IIGCC

PCRAM case study

Last mile logistics warehouse in Barcelona, Spain

AXA Investment Managers | PART OF BNP PARIBAS GROUP

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Acknowledgements

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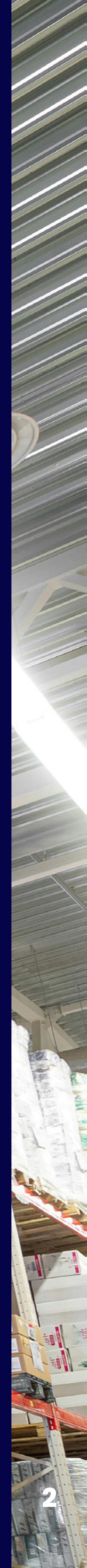


Key Findings from PCRAM Application in Real Estate Case Study

1 Real Estate Requires a Tailored PCRAM Approach

Real estate assets involve distinct roles for owners and tenants, often with differing responsibilities and vulnerabilities to climate risks. This necessitates sector-specific guidance and lease-sensitive analysis.

2 Collaboration and Stakeholder Engagement is Critical

Building resilience depends on early collaboration between owners and tenants, especially for data collection and operational insights. Effective stakeholder mapping is essential to develop targeted engagement strategies that support systemic resilience.

3 Portfolio-Level Screening and Adaptation Pathways Enhance Strategic Planning

A pre-screening exercise helps prioritise assets for full PCRAM application. Where climate risk materiality is uncertain, adaptation pathways offer a flexible framework for long-term decision-making that can also be used at the portfolio level.

4 Systems Thinking Strengthens Risk Identification and Value Protection

Embedding systems thinking from the outset allows identification of interdependencies beyond the building itself. This supports understanding of systemic risks and their impact on asset value, even when site-specific risks are low.

5 Resilience Metrics Should Complement Financial Analysis

Traditional financial metrics should be augmented with bespoke resilience indicators, including reduction in Average Expected Loss (AEL). These can be monetised by tenants to fund future resilience investments or offset potential insurance gaps.

6 Collaborative Stewardship is Key Where Direct Investment is Constrained

In cases where CAPEX investment is not viable—such as newer assets under tenant control—resilience efforts should focus on tenant engagement and system stewardship. This approach supports risk mitigation while respecting asset-specific constraints.

7 System-Level Governance and Financial Alignment Are Essential for Scalable Resilience

Clearer engagement thresholds with local authorities, and stronger coordination with insurers and lenders are required. These steps are vital to incentivise resilience investment and ensure equitable risk-reward distribution across the value chain.

Investment overview

The asset is part of a well-diversified portfolio of high-quality logistics assets in Core markets in western Europe, managed by AXA Investment Managers (AXA IM Alts, also referenced as "landlord"). This 50,000 sqm last mile logistics facility in Barcelona (Spain) is leased to a global e-commerce organisation ('the tenant'). AXA IM Alts has managed the asset on behalf of client since its development in 2021, with the tenant holding a 20+year lease.

Asset objectives

- Provide last-mile distribution into the city of Barcelona for logistics tenants during the lease period
- Enable the site to continue to function as an attractive site for current and future commercial tenants
- Safeguard and increase asset value in the long term

Sector

- Power generation (renewable)
- Power generation (other)
- Power transmission
- Other energy infrastructure
- Maritime transport
- Rail
- Water resources/network
- Airport
- Highway
- Telecommunications
- Data centres
- **Real estate: Logistics**

Asset lifecycle

- Development
- Construction
- **Operational**
- Decommission

Investment stage

- Pre investment
- **Holding**
- Exited

Finance type

- Blended finance facility
- **Private investment**
- Government funding
- DFI funding

Hazards screened

- Acute - Heavy Precipitation, Pluvial Flooding, Fluvial Flooding, Heat Waves
- Chronic – N/A

Hazards analysed

- Pluvial Flooding
- Fluvial Flooding

Figure 1: The PCRAM Process

	1	2	3	4
Steps	**Scoping and data gathering**	**Materiality assessment**	**Resilience building**	**Value enhancement**
Objective	Determine data sufficiency	Assessing asset vulnerability	Identifying adaptation options	Optimised resilience with residual risk transfer
Sub-tasks	→ Project initiation → Project definition → Data gathering and sufficiency	→ Hazard scenarios → Impact pathways → Financial sensitivities (return & debt) → Distinguish acute damage vs. chronic performance efficiency	Adaptation options, costs and availability: → Hard (Structural/Capex) → Soft (Operational/ Systems)	→ Identify resilience metrics → IRR comparisons → Insurability and credit quality
Outputs	→ Initial climate study → Critical asset and system components → KPI selection, risk appetite → Base Case cashflow forecast	→ Detailed climate study → Quantified list of impacts and severity by component → Climate Case(s) cashflow forecast	→ Repeat materiality assessment → Cost/benefit for suitable measures → Adaptive pathways → Resilience Case(s) cashflow forecast	→ Investment case narrative → Value implications across investment value chain actors e.g. investors, lenders, insurers
Decision gates	**Gate A** What are the scope boundaries and data sufficiency according to the investment strategy?	**Gate B** Are PCRs material for the asset(s)? Reviewing asset KPIs, what factors influence the materiality?	**Gate C** What are the most effective adaptation options for this asset, the optimal timing for their implementation, and the responsible parties for funding and execution?	**Gate D** How can resilience investment be optimised and incentivised, while ensuring equitable risk-reward distribution across the value chain actors?

Step 1: Scoping and data gathering

Exploring the assets operating conditions, climate and system dependencies.

Step 1a) Project Initiation

A PCRAM case study group was formed, consisting of three workstreams.

