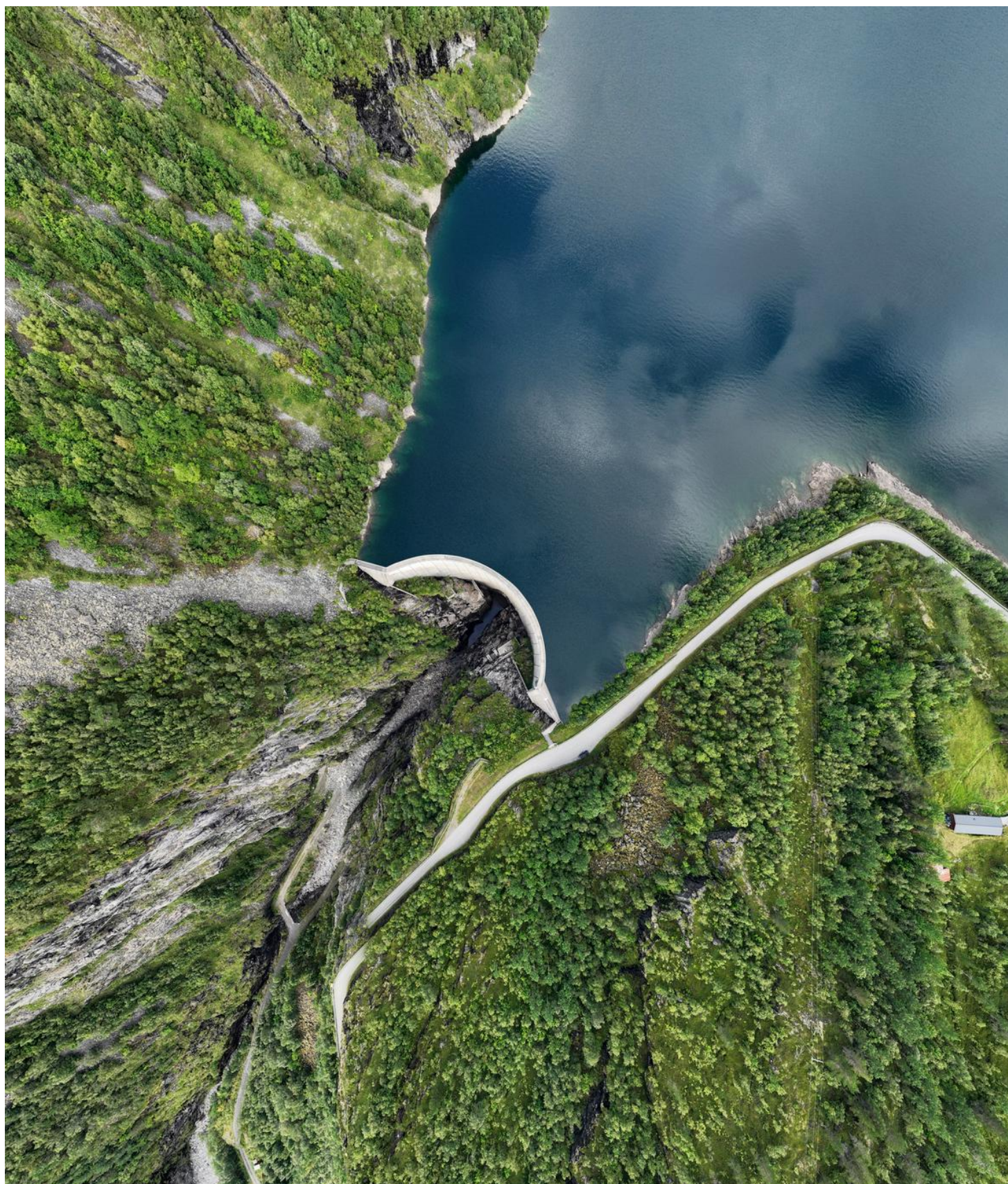




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While the transition is still underway and electrification is gaining pace, it is too slow to prevent global warming from causing economic damage. Substantial investment is now needed both for mitigation and adaptation. Investors and companies need to know where physical risks are likely to emerge and how to limit the economic and financial damage.

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Sustainable bonds reached USD 1598bn resulting in a 15% YOY growth despite geopolitical turmoil. Corporate issuers generally allocate only a small share of sustainable finance to investments in climate resilience. By contrast, the most climate-hazard-exposed holdings in selected investment funds have allocated a substantially higher share to climate resilience than MSCI ACWI companies overall. Asset-level assessment is essential to assess whether sustainable finance can reduce companies' vulnerability to physical risks and protect investors from financial impacts.

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Regulators, standard setters and financial institutions increasingly expect physical climate risk to be translated into financial consequences and credible adaptation responses. Across corporate reporting, sustainable finance and prudential supervision, frameworks are converging on a more location-specific and forward-looking assessment process, even as differences in materiality, methodology and data continue to constrain comparability.

Asset level physical risk analysis	Error! Bookmark not defined.
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Asset-level insights from SEB's Physical Risk Intelligence Tool reveal location-specific and overlapping climate exposures in mining holdings and data centres. Two case studies highlight material physical risk exposure at a mining company's Chilean properties and identify 48 European data centres with significant exposure to a hazard combination that could strain electricity systems without effective adaptation measures.

Water: from systemic risk to bankable opportunity	29
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Water is fundamental to economic growth, industrial production and societal development. Yet ageing infrastructure, persistent underinvestment, pollution and growing demand are putting water systems under increasing pressure, while climate change brings increasing unpredictability through droughts and floods. This article sets out why water is becoming a material financial risk and how SEB is working with clients to turn it into bankable opportunities.

