise awareness; begin to define roles and responsibilities.

**As an entity matures it may:** integrate climate risk management into sustainability, business continuity, and operational planning frameworks; design and apply site-specific adaptation pathways, thresholds, and triggers using ISO 14091-aligned prioritisation; use monitoring systems, dashboards, and vulnerability assessments to inform decisions and actions; embed climate risk into enterprise risk management and continuity planning.

**A mature entity may:** execute adaptation systematically across governance, planning, and operations using ISO-aligned cycles; apply downscaled scenarios, real-time monitoring, and quantitative pathways across the mine life cycle; iterate actions through feedback and learning to remain adaptive under deep uncertainty.

## Tangible Tools and Tips for Implementation Strategy

The following practical actions can help entities ensure that their implementation strategies are appropriate, flexible, and well-timed:

- **Identify proactive and reactive controls with Risk Bowties.** Update as maturity develops and different information is valued, also as learning and new information reveal fresh insights. There is no silver bullet for any individual risk, so using tools to identify a suite of complementary proactive and reactive controls that compensate for each other's weaknesses can help ensure that risk management is effectively implemented.

- **Use simple action-planning tools and cross-functional workshops to guide implementation across teams.** Make sure that strategies are integrated and aligned with overall goals, and are proportionate to the maturity of practice being developed at that point.

- **Consider and prioritise community value.** Where relevant, design products, services, or infrastructure that also deliver resilience benefits to local communities.

- **Refer to previously used scenarios and thresholds.** Choosing decision-useful scenarios (e.g., NGFS, IPCC, bespoke) with a clear set of assumptions makes the scenarios more useful later down the line, especially when trying to explore and understand tipping points.

- **Carry out an Adaptation Pathways Assessment.** Mapping "low-regret → flexible → transformative" actions against climate- or business-related triggers (e.g., rainfall > 200 mm in 24 hours) can ensure that actions are implemented at an appropriate pace. It can also help to understand the thresholds at which current practices are no longer able to deliver on objectives and ensure an enabling environment for adaptation is retained through near-term decisions.

- **Embed a range of prioritisation tools.** In addition to the adaptation hierarchy ("low-regret -> flexible -> transformative" actions), other tools can be utilised, including ranking actions by the effort required and the potential impact of the action. Simple tools such as Kanban boards can be repurposed to help prioritisation as well as sequence and track actions.

- **Action findings of exercises.** Mainstream governance frameworks, priorities, capabilities and competencies to action the findings of all exercises carried out.

- **Create an adaptive capacity development plan.** Set out how the entity will build the skills, systems and partnerships needed to understand and manage climate-related risks and opportunities over time.

- **Complete an Adaptation Plan.** Implement an adaptation plan, which can help identify and define what actions are needed across the entity, to manage climate-related risks and opportunities. Key components include:
  - strategic direction and goals,
  - the outcomes of entity-wide vulnerability and risk assessments,
  - defined climate thresholds that trigger specific climate resilience and business-continuity responses,
  - identification of tipping points in chronic risks that change risk priorities and required action, and
  - integration of adaptation into core strategies, risk registers, operational procedures and capability-building so that the right decisions are taken at the right time.

- **Develop an adaptation or resilience investment plan.** Developing a robust adaptation investment plan allows entities to set out how adaptation measures will be financed and delivered through specific investments and financing arrangements. Key components include:
  - a prioritised portfolio of activities and projects,
  - financial risk assessments of climate-related risks and opportunities,
  - cost-benefit assessments,
  - budgets and financing mechanisms, and
  - a resource-mobilisation strategy.

- **Update mechanisms at an appropriate pace.** Set clear processes to revise plans as new technologies or norms emerge, keeping implementation current and effective. Identify and address any capacity gaps to operating at the required adaptive maturity through these and any other required measures.

## 3. Engagement strategy

It is rare that an entity is completely in control of its resilience to climate risk. To varying degrees, it is normal for resilience to depend upon decisions made by others that are outside their control. It is equally true that an entity's adaptation decisions can have consequences beyond their own operations. Some important resilience measures are not under the control of a single entity and require a combined effort. This is one key difference between adaptation and decarbonisation. The "Engagement Strategy" disclosure element under the "Action" principle highlights the importance of working with a range of stakeholders to ensure that all relevant actors understand, support, and contribute to climate-adapted climate transitioning.

### How do adaptation and resilience come in?

For an entity to identify and interrogate a full breadth of risks and opportunities, engagement with a broad and diverse set of stakeholders is helpful. Together, entities and their stakeholders can explore climate impacts and adaptation opportunities; form relationships and build a shared understanding; use expert knowledge and existing data likely beyond an entity's in-house expertise; identify and estimate thresholds where action is needed; identify actions that could be implemented; and develop high-level adaptation pathways. Engagement can also clarify who else to involve and highlight areas requiring further investigation.

Adaptation and resilience are embedded in a mining company's engagement strategy by collaborating early and inclusively with stakeholders including local communities, governments, utility and infrastructure operators, supply chain partners, sector partners and subject matter experts. Sharing climate data, local insights, and ecosystem knowledge builds trust and ensures that adaptation plans reflect real-world needs and priorities. By making engagement an ongoing, iterative process, entities can co-develop effective resilience measures, align efforts across operations and supply chains, and maintain social acceptance in the face of a changing climate and economy.