- Climate Resilience – Led by Mott MacDonald, this workstream focused on conducting a quantitative climate risk assessment of the site with the physical climate risk data provided by the reinsurer Swiss Re. Swiss Re's Risk and Data Services (RDS) model was used to analyse the site's exposure and vulnerability to climate hazards.
- Systems – Led by Mott MacDonald, this workstream was responsible for incorporating systems thinking from the case study's outset. The systems analysis developed for the pilot was valuable for clarifying how the incidence of climate risks beyond the asset boundary may affect outcomes onsite. This improved understanding of systems thinking has been embedded into PCRAM 2.0.
- Financial Risk and Value Enhancement - Led by the Institutional Investors Group on Climate Change in collaboration with AXA IM Alts to understand financial materiality drivers.

All workstreams were informed by the asset manager, AXA IM Alts, including stakeholders from property management, asset and fund management, responsible investment, and the logistics sector. This collaboration ensured that the case study balanced scientific and strategic rigour with cross-sectoral language.

Step 1b) Project Definition

Investment structure and KPIs: The last-mile logistics asset selected for this case study is part of a well-diversified portfolio of high-quality logistics assets in western Europe's core markets. The site is managed by AXA IM Alts on behalf of its client, and leased to a major e-commerce conglomerate, which is responsible for all site operations. Several key performance indicators were identified and explored to guide this case study.

One of the primary **KPIs identified by the fund management team** was the asset's strategic site location, as the site represents one of a limited number of sites in Barcelona usable as a last mile logistics facility. Other non-financial KPIs which are monitored at the fund level were explored, including nature impact, carbon intensity (CO2 equivalent emissions) as well as Energy Performance Certificate (EPC) and certification impact.

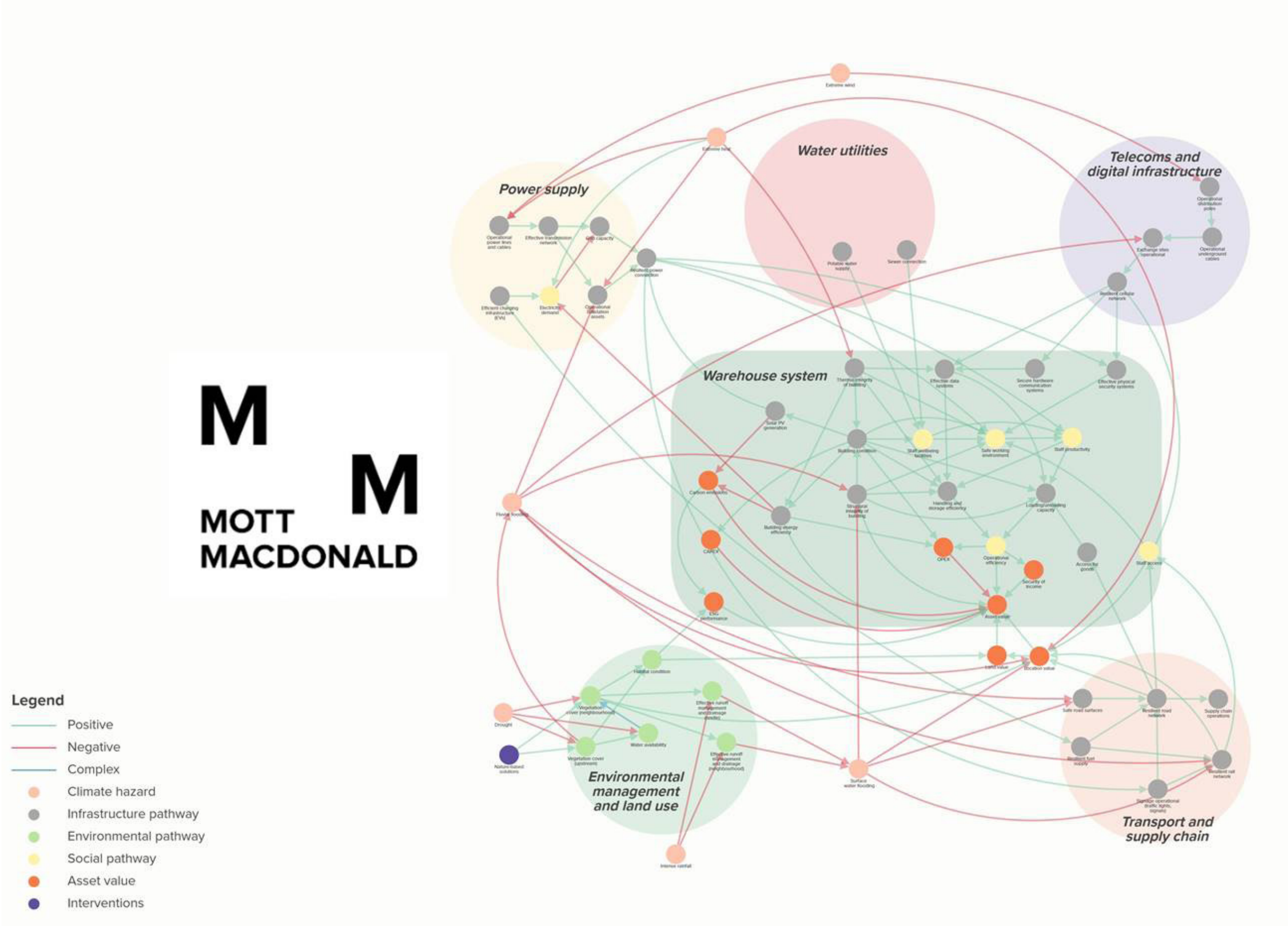
The **asset management KPIs** identified by the case study team are aligned with the fund-level drivers. The asset management team's priority is to maintain rental income (EUR) from the tenant over and beyond the lease period, rather than directly on total asset value. This was explored qualitatively as part of the systems assessment. Additional KPIs, including capital expenditure (CAPEX, EUR) were also explored as part of the Resilience Building step.

As this PCRAM was undertaken by the landlord, tenant KPIs, such as operational impacts (downtime), were not quantified. Instead, these were qualitatively assessed through the systems assessment.

