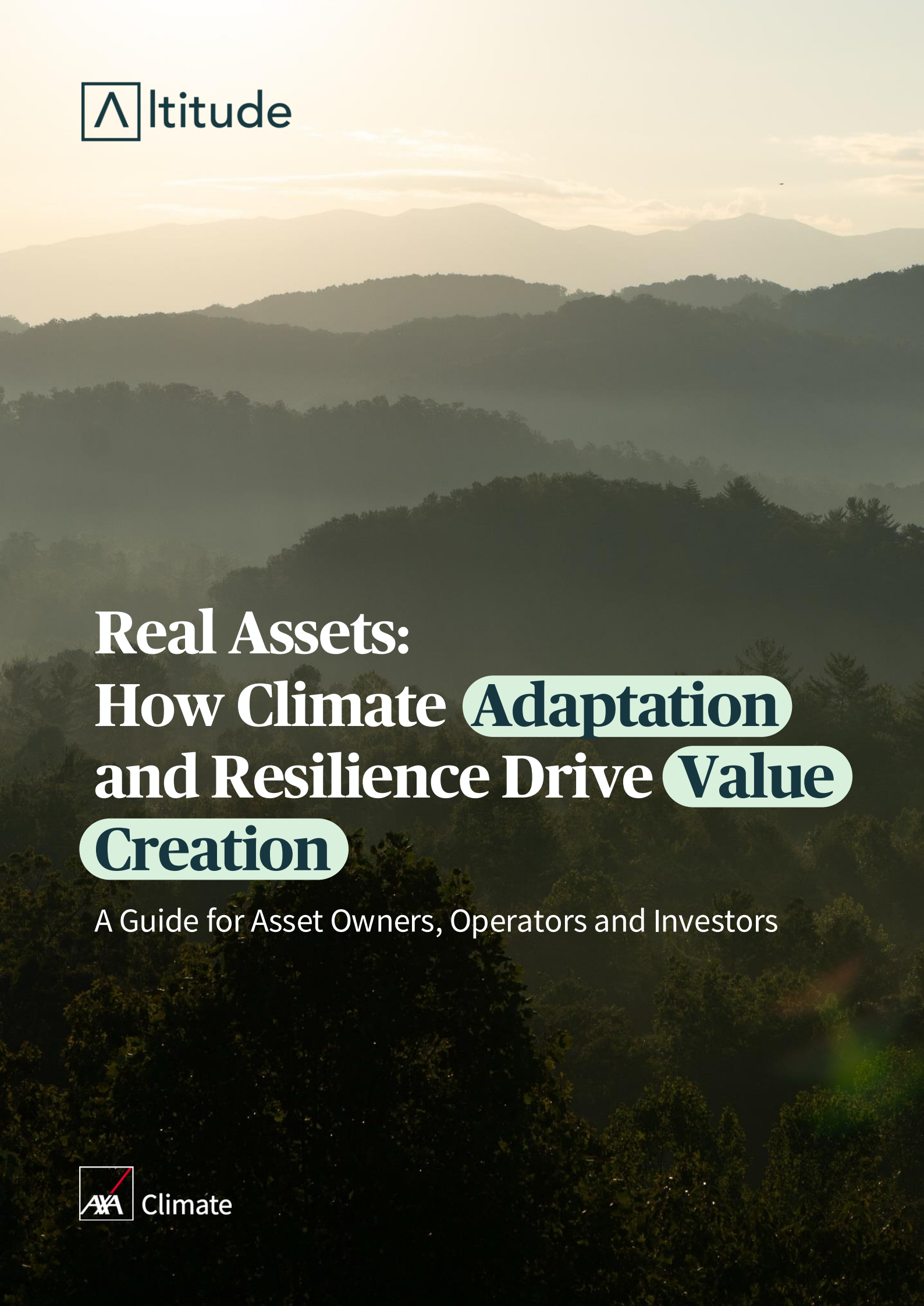


Altitude

Real Assets: How Climate Adaptation and Resilience Drive Value Creation

A Guide for Asset Owners, Operators and Investors

AXA Climate

As climate risks intensify, adapting real assets is essential, yet the sector faces three challenges

In a context of increasing climate risks and their growing material and financial impacts, the adaptation of Real Assets is essential to ensure their continued operation and their capacity to deliver essential services.

This is particularly critical for infrastructure assets that ensure essential services to populations, as well as for real estate and industrial assets that support economic activity.