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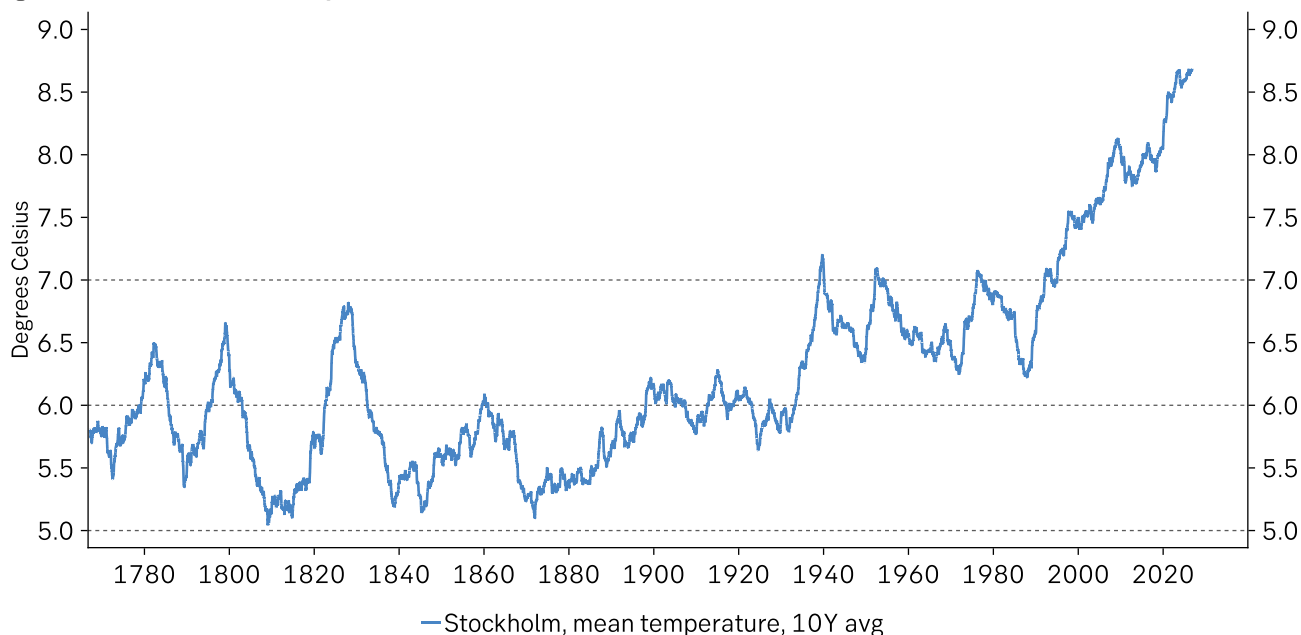
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Energy transition update

Too slow transition means more capital needed for adaptation

While the transition is still underway and electrification is gaining pace, it is too slow to prevent global warming from causing economic damage. Substantial investment is now needed both for mitigation and adaptation. Investors and companies need to know where physical risks are likely to emerge and how to limit the economic and financial damage.

Figure 1 Stockholm mean temperature



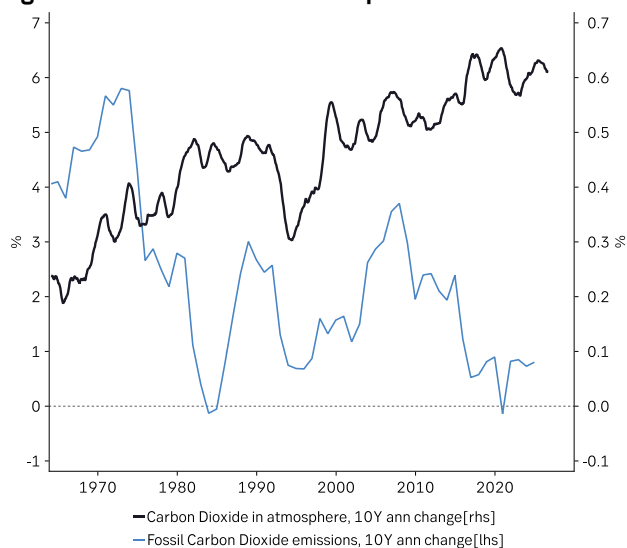
Source: Macrobond, SEB Strategy Research

From mitigation to adaptation

Global warming is a reality, mitigation too slow and adaptation needed. Over the past eight years, we have analysed the clean energy transition in this publication and tried to understand if it was progressing fast enough to stave off a climate crisis.

The transition is indeed underway, driven by economic and geopolitical forces, but it is not happening fast enough to avoid further global warming. The WMO projects annual global mean near-surface temperatures at between 1.3°C and 1.9°C above the 1850–1900 average during 2026–2030. The global temperature level has already increased by more than 1.5 degrees and is likely to continue rising for at least a couple of decades, because while emissions are levelling off, they are still rising, and so is the amount of CO₂ in the atmosphere.