Asset system mapping: the following asset systems were identified as material to the asset:

- Power supply
- Transport and supply chain
- Telecoms and digital infrastructure
- Water utilities
- Environmental management and land use

Figure 2: Asset Systems Mapping, originated from Mott MacDonald's Systems Engineers



Through a participatory exercise with AXA IM Alts' asset management and fund management teams, the Systems workstream, led by Mott MacDonald identified interdependencies between the site and the systems listed above, in preparation for the materiality assessment.

Step 1c) Data availability

Asset level controls between the landlord and tenant mean that there are conditional variables which drive data availability, mandates and implementation decisions.

Table 1: Conditional Variables: Asset specifications affecting investor control and influence across PCRAM steps

Asset Governance				
Asset level control	Developer	Owner-occupier	Owner-lessor	
Type of lease	Single net	Double Net	Triple Net[1]	
Lease length	0-9 years	10-15 years	Longer	Other e.g. usufruct
Asset Management retained?	Yes	No		
Asset details				
Lifecycle phase	Planning or development	Acquisition	Operational and maintenance	Disposal
Age of asset	New development (last 5 years)	Operational (> 5 years)	Operational (retrofit opportunity)	End of life
Investment Details				
Investment Structure	Equity investment minority e.g. joint ventures	Equity investment majority	Debt Investment	
Debt	Asset level	Fund level		
Insurance contract	Asset level	Fund level		
Legend: Conditional variables applicable to this case study				

1 A triple net lease (NNN lease) is a commercial lease where the tenant pays the base rent plus three types of operating expenses: property taxes, building insurance, and maintenance costs. This shifts most of the property's operating costs and responsibilities from the landlord to the tenant, offering landlords predictable rental income while potentially providing tenants with lower base rents.

Decision Gate A

What are the scope boundaries and data sufficiency according to the investment strategy?

- **Value drivers:** The asset value drivers were assessed based on the conditional variables outlined in table 1 (page 8). These set out clearly where impact and influence lie and outline the driving factors behind each decision gate. Note that if the conditional variables were different, e.g. a direct investment with AXA IM Alts as the occupier would result in material impacts on the tenant being quantified, like business disruption, and would result in the necessary data being made available.
- **Scope:** One of the main value drivers, the connectivity of the site and its location, determined that the systems analysis was critical to this case study, as the connectivity of the site to the surrounding location is a primary value driver for this asset.
- **Institutional boundaries, responsibility and mandate:** Asset specifications affect investor control and influence across PCRAM steps.
- **Data availability:** The case study did not pursue a quantitative approach to business disruption due to lack of data on the tenant side. This presents an opportunity post case study to engage with the tenant in accessing the requisite data for quantifying asset downtime associated with climate risks. The data provided by Swiss Re via its RDS model was deemed sufficient for quantifying the damages associated with physical climate risk at an asset-level, through locational fluvial and pluvial flood risk and financial loss data. However, engaging with the tenant to access data for quantifying asset downtime might not always be possible and proxy data reflecting business disruption is not standardised across the industry.

	1	2	3	4
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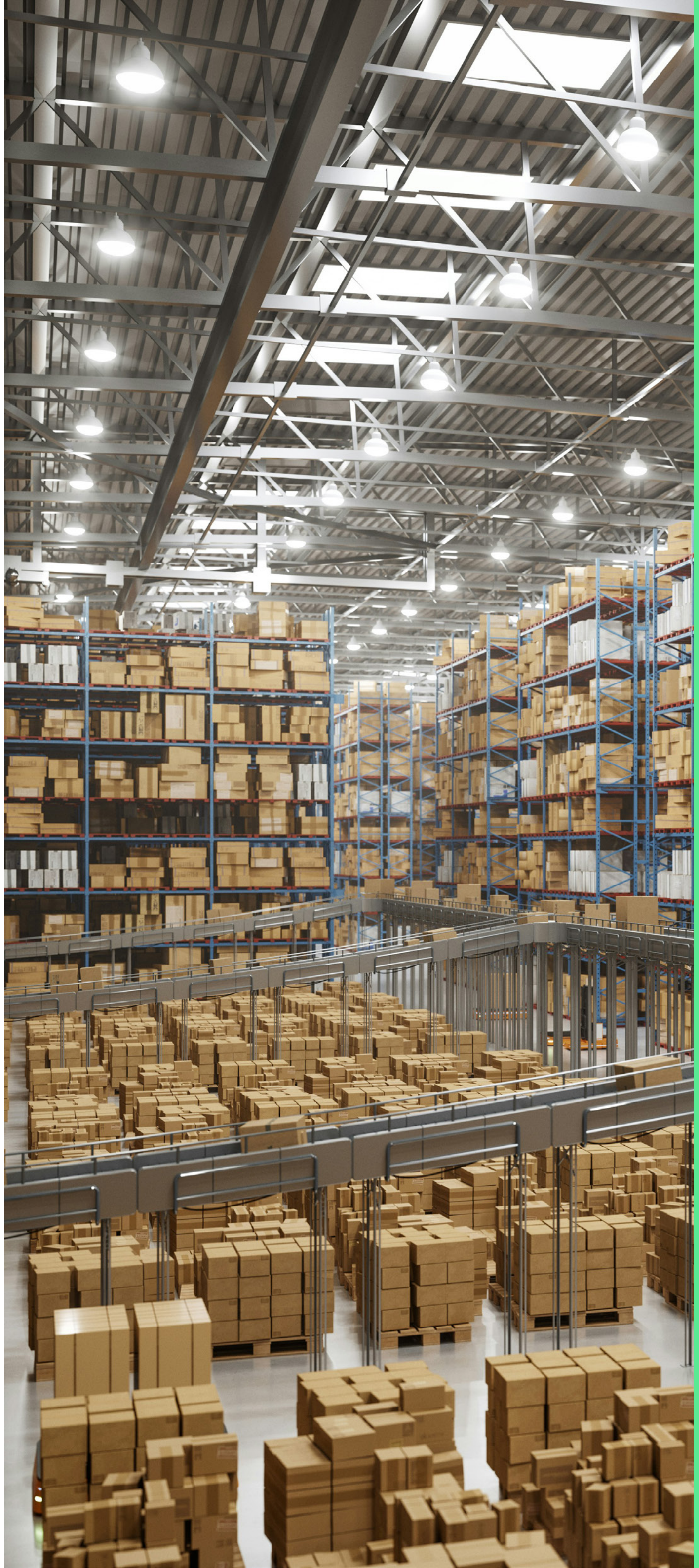
Current state of play and direction of travel: As real estate investment strategies increasingly hinge on asset-specific value drivers and conditional variables, the direction of travel for resilience investment must shift toward system-level analysis and proactive data engagement, particularly with tenants, to quantify and mitigate climate-related disruptions across the asset lifecycle. Where operational downtime data is not available, the industry needs to agree on standardised proxy data to analyse business disruption.