In 2024, natural disasters caused approximately $320 billion in losses worldwide, of which only $140 billion were insured[1]. **This gap is expected to widen as climate risks intensify.**

While the topic is critical, the infrastructure and real-asset sectors face three main challenges that limit visibility and slow the prioritisation of climate adaptation:

Physical risk can be difficult to model and apprehend

Modelling the link between climate hazards, financial value, and value-chain transmission remains challenging. Current risk models tend to trigger action only when threats are visible or imminent, reflecting the 'tragedy of the horizon'.

There is no standardised set of metrics for climate adaptation

Unlike climate change mitigation, there is no global KPI equivalent to tCO2e yet. Standards remain voluntary despite existing initiatives and adaptation is highly location- and asset-specific, making investments hard to compare or scale.

Climate adaptation suffers from the prevention paradox

Adaptation faces a prevention paradox: investing to avoid damage yields benefits that can be hard to quantify – what is the ROI of a flood that never happens? Public funding is necessary, but adaptation is not yet mainstreamed in the private sector.

Adaptation planning typically involves multiple stakeholders across both the public and private sectors, each with distinct responsibilities and decision-making frameworks.

1. Munich RE, 2024.

This guide outlines our practical climate-adaptation approach built on four principles

To address the complexity and operational challenges of climate change and adaptation, our approach follows four core principles:

Cross-functional collaboration is essential across asset fund managers, asset owners and operators, and with the broader stakeholder ecosystem (e.g., suppliers, municipalities, regulators).

Financial impacts must be quantified to assess effects on cash flows, resilience, and value creation potential before committing the required CAPEX or OPEX.

Operational realities should drive adaptation with assessments that link climate risks to business plans through causal chains grounded in assets' operational realities.

Climate adaptation is a continuous process that can be integrated at any stage of an asset's lifecycle, from project preparation and due diligence process to monitoring and maintenance of the asset over time.

This guide is intended for investors and asset operators, especially development, sustainability, operations, and finance teams. We want to share our approach to support your climate-adaptation and value creation journey.

Our guide aims at offering a practical way to understand how climate change affects assets and what adaptation measures can deliver in terms of value.

It enables the identification of asset-specific adaptation measures while considering the broader physical, operational, and institutional environment to ensure overall resilience and clarify the stakeholders involved in protecting and operating the asset.

We believe that combining business-model insights with climate-risk assessments enables a robust financial evaluation of adaptation and value creation strategies at both asset and portfolio levels.

Beyond safeguarding asset value, climate-adaptation assessments can unlock new sources of value by strengthening the understanding of value-chain interdependencies, the territorial context, and long-term performance.

For real-asset managers, this reframes physical climate resilience as a lever for value creation and operational performance, supporting consistent comparison of asset resilience, transparent investor communication, and structured dialogue with project companies on financing adaptation.

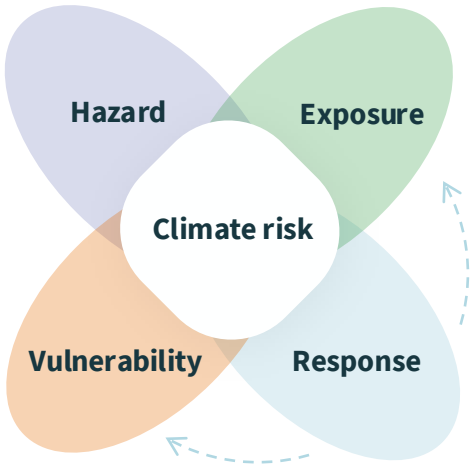
Our four-step approach follows the guidance of major international and European standards

We developed a structured and practical approach through our platform and advisory services. This is built on our collaborative work with private funds since 2019, partnering with real-assets operators and investors to strengthen asset resilience and capture value creation opportunities.

Rather than introducing a new methodological standard, our approach is aligned with major international standards, including the Task Force on Climate-related Financial Disclosures (TCFD), the Physical Climate Risk Appraisal Methodology 2.0 (PCRAM 2.0), guidance from the World Bank, as well as **European frameworks** such as the EU Taxonomy, the Corporate Sustainability Reporting Directive (CSRD).

Our four-step approach follows IPCC guidance by assessing the interaction between climate hazards, exposure, vulnerability, and response. Although interdependent, they must be evaluated together to provide a comprehensive view of physical climate risks.

