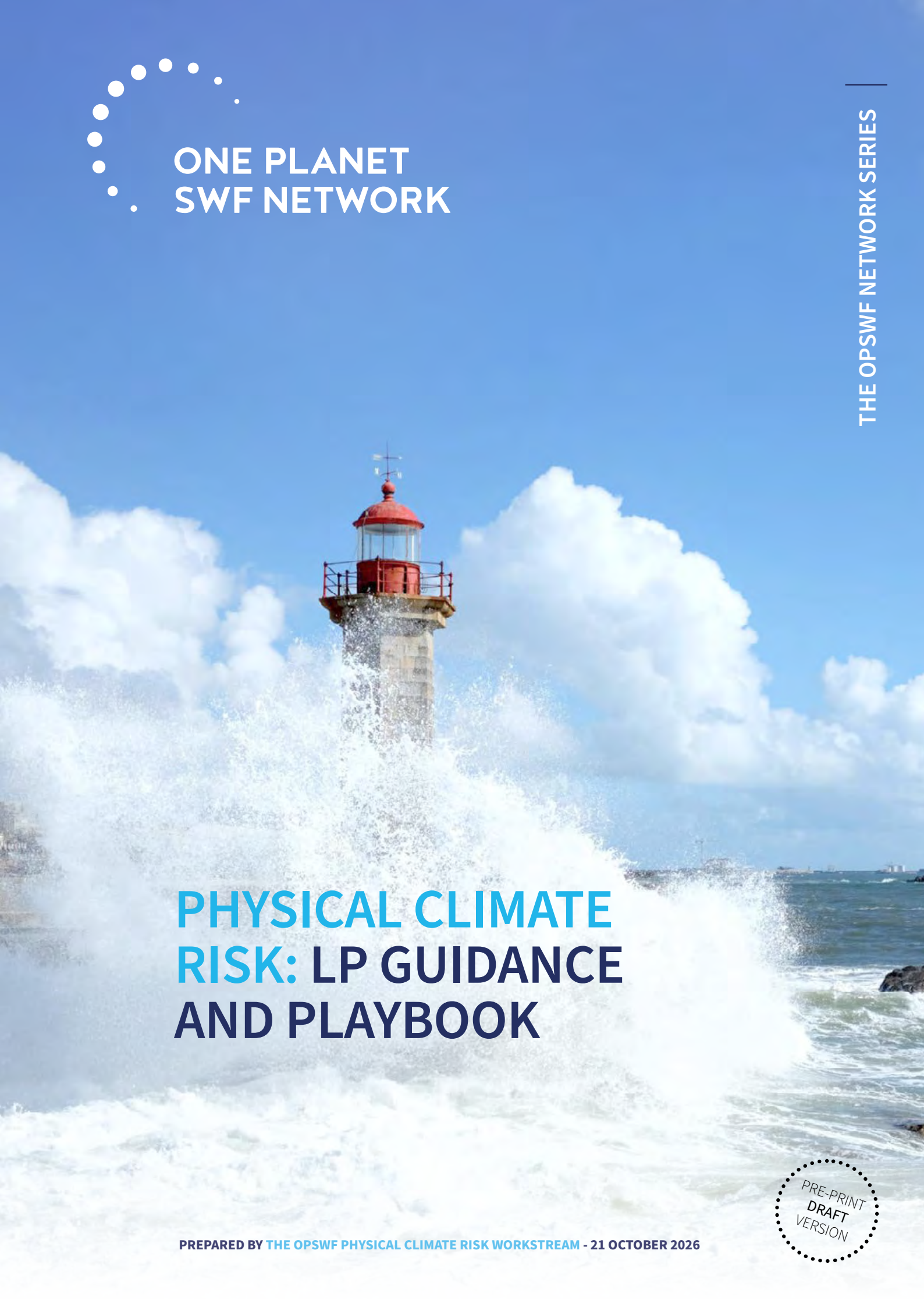
ONE PLANET
SWF NETWORK

THE OPSWF NETWORK SERIES



PHYSICAL CLIMATE RISK: LP GUIDANCE AND PLAYBOOK

PRE-PRINT
DRAFT
VERSION

PREPARED BY THE OPSWF PHYSICAL CLIMATE RISK WORKSTREAM - 21 OCTOBER 2026

ONE PLANET
SWF NETWORK



THE OPSWF NETWORK SERIES

PHYSICAL CLIMATE RISK: LP GUIDANCE AND PLAYBOOK

PREPARED BY THE OPSWF PHYSICAL CLIMATE RISK WORKSTREAM - 21 OCTOBER 2026

EXECUTIVE SUMMARY

Physical climate risk is increasingly affecting the performance and value of investments. Floods, storms, heat, water stress and other climate hazards can damage assets and disrupt operations, but impacts can also travel through supply chains, infrastructure, insurance markets and other business dependencies. For investors, these risks can affect revenues, costs, cash flows, financing and ultimately asset value.

For limited partners (LPs), physical climate risk should therefore be considered as part of the core investment process—not as a separate sustainability or disclosure exercise. The challenge is to identify which risks are financially material, understand how they could affect an investment, and determine what can reasonably be done to manage them. This requires a practical and proportionate approach rather than ever more detailed climate analysis.

This playbook provides practical guidance for asset owners and LPs on how to identify, assess and manage physical climate risk across private-market investments. It does not create new standards. Instead, it translates existing frameworks and emerging good practice into guidance that LPs can apply across both direct investments and investments through GPs.

The approach is built around four principles: materiality, proportionality, consistency and relevance. Investors should focus on risks that could materially affect financial performance; scale analysis to the significance of the exposure and available information; use sufficiently consistent approaches to compare investments over time; and ensure that the analysis ultimately informs investment decisions.

A five-stage maturity framework provides a common way to assess the extent to which physical climate risk is being managed at asset level and to track improvement over time. The playbook then shows how these principles can be applied throughout the investment lifecycle—from due diligence and underwriting, through ownership and asset management, to exit. For indirect investments, it provides corresponding guidance on GP selection, ongoing oversight and engagement, and reinvestment decisions.

Finally, the playbook moves from individual investments to the portfolio level. By combining information on asset maturity, sector, geography, investment value and material exposures, LPs can identify concentrations and correlated risks that may not be visible when investments are considered individually. These insights can inform engagement, capital allocation, portfolio construction and investment decisions.

The objective is not to eliminate physical climate risk or create a single climate-risk score. It is to help investors make better-informed investment decisions, strengthen the resilience of their assets and portfolios, and protect long-term value as physical climate risks evolve.

TABLE OF CONTENTS

EXECUTIVE SUMMARY ____ **4**

SECTION 1
INTRODUCTION ____ **8**
PURPOSE AND CONTEXT ____ 10
WHAT IS PHYSICAL CLIMATE RISK? ____ 10
THE CASE FOR ACTION ____ 13
INVESTOR CLIMATE FRAMEWORKS ____ 15
SCOPE ____ 16

SECTION 2
HOW TO USE THIS PLAYBOOK ____ **18**
A NOTE FOR GPS AND ASSET MANAGERS ____ 21

SECTION 3
GUIDING PRINCIPLES ____ **22**
MATERIALITY ____ 25
PROPORTIONALITY ____ 26
CONSISTENCY ____ 28
RELEVANCE ____ 28

SECTION 4
MATURITY FRAMEWORK ____ **30**

SECTION 5
INVESTMENT LIFECYCLE GUIDANCE ____ **36**
SECTION 5A - DIRECT INVESTMENTS ____ 40
DUE DILIGENCE ____ 40
HOLD PERIOD ____ 47
EXIT ____ 50
HOW TO UTILISE THIS SECTION AS A MINORITY INVESTOR ____ 51
SECTION 5B - INDIRECT INVESTMENTS ____ 53
GP SELECTION AND COMMITMENT ____ 53
FUND OVERSIGHT AND ENGAGEMENT ____ 55
GP DELIVERY AND REINVESTMENT ____ 56

SECTION 6
PORTFOLIO MANAGEMENT ____ **58**
MATURITY FRAMEWORK APPLICATION AT THE PORTFOLIO LEVEL ____ 61
PORTFOLIO EXPOSURE ____ 63
USING PORTFOLIO INSIGHTS TO INFORM DECISIONS ____ 65

APPENDIX A
KEY QUESTIONS TO ASK GPS ____ 67
GP SELECTION AND COMMITMENT ____ 67
OVERSIGHT AND ENGAGEMENT ____ 68
GP DELIVERY AND REINVESTMENT ____ 68

APPENDIX B
ASSET CLASS CONSIDERATIONS ____ 69

APPENDIX C
POTENTIAL IMPACT MECHANISMS BY INDUSTRY ____ 72

APPENDIX D
GLOSSARY ____ 73
FRAMEWORKS, STANDARDS AND ORGANISATIONS ____ 73
KEY TERMS ____ 74

CONTRIBUTORS ____ 76

DISCLAIMER ____ 79

SECTION 1

INTRODUCTION

SECTION 1

INTRODUCTION

PURPOSE AND CONTEXT

This playbook provides practical guidance for asset owners and limited partners (LPs) on how to identify, assess, and manage physical climate risk. It is not intended to create new rules or standards, but to help LPs apply a more mature, consistent, and decision-useful approach across the investment lifecycle. It draws on existing standards, emerging best practices, and input from private markets participants.

The playbook aims to support LPs across several key activities.

1. **Identify and assess what matters:** Help LPs focus on material physical climate risks across investments and portfolios.
2. **Translate risk into action:** Enable LPs to incorporate material risks into investment decisions and asset-management priorities.
3. **Drive consistent, comparable oversight:** Give LPs a common framework for monitoring and engaging on physical climate risk across both directly held investments and indirect investments via general partner (GP) relationships, improving comparability.
4. **Support disclosure and accountability:** Help LPs meet their fiduciary duties and disclosure requirements under voluntary reporting frameworks such as the Task Force on Climate-related Financial Disclosures (TCFD)[1] and mandatory regimes that vary by jurisdiction, including ISSB-aligned standards and CSRD in Europe.

This playbook focuses specifically on physical climate risk, where assessment remains less standardised than for transition risk. However, physical and transition risks are interconnected, and physical climate risk often amplifies existing business risks rather than creating entirely new ones, so these risks should be considered in parallel.

WHAT IS PHYSICAL CLIMATE RISK?

Physical climate risk refers to the physical impacts of climate change on assets, portfolios, and underlying economic activity. These risks stem from changes in climate patterns and the increasing frequency and severity of climate-related hazards, which can affect investment performance through physical damage, operational disruption, reduced productivity, and impacts cascading through supply chains and the wider economy.

Physical climate risk is best understood along two dimensions: the type of hazard, and how it impacts an asset or value chain[2].

TYPE OF HAZARD

- **Acute physical risks:** Event-driven hazards such as floods, storms, heatwaves, wildfires, and extreme precipitation. These can cause sudden and severe damage to physical property, interrupt business operations, and lead to significant recovery and insurance costs.
- **Chronic physical risks:** Risks resulting from longer-term shifts in climate patterns, including rising average temperatures, sea level rise, water stress, changing precipitation patterns, and ecosystem degradation. These can erode asset productivity, increase operating costs, shorten plant and equipment lifespans, and undermine long-term business viability.

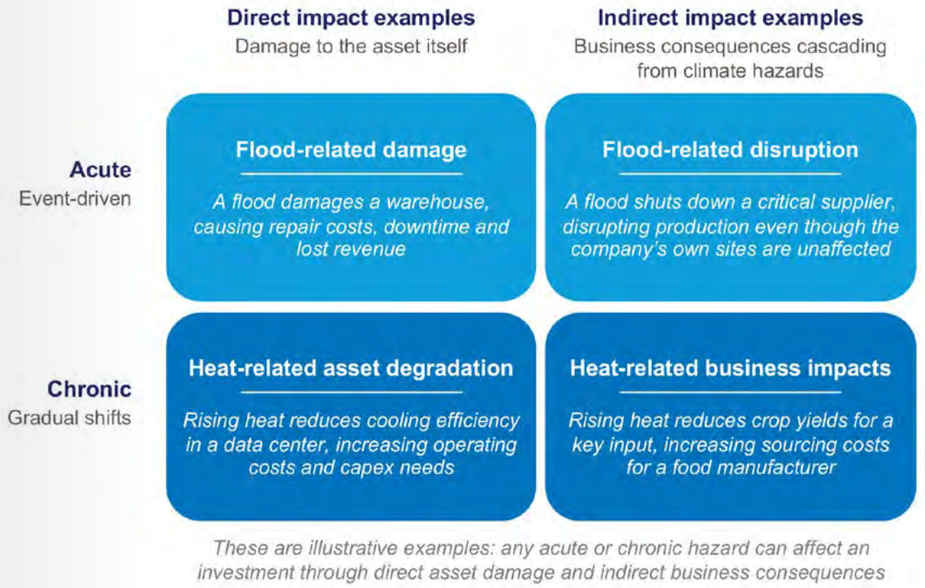
TYPE OF IMPACT

- **Direct impacts:** Physical damage, downtime or reduced output affecting the asset's property, plant, equipment, or infrastructure.
- **Indirect impacts:** Financial or operational impacts transmitted through suppliers, demand destruction, infrastructure, workforce, insurance, financing or other dependencies. Indirect impacts often exceed the direct damage costs and are not always quantifiable, tangible or protectable.

The two dimensions combine, and both acute and chronic hazards can generate material direct damages and indirect consequences, as illustrated in Figure 1 below:

While acute and direct physical climate impacts are relatively well understood, chronic and indirect impacts can be equally material and should not be treated as secondary risks. The case study below shows how an acute hazard can affect a business indirectly through the value chain.

***Figure 1:** Risks can be sudden or gradual, and affect the business directly or cascade*



[1] *The TCFD was disbanded in October 2023, having fulfilled its remit. Its recommendations are fully incorporated into IFRS S1 and IFRS S2, and the IFRS Foundation assumed responsibility for monitoring progress on climate-related disclosures from 2024. References to TCFD in this playbook reflect its continuing influence on the four-pillar architecture carried forward into IFRS S2, and the fact that some jurisdictions' requirements are still framed in TCFD terms.*

[2] *TCFD, Recommendations of the Task Force on Climate-Related Financial Disclosures; ISSB, IFRS S2 Climate-related disclosures.*

CASE STUDY

SHERWIN-WILLIAMS. *Sherwin-Williams is a manufacturer and retailer of paints, coatings and related products, serving 120+ markets globally*

SITUATION

In 2021, Winter Storm Uri and Hurricane Ida disrupted Sherwin-Williams' **upstream petrochemical and raw-material suppliers in Texas and Louisiana,** constraining key inputs used in paints and coatings. At the peak of the disruption, **nearly 170 suppliers were offline**.