Step 2: Materiality assessment

The materiality assessment was delivered through the Climate and Engineering workstreams. Firstly, the Climate Resilience Workstream utilised Swiss Re's Risk and Data Services (RDS) to quantify the asset's exposure to climate hazards. This included a technical review of the RDS platform's approach to asset criticality and the geospatial data used.

Two future climate scenario, shared socioeconomic pathways (SSPs), were considered for the assessment. SSP2-4.5, a 'middle of the road' scenario, and SSP5-8.5 a reasonable worst case, 'fossil fuel-rich development' scenario. In line with the lease period and asset lifecycle, present day, 2050, and 2080 time horizons were assessed.

Having both the systems and asset-level view was vital. While the asset perspective enabled the owner to understand the possible direct financial impacts of climate change on the site, the systems perspective enabled the pilot team to articulate how wider infrastructure systems might impact the strategic value of the asset. This is vital for logistics assets, especially last mile, which are reliant on wider systems (particularly transport and digital) to stay in operation. For example, increasingly severe and frequent heatwaves may lead to damages to power infrastructure, which could prevent the tenant from accessing operational systems. Repeated periods of downtime can then result in leases not being renewed and decreases in asset value, which are not reflected in a solely asset-level assessment.



Step 2a) and 2b) – Exposure to Climate Hazards and impacts

To prepare for assessment, an understanding of the asset's exposure to climate hazards was determined based on several climate data sources, including the Swiss RE RDS model and Spanish Government Flood mapping:

Fluvial flooding (acute) is associated with changes in the occurrence of flooding from the local river, the Besòs, while **pluvial flooding** (acute) is associated with intense rainfall resulting in surface water flooding. Although average temperature rise is projected to be higher under a "fossil fuel-rich development" (SSP5-8.5) scenario, intensification of both fluvial and pluvial flooding under an SSP5-8.5 scenario is projected to be less likely to occur during the lease period. This could be due to a range of factors, including a projected overall drying trend for the region under an SSP5-8.5 scenario. However, the risk of fluvial flooding is projected to increase under a "middle of the road" scenario (SSP2-4.5). An SSP2-4.5 scenario is projected to lead to an increase in the frequency and severity of pluvial and fluvial flooding, with a resulting increased likelihood of water damage to the site, goods, and disruption to interdependent systems like road networks and telecommunications.

The extent of the site's exposure to fluvial flood risk varied across different models including the RDS model, the Spanish Government Flood Mapping data, and alternative data providers. Similarly to fluvial flooding, the extent of the site's exposure to this risk varied across the RDS model, Spanish Government Flood Mapping data, and alternative data providers. **A lack of coherence across the modelling led to a degree of uncertainty and reduced overall confidence. As such, an adaptable approach to managing risks was considered most appropriate.**

Extreme heat (acute) intensification and likelihood of occurrence was projected to increase by the end of the 21st century for both a middle of the road (SSP2-4.5) and reasonable worst-case scenario (SSP5-8.5). Potential impacts to the site might include performance impacts on Heating, Ventilation and Air Conditioning Systems (HVAC), and damage to power networks, resulting in power tripping or outages and subsequent downtime on the asset.

Step 2c) and 2d) - Assess and Quantify Severity of Impact(s) on Assets

Although extreme heat was identified as a risk to the site, it has not been considered further as it was identified and addressed during the design of the asset, with the HVAC system engineered to operate effectively under very high temperature conditions. From a qualitative perspective, potential risks to power networks were identified but were considered out of scope for this assessment as they are outside of the purview of the landlord.

Based on a quantitative assessment, pluvial and fluvial flooding were identified as the main risks with some risks of limited financial materiality to the asset under both middle of the road (SSP2-4.5) and reasonable worst-case scenarios (SSP5-8.5) across time horizons.

These impacts were understood to be more significant from a systems perspective: fluvial flooding was identified as material to key systems including road networks, where restrictions to access may lead to a fall in tenant satisfaction and land value, particularly if the site were to become unattractive as a logistical hub.

A summary of this analysis is outlined in the below Figure 2.

Figure 3: Case Study Approach to Materiality Assessment

STEP 2: MATERIALITY ASSESSMENT

SWISS RE & MOTT MACDONALD – ASSET RISK ASSESSMENT (QUANTITATIVE)

- ❑ Exposure of the site and asset components to physical climate risks: flooding
- ❑ Site and locational risk exposure quantified on Swiss Re's RDS platform
- ❑ Emissions scenarios, SSP2-4.5 and SSP5-8.5
- ❑ 2050 and 2080 time horizons

OUTCOME:
Financial quantification of key climate hazards material to the warehouse

INTERDEPENDENCY RISK ASSESSMENT (QUALITATIVE)

- ❑ Participatory systems mapping
- ❑ Wider infrastructure systems that the site is reliant on explored
- ❑ Impact of PCRs on interdependencies identified and qualitatively assessed -time horizons and scenarios aligned with quantitative assessment.

OUTCOME:
Conceptual understanding and prioritisation of system risks to support resilience assessment

Real Estate Considerations in Materiality Assessment

In real estate, climate risk impacts vary due to the separation between investors and operators (tenants). This creates a Principal–Agent Problem:

- **Investors** focus on asset value and lease compliance, viewing climate risks primarily as physical damage.
- **Tenants** prioritise operational continuity, interpreting climate risks as potential disruption or downtime.