Figure 2 Carbon dioxide in atmosphere and emissions



Source: Macrobond, SEB Strategy Research

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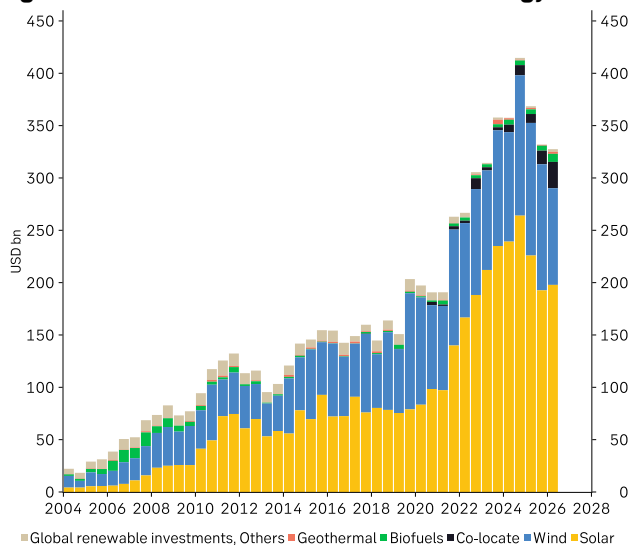
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Transition is coming but not fast enough

A further increase in temperatures would according to most estimates have a substantial negative effect on human welfare. And yet we do not appear to be acting with much urgency to prevent such an outcome. This does not mean there has been no progress; after all, global investment in renewable energy has doubled since 2020 according to data from BloombergNEF, with solar energy as the main engine. Complementary investment has also surged in areas like grids, storage and electrified transportation that are needed for a new energy system based on non-fossil electricity to work.

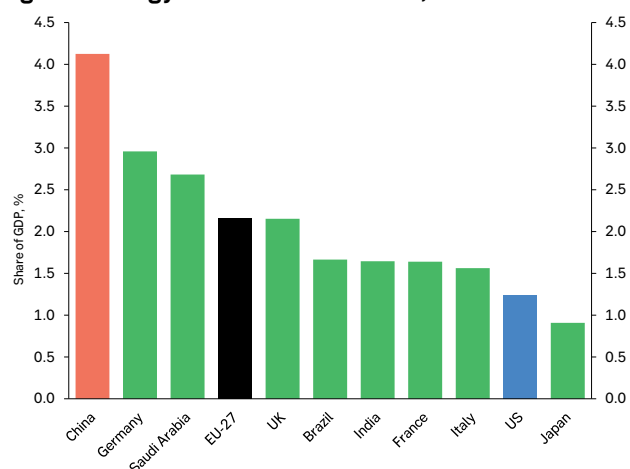
Figure 3 Global investments in renewable energy



Source: BloombergNEF, SEB Strategy Research

Adding up all the investment across the transition supply chain, BloombergNEF estimates that the world is spending more than USD 2tn or close to 2% of GDP, which is impressive, but falls short of the level that is needed to start reducing emissions in the current decade.

Figure 4 Energy transition investment, % of GDP 2025



Source: BloombergNEF, SEB Strategy Research

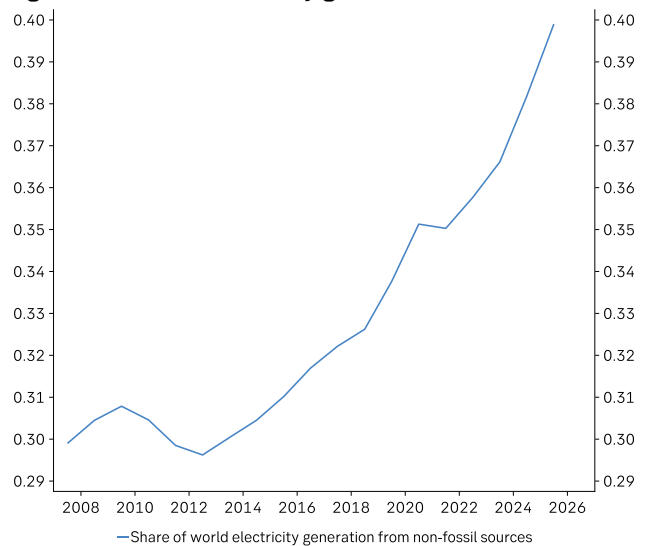
Furthermore, the investment boom has so far been concentrated in China, where more than 4% of GDP was

invested in 2025. Europe is close to the global average just above 2%, while the US only spends around 1% of GDP on transition investment.

Electrification IS transition

It is important to note, though, that the economic case for electrification with non-fossil primary energy sources remains powerful, and that full decarbonization remains likely to happen within the next 50 years. This will ultimately halt global warming and gradually reverse it, even if the peak temperature will end up higher than we had hoped a decade ago, when the ambition was to reach net zero 25 years earlier.

Figure 5 Share of electricity generation, non-fossil



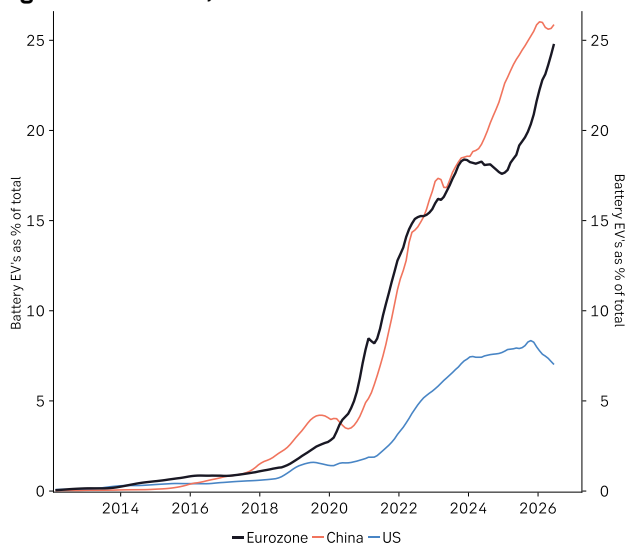
Source: Macrobond, SEB Strategy Research

The main argument for electrification is technological. We believe the world is starting to move to a fully digitalized, AI-powered economic model that will replace the mass production model of the last century. Like the four earlier industrial revolutions, this new model will also require a different energy system, this time replacing the oil and gas-based system of the 20th century's mass production model.