INDIRECT IMPACTS

Sherwin-Williams did not need to suffer direct storm damage for its business to be affected. Constrained production, limited ability to meet customer demand and increased input costs, resulting in **full-year sales being reduced by a reported mid-single-digit percentage**, while industry **raw-material inflation exceeded 20%**

Chronic risks can also transmit indirectly through value chains: Unilever has estimated that chronic heat stress could reduce profits by EUR 1.9-2.8B in 2050 by lowering crop yields and increasing input prices[3]. These examples show that physical climate risk can affect financial performance even when the impact is gradual, indirect, or outside the boundary of an investor's directly owned assets.

HOW PHYSICAL CLIMATE RISK AFFECTS INVESTMENTS

Physical climate risk can affect investment performance at both the asset and portfolio level.

At the asset level, physical climate risks can affect operational resilience, reduce revenue generation and cash flow, and lead to significant cost increases. These dimensions are often connected, ultimately affecting asset valuation and/or exit outcomes.

At the portfolio level, similar hazards, geographies or shared dependencies can create correlated exposure across multiple investments. A risk that is manageable for one asset may become more material when repeated across a meaningful share of the portfolio.

For investors, physical climate risk should therefore be treated as a financial risk across both individual investments and the portfolio as a whole.

[3] Unilever, Annual Report and Accounts 2023

THE CASE FOR ACTION

THE BUSINESS IMPACTS OF PHYSICAL CLIMATE RISK ARE REAL AND INCREASING

Physical climate risk is already affecting businesses, and its relevance is expected to grow as climate hazards become more frequent and intense. Analysis of the S&P Global 1200 index indicates that annual financial impacts could rise from approximately USD 885 billion in 2030 to approximately USD 1.2 trillion in 2050 if physical climate risks go unaddressed[4].

The nature of impact will vary by sector and geography. Asset-heavy businesses may face physical damage and downtime; others may be more exposed through critical inputs, supply chains, customers, financing or insurance.

These impacts are changing the operating environment for companies and investors and therefore the way physical climate risk should be approached. Insurance can mitigate some losses, but is not a resilience strategy as it often does not cover indirect, cascading or chronic impacts, nor does it improve or protect asset valuation[5]. At the same time premiums are rising and coverage is tightening[6], leaving owners to carry more of the risk themselves. This creates a broader imperative to understand exposure, build resilience capabilities, and treat resilience not only as downside protection, but as a source of differentiated asset performance and long-term value creation.

CASE STUDY

conEdison *Con Edison is New York's main utility, serving 3.6M electricity customers*

SITUATION

Superstorm Sandy struck in 2012, marking the worst storm in its history, causing **outages for nearly 1.4M homes and businesses**

ADAPTATION

After Sandy, the company invested **$1B in climate resilience** measures and conducted a **company-wide vulnerability study** and resilience planning

OUTCOMES

Con Edison says those investments **prevented 1.1M weather-related customer outages** over the following decade

WHAT THIS MEANS FOR LPS

Physical climate risk exposure should be a meaningful input for underwriting investments, managing assets, and protecting value through exit, across both an LP's direct investments and for GP-managed indirect investments. It should be incorporated as part of the core investment process rather than as a separate sustainability or disclosure exercise.

Physical climate risk can evolve over a hold period, challenging investment assumptions made at entry. This is particularly relevant where assets have longer holding periods, as in parts of infrastructure and real estate, but can also matter in shorter-hold strategies where positions are concentrated, illiquid, and difficult to exit quickly if conditions change. This exposure also varies by sector: for example, infrastructure, real estate, and energy face more direct physical damage to assets, while other sectors, though less exposed to direct damage, can be materially exposed through supply chains, critical inputs, or customer concentration.

As set out in Figure 2, the impact of physical climate risk on value across the investment lifecycle depends on how well it is identified, priced, and managed.

[4] S&P Global, Sustainable1 Insights

[5] Swiss Re; Lloyd's

[6] *Government data show homeowners in the highest-risk U.S. ZIP codes pay ~82% more for insurance, with non-renewal rates ~80% higher. In U.S. commercial real estate, First Street reports premiums have risen by more than 150% since 2017, while Swiss Re expects data-centre insurance premiums to more than double by 2030 as physical risk concentrates in high-value assets. Similar repricing and coverage constraints are expected in exposed parts of Europe, Canada, Australia and Japan.*

***Figure 2**: Physical risks can have value impacts across the investment life cycle*



RESILIENCE AS AN INVESTMENT THEME

Physical climate risk may also create an investment opportunity around adaptation and resilience. In line with TCFD, resilience can be understood as the adaptive capacity of assets, companies and systems to respond to climate change, manage associated risks and continue operating under changing conditions. These opportunities include products, services and infrastructure that protect assets, strengthen critical resources, improve risk intelligence and help businesses adapt.

This playbook focuses on identifying, assessing and managing physical climate risk in private market investments, rather than providing guidance on allocating capital to resilience solutions. However, LPs should be aware that climate impacts are reshaping demand for several types of products and services across areas such as asset and infrastructure protection, resource resilience, climate risk analytics and finance, and resilience advisory and implementation services.

The revenue pool for commercially investable climate resilience and adaptation solutions is already material, estimated at approximately USD 1 trillion in 2024, and is projected to grow to approximately USD 4 trillion by 2050[7].

The implication for investors is two-fold. Resilient assets and companies may be better positioned to protect cash flows and exit value, while adaptation and resilience solutions may create investable growth opportunities as demand rises across exposed sectors.

CASE STUDY

BABCOCK RANCH *Babcock Ranch is a purpose-built, master-planned community in Florida, developed by Kitson & Partners*

SITUATION

In September 2022, **Hurricane Ian struck Southwest Florida** as a Category 4 storm, causing **severe flooding, structural damage and more than 2 million power outages** across the region.

ADAPTATION

Babcock Ranch was designed for resilience from the start: located inland and ~25-30 feet above sea level, with underground power and fiber lines, on-site solar-plus-battery power, and lakes and wetlands designed to absorb floodwater.

OUTCOMES

Despite taking a direct hit, Babcock Ranch experienced **no power outages, no loss of water or internet service, and no significant flooding**, while nearby areas suffered widespread disruption.

[7] *GIC, Sizing the Inevitable Investment Opportunity: Climate Adaptation*

INVESTOR CLIMATE FRAMEWORKS

This playbook complements, rather than replaces, existing climate frameworks and standards. Applying this playbook will help LPs build the risk identification, assessment, and management processes that underpin emerging disclosure obligations and commitments such as ISSB or TCFD reporting.

Existing approaches fall into two groups, with examples below.

1. Disclosure standards (detailed in Appendix D):

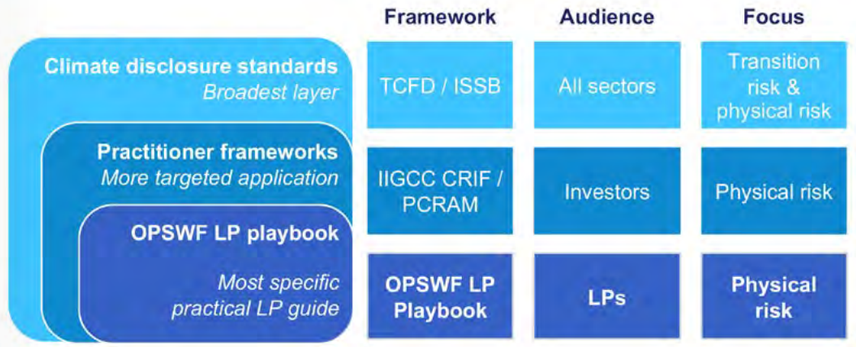
- **TCFD / ISSB:** Set broad expectations for climate-related governance, strategy, risk management and disclosure.

2. Practitioner frameworks:

- **IIGCC PCRAM 2.0:** PCRAM provides detailed asset-level guidance for assessing physical climate risk, evaluating adaptation options and linking these to investment appraisal, particularly for real estate and infrastructure.
- **IIGCC CRIF:** Complements PCRAM by supporting investors to develop adaptation and resilience plans, targets and implementation strategies at asset and portfolio level; PCRAM underpins its asset-level target-setting approach.

As noted above, this playbook builds on existing principles, translating them into useful guidance for an LP to put into practice in a private markets context, as illustrated in Figure 3 below. Its focus is on how LPs can use asset- and GP-level information to oversee physical climate risk across direct and indirect investments, engage with managers, and build a portfolio-level view. While frameworks such as PCRAM and CRIF are not specifically designed for buyout or corporate private equity, many of their underlying principles remain relevant and are adapted here for a broader range of private-market investments.

***Figure 3:** This playbook is intended as a practical LP guide for private markets*



SCOPE

The principles and approaches in this playbook are broadly applicable to LPs seeking to understand and manage physical climate risk as part of their investment and portfolio oversight. The detailed guidance, however, is written primarily with equity investments in mind, in particular buyout, infrastructure, and real estate investments, where the investor has meaningful influence over the asset and where physical exposure is concentrated.

The playbook covers both direct investments, where the LP holds the asset, with greater control over asset-level decisions, and indirect investments made through funds and GPs. Both acute and chronic physical risks are addressed, including their direct and indirect impacts.

For other strategies, such as private credit and secondaries, the principles still apply but application may differ. These investors typically have less influence over the underlying asset and less access to information, so the emphasis may shift towards assessment at entry and manager or counterparty engagement.

This physical climate risk playbook is...

Practical guidance for the investment lifecycle

- Helps investors understand what to consider at entry, during ownership and at exit

A flexible approach for different investment contexts

- Supports proportionate action based on materiality, influence, data availability and decision-usefulness

A shared reference point for LPs, GPs and asset managers

- Helps align expectations on what matters, how much analysis is needed, and what action is viable

This physical climate risk playbook is not...

A reporting standard or assurance framework

- It does not replace ISSB, TCFD, or other disclosure requirements.

A public commitment or pledge

- It does not require investors or managers to adopt a specific climate resilience target.

A fixed methodology or modelling tool

- It does not prescribe one scenario, metric, threshold, provider or assessment approach.



SECTION 2

HOW TO USE THIS PLAYBOOK

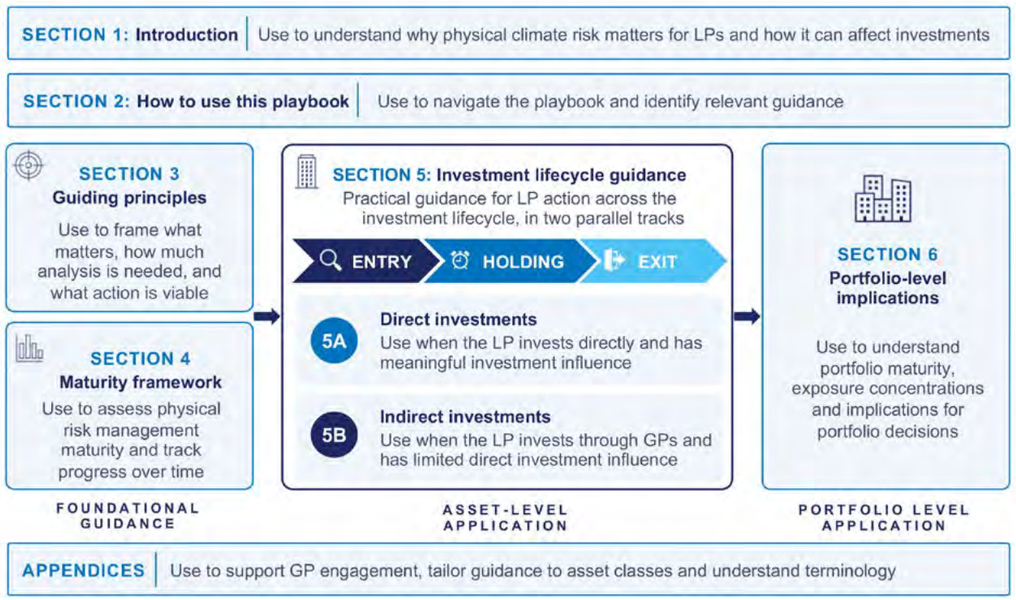
SECTION 2

HOW TO USE THIS PLAYBOOK

The playbook is written primarily from the LP perspective and to guide LP teams. Its application varies across different investment structures and responsibilities, as illustrated in Figure 4. Sections 3-4 provide foundational guidance applicable across investment types. Section 5A focuses on direct investments made by the LP. In this case, the LP's own investment and asset management teams will be directly involved in assessing and managing physical climate risk at the individual investment level. In contrast, Section 5B addresses the LP's role in selecting and overseeing external GPs (where the GP has the primary responsibility for risk assessment and ongoing management).

Section 6 focuses on broader LP risk and portfolio management responsibilities, drawing on information from both internal investment teams and external GPs to inform portfolio-level decisions. The appendices provide supporting reference material, while a separate note at the end of this section explains how GPs and asset managers can also apply the playbook to their own activities.

Figure 4: *The playbook provides foundational guidance for LPs and how they can apply it practically*



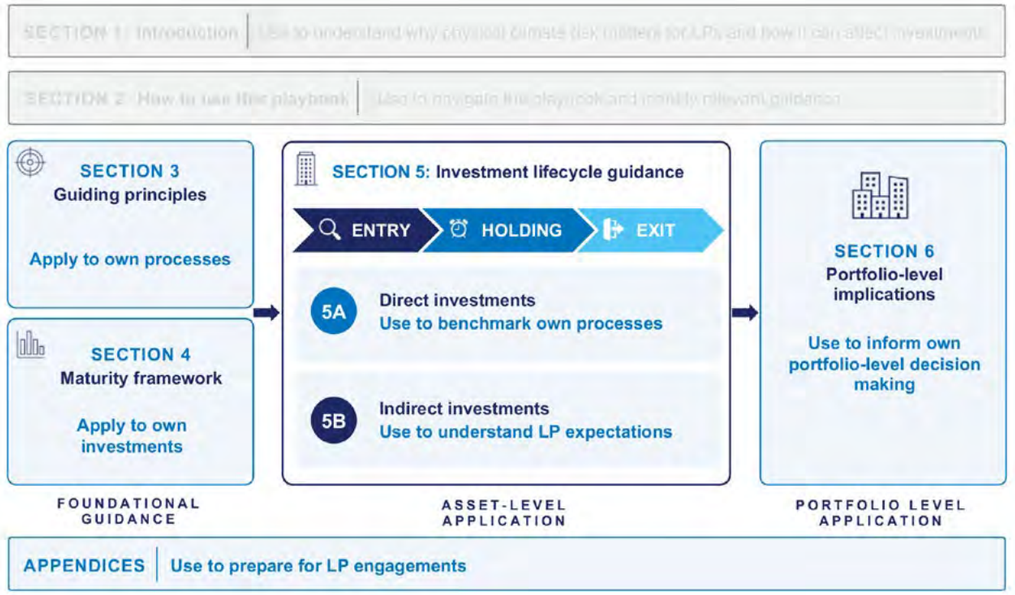
LPs can use it selectively to complement and strengthen their existing processes, depending on their starting level of maturity.