Climate risk framework
Source: IPCC AR6, WGII (2022)



E H	**Phase 1 - Climate risk screening** Which climate hazards could affect the assets' location?
V	**Phase 2 – Climate impacts on the business model** If these hazards occur, what are the impacts on the business model?
R	**Phase 3 - Resilience and adaptation measures** What responses are available, and why should they be implemented?
	Phase 4 - Implementation in the business plan How do you ensure an efficient implementation of the adaptation plan?

Climate risk refers to the potential for adverse consequences for human or ecological systems resulting from impacts of climate change. Physical climate risk focuses specifically on risks arising from the physical impacts of climate change, including extreme events and long-term shifts.

We are equipped with eight tools to drive effective climate adaptation and resilient value creation

Risk component / Purpose	Translate climate considerations into strategic insights	Support decision-making and guide value-creation strategies
Exposure	**Phase 1 - Climate risk screening** Which climate hazards could affect the assets' location?	
	Tool #1 - Asset profile sheet (Platform/Advisory)	**Tool #3 - Gross risk dashboard** Enabled by Tools #1 and #2 (Platform/Advisory)
Hazard	**Tool #2 - Climate framework** (Platform/Advisory)	
Vulnerability	**Phase 2 – Climate impacts on the business model** If these hazards occur, what are the impacts on the business model?	
	Tool #4 - Climate causal chain Enabled by Tools #1 and #3 (Platform/Advisory)	**Tool #5 - Prioritisation matrix** Enabled by Tools #3 and #4 (Advisory)
	Tool #6 – Climate stress test Enabled by Tools #4 and #5 (Advisory)	
Response	**Phase 3 - Resilience and climate adaptation measures** What responses are available, and why should they be implemented?	
	Tool #7 - Adaptation appraisal Enabled by Tools #5, and #6 (Advisory)	
	Phase 4 - Implementation in the business plan How do you ensure effective climate adaptation and value creation?	
	Tool #8 - Value creation plan with KPIs Enabled by Tools #3, #5, and #7 (Advisory)	

(Platform) **Tool covered by Altitude's platform**
Delivered through our platform, providing automated climate-risk calculations, dashboards, and standardised outputs with seamless access and minimal setup.

(Advisory) **Tool covered by Altitude's advisory services**
Delivered through support from our consultants and experts, including bespoke analyses, prioritisation, and integration into decision-making and value-creation processes.

- This tool can be deployed with **development, strategy and ESG functions**
- This tool can be deployed with **real-asset management and operations functions**
- This tool can be deployed with **financial planning, analysis and cash-flow modelling functions**

Application to a transport line

An investor is planning to redevelop a public transport line under a 30-year concession. They know they are aware of their high exposure to flood risk and want to assess the **resilience** of their proposed development plan to climate change.

Phase 1. Climate risk screening

After collecting the line's location, design, and operational dependencies (Tool #1), gross-risk levels were screened based on the EU Taxonomy indicative classification of hazards, considering SSP2-4.5 and SSP5-8.5 scenarios (Tool #2).

The analysis confirmed a significant, recurring pluvial flood risk, with specific segments repeatedly identified as at-risk (Tool #3) under a 30m-resolution hazard layer. There is a 26% chance of one RP100 event and a 3.6% chance of two occurring over the concession period. Each event would lead to about 30 days of service interruption.

Line segments	Flood gross risk	Storm gross risk	Wildfire gross risk
Segment #1	High	Low	Low
Segment #2	High	Low	Low
Segment #3	Low	Medium	Low
Segment #4	Low	Low	Medium
Segment #5	Low	Low	Low

Phase 2. Climate impacts on the business model

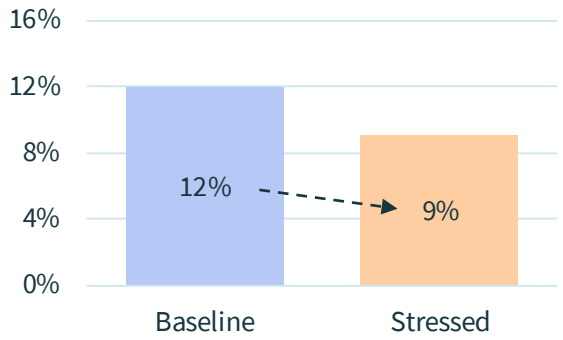
Financial impacts were assessed based on the climate causal chain (Tool #4), showing that each RP100 flood event would result in 30 consecutive days of service interruption.