Adaptation is an iterative process that is most effective when key stakeholders share a common understanding and shared interest. Workshops that provide "safe spaces" for discussing vulnerability with key stakeholders are effective and efficient. However, carried out, meaningful engagement ensures that key adaptation processes including vulnerability and adaptive capability assessments, adaptation actions, and prioritisation are all reflective of on-the-ground realities and the views and needs of affected groups.

### 3.1 Value Chain

Mining companies can engage their suppliers, contractors, and customers to ensure climate adaptation measures, in addition to emissions targets and transition planning, are understood and implemented throughout the value chain. By sharing climate risks and adaptation strategies, entities foster resilience in sourcing, logistics, and downstream operations, helping to reduce disruption and strengthen the long-term stability of supply and demand networks. Sharing factual, evidence-based inputs such as climate hazard and exposure data openly with value chain stakeholders also provides a common point of departure for an effective, long-term engagement process.

### 3.2 Industry

Industry-wide adaptation involves collaboration on knowledge sharing, best practices, and innovation for climate resilience. This is especially pertinent for sectors such as Mining & Metals, where there can be negative perceptions and scrutiny from outside groups. By partnering with industry peers, groups, and associations, entities operating within the sector (including exploration companies, mining companies, investors, and industry partners) can set adaptation standards, advocate for supportive policy, and co-invest in sector-wide initiatives that address shared risks and opportunities brought by climate change.

### 3.3 Government & Civil Society

Engagement with local governments enables companies to align their adaptation plans (as well as their Net Zero targets) with regional climate policies, infrastructure planning, and emergency response strategies. Working closely with public officials supports coordinated action on climate risks that have regional effects (such as flooding, water scarcity, or extreme weather) and ensures entity adaptation efforts contribute to broader community resilience.

Civil society groups such as non-government organisations, academic institutions, and community organisations offer vital perspectives and expertise on local environmental and social dynamics. Including these voices enhances the relevance and legitimacy of adaptation plans, helps identify vulnerable populations, and ensures that adaptation actions deliver real benefits for people and nature.

Transparently disclosing adaptation priorities and progress, entities can build confidence with affected stakeholders, demonstrate accountability, and, where possible and appropriate, encourage reciprocal investment in resilience-building activities.

## Maturity Journey for Engagement Strategy

The engagement maturity journey shows how organisations evolve from transactional, compliance-focused engagement toward sustained collaboration that recognises resilience as a shared challenge across communities, supply chains, infrastructure, and authorities.

**An entity may already:** use community engagement primarily to support social acceptance and permitting, with climate discussions triggered by approvals or disruptive events.

**As first steps moving forward, an entity may:** initiate stakeholder mapping and site-level workshops, with clearer roles for climate and community engagement; structure climate engagement around short-term physical risks, remaining focused on managing impacts on communities rather than shared vulnerability; communicate climate strategy cautiously, with limited sharing of lessons learned.

**As an entity matures it may:** expand engagement to support adaptation planning, informed by ISO 14091-aligned mapping of vulnerabilities and interdependencies; incorporate community and infrastructure perspectives into vulnerability assessments; integrate engagement into the adaptation management cycle and align actions with sustainability objectives.

**A mature entity may:** embed engagement as a strategic function of adaptation, aligned with TPT and ISO 14090 & 14091; use standardised, participatory assessments with communities and authorities to address shared risks; allocate clear leadership, resources, and budgets, and act as a partner in regional resilience planning.

## Tangible Tools and Tips for Engagement Strategy

The following actions can help entities ensure that engagement strategies are effective and enable productive, two-way dialogue which is essential to a balanced adaptation plan:

- **Use existing processes to help map stakeholders across the value chain, wider enabling environment, and domain of impact of adaptation measures.** Using the adaptation pathways process to identify key stakeholders whose input can be vital to affected adaptation pathways approaches or using information already collected for Scope 3 emissions mapping can streamline approaches. The Extended Enterprise activity can be adapted and used to identify value chain partners associated with the relevant inputs, outputs, and external influences that an entity's core activities depend on.

- **Engage vulnerable points in the stakeholder system to find ways to increase resilience.** Develop procurement protocols which encourage and support climate resilience for climate vulnerable goods and services.

- **Update the scope and process of engagement.** This may be done as adaptive capacity development reveals engagement to be positive.

- **Put in place the roles, responsibilities and resources to deliver the more mature scope and processes.**

- **Revisit and update stakeholder engagement plans.** Value chain mapping and broader stakeholder mapping activities, whether carried out using an Interest vs Influence Matrix or other tool, should be updated and revisited throughout the planning and implementation cycles of adaptation.

- **Run cross-functional workshops and continually communicate.** Workshops (particularly threshold identification through adaptation pathways assessment), group interviews, or even townhalls with key partners can help to collect insights that align priorities. Share selected findings from vulnerability, climate risk and adaptation pathways assessments with community partners, local authorities, and civil society. This two-way communication builds trust, enhances transparency and accountability, and provides useful data that can supplement public resources or even inform other adaptation efforts. It can also build the appetite for mutually beneficial collaboration where required.

- **Embed adaptation into shared value.** Where working with stakeholders on co-created compacts or projects aiming to build and enhance shared value, consider integrating adaptation measures as standard.