- **LPs starting to build their approach** may benefit from working through the playbook in sequence, using Section 3 to anchor core principles, Section 4 to establish a maturity baseline, Section 5 to develop asset-level management and GP engagement processes, and Section 6 to build a portfolio-level view as those processes mature.
- **LPs with existing or established processes** can use the playbook as a benchmark and reference guide, identifying gaps and selectively incorporating relevant guidance where it strengthens decision-making, oversight or consistency across investments and GP relationships to maximise outcomes.

A NOTE FOR GPS AND ASSET MANAGERS

GPs and asset managers can also use the playbook as a practical reference to benchmark and strengthen their own physical climate risk management processes, while better understanding LP expectations. Figure 5 illustrates how the different sections can be applied from a GP and asset manager perspective.

Figure 5: *The playbook can also be a reference for GPs and asset managers*



SECTION 3

GUIDING PRINCIPLES

SECTION 3

GUIDING PRINCIPLES

The following principles underpin the guidance across both the direct and indirect investment tracks and all lifecycle stages:

Principle	How LPs can apply this principle	Underlying basis
1.MATERIALITY	**Focus on risks that could meaningfully affect cash flows, financing, profitability, insurance, or valuation, at entry and as conditions change through the hold.**	Materiality (IFRS S1): 'Information is material if omitting, misstating, or obscuring that information could reasonably be expected to influence decisions that the primary users of general-purpose financial reports make on the basis of those reports'.
2. PROPORTIONALITY	**Scale the depth of analysis to the relative size, correlation with other investments/ risks and the potential financial significance of the exposure. Additionally, the LP's degree of influence should not determine whether material risks are assessed but should inform the effort spent analysing how identified risks can be addressed. For minority positions, the LP may rely more heavily on GP-led or third-party diligence and asset management.**	Proportionality mechanisms (IFRS S1[8]): use 'all reasonable and supportable information that is available... without undue cost or effort'. TCFD encourages organisations to 'begin where resources and expertise allow', expanded here to the LP investment context.
3. CONSISTENCY	**Where possible, apply similar approaches across assets and over time so information can be compared, at entry, through the hold, and at exit. Consistency should not be mistaken for uniformity, as depth still varies by proportionality.**	Comparability (IFRS S1 enhancing characteristic): information that 'enables investors, lenders and other creditors to identify and understand similarities in, and differences among, items.' IFRS notes consistency is the means, not the goal: 'comparability is the goal; consistency helps to achieve that goal'.
4. RELEVANCE	**Ensure information is decision-useful by showing how physical climate risk could influence how an investor engages, prices or allocates capital.**	Relevance (IFRS S1 fundamental characteristic): information 'capable of making a difference in the decisions made by users,' satisfied through predictive value, confirmatory value, or both.

[8] *Refers to ISSB's standard for General Requirements for Disclosure of Sustainability-related Financial Information*

MATERIALITY

Materiality depends on which hazards are relevant to an investment, which parts of the business or locations are potentially impacted, and the scale of potential disruption and financial consequences relative to the overall size of the investment. Physical climate risk should be assessed using the same financial materiality threshold applied to other underwritten risks, with the potential financial effects set out in the IFRS S2-based table in Section 5.

IN PRACTICE, LPS MAY FIND IT USEFUL TO:

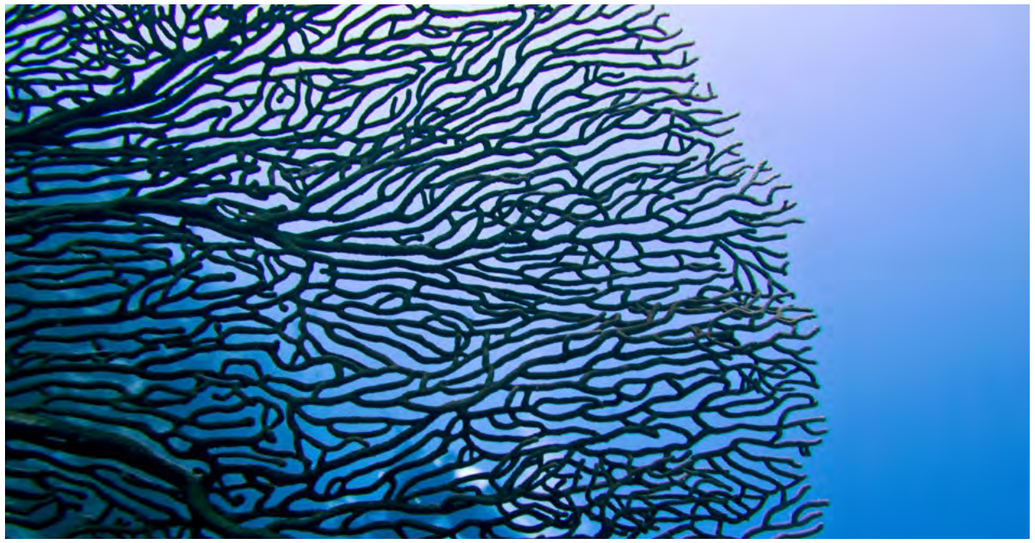
- Consider what magnitude of impact would concern them for each investment, since they own the underwriting decision. Ideally this should be framed directionally. What scale of effect on cash flows, financing, or valuation would change their view, rather than as a precise numeric threshold set before analysis has been done.
- In practice, materiality assessment can be structured around five linked concepts:
  - **Time horizon:** The period over which the investment is exposed, including risks that may affect exit value beyond the expected hold period.
  - **Hazard:** A climate-related event or condition that may cause damage, disruption, or financial loss.
  - **Exposure:** The extent to which assets, operations, critical dependencies, and value-chain nodes are subject to those hazards based on likelihood and severity of events across multiple climate scenarios.
  - **Vulnerability:** The susceptibility of exposed assets and operations to harm, taking into account asset characteristics, design standards, resilience measures, operational dependencies, and commercial arrangements.
  - **Impact:** The resulting operational and financial consequences arising from the interaction of hazard, exposure, and vulnerability.

TAKEN TOGETHER, THE ASSESSMENT SHOULD ASK:

1. What is the relevant time horizon?
2. Which hazards are already significant and which could become significant over that horizon?
3. What is the future change in likelihood and severity of the hazards across the asset's specific locations and across its value chain?
4. How vulnerable is the investment to those exposures when accounting for asset characteristics, commercial terms, and existing adaptation measures?
5. What operational and financial impacts could result, and could those impacts be material to the investment?

Document what is considered material versus non-material, and why, at entry and at each reassessment. Materiality should ultimately be judged by the potential financial consequence for the investment, rather than by hazard, exposure or vulnerability in isolation.

Example: A portfolio of thousands of geographically dispersed telecom towers may face exposure to multiple physical climate hazards, but the impact of any single site disruption may be limited by diversification and network redundancy. By contrast, a single-location LNG facility may warrant deeper assessment where a material hazard could disrupt a large share of operations and cash flows. The depth of analysis should therefore reflect the concentration and potential financial materiality of the exposure.



PROPORTIONALITY

The depth of analysis should be scaled based on what is warranted and what is achievable, influenced by the following considerations.

1. **How much analysis is warranted** follows from financial impacts the asset has already experienced, current exposure, the risk of such impacts increasing materially, hold period, and how much influence the LP has over the outcome
2. **How much analysis is achievable** can be affected by deal timelines, data quality, and the access an ownership position allows.

LP's degree of influence should not determine whether material risks are assessed but should inform the effort spent analysing how identified risks can be addressed. For minority positions, the LP may rely more heavily on GP-led or third-party diligence and asset management.

As set out by ISSB, what constitutes undue cost or effort depends on the circumstances of each investment and involves weighing the effort of obtaining information against what it adds to the decision.

SCALING TO WHAT IS WARRANTED

In practice, LPs may find it useful to:

- Apply greater analytical depth where physical climate risk could materially affect the investment case, the investment represents a significant exposure for the LP, or there is potential correlation of exposure across several investments.
- Direct deeper analytical and engagement effort towards risks the LP can meaningfully act on, price or mitigate, while scaling back analysis of potential responses where the LP has limited ability to influence the outcome. LPs may influence outcomes through governance rights, contractual protections or GP engagement.
- For GP-led investments, consider the GP's demonstrated capability and track record in identifying and managing physical climate risk when determining how much additional LP analysis is warranted, particularly where the LP has limited influence.
- Let a material risk that sits outside the LP's influence still inform the investment decision, including whether to proceed and at what price. Limited ability to act on a risk should not be a reason to leave it out of the assessment.

WORKING WITHIN WHAT IS ACHIEVABLE

In practice, LPs may find it useful to:

- Use qualitative or high-level screening, third-party data or resources where direct access is limited, or detailed analysis is not feasible, using the findings to identify areas that warrant further questions of management, GPs or diligence providers.
- Document what the assessment covered and why its depth was judged sufficient to support the decision.
- Flag any potentially material risks that remain unassessed, explaining why they are not expected to change the decision, or address them through further diligence, investment conditions or post-close actions with clearly assigned ownership.
- Expect analysis to be refined during the hold period as data, access and capabilities improve, rather than treating as final the assessment that was completed at entry.

Data and tools in this area are still maturing, so starting where resources and expertise allow is reasonable. As disclosure requirements mature, data availability will improve, and the practical bar for what's achievable will rise accordingly. The aim is to support informed decisions at each stage, while recognising that climate analysis is iterative and should improve over the life of the investment.

Example: During a two-week due diligence on a manufacturing business, full hazard modelling across all sites and mapping of the global supply chain is neither warranted nor achievable. Analysis concentrates on the two plants that carry most of production and on inputs with no ready substitute, since that is where exposure could move the investment case. Remaining sites are covered through portfolio-level screening, and broader supply chain mapping is picked up post-close, with the reasoning for both documented.

CONSISTENCY

Assets, managers, and data sources will always differ, but LPs should seek consistency in the process they follow.

IN PRACTICE, LPS MAY FIND IT USEFUL TO:

- Use Section 5 as the common lifecycle structure for assessing physical climate risk at entry, monitoring it through ownership and considering it at exit.
- Capture a consistent set of decision-useful outputs, including material risks identified, potential financial implications, how these are reflected in underwriting or asset management, and any material follow-up actions.
- For indirect investments, apply a common set of expectations across GPs, translating different methodologies or reporting formats into comparable categories where possible.

Methods and data sources may evolve, but material changes should be documented so changes in risk can be distinguished from changes in methodology.

Consistency does not mean uniform or static treatment. Depth may vary by proportionality, and methods may evolve as data, tools and experience improve, provided changes are explained and comparability is maintained.

Example: An LP receives physical climate risk information from 15 GPs using different tools and metrics. By translating each assessment into the maturity categories, the LP can compare funds on a common basis and focus engagement on the assets and managers requiring the most attention.

RELEVANCE

Assessment of climate risk should be decision useful (in line with ISSB). Information can be relevant in two ways: through predictive value, helping assess a potential future outcome, or through confirmatory value, confirming or revising a previous evaluation. An assessment can be material, proportionate, and consistent, and still fail to be relevant, if it never actually shapes how an LP or GP acts.

IN PRACTICE, LPS MAY FIND IT USEFUL TO:

- Apply this test to GP reporting, IC materials, and ongoing monitoring alike.
- Look for outputs that show whether a risk position has changed and what should happen next, rather than ones that only record actions completed or capital spent.

Example: An LP directly holds several data-centre assets. A likely decision-useful analysis would show where heat, water stress, flooding or wildfire risks are concentrated, how they could affect operating performance and resilience capex, and whether this should change asset-management priorities or future acquisitions. A single portfolio-level risk score, without showing which assets drive it, is less likely to be decision-useful because it cannot readily inform where the LP should act or allocate capital.



SECTION 4

MATURITY FRAMEWORK

SECTION 4

MATURITY FRAMEWORK

The physical risk maturity framework provides a common language for describing the extent to which physical climate risk is identified and managed at the asset level, whether the asset is held directly or sits within a GP-managed fund. It is designed to establish a baseline at diligence and enable LPs to track progress through periodic reassessment during the hold period, with a view to improving asset maturity and de-risking the portfolio over time.

The framework aligns with IIGCC's Climate Resilience Investment Framework (CRIF), which has drawn from other established maturity approaches, including the Private Markets Decarbonisation Roadmap (PMDR) and Net Zero Investment Framework (NZIF) that use staged frameworks to track progress in decarbonisation.