Many activities that today are powered directly by gasoline, diesel or jet fuel will in the future have to be transformed into electricity to work. Transportation will become fully electrified, and autonomous machinery will complete the electrification of the manufacturing sector, and the AI infrastructure itself will also require substantial amounts of electricity.

As we highlighted in the September edition of the Transition Update, electrical vehicle sales have increased significantly, particularly in Europe during the first months of 2026.

Figure 6 BEV sales, % of total

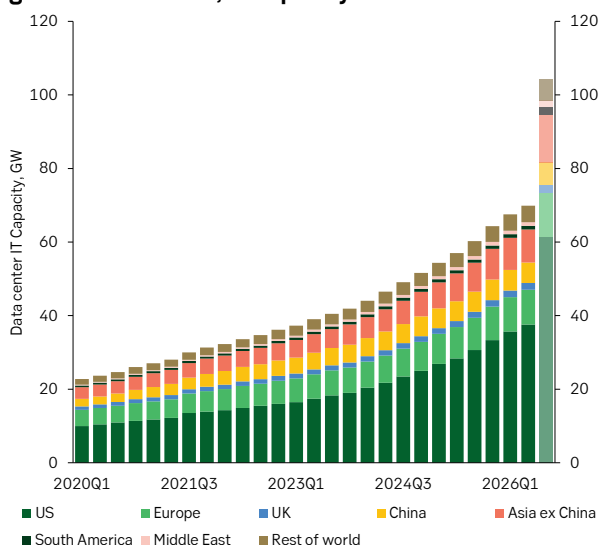


Source: Macrobond, SEB Strategy Research

This trend accelerated into Q2 as the BEV's share of total sales reached 25% in Europe, has as high as China's, and data for Q3 indicate that the surge continued. Meanwhile, the downward trend continued in the US, which is a laggard both in terms of the supply of electricity and electrification.

The build-out of AI infrastructure also boosts demand for electricity. Global live data center IT capacity has tripled since the start of 2020, from 23 GW to 70 GW in Q2 2026, and the pace is still picking up, with further 34 GW under construction, which would lift global capacity to more than 100 GW once completed. Running at full load, the capacity under construction alone would consume around 300 TWh of electricity a year resulting in around 900 TWh total consumption for just the IT equipment inside the data centers. Including cooling and other overhead, BNEF estimates that the total draw is up to around 1200 TWh a year, close to 4% of global generation.

Figure 7 Datacenter, IT capacity

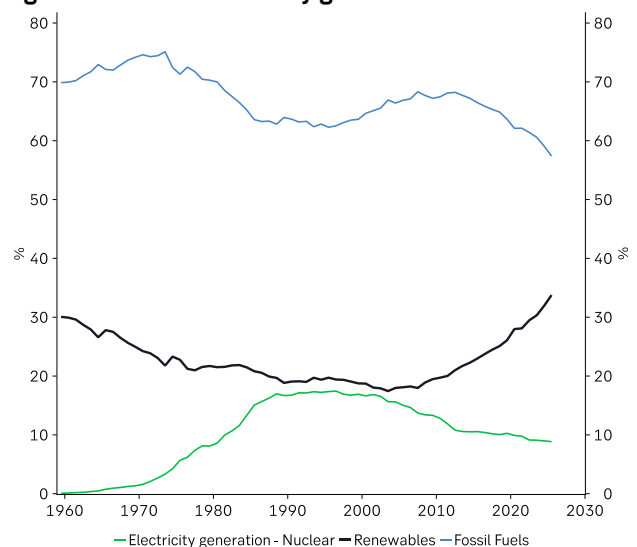


Source: BloombergNEF, SEB Strategy Research

Electric vehicles and data centers are just two examples within a broader pattern. Heavy trucks, autonomous mining machinery, drones and humanoid and other robots will also run on electricity. There is little doubt that electricity will deliver a significantly higher share of final energy consumed 10-20 years from now.

And while fossil energy could be used to generate electricity, there are also strong reasons to believe that the share of electricity that is generated from non-fossil sources will increase due to both lower cost and reduced dependence on foreign suppliers. This trend is already evident in recent decades.

Figure 8 Share of electricity generation



Source: Our World in Data

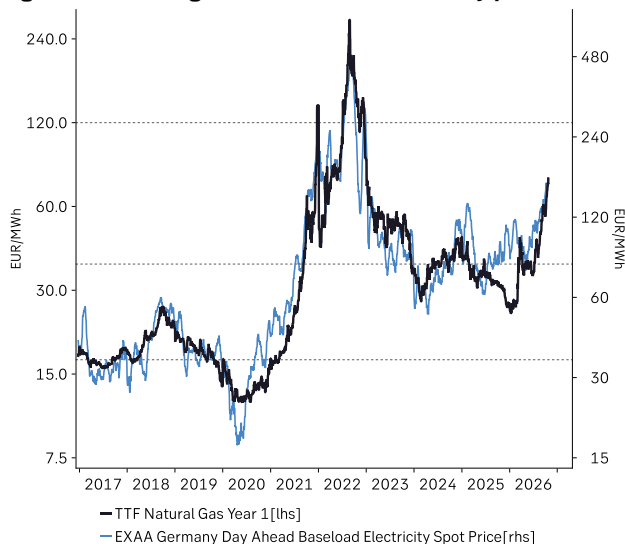
Security and cost prioritized over climate risks

Why is the transition not happening faster? One key reason in large Western economies is that the short-term security of energy supplies dominates long-term objectives like preventing global warming in the political process.