- **Collaborate on infrastructure planning.** Pool resources with governments, peers, supply chain partners and communities to deliver resilient regional infrastructure. Provide regular updates on adaptation plans and progress to support coordination and alignment.

- **Build mutually beneficial capacity through exchanges.** Use placements, visits, or role exchanges to build mutual understanding and strengthen adaptation capabilities across an entity or between different parties. This could extend to and include working with academic institutions on focused research projects, learning from other local mining companies where shared actions would provide shared benefits, and encouraging subject matter experts to take opportunities to learn in different settings.

## Accountability

Without accountability, there can be less incentive for an entity to carry out their ambitions and actions; and when they are carried out, it may be with lacking cohesion. Accountability ensures that climate ambitions translate into real outcomes. The Accountability principle engenders the structure needed to track progress, respond to change, and maintain alignment between strategy and day-to-day decision-making.

This disclosure element comprises “Metrics and targets” and “Governance”.

**4. Metrics and targets**

Metrics and targets are critical for tracking key performance indicators (KPIs) and ensuring continuous improvement. While indicators are what an entity assesses (i.e., qualitative or quantitative variables that help assess changes, progress, or status), metrics are the means by which an entity measures an indicator (i.e., specific, measurable data points or units used to quantify an indicator). Targets represent where an entity wants to get to (i.e., explicit goals established for an indicator or metric that define the desired level of performance or achievement). Targets are typically time-bound, whether quantitative or qualitative. The aim is to ensure alignment with strategic climate ambitions while holding entities accountable for meaningful progress and transparency in their climate adapted transition plans.

**How do adaptation and resilience come in?**

Adaptation indicators are often those which signal changes in progress or status in vulnerability and/or adaptive capability at the site, entity, or value chain level. As a result, adaptation metrics tend to be those which help to measure improvements needed in adaptive capabilities to implement pathways or pivot with new information or unexpected developments. They support disclosures on the performance of course-correction processes to ensure action is guided by lessons learned and continuous improvement occurs, in addition to supporting smarter, transparent, and responsible decision-making. This disclosure sub-element focuses on meaningful metrics and targets to measure, manage, and communicate progress toward an entity's climate resilient transition objectives.

### 4.1 Governance, engagement, business and operational

Metrics and targets that measure and drive improvements regarding key enablers for adaptation and resilience can catalyse and drive progress towards climate resilience.

**Governance:** These should help entities monitor leadership accountability and strategic decision-making on climate risks, through e.g., board oversight, the presence of climate adaptation policies, or the completion of climate risk reviews.

**Engagement:** A starting point for measuring and monitoring engagement may be to track the number of stakeholder meetings held or feedback scores from engagement activities, while a more nuanced and fulsome approach to resilience might be to track the diversity of groups consulted (e.g., local communities, governments, industry associations) and range of issues upon which long-term resilience depends (e.g., nature and biodiversity). These help measure the depth and effectiveness of stakeholder involvement in climate adaptation planning, implementation and resilience-building over the short, medium- and long-term.

**Business and operations:** Within Metals & Mining, relevant metrics and targets may include production downtime due to extreme weather, water use efficiency, rehabilitation of mining sites, or worker health and safety incidents linked to weather and climate impacts, as well as adaptation pathways (both implementation of and deviation from), and adaptive capabilities of employees, contractors, and community partners.

Adaptation metrics linked to adaptation pathways show not just where an entity is heading, but how well it is progressing in implementing prioritised adaptation actions and achieving resilience outcomes. At each decision point in a pathway, metrics (e.g., volume of water recycled per month) monitor proximity to thresholds (e.g., 2+ severe droughts in 3 years) and associated triggers (e.g., number of droughts). If targets are achieved, then the entity continues as planned. If targets are missed, then action escalates to the next pathway step (e.g., the development of alternate water sourcing).

Adaptive capability metrics and targets measure the gap between where an entity is and where the same entity needs to be, and may include:

- Leadership and its commitment to the adaptation process
- Organisational structures that define roles and responsibilities clearly and permits effective delivery of actions and can remain flexible to new opportunities for improved actions
- Availability and mobilisation of financial, human and technical resources
- Identifying the moments when the organisation makes decisions that could be impacted by climate change
- Organisational Learning
- Technical Expertise

For robust systems-level resilience, adaptive capabilities of key stakeholders may also be measured and, where possible, managed collaboratively.

### 4.2 Financial

Financial metrics for understanding and managing the economic impacts of climate risks and adaptation efforts help quantify financial vulnerability, inform risk management, and guide planning and budgeting by tracking climate-related losses, the cost of resilience investments including (e.g., infrastructure upgrades or water management), insurance premiums, and asset valuation shifts due to climate exposure. Clear targets demonstrate financial stewardship and support long-term business resilience (e.g., boosting adaptation investments, lowering insurance costs, or generating positive returns on resilience projects).

Financial metrics used in various sectors include:

- ·climate-adjusted returns, which incorporate climate-related costs and resilience benefits into projections;
- ·scenario stress-cost ratios, comparing operating costs with and without resilience measures under extreme conditions; and
- ·cost-avoidance estimates alongside return on resilience investment (RORI), highlighting the cash savings and “bang-for-buck” from proactive adaptation.

Additional metrics such as climate risk-adjusted payback periods, climate-adjusted asset values, capex resilience share and OPEX resilience allocations provide forward-looking, quantitative insights for decision-makers to structure resilient investments, prioritise adaptation actions, and communicate financial outcomes under a range of climate scenarios.