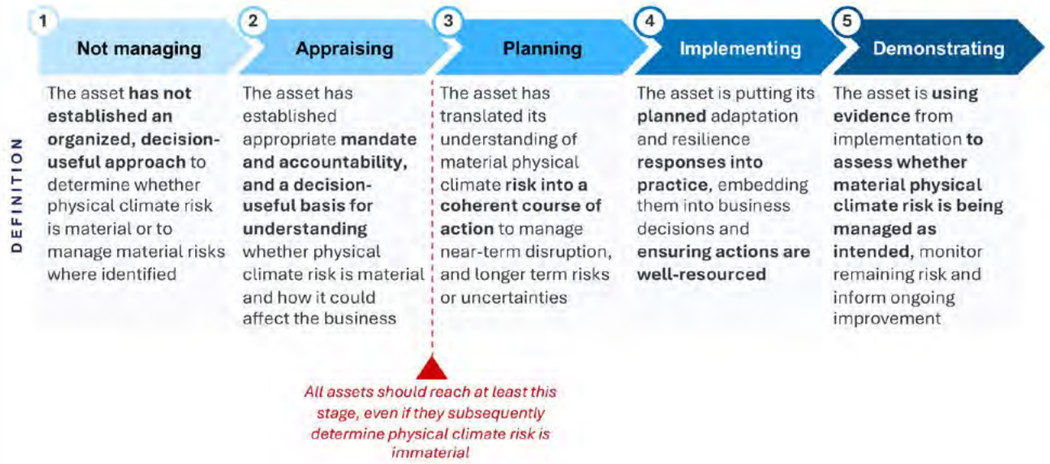
KEY CONSIDERATIONS

- **Maturity can indicate how systematically risk is being managed, but it is not a substitute for sizing the risk itself.** An asset may meet the requirements of a higher maturity stage without its processes being sufficiently robust to manage the material risks it faces. Section 5 provides guidance for assessing the quality of those underlying processes.
- While other frameworks may be applied more broadly, **this playbook's maturity guidance is primarily focused on equity investments**, where owners or managers have greater ability to influence asset-level governance and improvement.
- This framework assesses an **asset's physical risk management maturity, not a GP's capability** to manage physical climate risk across its funds. GP capability is assessed separately in Section 5B. LPs may encourage GPs to apply the framework consistently across underlying assets and report the resulting maturity distribution to LPs



At asset level, progression through the framework reflects a shift from not managing physical climate risk, to appraising material risks, planning and implementing responses, and demonstrating their effectiveness over time, as seen in Figure 6 below:

***Figure 6:** Physical risk management maturity can be assessed across 5 stages*



KEY CONSIDERATIONS

- An asset should be **classified at the highest stage for which all minimum criteria are met**. More advanced practice on isolated criteria does not advance the overall stage
- The analysis underpinning an asset's maturity stage **should be refreshed periodically**, and whenever material new hazard data, climate science or risk events emerge. This reassessment **runs in parallel at every maturity stage**, ensuring the asset's risk view remains current as conditions change, regardless of the pace of progression in maturity

ROLE OF THE ASSET AND ASSET MANAGER IN DRIVING MATURITY

Responsibility for advancing maturity sits primarily with the asset's executive team, under board oversight. The asset manager (LP or GP responsible for overseeing the asset) supports and oversees that progression, while implementation is the executive team's responsibility. The table below highlights how the roles vary across four core pillars of climate risk management (as originally set out in TCFD). Some roles become more relevant at specific stages of maturity, while others are broader and stay important throughout:

Pillar	Role of the Asset	Role of the Asset Manager
STRATEGY AND TARGETS	• Set goals for improving maturity • Translate priority risks into an Adaptations & Resilience (A&R) plan with clear actions, ownership, budget and timelines • Integrate material climate impacts and resilience needs into business planning	• Set expectations for maturity improvement • Review whether the A&R plan addresses priority risks and considers key strategic trade-offs, including capital requirements and other business objectives
GOVERNANCE	• Establish clear ownership and board oversight • Build the capabilities needed to manage physical risk • Identify and escalate material capability, budget or technical gaps requiring support	• Assess whether governance, ownership and capabilities are sufficient • Facilitate access to expertise or resources where useful, without taking ownership of implementation
RISK MANAGEMENT	• Identify, size and prioritise material direct and indirect risks • Implement agreed adaptation measures • Monitor whether measures are reducing risk as intended and strengthen the approach over time	• Review the robustness of risk assessments, assumptions and priorities • Monitor delivery of agreed measures • Test whether they are achieving the intended outcome
DISCLOSURE AND REPORTING	• Escalate material findings to the board and report material risks, A&R delivery, delays and changes in the risk position to the asset manager • Maintain evidence of effectiveness over time	• Establish a structured review and reporting cadence • Review evidence of maturity, material risks and A&R delivery • Use identified gaps or stalled progress to focus ongoing engagement

In direct investments, the LP or its appointed asset-management team performs the asset-manager role; in indirect investments, the GP performs this role while the LP sets expectations and monitors delivery.

In sum, the maturity framework provides a standardised way to assess and compare how physical climate risk is managed at the asset level, track progress over time and identify where further engagement may be needed. Section 6 builds on this asset-level view by showing how maturity can be aggregated across the portfolio to support decision-useful oversight. In practice, LP engagement will often be informed by how their portfolio is distributed across the maturity stages, helping prioritise attention where gaps are most material or widespread.



SECTION 5

INVESTMENT LIFECYCLE GUIDANCE

SECTION 5

INVESTMENT LIFECYCLE GUIDANCE

This section sets out what physical climate risk management practices LPs can adopt today. It distinguishes between direct investments (Section 5A), where the LP's own investment and asset management teams assess risks and engage at the asset level, and indirect investments (Section 5B), where the LP focuses on assessing and engaging external GPs on their management of underlying assets. Both tracks follow the same underlying risk management logic, adapted to the LP's varying role and level of influence.

Across both tracks, LPs should consider the range of financial impacts that physical climate risk may have on their assets. Understanding and building resilience to these impacts underpins the guidance in both Sections 5A and 5B. The table below provides a view of potential financial impacts that could be relevant. It is anchored in IFRS S2's framing of climate-related financial effects across financial performance, financial position, and cash flows, then translates that framing into the types of physical climate impacts that can affect investment decisions, setting out examples of each.



Category (per IFRS S2)	Impact type (non-exhaustive)	Examples
FINANCIAL PERFORMANCE	**Demand shock**	Change in demand for the asset's products or services as customers, off-takers or end markets are affected by climate hazards.
	Operating disruption	Disruption to production, transportation, or distribution reduces revenue or increases cost for the period disrupted.
	Increased operating costs	Higher recurring costs, including resource costs, insurance premiums, maintenance, cooling, climate-exposed input costs and labour productivity losses from heat.
	Value chain disruption	Disruption through suppliers, logistics routes, utilities or shared infrastructure the asset depends on, creating input availability, cost or delivery reliability impacts.
FINANCIAL POSITION	**Asset value change**	A change in the value or useful life of an asset, reflecting physical damage, elevated risk, or impairment to any aspect of financial performance listed above.
	Liabilities	Provisions, remediation costs, penalties or restoration obligations arising from climate-related damage, disruption or exposure.
CASH FLOW AND FINANCING	**Cash flow impact**	Reduced, delayed or more volatile cash flows resulting from lost revenue, higher costs, working capital pressure, disruption events or recovery periods.
	Cost and access to capital	Higher financing costs, tighter lender terms, reduced debt capacity or more constrained refinancing options, reflecting the market's own pricing of climate exposure.
	Capital expenditure	Unplanned or accelerated spend to repair, protect or adapt the asset, including resilience capex, equipment replacement or backup systems.

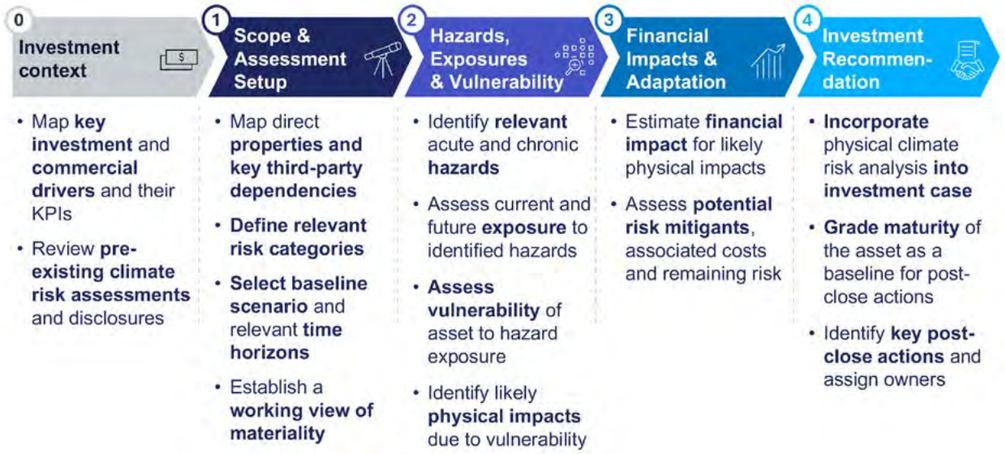
The same potential financial impacts should be considered at every stage of the investment lifecycle from diligence, through the hold period, to exit.

SECTION 5A
DIRECT INVESTMENTS

Direct investments are those where the LP invests directly in an asset, whether as sole owner, majority owner, or minority co-investor. The LP's visibility and influence will vary by ownership position, but will generally be greater than in an indirect fund investment. This section sets out practical guidance for LPs across each stage of the investment lifecycle.

- **5A.1: Due Diligence.** Assessing physical climate risk before capital is committed, and incorporating findings into the investment's financial case and decision.
- **5A.2: Hold Period.** Embedding an appropriate adaptation and resilience strategy at asset level, with clear governance and maturity tracking, and using asset-level findings to inform portfolio oversight and engagement.
- **5A.3: Exit.** Demonstrating how risk has been managed through ownership and using relevant evidence to support buyer diligence and where appropriate, valuation.

Figure 7: Physical risk is assessed across 4 steps at the due diligence stage



5A.1: DUE DILIGENCE

Ensure material physical climate risks are surfaced early in diligence, tested for financial relevance, and translated into insights that investment teams and decision-making bodies can use to inform investment decisions.

WHAT THIS CAN LOOK LIKE

The process follows four steps (excluding a Step 0 which lays down considerations around the investment context).

STEP 0: INVESTMENT CONTEXT

The objective of this step is to anchor the physical climate risk assessment in the wider deal context and the asset's key commercial and financial drivers. Before formal analysis begins, the deal team and sustainability team should align on two areas.

- Map the asset's key investment and commercial drivers: Highlight the asset's key commercial and financial drivers so that subsequent climate risk analysis is aligned with what is most important to overall investment performance (this will vary by asset type). Understanding the deal's value drivers also means understanding who bears the financial impact of any disruption, including where contractual or other risk-sharing arrangements may transfer part of the exposure.
- Review existing climate risk work: Assess any pre-existing climate risk assessments, TCFD or ISSB disclosures, insurance reviews, engineering reports, third-party studies, or analysis prepared by the asset, manager, seller or prior owner.

STEP 1: SCOPE AND ASSESSMENT SETUP

Once the deal's value drivers are clear, deal teams should define the scope and parameters of the physical risk assessment.

1. **Map asset and system dependencies:** Understand what the asset physically consists of, what it depends on to function, and where it sits in a broader value chain. These three layers carry different consequences for how climate risk is managed.
   - ▸ **What the asset owns or controls:** Physical property, plant, equipment and infrastructure directly owned or operated by the asset, where climate impacts may create direct damage, downtime, repair costs, resilience capex and insurance impacts.
   - ▸ **What the asset depends on but doesn't own:** Critical third-party infrastructure and services, including utilities (e.g., power, water, telecoms), ports, transport corridors and other geographically important dependencies, where disruption may affect operations even if the asset itself is unharmed.
   - ▸ **The value chain:** Critical suppliers, inputs, customers, off-takers and logistics links or supply chain nodes upstream or downstream in the asset's value chain, where climate-related disruption could affect input availability or costs, demand, revenues and operational continuity.
2. **Define the operational and commercial risk categories to assess:** Based on the asset's business model and value drivers (see Step 0), identify how the asset can be impacted directly or indirectly, such as through physical damage, business interruption, supply-chain disruption or other material operational and financial effects.
3. **Select scenarios:** Use a base and downside scenario, with the downside reflecting higher levels of warming. Scenario choice should reflect the asset's exposure and investment horizon. Different scenarios may result in different expected frequencies and severities of hazards, which should be reflected in the underlying analysis. PCRAM 2.0 offers more detailed guidance on scenario selection and adaptive pathways.
4. **Set time horizons:** Align the selected horizon to the investment timeline, typically the expected hold period (e.g., 5-7 years), and where relevant, the useful life beyond hold (e.g., an additional 10-15 years) that may affect exit pricing or the next owner's view of risk.
5. **Establish the basis of assessing materiality:** Identify the investment metrics and value drivers that could be affected by physical climate exposure, such as EBITDA, capex, asset value, insurance costs and availability, downtime, financing terms or exit assumptions. Agree with the deal team which of these are most relevant to the investment case and use them to guide the analysis in Steps 2 and 3.

Data to request from the target at this stage, where available and proportionate:

- Any prior climate or natural hazard assessments
- List of property locations relevant to the assessment, with coordinates or addresses
- Key inputs; suppliers and their locations; critical dependencies (power, water, transport, telecoms)
- Historical climate-related incidents
- Insurance schedules and claims history

- Property / plant design standards, engineering specifications and existing adaptation measures for the most critical infrastructure / buildings (at a minimum)
- Any adaptations or resilience measures in place

STEP 2: HAZARD, EXPOSURE AND VULNERABILITY ASSESSMENT

This step assesses the potentially relevant hazards, exposures, vulnerabilities and physical impacts to determine whether they could create material financial impacts, and how the materiality changes over time. The financial impact itself is estimated in Step 3 that follows.

Step 2.1:
Hazard Assessment: Identify the relevant acute and chronic physical climate hazards that could affect the investment, based on the asset type, operating context and locations identified in Step 1.

Step 2.2:
Exposure Assessment: This assessment should be carried out in two parts: first establishing the asset's current exposure baseline, then assessing how future hazard exposure could change that profile over the relevant investment horizons:

- **Establish a current baseline:** Assess current exposure using the best available hazard data, supplemented by observed events, claims history, incident records, management input and other relevant evidence. Consider the likelihood and severity of relevant hazards across the asset's owned or operated assets, critical dependencies and value chain.
- **Assess future exposure** (on a total risk basis, i.e. before any new adaptation or resilience measures are taken into account. Further mitigation options are assessed in Step 3). Use appropriate forward-looking climate data, third-party tools, advisers or internal models to assess how the likelihood and severity of relevant hazards may evolve under the scenarios and time horizons selected in Step 1

Step 2.3:
Vulnerability Assessment: Assess how susceptible the exposed assets, operations and dependencies are to being meaningfully affected by the hazards identified. Significant exposure does not necessarily imply material risk where the asset's characteristics or existing resilience reduce its vulnerability.

Consider factors such as:

- Design standards and engineering characteristics
- Existing resilience and adaptation measures
- Operational flexibility and redundancy
- Adaptive capacity, should conditions change

This assessment should consider both the current exposure baseline and how vulnerability may affect outcomes as exposure evolves under future scenarios.

Step 2.4:
Physical Impact Assessment: Assess how the interaction of hazard, exposure and vulnerability could translate into physical or operational impacts, considering both current conditions and how impacts may change over time. The output should identify which impacts could plausibly be significant enough to warrant financial assessment in Step 3.