At the start of the current decade, climate risks were high on the political agenda, and governments appeared willing to raise money for an accelerated transition, but then reality intervened. The past five years have seen two major energy supply disruptions in connection with Russia's invasion of Ukraine in 2022 and the US war with Iran in 2026 and they changed the priorities.

We are now eight months into the war in the Middle East without any resolution in sight. Crude oil prices remain almost twice as high as when the war started, but shortages of refining capacity have driven diesel prices even higher, and LNG prices are also soaring due to the lack of strategic gas reserves.

Figure 9 Natural gas and German electricity price



Source: Bloomberg, Macrobond, SEB Strategy Research

Natural gas prices could become a problem for Europe heading into the winter. Electricity prices are now at the highest level since 2023, and this forces politicians to focus on near-term risks and use all means to increase supply and reduce the economic pain for consumers, even burning more coal which currently is highly profitable. Many countries have reduced taxes on gasoline, diesel and electricity to reduce the economic shock to consumers and producers alike.

All this means that the transition is unfolding at a pace determined by economic drivers. A faster transition to net-zero would require a willingness to sacrifice economic objectives, which is not present today.

Physical risks and economic costs are rising

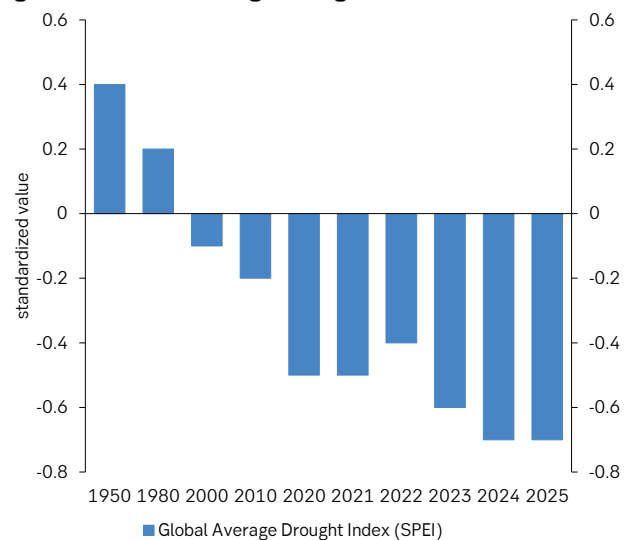
If the transition is too slow to prevent further global warming, then we are likely also to face a rising economic cost, as rising temperatures increase the frequency of extreme climate events like droughts, extreme heat, flooding and rising sea levels.

As there are large variations between individual years, the changes are only likely to show up in longer time series, but insurance companies, which are first in line to feel the consequences, confirm that the number of events with economic consequences are rising on a trend basis, but also highlight that the economic costs depend on whether adaptation measures are in place.

Research from Swiss Re Institute shows that economic losses related to natural catastrophes in 2025 mounted to USD 220 bn and roughly half of that are insured losses. They estimate that long-term average annual growth trend in insured losses from natural catastrophes of 5-7%.

However, if insurers understand these risks, then insuring against climate-related losses will also become increasingly expensive or even in some cases impossible.

Figure 10 Global average drought index

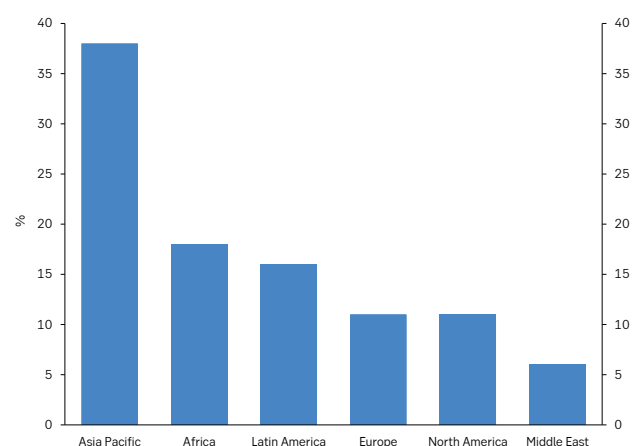


Source: Allianz Research

However, neither the physical hazards nor the economic consequences are evenly distributed around the world. According to Allianz Research, the largest climate related events take place in the developed world, but the economic costs are higher in developing countries because they lack the resources to prepare with adaptation measures.

According to their study, *"the disasters of 2025–2026 exposed a widening adaptation gap: countries with prevention systems, pre-arranged financing and clear response mechanisms were better positioned than those still relying mainly on post-disaster relief."*¹

Figure 11 Share of 2025 peril occurrence by region



Source: Allianz Research

They also find that the economic costs differ between hazards, with wildfires carrying a higher economic cost

¹ 2026-09-24-climate-economic-report-AZ.pdf

relative to the frequency of events than e.g. floods and drought.