**Resilience dividends**

Resilience dividends recognise that climate adaptation and resilience investments capture growth and well-being generated by making systems more robust to climate shocks and stresses. They help mining companies, value chains, and the industry sector achieve lasting resilience in a dynamic climate. Using a resilience dividends approach has the potential to support the development of innovative financial instruments (e.g., blended finance, risk-sharing mechanisms) to de-risk adaptation and attract private capital, which is well-noted as critical to achieving broader adaptation goals.

Robust, systems-level climate resilience means that mining companies, investors, and local governments measure and communicate value across resilience dividends and demonstrate real net benefits and unlock further investments. This holistic approach makes adaptation not just a protective measure, but a catalyst for sustainable development and robust stakeholder value in the mining sector.

The three categories of benefits are:

- Dividend 1: avoided losses from climate hazards
- Dividend 2; new economic gains
- Dividend 3: broader social or environmental co-benefits.

Examples:

- Tailings Dam Strengthening: Beyond avoiding catastrophic failure (Dividend 1), can provide local construction jobs (Dividend 2) and create safer downstream ecosystems (Dividend 3).
- Water Management Infrastructure: Installing new water recycling systems prevents losses during drought (Dividend 1), reduces input costs and boosts mine profitability (Dividend 2), and supports local agriculture and water quality (Dividend 3).
- Climate-Adaptive Energy: Transitioning to renewable energy on site lowers risk of supply disruptions (Dividend 1), creates skilled jobs (Dividend 2), and eliminates some emissions (Dividend 3).

### 4.3 GHG metrics and targets

The calculation of greenhouse gas emissions is a core part of understanding the impact of an entity or operation on the surrounding climate and setting of meaningful decarbonisation targets. However, it is critical that emissions tracking and decarbonisation efforts are not undertaken at the detriment of adaptation. Target setting should not focus disproportionately on decarbonisation, as this can lead to decisions diverting resources and focus from key areas of adaptation to achieve materially less significant improvements.

### 4.4 Carbon Credits

Many entities use carbon credits to offset residual, un-abatable greenhouse gas emissions. Carbon credit markets remain relatively unregulated and unstandardised, although all offsets are guided by two requirements: 1) they should be additive, an additional activity beyond the scope of usual business activities, and 2) they should be permanent, acting as a long-term store of the captured or sequestered carbon. However, not all carbon credits are made equal.

When selecting a carbon offset, both the adaptive resilience of the project and any potential adaptive capabilities that the project could provide should be considered. Firstly, is the project resilient to impacts of climate change itself? Many projects include biological carbon sequestration through the planting of trees; the potential vulnerability of these projects to future wildfires or other physical risks now, in the long term, and across multiple plausible climate scenarios may be useful to consider. Furthermore, are there any additional adaptive capabilities that a project could provide an entity as a secondary benefit to the scheme? For example, the project could be developed in a way that improves certain ecosystem services or water quality to make local communities more resilient to the impacts of climate change. Additional co-benefits of projects provide an opportunity to improve ecosystem resilience, bridge nature and climate-related risk management to ensure greater adaptive resilience for the entity.

## Maturity Journey for Metrics and Targets

The metrics and targets maturity journey explains how entities progress from compliance-focused indicators toward decision-relevant measures that track vulnerability, adaptive capability, and progress against climate resilient transition objectives.

**An entity may already:** focus metrics on environmental disclosure, with qualitative treatment of climate risk and limited insight into site-level vulnerability or adaptive capacity.

**As first steps moving forward, an entity may:** establish robust Scope 1–2 GHG accounting and partial Scope 3 estimates; track site-level water and adaptation data inconsistently, often triggered by events rather than targets; introduce early adaptation indicators, largely led by sustainability teams.

**As an entity matures it may:** improve Scope 3 data quality and introduce an adaptation metrics cycle with defined review and feedback; use ISO 14091-aligned tools to produce consistent vulnerability and adaptive capacity metrics across sites; set enterprise-led targets that link thresholds, dashboards, and prioritised adaptation actions.

**A mature entity may:** operate an integrated, quantitative metrics framework aligned with TCFD and ISO 14090 & 14091; embed resilience KPIs and financial risk metrics into planning and investment decisions; use continuous monitoring and learning to refine targets over time.

## Tangible Tools and Tips for Metrics and Targets

The following actions can help entities embed accountability in the most appropriate, measured, and flexible manner:

- **Balance transition and adaptation.** Track both mitigation (e.g., GHG emissions, carbon credits) and adaptation outcomes (e.g., slope stabilisation, ecosystem resilience). Set targets that cover and, if possible, integrate transition and adaptation, ensuring objectives reinforce rather than undermine each other. Where needed, start with prioritising metrics that support business continuity (rather than investor engagement).

- **Consider short-term measurability, long-term relevance.** Choose indicators that can be measured in the short-term but link to long-term outcomes, enabling tracking of adaptive capability and course correction (e.g., the evolution of impacts and adaptive capability, instigation of monitoring, and evaluation for corrective actions).

- **Use evidence-based target setting.** Ensure commitments are realistic, time-bound, and fully embedded into strategy and operations. Avoid “fad” targets, even when others in the industry are aligning to them.