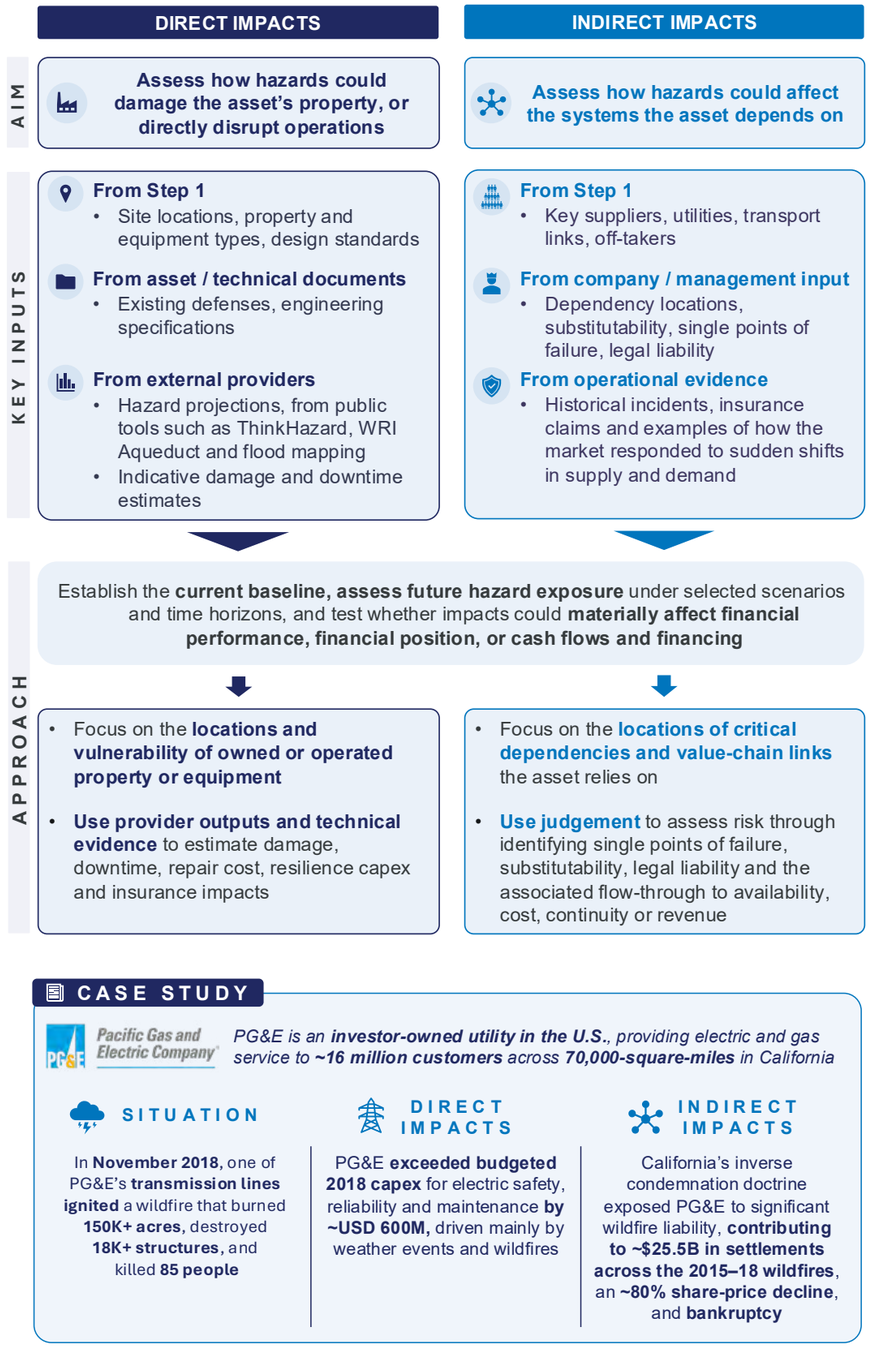
Impact mechanisms will vary by industry because different business models have different points of failure. Appendix C provides an illustrative starting point for identifying relevant industry-specific impact mechanisms, rather than an exhaustive list.

PCRAM 2.0 offers more detailed guidance on asset-level hazard and materiality assessments.

Where this analysis surfaces no plausible material exposure or impact, document that conclusion and close out the physical climate risk assessment, without proceeding into Steps 3 and 4.

The approach to applying this step, however, would be nuanced by impact type as illustrated in Figure 8 below:

Figure 8: *Materiality assessment for Direct vs Indirect Impacts*



CASE STUDY

Pacific Gas and Electric Company

*PG&E is an **investor-owned utility in the U.S.**, providing electric and gas service to **~16 million customers** across **70,000-square-miles** in California*

SITUATION

In **November 2018**, one of PG&E's **transmission lines ignited** a wildfire that burned **150K+ acres**, destroyed **18K+ structures**, and killed **85 people**

DIRECT IMPACTS

PG&E **exceeded budgeted 2018 capex** for electric safety, reliability and maintenance **by ~USD 600M,** driven mainly by weather events and wildfires

INDIRECT IMPACTS

California's inverse condemnation doctrine exposed PG&E to significant wildfire liability, **contributing to ~$25.5B in settlements across the 2015–18 wildfires**, an **~80% share-price decline**, and **bankruptcy**

STEP 3: FINANCIAL IMPACTS AND ADAPTATION

Translate the physical impacts identified in Step 2 into decision-useful financial insights. Direct impacts can typically be quantified using standard, provider-led metrics. Indirect impacts are harder to model with precision, so practical approaches rely more on dependency analysis and reasoned estimation.

Some common metrics for direct and indirect impacts are listed below (non-exhaustive).

Metric	What it captures	Illustrative example	How it's measured
DIRECT **Average Annual Loss (AAL)**	Expected annual cost of physical damage (as a currency figure or % of asset replacement value).	A coastal warehouse with an AAL of 2% against a $50M replacement value implies ~$1M in expected annual flood damage.	Provider models combine hazard probability (frequency and severity) with asset vulnerability and value, averaged across the full range of possible events.
DIRECT **Probable Maximum Loss (PML)**	Worst-case loss from a single severe event; used by insurers to set capacity and pricing (Currency, or % of asset value).	A single major storm could cause losses several multiples of the AAL - the figure against which insurers size coverage limits.	Taken from the same underlying loss curve as AAL, but at a high percentile (e.g., a 1-in-250-year event) rather than averaged.
DIRECT **Adaptation and resilience Capex**	Estimated capital required to implement measures that reduce or manage material physical climate risks, informing whether those actions are economically justified.	A logistics asset exposed to flooding requires $2M of flood-protection upgrades. The cost may be judged reasonable or unreasonable relative to the likelihood and potential impact of flooding during the expected holding period.	Based on technical or engineering assessments of required measures, including when the expenditure would need to occur relative to the expected hold period and evolution of the risk.
DIRECT **Adaptation and resilience Opex**	Ongoing operating costs required to maintain and monitor resilience systems and preparedness measures over time, distinct from one-off capital upgrades.	A flood-exposed warehouse incurs ~$150K every three years to inspect and service flood barriers, pumps and drainage systems, alongside more frequent testing of backup generators and alert systems.	Estimated cost of recurring resilience-related maintenance and monitoring activities, together with the expected frequency or maintenance cycle for each activity.
DIRECT **Downtime and business interruption**	Lost operating days per hazard event, converted into lost revenue using daily revenue or throughput (Days per hazard event; currency of lost revenue).	A toll road generating $200K/day, with 5 expected days of closure per storm, implies ~$1M in lost revenue per event.	Provider models estimate expected closure days per hazard event; multiplied by the asset's own daily revenue or throughput.
INDIRECT **Dependency value at risk**	Revenue or margin tied to a climate-exposed supplier, route, utility or offtaker (% of revenue or margin).	A processor sourcing 40% of inputs from one drought-exposed supplier and anticipating a 2-month disruption may have ~7% of annual revenue at risk.	Share of revenue or margin tied to the exposed party, multiplied by a plausible disruption duration and adjusted for how easily it could be substituted.

There are two further factors relevant to physical climate risk which may be better tracked as context rather than treated as required diligence outputs.

- **Insurance trajectory:** Track changes in premiums, terms, coverage and potential (un)insurability. PCRAM 2.0's insurer evidence-pack approach provides a useful reference for how assets can evidence their risk management and resilience measures at renewal.
- **Cost of capital:** The extent to which climate exposure raises financing costs or required returns.

Both may become more assessable later in the hold period, once real claims history or refinancing terms exist.

KEY CONSIDERATION

Across all metrics:

- Treat outputs as **due diligence inputs** rather than precise forecasts
- **Be explicit about what is known**, what is uncertain, and what would need reassessing post-close
- Frame outputs as **ranges or scenarios** where confidence is limited
- Only **carry impacts** into the model **that clear the materiality** requirements set in Step 1

Further adaptation and resilience actions

For each material physical climate risk identified, the deal team should identify further risk-transfer, adaptation or resilience options available, including their expected cost, timing and financial benefit. Material actions should be incorporated into the 100-day or asset management plan, with clear ownership and milestones, and progress reported through the hold period.

Reflect material financial impacts in the appropriate parts of the investment underwriting, considering their nature (one-off or recurring), timing, and implications for revenue, operating costs, capex or valuation. Where precise quantification is not feasible at diligence stage, document the best available view and any required post-close follow-up.

STEP 4: INVESTMENT RECOMMENDATION

This step brings together the analysis from Steps 2 and 3 into an investment decision, generally following four questions in sequence.

- **How big is the (total) risk?** Summarise the material financial implications identified in Steps 2 and 3, supported by a qualitative view where quantification is not feasible.
- **What can be done and at what cost?** Assess the relevant adaptation and mitigation options identified in Step 3, including allowances made for expected cost of the risk (e.g. operational downtime, additional capex etc.).
- **What risk remains after mitigation?** Assess the baseline risk (after existing controls). Where further adaptation measures are assumed in the investment case, also evaluate the expected residual risk after those measures are delivered.
- **How does this change the investment case?** Reflect material financial risks identified through this exercise in the investment base case, particularly where the underlying figure (such as an AAL-type metric) already reflects the probability and severity of a range of possible events. Sensitivities are more useful for testing discrete uncertainties or decisions not already captured in the base case, such as the case for additional resilience investment under a more severe scenario.

Where relevant, the deal team should apply this same thinking across the investment case assumptions, including:

- **Operating performance.** Where a reliable figure exists (e.g., an AAL-based estimate), reflect it in the base case as a single number. A sensitivity may still be useful where a specific, separate decision is genuinely in question.
- **Capital expenditure.** Committed or clearly planned adaptation capex would typically sit in the base case, with any additional spend that only becomes relevant under a more severe scenario tested separately.
- **Terminal value.** The expected post-adaptation risk profile can inform exit assumptions, with a sensitivity reserved for a specific event or open question that would materially change the exit story.

The climate analysis should be incorporated directly into the main investment materials and reflected in the underwriting case where relevant. Any material post close actions should be assigned owners and incorporated into the 100-day or asset management plan.

DOs	DON'Ts
✓ Focus on governance and decision use	⊗ Require granular geospatial outputs without decision relevance
✓ Accept qualitative analysis where proportionate	⊗ Default to single metrics (e.g., CVaR) as a proxy for robustness
✓ Prioritize material risks	⊗ Confuse data volume with quality
✓ Ensure residual risk is transparent	
✓ Clearly explain scenarios and time horizons applied, and the rationale for their selection	

CASE STUDY

***A data center portfolio was assessed during due diligence**, with value dependent on asset uptime, operating efficiency, contract pass-through costs and renewals, and planned asset carve-outs. Existing physical climate risk analysis was qualitative.*

ASSESSMENT PROCESS

The assessment focused on hazards most relevant to the asset type:

- **Heat stress:** material due to potential impacts on cooling performance, availability and operating costs; downtime per heatwave was estimated and tested against projected 2030 heatwaves under RCP8.5.
- **Water scarcity:** identified as a potential stranded asset risk for carve-out assets, with exit implications assessed qualitatively.
- **Flooding:** assessed as unlikely to be materially relevant over the hold period.

DILIGENCE OUTCOME

The assessment **did not result in a no-go decision**. Instead, the estimated heat-related impact was tested as an **additional 30 bps downside sensitivity to IRR**.

The portfolio was considered **resilient overall**, while **clusters of assets required** further technical analysis and **proactive management** to mitigate potential asset-stranding risk.

5A.2: HOLD PERIOD

Set clear expectations with the asset's management team for how physical climate risk is managed throughout the ownership period and hold the team to account for delivery.

WHAT THIS CAN LOOK LIKE

Direct investments give investors greater visibility into asset-level climate risk and more influence over how it is managed, typically through board and observer rights. LPs should work with the boards and leadership teams of their assets to ensure ongoing management of physical climate risk.

1. **Physical climate risk embedded into general risk management processes:** Physical climate risk should be embedded within the asset's existing risk management processes. Material risks identified through assessment should be translated into the A&R plan and tracked through implementation.

Effective delivery of the A&R plan can reduce business interruption, revenue losses and reactive maintenance costs, while improving operational resilience and potentially supporting better insurance or financing terms. Over time, a stronger risk profile can also enhance the asset's attractiveness to buyers and support exit value.

The respective roles of the executive team, the board and the investor include:

- **Executive / Senior management team.** Own management of physical climate risk and ensure it is integrated into business planning and decision-making. A designated senior management individual should lead day-to-day management and delivery against relevant adaptation milestones, including hazard assessments, insurance reviews and A&R plan delivery, with material issues and delays escalated through the appropriate governance channels.
- **Board.** Provide oversight and challenge, including whether:
  - The business adequately understands its material physical climate risks and the maturity of its response.
  - Key risk decisions are being made explicitly, including actions to take, capex to commit and risks to accept.
  - A&R measures are delivering the intended outcomes, including whether insurers recognise improvements in the asset's risk profile.
  - Relevant committees are engaged where physical climate risk affects risk management, valuation, financial reporting, financing or insurance.
  - The business plan appropriately reflects material physical climate impacts and the business response.
- **LP (Investor).** Set expectations, challenge where appropriate, monitor progress and provide support while leaving ownership with the executive team and board. Where asset-level capabilities are still developing, a key investor role is to help build awareness and capability across senior management and the board, including by:
  - Ensuring management and board members undertake targeted upskilling or training on physical climate risk and resilience.
  - Sharing good practice and lessons from across the portfolio.
  - Connecting the asset with relevant internal or external expertise.
  - Encouraging clear board-level ownership, for example by identifying a board member to act as a resilience lead and maintain continuity of engagement with management.

2. **Regular reporting and maturity tracking:** Investors should expect regular reporting that provides a consistent basis for monitoring physical climate risk and progress in risk-management maturity through the hold period. The maturity framework in Section 4 can be used to assess progress against the asset's starting position and identify where further action or engagement is needed.

Where available, reporting should include:

- Progress against the asset's maturity assessment and any material gaps identified.
- Actual losses incurred from climate-related events.
- New adaptation or resilience measures implemented since the last reporting cycle.
- A current assessment of material risks and how they have changed.
- Any material changes to the business plan, financial projections or valuation assumptions arising from physical climate risk.
- Where relevant, reporting should also capture a small set of consistent asset-level fields that can support portfolio aggregation, including maturity, sector, geography, material or potentially material physical climate exposures, and investment value. Section 6 sets out how these can be used to identify portfolio-level concentrations and correlations.