Both the random element in the timing and distribution of physical risks and the importance of adaptation for the economic costs, which may differ depending on where shocks occur, make it difficult to assess the broader economic implications of global warming, but they are starting to become significant. Allianz Research estimates a “net output loss of USD451bn in 2027, equivalent to 0.24% of projected GDP across 144 economies”.²

Over the longer term, the effects are likely to be larger. One recent study by researchers from Stanford University and Northwestern University, concluded that “quantitatively, we find that a permanent 1°C rise in global temperature causes global GDP to persistently decline by over 20%” relative to the baseline over 10-20 years.

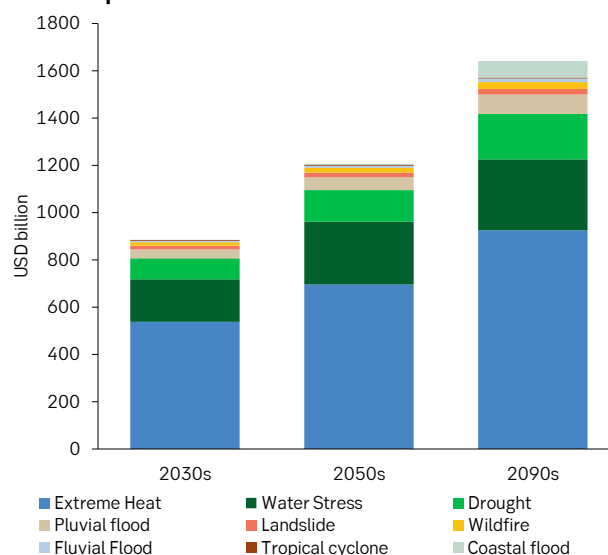
Other studies have suggested smaller, but still significant effects. A recent meta-analysis from researchers at LSE find by 2050, “climate change could reduce average GDP per capita by 3–15% due to rises in local temperatures and sea-level, and some climate tipping points, based on a rise in global average temperature of 2.2–2.8°C relative to the pre-industrial climate, and assuming no further increases in adaptation and resilience”³.

The exact number is up for debate, but there is little doubt that a continued increase in temperature beyond 2 degrees, which now is the base case, would lead to serious adverse economic effects. If global warming does have significant negative economic effects, then it also is significant for companies and for investors trying to assess the risk that companies are facing.

In study from 2025, S&P Global estimated that the annual cost of physical climate risks for companies in the S&P Global 1200 could reach USD 1.2 tn by 2050 if emissions follow current trends and policies and assuming no adaptation measures and expressed in nominal terms.

They also note that extreme heat and water stress account for the largest costs, while the severity of individual hazards is projected to increase at different rates over time. USD 1.2tn is around 25% of the total profit in the S&P 1200, so this is clearly a significant impact.

Figure 12 Total annual financial impact on S&P Global 1200 companies under the SSP2-4.5 scenario⁴.



Source: S&P Global. Data shown in 2024 nominal terms.

However, it is worth noting the assumption made about no adaptation measures. The negative effect will not be evenly spread across the market because a) not all companies have the same exposure to physical risks and b) not all companies will deploy the same adaption measures to reduce the economic effect of the physical risks.

Adaptation is costly, but research suggest that it is much cheaper than the alternative. In the LSE study quoted above, the authors find that “economic metrics indicate substantial returns on adaptation investment, with median economic benefit–cost ratios of around 4:1 and economic internal rates of return of around 25%”. They also note that “Adaptation investments can yield substantial returns at the macroeconomic level, resulting in a ‘triple dividend’: preventing losses, stimulating economic activity and providing social and environmental co-benefits.”

There are several important conclusions to draw from this analysis. First, while accelerating the clean energy transition remains the top priority for sustainable finance, investment in adaptation is becoming increasingly important and can have positive effects both for society and for business. Second, for companies and investors to identify where the risks are and how to adapt to them, we need a deeper understanding of both where the physical risks are likely to be concentrated and what measures that are taken to limit the economic fallout.

² [2026-09-24-climate-economic-report-AZ.pdf](#)

³ [The-macroeconomic-case-for-investing-in-climate-adaptation.pdf](#)

⁴ This is known as the ‘Medium-emissions scenario’ (SSP2-4.5), which is the pathway most consistent with the world’s current emissions trajectory

Measuring physical risk exposure

Over the past decade, physical climate risk has often been viewed as a distant and uncertain liability—important in theory, manageable in practice through maintenance, and difficult to price. Fast forward to today and this framing is no longer justifiable. Extreme weather events are becoming more frequent and severe, with financial consequences emerging well before long-term climate projections suggest.

Although the timing of individual extreme events remains uncertain, their impacts are evident today: wildfires are destroying assets, water scarcity is disrupting industrial production, coastal flooding is repricing real estate and infrastructure, and heat waves are simultaneously reducing worker productivity and straining energy systems. The analysis that follows draws on a comprehensive physical

risk-exposure tool developed by SEB, called PRIT—

Physical Risk Intelligence Tool, using S&P's physical risk data, designed to generate decision-useful insights for both investors and corporates.

For investors, physical risks affect company value through revenues, operating costs and asset values. Yet conventional ESG screening largely overlooks them. A company can have low carbon intensity and strong governance while operating assets exposed to acute hazards, such as floods and cyclones, or chronic hazards, such as drought and extreme heat.

This analysis examines where physical risk exposures are located in the stock market. It asks which investment funds carry more or less exposure than the broad market, what explains the difference, and how to interpret exposure for the most-exposed companies within each fund.