- **Stress test performance.** Use scenarios, basic climate risk checklists, external toolkits, and cost avoidance estimates (e.g., benchmark against recent local events or use simple in-house calculations) to help justify specific, near-term adaptation investments that can materially reduce operational risks or downtime. Develop the scope of the stress testing to align with increasingly mature adaptive practice.

- **Define decision thresholds.** Define the climate, operational, or business thresholds that would trigger adaptation or resilience investments to sustain performance under different scenarios. Ensure that budgets are set up in advance to reflect the possibility of this occurring and have mechanisms in place which enable smooth utilisation of the required funding.

- **Consider qualitative or semi-quantitative data.** If needed, especially at project or site level, use qualitative or semi-quantitative data where detailed analytics or modelling is not feasible. This can be generated with appropriate expert support through:
  - local climate scenario workshops with community partners to estimate the stress-cost ratio.
  - applying “rule-of-thumb” calculators or industry benchmarks for cost avoidance.

- **Increase transparency in external communication.** Communicate targets clearly to external stakeholders, highlighting both decarbonisation progress and resilience dividends.

- **Embed adaptation in mainstream accountability.** Place KPIs for delivery with core functions including finance and operations, not just sustainability. Integrate CAPEX/OPEX resilience allocations into existing budgeting processes e.g., annual or project-level capital plans (rather than a stand-alone report). Ensure that those with roles and responsibility for adaptation have the authority and resources to implement effective adaptive action.

- **Monitor progress.** Ensuring progress is monitored against the adaptive capacity development plan, and the adaptation pathways plan, among others. Ensure plans are regularly updated as new learning and information emerge, and that monitoring, evaluation and learning processes effectively guide adaptive practice and are themselves refined in light of new insights.

- **Work towards financial integration.** Use climate-adjusted financial metrics such as climate-adjusted returns, Capex Resilience Share, and OPEX Allocations to resilience.

- **Use an adaptation pathways approach.** This can help understand what future impacts need to be managed, and how to retain a suitable adaptive enabling environment through the decisions being made in the near-term. Specifically, this method enables companies to identify when operations are no longer meeting financial or non-financial goals due to climate shifts and to select cost-effective measures at those thresholds.

- **Carry out a credit and offset assessment.** Carry out an assessment of proposed carbon or nature credit purchases to investigate additional benefits related to other aspects of sustainability e.g. shared value, ecosystem services support, biodiversity. Assess potential credit purchases for their resilience to climate change impacts, and determine if their mode of operation embeds adaptation.

**5. Governance**

Governance considers who holds the entity accountable for delivering on its transition and adaptation objectives. It includes the role of the board and senior leadership, and the systems in place to monitor progress and drive action. For adaptation, strong governance means clearly defined responsibilities, cross-functional coordination and integration of climate resilience into enterprise-wide risk management and decision-making processes.

**How do adaptation and resilience come in?**

Whether or not adaptation and resilience efforts are successful is reliant on the effectiveness of governance frameworks. The responsibilities for making adaptation-related decisions and implementing actions should be explicit, inclusive of making clear the options available to decision-makers and operatives when implementing adaptive actions. To ensure that potential impacts of adaptation and resilience actions are maximised, and are not inhibited by other elements of business strategy, all decisions within the entity should be climate informed, i.e. other elements of business strategy are not developed or actioned without climate change being considered and the trade-off implications for adaptation and resilience actions.

**5.1 Board oversight and reporting**

Board and executive oversight (e.g. at a committee or equivalent level) plays a crucial role in steering adaptation and resilience investments for mining companies. Boards are responsible for setting policy, profitability, and return on investment objectives, and evaluating implementation with fiduciary responsibility for managing known risks such as climate change.

Boards may ideally conduct regular reviews of adaptation measure progress and effectiveness, ensuring that these investments deliver meaningful risk reduction and systems-level improvements each year. This ongoing assessment not only strengthens governance but drives accountability at the highest levels, providing confidence to stakeholders that climate resilience remains a core business priority.

**5.2 Roles, responsibility and accountability**

Clear management accountability is essential for effective delivery of adaptation and resilience projects. Senior leadership must establish direct responsibility for implementation, ensuring that project managers and teams are mandated to track return on investment as well as lessons learned from each initiative. Within Metals & Mining entities, the need for clear definitions of roles, responsibilities, and accountability is especially pertinent given the division of labour between corporate sustainability teams (who are regularly responsible for the design of transition and adaptation planning) and local operational teams who are tasked with implementing the planned actions in and amongst other core day-to-day responsibilities.

Regardless of specific business line roles and responsibilities, there remains cross-functional enterprise-wide responsibility for adaptation planning and progress tracking.

### 5.3 Culture

To ensure successful implementation, an entity's culture must align with the strategic ambition of its transition plan. By fostering a culture that recognises teams excelling in adaptation and resilience, and encouraging open sharing of knowledge through the discussion of "lessons learnt" and "what worked well", entities can accelerate adoption and implementation of best practices across all sites and business lines to maximise the potential of its integrated transition plan.

### 5.4 Incentives and remuneration

Employee incentives are a powerful tool for aligning individual and organisational goals with climate resilience strategies. Linking executive and staff variable pay to the achievement of key milestones such as successful investment delivery and tangible reductions in climate risk ensures that the workforce remains motivated and accountable. This can help to link corporate and operational site-level targets, further encouraging a well thought-through and joined up approach between an entity's different teams.