The respective roles include:

- **Executive / Management team.** Maintain the underlying information, deliver actions needed to address material maturity gaps and provide timely, decision-useful reporting.
- **Board.** Review significant developments and oversee progress against agreed maturity expectations.
- **LP (Investor).** Monitor risk and maturity through the hold period, set expectations for improvement and determine the appropriate response where progress is insufficient.

3. **Ongoing engagement on insurance, financing and other risk transfer mechanisms:** As conditions evolve through the hold, insurance availability, affordability and potential (un) insurability should be monitored alongside any implications for financing terms and asset value. Engagement with insurers should draw on updated evidence of the asset's risk profile and A&R measures where this could support improved coverage or pricing. Furthermore, consider how other risk transfer mechanisms can be built into supplier, customer or dependent service network contracts.

The respective roles of the executive team, the board and the investor include:

- **Executive / Senior management team.** Manage ongoing engagement with insurers and lenders, provide relevant evidence on the asset's risk profile and A&R measures, and identify material changes in terms or availability.
- **Board.** Oversee significant insurance or financing developments and the adequacy of the executive team's response.
- **LP(Investor).** Monitor whether changes in insurance or financing affect the investment case and determine whether further engagement or action is warranted.

4. **Reassessment on a defined trigger and cycle:** Risk analysis should be refreshed periodically, with the frequency informed by the asset type, expected hold period and pace at which the relevant risks may change, as well as when material updates in climate science or data occur, such as new IPCC assessments.

The respective roles of the executive team, the board and the investor include:

- **Executive / Senior management team.** Refresh the risk assessment when defined triggers are met and update the asset's response where findings materially change.
- **Board.** Define and periodically review the triggers for reassessment and oversee whether material changes in the risk position are appropriately reflected in management actions.
- **LP (Investor).** Aggregate findings across assets to identify systemic exposures and use them to inform engagement, insurance strategy or the case for divestment where risk exceeds tolerance (see section 6 for further details)

DOs	DON'Ts
✓ Focus on progress and ownership	⊗ Treat initial DD as sufficient for full hold period
✓ Aggregate portfolio insights proportionately	⊗ Request unnecessary annual re-modelling without material change
✓ Review the net risk log	
✓ Encourage risk-based periodic reassessment	



5A.3: EXIT

Direct investments may benefit from preparing physical climate risk evidence ahead of exit, particularly where adaptation and resilience actions have strengthened the asset's risk profile. The purpose of this exit-stage guidance is not to create a standalone climate disclosure exercise, but to give the deal team discretion to leverage the risk management track record, where it can support valuation. If the hold period has been managed well against Section 5A.2, the existing evidence should help position the asset as more resilient and ultimately more valuable.

Where relevant, the seller can use this evidence from the hold period to support the broader asset-quality narrative, respond confidently to buyer diligence, and show that material risks have been understood and have been (or are being) managed.

WHAT THIS CAN LOOK LIKE

1. **A climate-informed exit narrative, anchored to maturity progression:** The LP can draw on the asset's maturity progression to explain how material physical climate risks have been identified, assessed and managed through the hold period. This can help demonstrate that resilience has been intentionally built into the asset over time.
2. **Adaptation progress and outstanding mitigations:** Buyer-facing teams can evidence adaptation measures delivered, capex spent, milestones achieved and outstanding risks and actions still being managed. This can give buyers confidence that remaining risks are known, manageable and, where relevant, have been mitigated to within acceptable materiality levels.
3. **Valuation reflecting the post-adaptation position:** Resilience actions that have improved operating continuity, insurability, cost visibility or reduced future capex uncertainty can help substantiate valuation assumptions and reduce the risk of buyers applying a broad climate-risk discount.
4. **Buyer materials built to support confidence:** Data rooms and vendor due diligence packs can include relevant climate risk evidence, such as insurance summaries, updated risk assessments, completed adaptation and resilience measures, capex records, and incident or claims history. This can help answer likely buyer questions, demonstrate management discipline, and show that material exposures have been actively managed through ownership.
5. **Accountability assigned early:** Deal teams and asset managers should agree on responsibility for preparing disclosures and responding to buyer queries, with LPs confirming accountability prior to commencing the exit process. This helps avoid reactive or inconsistent responses if the topic comes up during diligence.

DOs	DON'Ts
Present climate risk as managed, not hidden	Ignore updated hazard projections
Provide transparent documentation	Rely solely on buyer DD to capture the value of implemented resilience measures
Show linkage between resilience and cash-flow stability	Overstate mitigation effectiveness

CASE STUDY

Airport exposed to material flood risk, with potential implications for operations, insurance and asset value.

ADAPTATION & RESILIENCE

A detailed flood resilience plan was developed and phased into the capital plan. By exit, the first phase of mitigation capex had been completed and helped support continued insurance coverage and pricing.

EXIT OUTCOME

The **full resilience plan**, including the second phase of capex, was **made available to buyers and incorporated into the forward financial plan**. This demonstrated that **material risks were understood, near-term exposure had been mitigated and remaining actions were planned**, supporting buyer confidence and the valuation case.

HOW TO UTILISE THIS SECTION AS A MINORITY INVESTOR

Minority investors may have direct asset exposure, but their ability to influence diligence, ownership decisions and exit planning will depend on the governance rights and level of control associated with their investment. Where influence is limited, minority investors may need to determine the extent to which they can rely on existing asset-level diligence and risk management processes, align with other shareholders, or supplement with their own independent assessment.

1. **Assess reliance on existing processes and other shareholders:** Determine whether the lead investor or other shareholders are conducting physical climate risk analysis and assess whether the scope and rigour of that work are sufficient for the investment. Minority investors should seek access to the findings to understand whether any potentially material risks could affect deal pricing, targeted returns or post-close actions. Where the analysis is insufficient or unavailable, consider whether proportionate supplementary diligence is warranted. Factors that should inform this choice include:
   - The materiality of physical climate risk to this specific asset
   - The size of the minority stake and the cost of independent work relative to it
   - The quality and rigour of the existing diligence process, assessed directly rather than assumed
   - The minority investor's ability to influence outcomes even where it doesn't lead, including whether it has a board seat or other governance rights and protections that help it influence decisions
2. **Establish the baseline:** Ask what physical climate risk analysis has already been completed, including hazard screening, asset and value-chain dependencies, financial implications, insurance considerations and adaptation needs. Use this to identify gaps and determine how much further effort is warranted, based on materiality, relative investment size, data access and influence.
3. **Demonstrate the investment relevance:** Where gaps exist, make clear to the lead investor, co-investors and management team that physical climate risk is not just a sustainability concern, but a potential driver

of cash flow disruption, higher capex, insurance constraints, financing risk, valuation pressure and exit risk. Where relevant, also highlight the upside from resilience, including improved operational continuity, reduced disruption and stronger buyer or lender confidence.

4. **Use available influence across the lifecycle:** Use the relevant Section 5A guidance as a common reference point with the lead investor, co-investors and management team, applying it proportionately across the lifecycle phases.
   - **Due diligence:** Seek alignment on the minimum assessment needed for the deal, and push for material findings to be reflected in underwriting, IC materials, insurance review and any post-close action plan.
   - **Hold period:** Use board or observer rights, information rights, shareholder agreements, side letters, investor reporting or co-investor alignment to track material risks, adaptation actions, insurance status, incidents and reassessment triggers.
   - **Exit:** Ask how physical climate risk management and adaptation will be reflected in buyer materials and valuation assumptions, including any material risks or actions that remain outstanding. This can help position resilience as part of the asset's value story rather than solely as a risk disclosure.



SECTION 5B: INDIRECT INVESTMENTS

LPs should seek to ensure that physical climate risk is managed effectively across their indirect investments by engaging with their GPs and Asset Managers. Across all stages of GP engagement, from selection and commitment through fund oversight and reinvestment, the emphasis placed on physical climate risk management should be proportionate to the materiality and relevance of these risks to the fund's strategy (see Section 3), and considered alongside other factors in assessing overall GP capabilities and performance.

LPs should aim to ensure:

- That GPs have an effective approach to addressing physical climate risk across the deal lifecycle that is consistent with the LP's own requirements
- That they are comfortable with the physical climate risk exposure associated with their indirect holding of assets across GP funds

The LP approach to climate risk is different when investing indirectly via GPs (compared to the direct investment approach as outlined in section 5A).

LPs should focus on:

- Selecting GPs that have a strong approach to and governance for managing climate risk (that is sufficiently rigorous to meet LP requirements). LPs may monitor how consistently that approach is applied and whether material risks are being identified and managed effectively across the portfolio. At reinvestment, LPs can consider the GP's demonstrated performance over time and across assets, rather than the outcome of any one investment.
- Engaging with GPs in support of their management of underlying assets and to gather sufficient information on underlying asset maturity and material risks so as to manage the LP portfolio exposure overall (see Section 6.), governance and track record of managing climate risk.

The level of rigour should be comparable to direct investment (per Section 5A), but the objective of assessment shifts from individual assets to the overall GP and fund approach. This section covers the following investment stages:

- **5B.1: GP Selection and Commitment**
- **5B.2: Fund Oversight and Engagement**
- **5B.3: GP Delivery and Reinvestment**

5B.1: GP SELECTION AND COMMITMENT

When selecting GP partners, LPs should assess whether a prospective GP manages physical climate risk with sufficient rigour to protect the LP's capital. LPs may also seek to clarify the GP reporting obligations during the life of any fund to allow LPs to understand their overall physical risk exposure.

WHAT THIS CAN LOOK LIKE

When selecting a GP partner, LPs may consider a number of dimensions of GP capability on physical climate risk.

Dimension	Example strong evidence	Potential red flags
Structured physical risk due diligence process	Consistent physical risk DD methodology applied across multiple past deals, documented in DDQs and IC materials, with material risks considered as part of overall asset valuation. Where possible GPs should undertake an equivalent level of diligence to what an LP would do if investing directly (as per Section 5A).	A general climate risk policy statement with no evidence it's actually been applied to specific deals. A climate change risk software analysis output with no investment-specific accompanying analysis or synthesis.
Proportionate approach	Clear approach to focusing physical risk assessment and management on the most material risks (i.e., aligned with the principles set out in section 3 of this document), with stated logic for when deeper analysis/engagement is triggered (e.g., by size of investment, exposure or geography), applied consistently.	Same screen applied to every deal regardless of exposure, or depth that appears arbitrary deal-to-deal.
Clear ownership and escalation	A named individual or function who owns physical climate risk, with a documented escalation path.	No one can name who owns this internally, or ownership shifts depending on who's asked.
Post-investment engagement and monitoring	Clear commitment to engaging with assets to enhance resilience (e.g., via actions in 100-day plan, via Board engagement). A defined monitoring cadence, with maturity assessment of assets (e.g., using the maturity framework in Section 4 [or equivalent]) with a clear ambition to improve maturity and reduce risk over time. Case studies / examples how risks are being managed and mitigating actions taken post-investment.	Limited or unstructured engagement on physical risk. Limited evidence that any material risks were identified / evidence why risks were deemed not material. Limited evidence of comprehensive A&R planning and implementation / progress tracking.
Portfolio-wide (or fund) perspective	GP can articulate its overall physical risk exposure, how this is managed overall and implications for fund strategy.	Limited or no aggregate view of maturity or risk across the fund/portfolio as a whole.

5B.2: FUND OVERSIGHT AND ENGAGEMENT

LPs should engage GPs on climate risk throughout the life of their participation in GP funds. This may include setting clear expectations for reporting on physical climate risk (e.g. on asset maturity); holding the GP to account for delivery on resilience/adaptation measures through both direct engagement and LPAC participation.

WHAT THIS CAN LOOK LIKE

For indirect investments, the GP manages climate risk at asset and fund level; the LP's role is exercised through the reporting and engagement cycle across the fund's life. LPs can set expectations of GP partners, potentially including:

1. **Regular, structured reporting.** Expect periodic reporting from GPs, aligned with the fund reporting cycle. Reporting may cover key material exposures, asset performance against identified climate risks, progress on adaptation plans and allocated capital, and any material incidents or changes in insurance availability. Where feasible, LPs may also seek a consistent minimum set of asset-level information from GPs including maturity, sector, geography, material or potentially material physical climate exposures, and investment value to support the portfolio-level analysis described in Section 6.
2. **Asset maturity progression.** Confirm that the GP grades every asset in the portfolio using the maturity framework in Section 4 (or equivalent) and reports maturity as part of the regular reporting cycle. LPs can track progression across the fund's life and press for improvement where maturity is static.
3. **Managing remaining risk.** Review how the GP identifies, tracks, and reports the risks that remain after mitigation across the portfolio, and how outstanding actions are being managed.

LPs can consolidate reporting across their GP fund commitments to identify systemic exposures and concentrations. This consolidated view may inform engagement priorities, and future commitment and re-up decisions. This is further detailed in Section 6.

ENGAGING MEANINGFULLY, BEYOND MONITORING

Fund oversight isn't only about holding the GP to account. LPs with visibility across many GP relationships and best practices from peers can add genuine value to which the GP may not have access on its own.

- **Share cross-portfolio benchmarks and lessons:** Drawing on patterns observed across other GP relationships facing similar hazards or asset types.
- **Facilitate introductions to specialist expertise:** Screening providers, engineers, or insurers, where the GP's own network is limited.
- **Support the GP's own capability development:** Particularly for GPs earlier in their climate risk maturity, rather than treating a weaker starting point solely as a basis for escalation.
- **Collaborate with peers on shared or systemic risks:** Use GP reporting to identify correlated risks across underlying investments, then assess whether similar patterns are emerging across other GP relationships and peer portfolios through platforms such as ILPA or IIGCC. Where these risks appear broader than any one fund or manager, LPs can coordinate engagement to amplify influence and, where appropriate, align with policymakers, regulators or other market enablers on potential barriers or solutions.

CASE STUDY

GP climate practice is evolving quickly, but repeated LP engagement highlights several lessons that remain relevant across managers

KEY LEARNINGS FROM EXISITING PRACTICES

1. Do not assume capability from broader ESG maturity

Climate-risk capability can vary significantly across GPs. Some otherwise sophisticated managers may have limited physical-risk processes, while smaller or less mature GPs may have developed relatively advanced approaches.

2. Look beyond polished reporting to the underlying analysis

Reporting based largely on desktop screening may appear comprehensive without demonstrating how material risks, adaptation needs or financial implications are being assessed. LPs should test the substance and ask for information that is decision-useful.