Table 1 Description of chosen funds for analysis

Strategy	Bloomberg ETF Ticker	Fund Description	Market Focus	Value Chain Position of fund holdings	% of covered holdings
MSCI ACWI	ACWI US	The ETF tracks the performance of the MSCI ACWI index, holding more than 1200 equities in developed and emerging markets	Global	• Diversified asset owners and operators • No value-chain concentration	99.54%
PAB	NZAC US	The ETF provides investment results that correspond Paris-aligned version of the ACWI, meeting EU PAB standards with fossil fuel exclusions, carbon intensity reductions, and a green revenue tilt	Global	• Diversified across the ACWI value chain • Lower fossil fuel and high-carbon exposure • Focus on reducing transition risk	91.78%
Tech	IXN US	Tracks the S&P Global 1200 Information Technology Capped Index. The ETF holds large-cap technology stocks from across the globe	Global	• Chip and hardware manufacturers • Software and intellectual property	96.92%
Global Clean Energy	ICLN US	The ETF tracks the performance of the S&P Global Clean Energy Transition Index	Global	• Renewable asset owners (~27%) • Equipment makers (~35%) • Utilities (~14%) and semiconductors (~15%)	75.37%
Industrials (Capital goods)	EXI US	The fund seeks investment results that correspond generally to the price and yield performance of the S&P Global Industrials Index	Global	• Industrial equipment and aerospace manufacturers • Infrastructure operators (~15%)	88.33%
Commodities (metals & mining)	PICK US	The ETF seeks investment results that correspond generally to the price and yield performance, before fees and expenses, of MSCI ACWI Select Metals and Mining Producers Ex Gold & Silver Investable Market Index	Global	• Mine owners (~75%) and critical mineral extractors (~15%) • Smelting and processing (~10%)	85.51%
Agri producers	VEGI US	The ETF seeks investment results that correspond generally to the price and yield performance, before fees and expenses, of the MSCI ACWI Select Agricultural producers Investable Market Index	Global	• Farming (~39%) has direct weather exposure • Machinery: Deere & Co (~31% of index) • Fertilisers (~15%) and food processing/trading (~15%)	76.92%
Nordics	XDN0 GR	The ETF replicates the MSCI Nordic Countries Index. Covers large- and mid-cap equities across Denmark, Finland, Norway and Sweden.	Nordic Region	• Diversified no value-chain concentration	86.81%
Emerging Markets	EMXC US	Tracks the investment results of the MSCI Emerging Markets ex China Index. Excludes Chinese equities.	Emerging markets	• Diversified no value-chain concentration	98.52%

Source: Bloomberg, SEB

Methodology

To explore this question, we selected nine stock market indices, proxied by listed ETFs (described in Table 1), reflecting both sector concentration, and geographic focus.

The methodology is further defined by the following metrics and parameters:

Metric⁵

The physical risk score measures exposure⁶ on a scale from 1 (lowest exposure) to 100 (highest exposure), relative to global conditions. It aggregates ten climate hazards as

illustrated in Figure 13. The metrics in the analysis are mainly comprised of tier 1 and tier 2 data, aggregated to a weighted average at fund level.

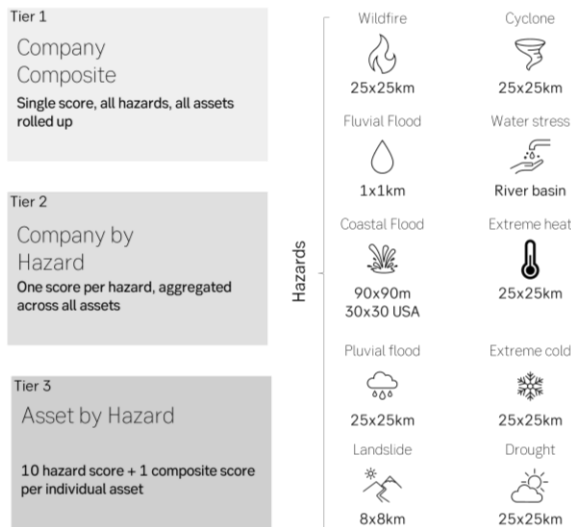
Scenario and time horizon

We use the **medium-emissions scenario** (SSP2-4.5), which is the pathway most consistent with the world's current emissions trajectory, and a **2030 horizon** to keep the analysis focused on near-term exposure.

⁵ The analysis is based on asset data sourced from publicly available information, which means the dataset may not capture every asset a company owns. Coverage gaps are possible.

⁶ A high exposure score tells you that a hazard is present and intense at that location. It does not tell you whether the asset would actually be damaged, disrupted, or affected in a financially meaningful way, further analysis is needed to fill these gaps.

Figure 13 Data structure



Source: S&P, SEB analysis

How to interpret the scores

The scores are comparative rather than absolute: they indicate whether one fund or holding has higher or lower exposure than another, but do not define a universally acceptable level of risk. Appropriate risk tolerances vary by investment strategy and investor.