Operational impacts are frequently excluded from investor considerations— not because they are financially immaterial, but because they typically fall outside the scope of what investors prioritise, especially when they do not directly affect the bottom line in financial models. It is therefore critical for resilience and engineering partners to demonstrate that recurring disruptions, especially those stemming from systemic hazards like surface water flooding, can erode asset value over time, for example through non-renewal of leases.

As business interruption data is commercially sensitive, tenants may be reluctant to share it. To improve assessment, it is important to clearly communicate how climate risks could disproportionately affect tenant operations.

Decision Gate B

Are physical climate risks (PCRs) material for the asset(s)? Reviewing asset KPIs, what factors influence the materiality?

- **Limited financial materiality:** Due to the investment structure (leverage applied at the fund level within a well-diversified portfolio), physical climate risks are physically material, but financial materiality is limited and considered managed by the investor, to be monitored as the risk changes (see step 3 adaptation pathways).
- **Physical materiality:** The physical materiality and associated losses were therefore quantified.
  - **Extreme heat descoped:** While previous climate change risk assessments had identified the site as exposed to extreme heat, it was noted that the Heating, Ventilation and Air Conditioning (HVAC) system included in the site was designed to withstand significant temperature thresholds which would prevent impacts on the tenant and reduce damages to the building.
  - **Pluvial and Fluvial Flooding are considered material to the asset** in terms of annual average expected loss (AEL) and in terms of interdependent risks potentially impacting the site's strategic value.

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Current state of play and direction of travel: While physical climate risks are increasingly recognised as material at the asset level, their financial impact can remain muted within diversified investment structures. This points to a need for resilience strategies that prioritise site-specific risk quantification and tenant engagement, especially around interdependent risks like flooding, while continuously monitoring evolving exposures.

Step 3: Resilience building

Step 3a) Identify Adaptation Options

With the asset exposed to direct and systemic climate risks, Mott MacDonald's flood engineering, nature and cost intelligence experts developed a longlist of resilience options.

Resilience options fell into three categories that were structured across hard (structural / CAPEX) and soft (operational / OPEX) actions.

Flood resistance options: Options where the structure of the asset is hardened, for example through flood doors, or by redirecting flood flow pathways by soft and hard landscaping. Considering the landlord – tenant relationship and potential impact on who would be covering the respective costs, Mott MacDonald's Quantity Surveying team estimated the CAPEX costs associated with these options.

Nature-based catchment solutions: Options that would be implemented outside of the site boundary, such as floodplain restoration, which could improve biodiversity as a co-benefit and deliver other environmental co-benefits. These options are costly and considering that they do not only impact the site, but the wider area, would ideally be co-funded by the municipal government. In this case, the landlord would be responsible for engaging key public sector actors rather than paying solely for any solution (with or without tenant support). A financial appraisal of these options was out of the scope for this assessment.

Planning, preparedness, response, and recovery: Operational options aiming at mitigating downtime during or after a weather event, for example through early warning systems. As the site's operations sits with the tenant, the landlord's action under this category would be to engage and influence the tenant. A financial appraisal of these options was out of the scope of this assessment, although the costs are expected to be low in comparison to any flood resistance options.

Step 3b) Reassess Materiality with Adaptation Options

To better understand the impact of each option on the site's resilience, Swiss Re remodelled the site's expected losses in the RDS model. These options were then appraised in terms of financial (such as the payback period and cashflow impact), and non-financial considerations (such as nature and carbon).

This appraisal was shared with the asset's Asset Manager, who reviewed the feasibility of options (e.g., minimisation of affecting tenant) and an options shortlist was developed.

Step 3c) Cost Benefit Analysis

Shortlisted options are outlined below (Table 1). Nature-based catchment options and planning, preparedness, response and recovery options have been captured under "Low CAPEX, low regrets options".

Table 2: Shortlisted resilience measures for logistics asset from fluvial and pluvial flooding

Adaption options	Estimated CAPEX cost	Benefits	Financial benefits quantified
		Resistance options	
1 Raised Kerbs Existing kerbs can have their height increased around parking to the asset, to redirect flows away from the building.	EUR 20k – EUR 35k	▪ Efficient for reducing AEL from fluvial flooding relative to its CAPEX cost. ▪ Unlikely to affect tenant operations while reducing the likelihood of a risk occurring. ▪ Limited carbon and nature impacts.	▪ Reduction in AEL ▪ Payback period
2 Structural redesign for flood resilience Where the structure is not designed to resist the lateral loads flood resistance could impose on it, the end of the structure vulnerable to flooding may be redesigned with a structural flood defence at the lower level (e.g., via cladding).	EUR 140k – EUR 240k	▪ Significantly reduces both fluvial and pluvial flooding. ▪ Design is likely to be a simple secondary structure to main walls and so minimal impacts on tenant operations are anticipated. ▪ Reduces likelihood of a risk occurring.	▪ Reduction in AEL ▪ Payback period
3 Permanent property-level protection - Flood doors and flood walls Flood doors and walls could be installed at the vulnerable end of the structure.	EUR 55k – EUR 95k	▪ Significantly reduces both fluvial and pluvial flooding. ▪ Installation is likely to be straightforward with suitable survey and design work. ▪ Reduces likelihood of a risk occurring.	▪ Reduction in AEL ▪ Payback period
		Low CAPEX, Low Regret Actions	
1 Engagement with government Work with local government or national weather ministries to understand local schemes and opportunitie	N/A	▪ Low-cost option. ▪ Potential for increased nature benefits in catchment area should catchment options be explored. ▪ Reduces the likelihood of a risk occurring	N/A
2 Engage tenant Work with tenant to define planning, preparedness, response and recovery options.	N/A - engagement to (i) align to periodic tenant meetings and (ii) including communication of key recommendations for improving resilience from Green Committees	▪ Low-cost option. ▪ Would support tenant in developing non-hard engineering responses to risk related to preparing, in anticipation of, during and after an extreme weather event. These may include signing up to early warning systems, developing flood response plans, or ensuring that sufficient insurance is in place. ▪ Engagement process i) done at the asset level ii) done transversally as part of key tenant engagement.	N/A