3. Simple questions can surface risks that formal reporting misses

In one engagement, a GP initially reported limited physical climate risk. Following an LP survey to list climate-related events experienced across portfolio companies in the prior year, several business impacts were identified, prompting deeper management focus on physical climate risk.

5B.3: GP DELIVERY AND REINVESTMENT

LPs can consider overall GP performance on physical risk at fund maturity. Exit-stage evidence can be used to assess whether the GP has effectively translated its climate resilience approach and actions into valuation upside during the life of any fund and to inform future commitment decisions.



SECTION 6

PORTFOLIO MANAGEMENT

SECTION 6

PORTFOLIO MANAGEMENT

LPs should seek to manage physical climate risk across their portfolio as a whole. This includes ensuring an acceptable level of financial exposure across the portfolio, actively addressing areas of correlated risk (e.g. where many individual assets have similar exposures), and developing the maturity of physical risk management portfolio-wide.

LP risk and portfolio management functions can draw on the risk and maturity assessments performed at the asset level by their own direct investment and asset management teams, as well as those reported by external GPs, to inform portfolio-level assessments and decisions. Key LP portfolio considerations may include:

- **Maturity.** Understand how physical climate risk management maturity is distributed across the portfolio, how it is progressing over time, and where engagement with assets or GPs may be needed to drive improvement. Section 6.1 sets out how to build this portfolio-level maturity view.
- **Portfolio risk.** Assess the overall level and concentration of material physical climate risk, including correlated exposures across geographies, sectors, hazards or shared dependencies. Section 6.2 sets out how to assess these portfolio-level exposures.
- **Resilience.** Understand where adaptation and resilience measures are needed across the portfolio, and how capital is being deployed to reduce material exposures and protect value. This is also considered in Section 6.2 alongside the portfolio exposure view.
- **Strategy.** Use the combined maturity, exposure and resilience insights to inform risk appetite, portfolio construction, capital allocation, engagement, new investments, re-ups and divestments. Section 6.3 summarises the portfolio decisions these insights can inform.

MATURITY FRAMEWORK APPLICATION AT THE PORTFOLIO LEVEL

LPs should seek to build an aggregate view of physical risk maturity across their portfolio (considering both direct investments and assets held indirectly via GP funds). This assessment can be built considering:

- The maturity of directly held assets
- The maturity of indirect assets (as reported by GPs)

A portfolio-level view answers two questions an asset-by-asset assessment cannot:

1. What share of capital sits at each maturity stage?
2. Is the distribution of maturity improving over time?

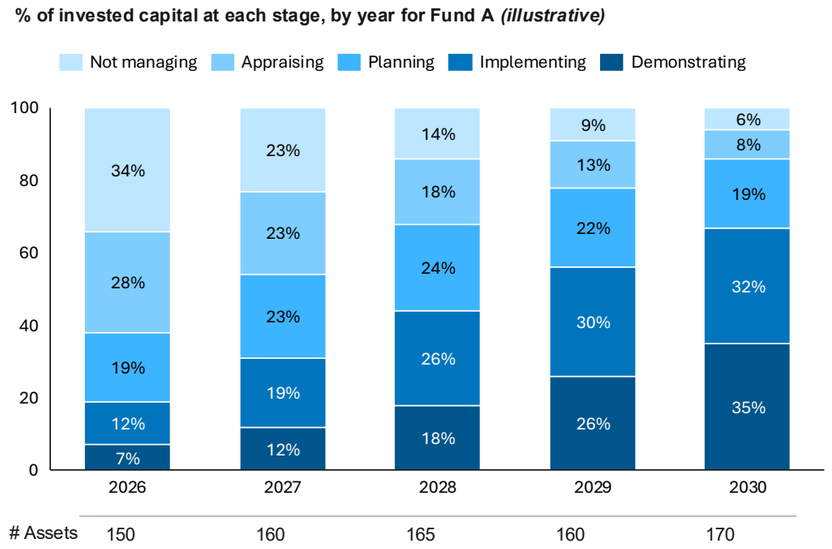
LPs can aggregate asset-level maturity assessments for each asset (as outlined in Section 4) in different ways depending on the purpose of the analysis. This may include an overall capital-weighted portfolio view, as well as analysis by fund, sector, vintage, strategy, geography or other relevant portfolio segment, and time-series analysis to track changes in maturity over time.

- Where a capital-weighted view is used, invested capital at cost can provide the primary view, with alternatives such as current asset valuation used where helpful.
- For indirect investments, GPs can provide the underlying asset maturity assessments needed to support these portfolio views.

The second question is answered by consolidating and comparing the portfolio maturity level across reporting periods. This can show where maturity is improving, where progress has stalled, and whether improvement is being sustained over time. Where agreed with management teams / GPs, LPs could also set targets for improvement in maturity and track progress against the portfolio-wide goal.

In practice, these views on physical risk maturity could be presented as illustrated in Figure 9.

Figure 9: *Tracking at portfolio level shows the maturity level of capital invested*



Together, this analysis can support broader portfolio management and investment decisions by helping LPs to:

- **Prioritise engagement.** The portfolio maturity view and progression over time can help LPs focus attention where a large share of capital remains at an early maturity stage, or where asset progression has stalled. LPs may also use this view to set tangible goals, such as an asset reaching a defined maturity stage within a certain period after acquisition, or a target share of invested capital reaching a given stage.
- **Inform capital allocation.** The portfolio view can inform broader decisions on insurance strategy, new commitments and GP re-ups or reinvestment. It helps ensure physical risk maturity is considered alongside other portfolio factors.
- **Support external credibility.** A capital-weighted, actively tracked maturity distribution can help LPs demonstrate a more systematic approach to physical climate risk management, complementing the evolving expectations of regulators, counterparties and other stakeholders.

Maintained consistently over time, this view can provide a useful management reference for understanding where maturity stands and whether real progress is being made.



PORTFOLIO EXPOSURE

LPs may choose to aggregate asset-level analysis to understand where material physical climate exposures are concentrated across the portfolio and where common drivers or dependencies could result in correlated impacts across investments. This may include considering common exposure to hazards and geographies, as well as shared dependencies such as critical infrastructure, supply chains, water systems or insurance markets, where disruption could affect multiple investments at the same time.

The portfolio view should reflect the financial relevance of these risks, taking into account the size and concentration of the investments affected, rather than relying on hazard exposure alone.

- A risk that is manageable for an individual asset may become material where it affects a significant share of portfolio value as it is repeated across several investments. LPs should seek to identify these repeated and correlated risks.
- Conversely, risks that are material at the asset level may not individually be relevant at the portfolio level.

BUILDING A PRACTICAL PORTFOLIO VIEW

A common challenge for LPs is knowing what information to collect at portfolio level. Asking for too much data can create a significant reporting burden and produce information that is difficult to digest and compare across assets and GPs; asking for too little can make it difficult to identify material concentrations or determine where further analysis or action may be warranted.

LPs can therefore start with a small, consistent set of asset-level information that is sufficient to identify where material physical climate risks may be concentrated across the portfolio. More detailed analysis can then be targeted to the areas that warrant it.

As a starting point, LPs may seek to capture for each investment:

- **Asset Sector.** A consistent sector classification.
- **Geography.** Country or countries of material operations.
- **Investment value.** NAV, invested capital or another consistently applied measure of financial exposure.
- **Asset-level maturity.** Physical climate risk management maturity, using Section 4 or an equivalent framework.
- **Material physical climate exposure.** The material hazards or dependencies identified through asset-level assessment.

For indirect investments, LPs may seek equivalent information from GPs where available and proportionate.

IDENTIFYING PORTFOLIO EXPOSURES

Using this minimum dataset, LPs can identify where individually manageable risks combine to create concentrations or correlations that may be financially significant at portfolio level. For example:

- **Concentration due to a common event:** Individually manageable flood exposure across several infrastructure and real estate assets may become material where a single severe event could affect a meaningful share of portfolio NAV at the same time, particularly if insurance coverage is also constrained across the affected market.
- **Correlated exposure through shared critical dependencies:** Assets in different sectors and locations may appear diversified but rely on the same regional power network, water basin, critical resources, port or transport corridor. A climate-related disruption to that shared dependency could therefore create simultaneous operational and cash-flow impacts across multiple investments.
- **Portfolio-wide vulnerability through business activities:** Several assets may each have moderate exposure to heat or water stress, but a portfolio view may reveal that a significant share of value depends on business models with similar sensitivity (e.g., cooling requirements, water-intensive operations or labour productivity) creating a broader earnings or capex exposure than is apparent asset by asset.

Asset-level maturity can provide additional context on how well those exposures are being managed. A concentration across assets with mature risk-management processes may warrant a different response from the same concentration across assets with significant management gaps or outstanding actions.

FURTHER ANALYSIS OF MATERIAL EXPOSURE

Where a potentially material concentration or correlation is identified, LPs can apply the materiality and proportionality principles in Section 3 to determine whether deeper analysis is warranted.

Depending on the risk, this may include considering:

- **Scale and financial significance:** How much portfolio value is exposed, and what could the potential impact be on financial performance, position, cash flows or financing?
- **Performance against underwriting:** Have actual losses or impacts differed materially from assumptions made at investment, and does this change the original investment stance?
- **Risk management and residual exposure:** To what extent is the risk being managed through adaptation, resilience measures, insurance or other mitigants, and what material exposure remains?
- **Direction of risk:** Is the exposure improving or worsening, based on changes in hazard intensity or likelihood, insurance availability or cost, financing conditions, or progress against planned resilience actions?
- **Location data:** In circumstances where the GP does not demonstrate adequate understanding of asset/portfolio climate risk and the LP has conviction of potential material risks, it may be appropriate to request some asset-level location data to undertake an outside-in analysis, applying materiality and proportionality to the data requested. Location data across a portfolio should be used selectively. Without specific questions to answer, location data often does not yield decision-useful results.

The objective is not to create a single portfolio climate-risk score or aggregate every available data point. It is to identify where concentrations or correlations could be financially significant and warrant deeper analysis, engagement or action.

These insights can then inform the portfolio-level decisions described in Section 6.3.

USING PORTFOLIO INSIGHTS TO INFORM DECISIONS

Over the medium to long term, the maturity analysis and exposure assessment together can inform:

- Investment stance and risk appetite. Reassess desired exposure to sectors, geographies or strategies where physical climate risk could have material financial implications.
- Portfolio reshaping. Identify where concentrated or correlated risks may warrant increasing, retaining, reducing or exiting positions, including where material resilience gaps create investable adaptation opportunities aligned with the LP's strategy.
- Capital allocation. Direct resilience investment toward areas where it can protect value or address material portfolio concentrations.
- Engagement priorities. Focus attention on assets or managers representing significant capital exposure and material physical climate risks, particularly where agreed actions are not progressing.

These insights should be considered alongside other investment factors to support portfolio construction, capital allocation and engagement decisions in order to build a climate-resilient portfolio and protect long-term value.





APPENDIX A

KEY QUESTIONS TO ASK GPS

This appendix provides a practical set of questions LPs can use to form a view of how a GP identifies, assesses and manages physical climate risk across the indirect investment lifecycle. The questions are organised around the three stages in Section 5B and can support manager diligence, fund reporting reviews, LPAC discussions and reinvestment decisions. They should be applied proportionately to the strategy, risk exposure and LP's level of influence.

GP SELECTION AND COMMITMENT (5B.1)

Ask when assessing a prospective GP and before committing capital to understand the GP's approach, capability and proposed LP rights

Theme	Questions
Strategy and targets	• Where does physical climate risk sit among the fund's strategic priorities, and how do you determine when it is material to the fund strategy or an investment? • Can you provide an example of how physical climate risk influenced a recent investment, whether through pricing, structuring, insurance, capital expenditure or a decision not to proceed? • What targets or expectations have you set for improving physical climate risk management and asset maturity over the life of the fund?
Governance	• Who is accountable for physical climate risk, and how are material issues escalated through the investment and ownership process?
Risk management	• What tools, climate scenarios (e.g. SSP/RCP) and underlying datasets (e.g. CMIP6, ERA5, Copernicus GLO-30) underpin your physical climate risk assessments, and how consistently are they applied across investments? • Once a physical climate risk is identified as material, how is it managed and reassessed during ownership, and what triggers deeper analysis or corrective action? • How do you assess concentrations, shared dependencies or correlated physical climate risks consistently across the fund? • What does the process for tracking improvements in physical climate risk management at the portfolio level look like?
Disclosure and reporting	• Under regular circumstances, how do you report physical climate risk to LPs in practice, including the frequency, level of portfolio detail and format? • What is the process for communicating material incidents, worsening risks or delays in adaptation plans to LPs between reporting cycles? • From previous funds or exits, can you provide examples of how disclosure of physical climate risk or resilience affected buyer diligence, pricing or deal terms, and how those lessons changed your approach?

OVERSIGHT AND ENGAGEMENT (5B.2)

Ask during the life of the fund to assess how physical climate risk is being monitored, managed and reported in practice.

Theme	Questions
Strategy and targets	• What progress has been made against the fund's physical climate risk management and maturity expectations since the last review?
Governance	• Where have capability or ownership needs emerged in managing physical climate risk, and how have these been addressed?
Risk management	• Have any events or changes triggered reassessment or deeper analysis since the last review? • Where an asset has not progressed as expected, what corrective action has been taken? • How is the risk remaining after mitigation actions being managed? • What concentrations, shared dependencies or correlated exposures are now evident at fund level, and what actions are being taken in response? • Where could additional LP support, collaboration or access to expertise help strengthen physical climate risk management across the fund?
Disclosure and reporting	• Where are there significant gaps in the physical climate risk information available for the fund or underlying assets, and how are these being addressed?

GP DELIVERY AND REINVESTMENT (5B.3)

Ask at fund maturity and ahead of re-up decisions to assess delivery, outcomes and lessons carried forward. These questions are relevant to physical climate risk only. The weight of physical climate risk management in the reinvestment decision should be informed by the guiding principles laid out in Section 3, within the context of other performance factors.

Theme	Questions
Strategy and targets	• How did the fund perform against the physical climate risk management or maturity targets set at commitment? • How did physical climate risk or resilience affect buyer diligence, transaction timing, pricing or deal terms? • Based on this fund's experience, what physical climate risk priorities or targets will you carry forward or change in the next fund?
Governance	• What changes, if any, will you make to physical climate risk ownership, accountability or escalation in the next fund?
Risk management	• What climate-related capex or insurance outcomes materially differed from the original underwriting case, and why? • Where did the fund's approach to managing physical climate risk work well or fall short, and what changes will you make as a result?
Disclosure and reporting	• Across recent exits, how did physical climate risk or resilience feature in buyer diligence, transaction timing, pricing or deal terms?