### 5.5 Skills competencies and training

To fully support the design and implementation of an effectively integrated transition plan, regular training and upskilling should be embedded for both site and corporate staff. Training should cover adaptation best practice, climate risk analysis in line with international standards (e.g., ISO 14090 & 14091), and ongoing investment monitoring, equipping teams with the capabilities needed for continuous improvement and robust climate performance.

## Maturity Journey for Governance

The governance maturity journey describes how accountability, authority, and escalation mechanisms evolve to ensure adaptation and resilience are embedded in decision-making, not treated as discretionary or peripheral.

**An entity may already:** focus governance on compliance, permitting, and disclosure, with episodic Board-level discussion of climate risk; manage site-level weather risks reactively through operational practices.

**As first steps moving forward, an entity may:** assign responsibility to senior leaders for climate risk, supported by policy statements and clear decision authority; maintain a focus on current risks and emissions, beginning to recognise adaptation needs; introduce speak-up mechanisms and site-level champions to surface risks.

**As an entity matures it may:** integrate site-level insights into corporate governance and consider future, reasonably foreseeable risks; use lessons from mature and closure-phase assets to inform new investments; apply quantitative vulnerability assessments and expert judgement to support proactive decisions.

**A mature entity may:** operate integrated governance with clear accountability across corporate and site levels; embed adaptation into Board oversight, investment, and acquisitions using ISO-aligned assessments; allocate dedicated resources to address uncertainty and adaptive capability gaps.

## Tangible Tools and Tips for Governance

- **Ensure board oversight covers both decarbonisation and adaptation.** This should be clarified when climate change is a standing agenda item with both elements listed as sub-items on the agenda.

- **Leadership demonstrates clear support.** This is important for adaptive action and continuous improvement, enabling increasing maturity of action, and enabling mainstream adaptive practice.

- **Ensure effective progress and action against plans.** Adaptive capacity (maturity) development plans, and adaptation pathways plans, are most effective where progress and actions are monitored, evaluated and learned from on a regular basis. This helps ensure that near-term decisions do not lock in maladaptive outcomes.

- **Appoint climate champions across the business to drive adaptation and transition integration.** Champions should regularly raise resilience and adaptation considerations in discussions to ensure that all decisions made consider climate change.

- **Encourage staff to raise uncomfortable issues.** Building a culture of openness helps to ensure that emerging risks are discussed and recognised rather than dismissed.

- **Create speak up mechanisms.** Create safe channels for staff to challenge assumptions and highlight overlooked risks, ensuring uncomfortable truths reach decision-makers.

- **Provide weather versus climate clarity.** Differentiate short-term weather events from long-term climate risks so both are recognised and escalated appropriately, recognising that failing to engage in the short-term can enhance potential impacts of chronic climate risks.

- **Regularly review operational objectives and external influences.** This is inclusive of regional and sector risks, opportunities, and news to refresh governance context, ensuring oversight remains relevant.

## Maturity Journey

The Metals and Mining value chain is complex. Project stages span from mineral exploration through project development, extraction, comminution, processing, and use of materials. While larger entities may have projects and divisions that span several value chain stages and minerals, most of the sector is composed of thousands of smaller (“junior”) entities which often specialise in a particular value chain stage and / or mineral. Projects are commonly progressed through sales from one specialist entity to another. It is important to note that the importance of adaptation and ease at which it can be implemented is not influenced by where an entity or project sits along the value chain. All entities require and can implement and integrate adaptation efforts. However, entities may differ in their level of maturity in doing so.

While aspects of a typical maturity journey have been outlined in this document, the technical supplements to this white paper are dedicated to outlining the maturity journey that any entity could take. To ensure that the examples presented in the next section are relevant to a diverse range of entities within the sector, a composite profile was developed to act as both an “everyperson” and a “strawperson”. In the TPT Aligned Technical Supplement, TPT principles (i.e., ambition, action, and accountability) are examined against what an entity may:

- already have or be doing,
- be doing or considering in its first steps in moving forward on a journey to maturity, with respective to adaptive capabilities,
- extend its actions and considerations to as it becomes adapted; and,
- do and/or consider when it becomes adaptive.

In the IFRS Aligned Technical Supplement, a coherent narrative of an entity's maturity journey is described in alignment with the four TCFD and IFRS aligned pillars (i.e., “strategy”, “risk management”, “metrics and targets”, and “governance”). Notably, “engagement” is included to help bridge the gap between IFRS and TPT.

## Decoding where to start

Knowing when and how to begin integrating adaptation can be difficult. Not all action is urgent, although some can be. Adaptation requires windows of agency. It may be viewed as something to address down the line, for instance once a mining project becomes operational, or once the site has been exposed to a physical risk, however reactionary measures are often more expensive than proactive actions. In reality, the earliest stages of a project offer the greatest flexibility to act (Figure 2); exploration and feasibility are when companies make foundational decisions with long term consequences. Designing for resilience from the outset can reduce lifetime costs, limit future retrofitting and avoid locking in exposure to climate hazards. This ultimately ensures a project's longevity, irrespective of what the future climate looks like and delivers more sound resilience.