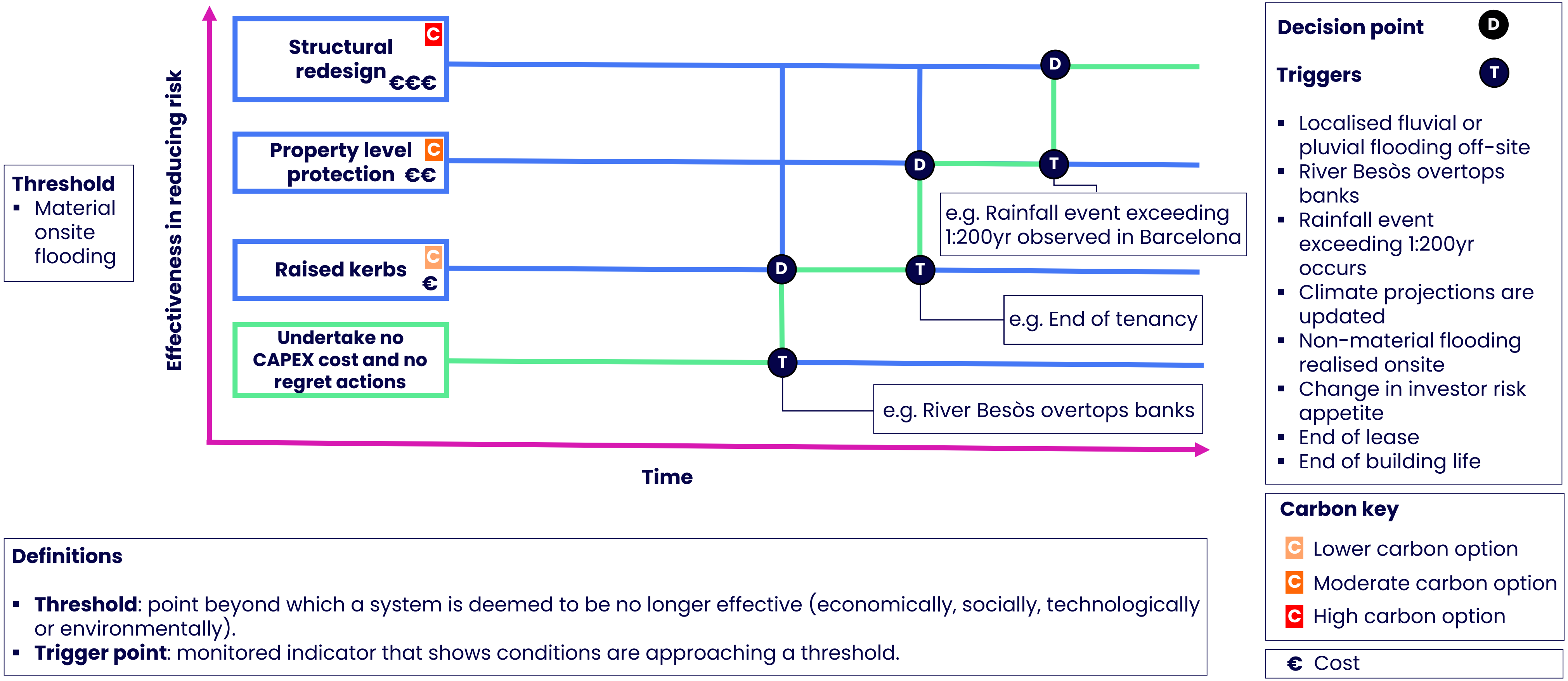
Managing Uncertainty with Adaptation Pathways

Climate data analysis revealed a lack of coherence in projections of future flood risk, with some models indicating significant fluvial and pluvial flood risk, while others projected none. Disparity in projections of future flood risk could be due to a range of factors, such as model granularity or methodology. Due to this uncertainty, the team adopted an "adaptation pathways" approach, based on the BS8631:2021 standard.

This approach involved identifying three potential adaptation options (see Figure 2), setting a threshold of material onsite flooding, and defining a series of triggers and monitoring protocols. A clear process was also established for how to respond if a trigger is activated. The adaptation pathway was also designed to be able to form the basis of any future PCRAM and enables a response that responds to dynamic levels of materiality. This flexible, staged strategy allows for and enables responsive decision-making over time, helping to manage uncertainty and build long-term resilience.

Figure 4: Adaptation pathways guiding implementation of adaptation options

According to the level of risk we suggest undertaking no CAPEX cost and no regret actions



Definitions

- **Threshold**: point beyond which a system is deemed to be no longer effective (economically, socially, technologically or environmentally).
- **Trigger point**: monitored indicator that shows conditions are approaching a threshold.

Decision Gate C

What are the most effective resilience options for this asset, the optimal timing for their implementation, and the responsible parties for funding and execution?

All options listed in Table 2 were progressed to Step 4. These options have been sequenced according to an **Adaptation Pathways** approach, given that the pluvial and fluvial flood risks identified at Step 1 were projected to result in limited financial materiality, along with the uncertainty arising from the granularity of different climate models and their projections of future flood risk. These are aligned to physical triggers (e.g., severe rainfall events, River Besòs overtopping), to lease events (e.g., change in tenancy), and to organisational policies (e.g., Portfolio Fossil Fuel Replacement).