APPENDIX B

ASSET CLASS CONSIDERATIONS

Physical climate risk can affect various asset classes differently because of differences in what drives value, how long capital is exposed, and how much influence an investor has over the underlying asset. The considerations below are non-exhaustive but highlight some characteristics of each asset class and how these considerations could play out across the investment lifecycle.

The considerations are written from a direct investment perspective. For indirect investments, these asset-class nuances are considered through the GP relationship. (Section 5B sets out how the LP's role changes for indirect investments.)

1. Private Equity

PE returns depend on the performance of the underlying business over a finite ownership period, making operational resilience, supply-chain continuity and robust business continuity planning particularly important. Longer-term monetisation risk should also be considered, as future buyers are expected to price in physical climate risk relevant to the subsequent ownership period.

These considerations could be translated to the investment lifecycle as follows:

- **Due diligence.** Assess whether critical sites, suppliers and dependencies could disrupt operations or earnings, while considering risks at least one investment cycle beyond the expected hold where they could affect valuation or the ability to exit
- **Hold.** Embed priority operational and supply-chain resilience actions into the value-creation plan and business continuity planning, tracking whether they protect earnings and whether longer-term risks are becoming relevant to the planned exit
- **Exit.** Document how operational and supply-chain resilience has improved during ownership and, where it strengthens the valuation case, use this to support the earnings outlook and buyer proposition.

This is consistent with the broader playbook, but places greater emphasis on business continuity, value creation during ownership and the buyer's time horizon at exit.

2. Real Estate

Real estate investment value is tied to fixed properties and locations, making changes in building vulnerability, insurability and tenant demand particularly important to preserving value. These risks should also be considered in the context of the wider portfolio, particularly where an investment may increase correlated exposure. Physical climate risk can materially affect the availability, affordability and terms of insurance, which is commonly used to transfer part of the risk in real estate. As noted in the Case for Action in Section 1, insurance can mitigate some losses but is not a substitute for resilience.

These considerations could be translated to the investment lifecycle as follows:

- **Due Diligence.** Assess location-specific hazards and building vulnerability alongside insurance coverage and terms, considering how these could affect tenant demand, financing or property value, and whether the investment increases material or correlated exposure in the portfolio.
- **Hold.** Monitor changes in location-specific hazards, building fabric and tenant exposure, using insurance renewals as a recurring check on how these are affecting coverage and cost. Where resilience measures improve the property's risk profile, engage insurers for better coverage or terms. If risk increases, assess whether further resilience measures or insurance remain economically viable; where they do not, consider whether divestment is more appropriate.
- **Exit:** Confirm continued insurability on acceptable terms and resilience improvements, particularly where these support property marketability and buyer pricing.

This is consistent with the playbook, but places greater emphasis on insurance and property-specific vulnerability throughout ownership, including using evidence of resilience improvements in insurer engagement.

3. Infrastructure

Infrastructure investment value often depends on a long-lived, fixed asset continuing to provide reliable service, making service continuity and the timing of resilience, maintenance and replacement capex particularly important over the asset's full life.

These considerations could be translated to the investment lifecycle as follows:

- **Due Diligence.** Assess whether climate-related disruption could affect service continuity or cash flows, considering design limits, business interruption risk and required resilience or replacement capex over the asset's life.
- **Hold.** Embed adaptation into the asset management plan, refresh risk assessments as hazard exposure, regulation or insurance conditions change, and align resilience upgrades with planned maintenance and replacement cycles.
- **Exit.** Document how resilience measures support asset availability, cash-flow stability and insurability, particularly where this strengthens refinancing assumptions or the buyer underwriting case.

Compared to the guidance of the broader playbook, this places greater emphasis on long-term service continuity and incorporating resilience into lifecycle capex and maintenance planning for assets expected to operate well beyond the investment hold period.

4. Private Credit

Private credit returns are driven by interest rates and repayment rather than ownership upside, and lenders typically have less influence over the underlying asset. This makes it particularly important to assess the borrower's ability to service and repay the debt and preserve collateral value despite any physical climate risks. Unlike equity investments, there is typically no separate exit process for the lender; the relevant end-state is repayment or refinancing. Refinancing risk can also extend the effective risk horizon beyond the original loan term, meaning the underlying asset may remain exposed to physical climate risks for longer than initially expected.

These considerations could be translated to the investment lifecycle as follows:

- **Due diligence.** Assess how physical climate risk could affect debt pricing and default risk, including potential breaches of covenants and refinancing risk. Given limited control over the underlying asset, place greater emphasis on data transparency and borrower covenants covering adequate insurance, agreed risk-mitigation measures and climate-risk reporting.
- **Hold.** Focus on borrower transparency, insurance requirements and covenant enforcement, using regular credit risk assessments and third-party data where direct access is limited. Assess whether changes in exposure or insurance are weakening cash flows, collateral value or refinancing prospects, and use available lender protections to pursue corrective action where needed.

This playbook is less directly applicable to private credit than to equity investments, with guidance needing to be adapted to reflect emphasis on borrower transparency, contractual protections and monitoring how physical climate risk affects the borrower's credit position.

5. Public Equity

Public equity investors typically have less direct access to company information and less influence over management, while listed securities can be repriced or sold more quickly as new information emerges. LPs should assess whether physical climate risk is adequately reflected in market valuations and what upside/downside potential may exist.

These considerations could be translated to the investment lifecycle as follows:

- **Due diligence.** Use company disclosures and third-party data to assess material physical climate risks and whether they appear adequately reflected in the share price and investment case.
- **Hold.** Reassess physical climate risk over the expected ownership horizon as company performance, hazard exposure or market information changes. Where material risks remain poorly managed, use shareholder engagement to improve management or consider adjusting the position where this changes the risk-return case.
- **Exit.** Physical climate risk should be a factor in informing the decision and timing to sell where a change in risk or management response weakens the investment case or is not adequately reflected in the market price.

The playbook is less directly applicable to public equity than to private-market equity investments, with guidance needing to be tailored to public information, shareholder influence and portfolio decisions rather than direct involvement in asset management.

APPENDIX C

POTENTIAL IMPACT MECHANISMS BY INDUSTRY

The cards below identify some impact mechanisms for various industries. They are meant to be a starting point for assessment, not an exhaustive list.

REAL ESTATE

- Structural damage and business interruption at a fixed location
- Insurance cost or availability affecting asset value and financing
- Tenant demand and marketability shifts in high-exposure locations

INFRASTRUCTURE & UTILITIES

- Network failure cascading beyond the point of damage
- Regulatory and liability exposure (e.g., wildfire-driven utility liability)
- Long asset life increasing exposure to future, not just current, hazard severity

MANUFACTURING & INDUSTRIALS

- Process interruption from input or utility disruption
- Input cost volatility from disrupted supply chains
- Facility relocation, retrofit, or hardening costs over the asset's life

AGRICULTURE & FOOD PRODUCTION

- Yield and quality loss from growing-condition disruption
- Long-term shift in crop or regional viability
- Price volatility passed through the supply chain

LOGISTICS & TRANSPORTATION

- Route or corridor unavailability
- Direct damage to vehicles, vessels, or rolling stock
- Rising insurance costs and rerouting expenses

TECHNOLOGY & DATA INFRASTRUCTURE

- Cooling failure and power interruption
- Utility-driven power safety shutoffs
- Long-term siting risk as cooling demand rises with chronic heat

RETAIL & CONSUMER

- Demand and footfall disruption
- Physical damage to store locations
- Supply chain disruption affecting inventory availability

FINANCIAL SERVICES

- Indirect exposure through loan book or collateral value
- Direct underwriting exposure (for insurers specifically)
- Systemic or correlated risk across a concentrated portfolio

APPENDIX D

GLOSSARY

D1. FRAMEWORKS, STANDARDS AND ORGANISATIONS

Reference	Description
CSRD – Corporate Sustainability Reporting Directive	EU directive requiring in-scope companies to report material sustainability information, including climate-related risks and impacts.
ISSB – International Sustainability Standards Board	Global standard-setting body within the IFRS Foundation responsible for investor-focused sustainability disclosure standards, including IFRS S1 and IFRS S2.
IFRS S1 – General Requirements for Disclosure of Sustainability-related Financial Information	ISSB standard that provides a set of disclosure requirements designed to enable companies to communicate to investors about the sustainability-related risks and opportunities they face over the short, medium and long term.
IFRS S2 – Climate-related Disclosures	ISSB's standard that sets out specific climate-related disclosure requirements for a company to disclose information about its climate-related risks and opportunities. IFRS S2 builds on the requirements set out in IFRS S1 and fully integrates the TCFD recommendations.
IIGCC Climate Resilience Investment Framework (CRIF)	An investor-focused framework for developing portfolio A&R plans, goals and implementation strategies, addressing physical climate risk from a financial-materiality perspective, structured to mirror NZIF.
IIGCC Physical Climate Risk Appraisal Methodology (PCRAM) 2.0	Asset-level methodology for assessing physical climate risk, evaluating adaptation options and linking the resulting impacts back to asset value, with particular relevance to real estate and infrastructure.
PMDR – Private Markets Decarbonisation Roadmap	A voluntary private-markets framework using a five-stage alignment scale to assess and track decarbonisation progress.
TCFD – Task Force on Climate-related Financial Disclosures	Foundational climate-disclosure framework structured around governance, strategy, risk management, and metrics and targets; its recommendations have subsequently been incorporated into IFRS S2.

D2. KEY TERMS

Term	Definition
Acute hazards	Event-driven hazards such as floods, wildfires, storms and heatwaves. Typically sudden, with impacts concentrated in time.
Adaptation	Actions taken to adjust to actual or expected climate impacts and reduce their consequences, e.g., flood defences, cooling systems or redundancy in critical equipment.
Adaptation and resilience (A&R) plan	A defined plan for addressing priority physical climate risks, setting out the measures, owners, budgets, timelines and milestones for implementation.
Adaptive capacity	The ability of an asset to adjust to climate impacts, reduce potential harm and maintain performance as conditions change.
Asset	In this playbook, an underlying investment held directly or indirectly by an LP, including a portfolio company, real estate property, infrastructure asset or private credit exposure. Depending on the investment type, the asset may itself own or operate property, plant, equipment or infrastructure.
Asset manager	In this playbook, the LP, GP or appointed asset-management team responsible for overseeing the asset, setting expectations and holding its executive team and board to account.
Chronic hazards	Longer-term shifts in climate patterns such as sea-level rise, sustained temperature increase, water stress and changing precipitation. Impacts typically build gradually over time.
Correlated exposure	Exposure where a common hazard or dependency could affect multiple assets at the same time, potentially creating a material portfolio-level concentration.
Critical dependency	Third-party infrastructure, service, supplier, input or other relationship that an asset materially relies on to operate or generate value.
Direct investment	An investment made directly in an asset, whether as sole owner, majority owner or minority co-investor, rather than through a fund vehicle. The LP's visibility and influence vary with its ownership position.
Direct physical risk	Impacts arising directly through an asset's owned or operated property, plant, equipment or infrastructure, such as physical damage, downtime or increased operating and capital costs.
Exposure	The extent to which assets, operations, critical dependencies, and value-chain nodes are subject to hazards based on likelihood and severity of events across multiple climate scenarios.
GP / LP	General Partner (GP): the fund manager responsible for making and managing investments. Limited Partner (LP): the institutional investor committing capital to the fund.
Hazard	A climate-related event or condition that may cause damage, disruption or financial loss, e.g., flooding of a given depth at a particular location.
Impact	The resulting operational and financial consequences arising from the interaction of hazard, exposure, and vulnerability.
Indirect investment	An investment made through a fund or GP, including fund commitments, secondaries and smaller co-investments where the LP mainly acts through GP selection, fund terms, reporting and engagement.
Indirect physical risk	Impacts transmitted to an asset through its dependencies or value chain, such as disrupted suppliers, supporting infrastructure, workforce or customer demand.
Maturity assessment	A structured evaluation of how well an asset identifies, assesses, manages and monitors physical climate risk, used to establish a baseline and track progress over time (see Section 4).
Physical climate risk	The risk of financial or operational impacts arising from climate-related hazards affecting an asset's property, operations, dependencies or value chain.
Residual risk	The level of risk remaining after adaptation and resilience interventions have been implemented, per UNEP FI's ARIC playbook.
Resilience	The ability of an asset or portfolio to anticipate, absorb, adapt to and recover from climate hazards while maintaining its function and value.
Scenario analysis	Assessment of asset or portfolio performance under different plausible climate futures, typically drawing on recognised scenario sets such as those published by the NGFS or IPCC.
Second-order effects	Broader knock-on consequences of climate hazards, such as insurance-market changes, regulatory shifts, demographic change or regional economic decline, that can affect asset value without directly damaging the asset.
Transition risk	Risk arising from the shift to a lower-carbon economy, including policy, technology, market and reputational changes. Outside this playbook's primary scope but often interconnected with physical risk.
Time horizon	The period over which the investment is exposed, including risks that may affect exit value beyond the expected hold period.
Value chain	The suppliers, inputs, infrastructure, logistics, customers, off-takers and other relationships through which an asset depends on or delivers value.
Vulnerability	The susceptibility of exposed assets and operations to harm, taking into account asset characteristics, design standards, resilience measures, operational dependencies, and commercial arrangements.

CONTRIBUTORS

The OPSWF Physical Climate Risk: LP Guidance and Playbook was developed with the support and contributions of members of the OPSWF Network and its Physical Climate Risk Workstream. We would like to thank the following organisations for sharing their investment experience, expertise and practical insights:

We are grateful to all contributors for their time and expertise, and to the wider OPSWF Network for the discussions and exchanges that helped shape the playbook.

The larger OPSWF Network provided helpful early input during roundtable discussions held in June 2026 at the OPSWF Mid-Term Meeting in Paris, hosted by Bpifrance and in October 2026 at New York Climate Week, hosted by Mubadala. The Physical Climate Risk Workstream members sincerely thank our colleagues for their thoughtful guidance which did much to shape the playbook's ultimate direction.

We would also like to thank Bain & Company for their technical expertise and support throughout the development of the playbook.



DISCLAIMER

This LP Guidance and Playbook has been prepared for educational and informational purposes only and does not constitute investment, financial, legal or other professional advice, or a recommendation to make any particular investment. Any investment examples, strategies or case studies are provided for illustrative purposes only.

The views and information presented reflect contributions from different organisations and practitioners and do not necessarily represent the views of all contributors, their respective organisations, or all members of the OPSWF Network. Participation in the LP Guidance and Playbook should not be understood as an endorsement of all its contents or conclusions.

THE OPSWF NETWORK SERIES

DESIGN: HOULTONSMETS

ONE PLANET
SWF NETWORK