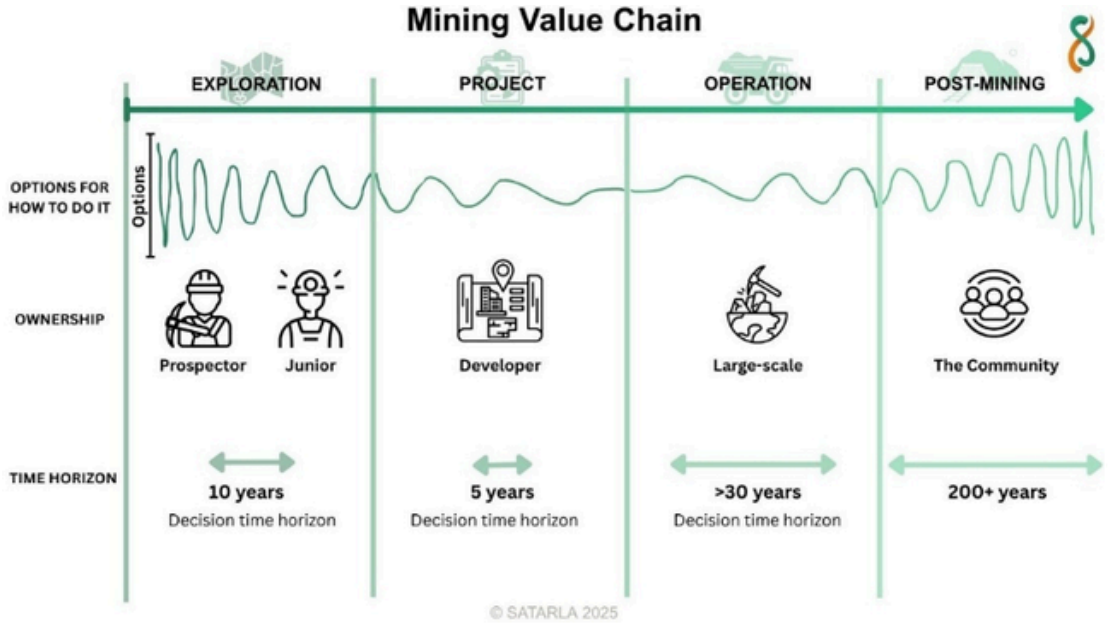


Figure 2. Decisions around infrastructure, materials, location and engagement are still open - making the outset of a project the most practical and cost-effective point to embed climate resilience.

Notwithstanding, adaptation is highly relevant throughout the entire lifecycle of a mine and there is great value in engaging ongoing projects and integrating adaptation into all stages of the mining value chain. Within development and operational projects, co-benefits can include increased social return on investment and local community acceptance of projects, managing threats of project disruption. This is particularly emphasised through the development of resilient regional infrastructure and the integration of adaptation into not only 'site' activities but all of those that the entity undertakes.

Looking ahead, adaptation can support post-mining land use and local economic transitions. For example, improving energy security for surrounding communities could offer co-benefits during operational and closure phases of a mine. Long-lived structures like tailings storage facilities (TSF), waste rock piles, and water management systems are frequently left in place indefinitely and definitively require adaptation planning to ensure structural integrity under changing climatic conditions and meet future regulatory and community expectations.

Adaptation is not a one-time decision; it is a continuous process. Starting early enables proactive planning and continuing through the lifecycle ensures that no stage is left exposed

## In Conclusion

Climate risk is now widely recognised as business risk, and adaptation is the essential response to this reality. While emissions reduction remains critical, it is no longer sufficient on its own. The mining sector, with its long project lifecycles and exposure to physical climate hazards, must integrate adaptation into its strategic planning to ensure operational continuity, regulatory compliance, and long-term value creation. This suite of documents aims to outline how adaptation can be embedded into transition planning using the Transition Plan Taskforce (TPT) framework, offering practical tools, case studies, and guidance tailored to the metals and mining sector.

Adaptation is not just about responding to hazards; it is about understanding the real risks and vulnerability and building internal capacity to act. By shifting focus from external threats to internal strengths, mining companies can proactively design resilience strategies that are context-specific and inclusive. This includes assessing adaptive capability, identifying decision thresholds, and developing adaptation pathways that guide timely and cost-effective action. The paper emphasises that adaptation should be embedded into business-as-usual processes, from procurement and operations to financial planning and governance.

Integrated transition plans that combine adaptation and decarbonisation offer a comprehensive approach to climate risk management. These plans enable entities to align capital investment, improve access to climate-aligned finance, and build stakeholder confidence.

Ultimately, adaptation is a continuous process that must be embedded throughout the lifecycle of mining projects, from exploration to closure and beyond. This white paper provides a replicable framework for integrating adaptation into transition planning, helping mining companies move from intention to impact. By starting now, even amidst uncertainty, entities can future-proof their operations, support community resilience, and contribute meaningfully to a low-carbon, climate-resilient economy.

## Glossary

**Adaptation**: The process of adjusting to actual or expected climate impacts to minimise harm or capture potential benefits. In mining, adaptation may involve redesigning infrastructure, strengthening water management, and adjusting operations to withstand extreme weather. Effective adaptation helps maintain productivity and resilience under changing climate conditions.

**Adaptive maturity**: The degree to which an entity has integrated climate adaptation into its governance, strategy, and operations. A mining company with high adaptive maturity actively monitors climate risks, embeds adaptation in decision-making, and aligns with global frameworks like TCFD and ISSB. This maturity reflects an organisation's readiness to manage long-term climate challenges.