	1	2	3	4
Steps	**Scoping and data gathering**	**Materiality assessment**	**Resilience building**	**Value enhancement**
Objective	Determine data sufficiency	Assessing asset vulnerability	Identifying adaptation options	Optimised resilience with residual risk transfer
Sub-tasks	→ Project initiation → Project definition → Data gathering and sufficiency	→ Hazard scenarios → Impact pathways → Financial sensitivities (return & debt) → Distinguish acute damage vs. chronic performance efficiency	Adaptation options, costs and availability: → Hard (Structural/Capex) → Soft (Operational/ Systems)	→ Identify resilience metrics → IRR comparisons → Insurability and credit quality
Outputs	→ Initial climate study → Critical asset and system components → KPI selection, risk appetite → Base Case cashflow forecast	→ Detailed climate study → Quantified list of impacts and severity by component → Climate Case(s) cashflow forecast	→ Repeat materiality assessment → Cost/benefit for suitable measures → Adaptive pathways → Resilience Case(s) cashflow forecast	→ Investment case narrative → Value implications across investment value chain actors e.g. investors, lenders, insurers
Decision gates	**Gate A** What are the scope boundaries and data sufficiency according to the investment strategy?	**Gate B** Are PCRs material for the asset(s)? Reviewing asset KPIs, what factors influence the materiality?	**Gate C** What are the most effective adaptation options for this asset, the optimal timing for their implementation, and the responsible parties for funding and execution?	**Gate D** How can resilience investment be optimised and incentivised, while ensuring equitable risk-reward distribution across the value chain actors?

Current state of play and direction of travel: While current resilience planning in real estate tends to rely on cost-benefit assessments of adaptation options, the direction of travel should embrace Adaptation Pathways—enabling a flexible, trigger-based sequencing of measures that can better navigate uncertainty in climate projections and align with lease events, physical thresholds, and organisational policies.

Step 4: Value enhancement assessment

Step 4a) Risk Transfer: Enhancing Resilience and Insurability

Given that both leverage and insurance are managed at the fund level, and the portfolio spans over 130 tenants across 150+ logistics assets in 11 countries, the impact of any single asset on the overall fund is expected to be minimal.

This includes potential risks such as refinancing challenges, insurance availability, or losses from hazard events—even for assets with higher hazard exposure.

In the case of this particular asset, surface water flooding is an increasing concern, especially in Spain due to recent events like the Valencia flash flood in 2024. The asset management team is actively monitoring the inclusion of flood cover in the building's insurance policy. Notably, extreme weather events in Spain are covered by the public sector entity *Consorcio de Compensación de Seguros*, though similar coverage may not exist in other jurisdictions.

Step 4b) Making the Investment Case for Resilience: Key Considerations

Table 3:

Investment scenario	Impacts	Description
	Base Case	
Investor projections 45 years expected operational life with planned end of lease mid-2037 and lease expiry after possible extensions 2047.	N/A	▪ Sell on for yield-based returns to institutional investor with desired IRR.
	Climate Cases	
1 Climate Case with tenant occupancy	↓ Revenue for tenant Span: operational life	▪ Impacts would be incurred by the tenant leading to downtime and loss of revenue. ▪ Cost of insurance might go up as alternative accommodation is one of the highest costs for insurers.
2 Climate Case with tenant vacancy	↓ Revenue for landlord Span: lease life	▪ Impacts would be incurred by the landlord, the reliance on a single tenant for this specific site present a residual risk outlined in the valuation report. ▪ Finding another tenant or repurposing the site would be options considered.
	Resilience Cases	
1 Engagement with government Work with local government or national weather ministries to understand local schemes and opportunities to improve resilience in catchment of Besos river	N/A	▪ Low-cost option. Potential for increased nature benefits in catchment area should catchment options be explored. This option would reduce the likelihood of a risk occurring.
2 Engage tenant Work with tenant to define planning, preparedness, response and recovery options.	N/A - engagement to (i) align to periodic tenant meetings and (ii) including communication of key recommendations for improving resilience from Green Committees	▪ Low-cost option ▪ Would support tenant in developing non-hard engineering responses to risk related to preparing, in anticipation of, during and after an extreme weather event. These may include signing up to early warning systems, developing flood response plans, or ensuring that sufficient insurance is in place. ▪ Engagement process i) done at the asset level ii) done transversally as part of key tenant engagement

Decision Gate D

How can resilience investment be optimised and incentivised, while ensuring equitable risk-reward distribution across the value chain actors?

Given the asset has only been recently developed (<5 years) and adaptation measures fall largely under tenant control, there is currently limited appetite for significant CAPEX investment. Instead, the preferred approach is tenant engagement and system stewardship, as outlined in the adaptation pathways.

Climate cases underscore the need to better quantify business disruption, while resilience cases point to further work needed at the portfolio level to manage physical climate risks and guide resilience investment.

Key Areas for Further Work:

- **Systems & Governance:** Define engagement thresholds with local authorities/regulators, to address indirect and interconnected risks.
- **Implementation:** Clarify optimal timing for adaptation pathway activation and stakeholder engagement.
- **Portfolio Risk Understanding:** Enhance approaches to valuation and insurance in light of climate risks and resilience.

	1	2	3	4
Steps	**Scoping and data gathering**	**Materiality assessment**	**Resilience building**	**Value enhancement**
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Current state of play and direction of travel: With direct resilience investment currently limited by asset maturity and tenant control, the emphasis is on collaborative stewardship and engagement. Looking ahead, optimising resilience across the value chain will require clearer governance frameworks, including engagement thresholds with local authorities, and stronger coordination with insurers and lenders to align incentives, clarify timing for adaptation activation, and improve portfolio-level understanding of climate-related risks and valuation.