Therefore, the line could face 2 x 30 = 60 days of service interruption over the concession period.

1 x RP100 flood event → **Structural damage + Access blockage** → **30 days of service interruption**

Prioritising flood-related impacts (Tool #5), the climate-related flood stress test (Tool #6) confirmed the line's resilience gap with an IRR dropping from 12% to 9%:

Project's Internal Rate of Return (IRR) across baseline and climate-stressed trajectories



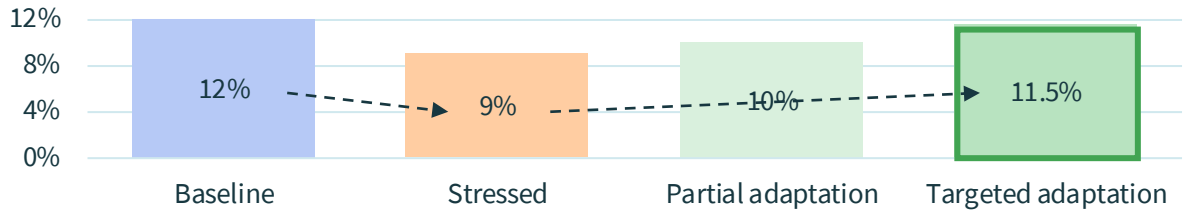
Phase 3. Resilience and climate adaptation measures

The investor had identified the flood risk and planned to raise the entire line by 1m above current ground level, based on historical data, for an investment of €100M CAPEX.

However, when integrating climate projections and topographic analysis, we observed that this measure would reduce service interruption by only 10 days per RP100 event. The asset would still experience 40 days of interruption (2 x 20 consecutive days as two RP100 events remain statistically plausible over the concession period), meaning the measure provides only partial adaptation. We compared this partial plan with two options, recommending the targeted adaptation option to avoid unnecessary raising and preventing over-engineering:

Options	CAPEX	Impact on service interruption
Partial adaptation Uniform +1m raising	€100M	Reduces total RP100 service interruption from 60 to 40 days
Full adaptation Uniform +2m raising	€200M	Reduces total RP100 service interruption from 60 to 0 days
Targeted adaptation Elevating the most exposed segments	€130M	Reduces total RP100 service interruption from 60 to 5-10 days

Project's Internal Rate of Return (IRR) across baseline, climate-stressed, and adapted trajectories



Phase 4. Implementation in the business plan and monitoring with KPIs

Implementation focuses on elevating the most exposed segments of the line, using the appropriate engineering specifications and scheduling works at the optimal time in the concession period. A monitoring plan is then put in place to ensure that the measures deliver the expected resilience outcomes and financial performance.

In addition to reducing flood-related interruptions, this adaptation plan aims at generating several financial and extra-financial benefits:

- **Reduced maintenance and repair OPEX** thanks to fewer structural damages and fewer emergency interventions after flood events,
- **More resilient financial profile**, with IRR almost returning to the initial baseline (11.5% vs. 12%) and smoother cash-flow trajectories without extreme shocks,
- **Improved insurance profile and strong argument for lenders,** potentially leading to lower risk premiums and more favourable debt terms,
- **Environmental enhancements** (slope vegetation, soil stabilisation)
- **Improved emergency preparedness strengthening both organisational and community resilience** (awareness campaigns, emergency-response drills, early-warning protocols, installation of demountable flood barriers)

Disclaimer

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Do you want to go further?

This document offers a first introduction to our approach and provides a practical overview of our guidance to help turn climate-change adaptation into value for infrastructure and real assets.

To access a more detailed version of this guide designed for asset owners, operators and investors, and explore how it can be applied to your portfolio, please contact our team :

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About Altitude and AXA Climate

AXA Climate supports companies and public institutions in their adaptation to climate and environmental change through four areas of expertise: parametric insurance, training, consulting and a SaaS platform called Altitude.

At Altitude, we accelerate adaptation to climate change through an innovative platform, based on science and robust data, and its dedicated advisory service.

Thanks to its expertise, Altitude supports financial actors and their investments in the creation of sustainable value across their portfolios. This support extends from the structuring of sustainability strategies and the conduct of ESG due diligence to the creation of decarbonization roadmaps, the quantification and financialization of climate risks, or the design of adaptation action plans.

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