**Adaptive capacity**: An entity's ability to anticipate, prepare for, and recover from climate-related disruptions. In the mining sector, adaptive capacity depends on technology, financial resources, skilled personnel, and the flexibility of operations. Higher adaptive capacity enables faster recovery and sustained performance during climate shocks.

**Adaptive capability**: The systems, tools, and competencies that enable an organisation to effectively respond to climate risks and opportunities. For mining companies, this includes data analysis, scenario planning, and risk management aligned with TCFD and ISSB standards. Strong adaptive capability supports long-term resilience and sustainable growth.

**Cascading impacts**: The sequence of secondary effects triggered by an initial climate event. A flood, for example, could disrupt mine transport routes, delay supply chains, and affect regional economies. Mining companies assess cascading impacts to ensure business continuity and community stability.

**Compound risks**: Situations where multiple risk drivers or hazards occur simultaneously or interact, amplifying overall impact. For example, heavy rainfall combined with high tides could severely flood coastal infrastructure. Understanding compound risks helps companies strengthen climate risk assessments and emergency planning.

**Control**: A measure or system designed to reduce or manage climate-related risks. In mining, controls can include improved drainage systems, monitoring infrastructure, and governance policies integrating climate factors. Strong controls are key to mitigating both physical and transition risks.

**Exposure**: The degree to which entity assets, employees, or operations are likely to experience climate impacts. For example, a mine located in a floodplain has high exposure to heavy rainfall events. Managing exposure through location planning and infrastructure design is essential for long-term resilience.

**Hazard**: A climate-related physical event or trend that has the potential to cause harm. Common hazards for mining operations include floods, heatwaves, and droughts. Assessing hazards allows companies to prioritize adaptation measures and enhance operational safety.

**Opportunity**: A positive outcome that arises from addressing climate challenges. Mining companies can capitalise on opportunities by investing in cleaner technologies, renewable energy, and efficient water use. Aligning these actions with TCFD and ISSB standards enhances competitiveness and investor trust.

**Physical risk**: The risk of direct physical impacts from climate change, such as extreme heat, flooding, or drought. For mining, these events can disrupt production, damage infrastructure, or endanger worker safety. Understanding physical risks helps companies plan adaptation measures and safeguard long-term operations.

**Residual risk**: The level of risk remaining after all adaptation and mitigation measures are implemented. Mining companies use residual risk assessments to identify persistent vulnerabilities and areas requiring further intervention. This approach ensures continuous improvement in resilience planning. With respect to adaptive capabilities, it is the risk that an entity is exposed to that it does not have the adaptive capability to manage.

**Resilience**: The capacity of a system or organisation to anticipate, absorb, and recover from climate-related disruptions. For mining companies, resilience is built through diversification, strong governance, and climate-informed risk management. A resilient mining operation maintains stability and value despite environmental challenges.

**Risk**: The potential for adverse consequences when climate-related hazards intersect with vulnerable assets or operations. Effective risk management underpins climate resilience and aligns with TCFD recommendations. Notably, “risks and opportunities” is the terminology used in this paper to be in line with IFRS guidance and terminology, though it is noted that in risk management, a risk itself can be a threat or an opportunity. The IPCC uses a specific framework to define risk from climate change as arising from the interaction of three elements: hazards (such as drought or heavy precipitation), exposure, and vulnerability. In IPCC language, a “hazard” refers to the physical climate event or trend (e.g., drought, extreme precipitation), while “risk” is the potential for adverse consequences resulting from the interaction of the hazard with exposed and vulnerable people, assets, or ecosystem. ISO 14090 and ISO 14091 align closely with the IPCC’s risk framework, distinguishing hazards from overall risk. A “hazard” in the context of ISO standards is a biophysical event (e.g., drought, rain, flood) that creates the possibility for impacts, but “risk” only emerges when that hazard intersects with exposure and vulnerability.

**Threat**: A condition or event that poses a potential danger to operations, assets, or strategic objectives. Climate threats in mining include drought, temperature extremes, or regulatory shifts impacting carbon-intensive processes. Identifying threats early enables proactive adaptation and planning.

**Transition**: The shift toward a low-carbon and climate-resilient economy, shaped by evolving policies, markets, and technologies. For mining companies, this transition involves reducing emissions, improving energy efficiency, and investing in sustainable practices. Aligning with frameworks like TCFD and ISSB supports transparent communication of transition strategies to investors and regulators.

**Transition risk**: Financial and operational risks arising from the global move toward a low-carbon economy. These may include carbon pricing, changing regulations, or shifts in market demand affecting mining operations. Managing transition risks is essential to maintaining competitiveness and investor confidence.

**Vulnerability**: The extent to which a mining operation is susceptible to climate-related damage or disruption. Vulnerability depends on site location, design robustness, and adaptive capacity. Reducing vulnerability through planning and investment improves operational sustainability.

## Acronyms

GHG Greenhouse Gas
ICCM International Council on Mining and Metals
IFRS S1 & S2. International Financial Reporting Standards S1 and S2
IPTN International Platform for Transition Plans
ISSB International Sustainability Standards Board
MAC Mining Association of Canada
PCRAM Physical Climate Risk Assessment Methodology
TCFD Task Force on Climate-related Financial Disclosures
TPT Transition Plan Taskforce
TSF Tailings Storage Facility
WEF World Economic Forum
WRI World Resources Institute