Lessons learned

In applying the PCRAM to this case study, the following lessons have been learned:

- Real estate has its own unique challenges and opportunities. The original PCRAM guidance was developed primarily for the infrastructure sector, where the investor and operator are either the same or have consistent incentives and drivers. In real estate, the building owner and tenant typically differ and may have different responsibilities for the asset, dependent on the type of lease. This not only means that there might be differences on who is responsible for capital investments under the lease agreement vs for site operations, but also who is mainly affected by physical climate impacts and to what extent.
- This creates an opportunity for the building owner to work collaboratively with the tenant to improve site resilience. Collaboration is also key so that relevant data can be collated for analysis during early project stages, especially in the cases where tenants are mainly responsible for the on-site operations. Collaboration between disciplines and actors, including engineers, climate scientists, finance, and the asset manager is key. This allows for evidence to be grounded in a balance of scientific and strategic rigour and in a language that speaks to key decision makers and stakeholders.
- Following the materiality assessment, the impact of climate hazards on the site was understood to be limited. This resulted in the suggestion of a pre-screening exercise to determine the value and criticality of climate hazards across the whole portfolio, to prioritise assets where a full PCRAM would be most beneficial. IIGCC's Climate Resilience Investment Framework can help navigate portfolio prioritisation.
- An adaptation pathways approach is recommended to support long-term decision making, especially where there is uncertainty around the physical risks' materiality. This approach involves identifying flexible strategies that can be adjusted over time as conditions change or new information becomes available.
- Where the drivers for investing in an asset are strategic (in this case, associated with its location relative to a major urban centre), the case for resilience is dependent on safeguarding the asset value and articulating this to future investors. This makes efforts to promote systemic resilience attractive even where site-specific materiality is low.
- Systems thinking is essential to understanding physical risk exposure and should be embedded from project inception, so that impacts, as well as options beyond the typical 'building' (or tenant – landlord) system boundary, can be identified. Visualising these interdependencies can help asset owners understand the consequences associated with systemic risks, particularly where interconnected systems are directly correlated with overall asset value. To this end, a qualitative assessment will suffice, although this should align with any quantitative assessments for consistency in terms of climate scenarios applied, time horizons, risk ownership and materiality.
- In advance of any systems mapping, it is vital that key system stakeholders are identified and mapped to the corresponding systems. This allows for a targeted stakeholder engagement plan to be developed and enacted, which is essential for the PCRAM process.
- The cost-benefit analysis of resilience measures is typically reflected in financial metrics. To strengthen this, bespoke resilience indicators—such as reductions in Average Expected Loss (AEL)—should be compared with potential changes in insurance premia. These reductions may arise from engaging insurers and highlighting resilience measures implemented at the asset level.
- Tenants could monetise these benefits, for example, by establishing a sinking fund based on theoretical annual savings in AEL resulting from reduced asset vulnerability. This fund could support future resilience investments or offset damages that may no longer be covered by insurance.

Limitations and caveats

Climate modelling assumptions

Future climate risk models face several key limitations: they are highly sensitive to scenario selection and projection year, which can drastically alter risk outcomes; often lacking sufficient spatial resolution to assess asset-level vulnerabilities, especially for localised hazards like flooding or heat stress. Operationally, integrating these models into decision-making requires cross-functional coordination and careful validation, such as conducted in this case study.

When conducting climate risk assessments, there are important trade-offs between portfolio-level and asset-level approaches. Portfolio-level assessments offer scalability and comparability across large holdings, but they often rely on generalised assumptions and coarse spatial resolution, which can obscure localised vulnerabilities. In contrast, asset-level assessments allow for more precise evaluation of site-specific risks—such as flood exposure or heat stress—but require access to detailed local data and, in many cases, bespoke modelling. This is especially critical when quantifying future impacts or designing adaptation strategies, as seen in this case study. In such instances, it's essential to work with a physical climate risk provider who is not only technically capable but also willing to engage in tailored analysis using local sources, ensuring the results are both credible and actionable.

Due to timing constraints and the case study's emphasis on the building owner, the analysis did not explore business interruption in depth. However, this remains a critical consideration for the building operator, typically the tenant, whose operations and revenue could be significantly impacted by climate-related disruptions. While the owner may focus on asset value and insurability, the tenant's exposure to downtime, relocation costs, and operational continuity underscores the importance of incorporating business interruption into future assessments.

Engineering assumptions

A range of costs were provided for the built resilience options developed for this PCRAM to account for uncertainty regarding design and extent of the option. Costs were initially derived from comparable projects and adjusted for Spanish construction costs and project scale, factoring in contractor costs, overheads, profit, and contingencies. Access to live operational and cost data in country, would provide more accurate resilience interventions costs.

Glossary

Climate projection	The simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases (GHGs) and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission/concentration/radiative forcing scenario used, which is in turn based on assumptions concerning, e.g. future socioeconomic and technological developments that may or may not be realised (IPCC Glossary Search).
CMIP	Coupled Model Intercomparison Project. A collaborative effort within the World Climate Research Programme (WCRP) aimed at advancing our understanding of climate change.
CORDEX	Coordinated Regional climate Downscaling Experiment. A framework under the World Climate Research Programme (WCRP) of the World Meteorological Organization (WMO) that coordinates activities for regional climate model downscaling.
Climate base cases	Base case evaluations are a part of scenario analysis, which helps decision-makers visualise and compare the most realistic outcomes for a business. With foresight into all possible outcomes, an organisation can greatly improve its financial planning and modelling, allowing management to make decisions with confidence.
GWh/year	Gigawatt hours per year (a measure of power)
Internal Rate of Return (IRR)	A metric used in financial analysis to estimate the profitability of potential investments. Annual return that makes the net present value (NPV) equal to zero or is the annual rate of growth that an investment is expected to generate.
Resilience measures	Physical or hard modifications in order to alleviate the impacts of climate change.
SCS	Severe convective storms characterised by significant weather hazards such as heavy precipitation, strong (gusty) winds, lightning, large hail, and potentially tornadoes.
SSP	Shared Socio-economic Pathways (SSPs) have been developed to complement the Representative Concentration Pathways (RCPs). By design, the RCP emission and concentration pathways were stripped of their association with a certain socio-economic development. Different levels of emissions and climate change along the dimension of the RCPs can hence be explored against the backdrop of different socio-economic development pathways (SSPs) on the other dimension in a matrix. This integrative SSP-RCP framework is now widely used in the climate impact and policy analysis literature, where climate projections obtained under the RCP scenarios are analysed against the backdrop of various SSPs.

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