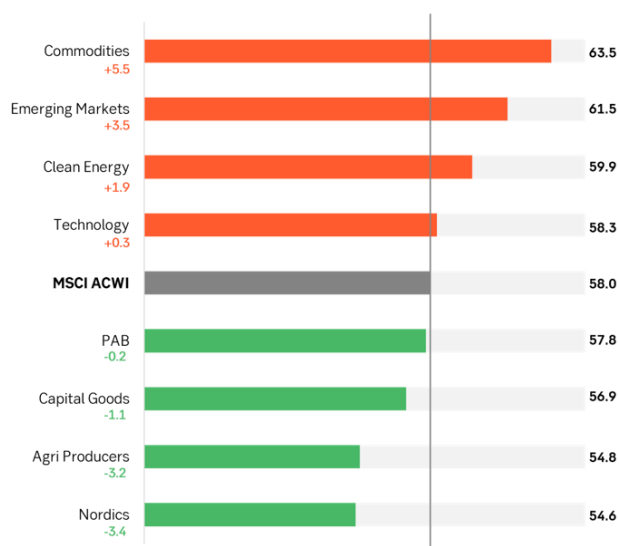
Calculation and range

Unless otherwise stated, fund-level scores are calculated as the exposure-weighted average of all fund constituents, based on reported weights as of H1 2026.

Physical risk exposure scorecard

Across the nine funds, scores span approximately nine points, ranging from 54.6 for Nordics to 63.5 for Commodities

Figure 14 Weighted composite exposure score, medium scenario, 2030



Source: S&P, SEB analysis

The Commodities sector has the largest hazard exposure weighted composite score in the analysis at 63.5 which is 5.51 points above the ACWI benchmark and the largest positive active score observed. This result reflects the nature and location of mining operations rather than fund construction. Most constituents directly own mines, smelters and processing facilities, with the most exposed holdings mining assets concentrated in Argentina, Chile, Mexico, the United States, Canada, Australia, Saudi Arabia and Peru.

Unlike most assets, mining sites cannot be relocated because operations depend on fixed mineral deposits. Their exposure to local physical hazards is therefore inherent and can only be reduced through adaptation measures.

On the other hand, the Nordic market achieves the lowest composite score of all the funds at 54.6, driven by most of the fund having higher concentration of assets in the Nordics in comparison to other funds (though only amounting to about 26% of all assets recorded of companies within the fund).

Interestingly, the PAB records an exposure-weighted composite of 57.8 which is almost indistinguishable from the broad market benchmark at 58.0. Paris alignment is fundamentally a transition risk framework, oriented around carbon intensity, fossil fuel exclusions, and decarbonisation trajectories. Physical risk is a separate dimension, and alignment to a 1.5°C pathway does not automatically reduce exposure to physical hazards.

The Technology fund's score of 58.3 sits just 0.31 points above the benchmark, a difference that partly reflects composition: approximately 92% of its holdings are also constituents of the MSCI ACWI, meaning the two portfolios share substantial underlying exposure.

The Agricultural Producers fund scores 3.2 points below the benchmark, a result that may initially seem counterintuitive for a fund where operations are directly tied to the natural environment. The explanation lies in composition: only 39% of holdings are actual farming companies, with the remainder being food producers whose physical asset footprint is less directly exposed to climate hazards.

To test whether the farmers themselves carry materially higher exposure, we isolated them by removing all non-farming holdings from the fund. The result was a 1-point increase in the exposure weighted composite score, confirming that the farming holdings are more exposed than the blended fund suggests, though still not to the degree the fund's name might imply. This is because company-level physical risk data does not capture supplier exposure.

However, these headline figures reveal only part of the picture. Two funds may record the same composite score yet be driven by entirely different hazards, and understanding which hazards are elevated, and whether that concentration is appropriate given the nature of the fund, requires looking beyond the composite. The following sections examine the underlying hazard profiles.

What's driving the differences: Hazard fingerprints

Disaggregating hazard scores reveal distinct exposure profiles. **Water stress, extreme heat and drought** dominate almost every fund, driven by an identified concentration of corporate assets in hot, water-scarce regions. The more informative signal lies in where funds deviate from this common baseline.

Table 2 Weighted physical risk exposure scores, by hazard

	Wildfire	Extreme Cold	Extreme Heat	Water Stress	Fluvial Flood	Coastal Flood	Tropical Cyclone	Drought	Pluvial Flood	Landslide
Commodities (metals & mining)	29.2	5.0	29.3	41.7	2.7	1.0	3.1	28.4	14.3	12.5
Emerging Markets	10.3	4.5	32.0	39.0	5.1	1.0	18.3	17.1	18.5	10.8
Global Clean Energy	15.4	5.3	27.6	41.4	5.5	1.1	3.4	21.7	16.4	12.0
Tech	8.0	5.0	28.7	40.4	5.8	1.0	7.5	19.9	16.4	9.9
MSCI ACWI	9.1	5.2	28.1	41.3	4.6	1.1	5.6	21.2	15.3	9.9
PAB	8.3	5.2	27.9	41.6	4.8	1.1	5.1	21.5	15.3	10.1
Capital Goods	8.7	5.4	26.8	40.1	4.0	1.1	3.8	22.4	14.8	9.6
Agri producers	9.3	5.6	27.4	34.7	4.0	1.0	3.1	23.2	14.8	8.2
Nordics	5.7	4.9	25.6	31.7	6.2	1.0	2.2	20.8	17.1	13.1

Source: S&P, SEB analysis

Table 2 shows the exposure-weighted hazard score for each fund across all ten climate hazards. Shading reflects ranking within this comparison set, from green (lowest exposure) to red (highest), allowing cross-fund comparison at the hazard level. Bold figures indicate the maximum score within each hazard column.

Water stress is the dominant hazard across all funds, with scores ranging from 31.7 for the Nordics to 41.7 for Commodities. The consistency reflects where corporate assets are physically located, sitting in regions that are already water-stressed and where that stress is projected to intensify under the medium emissions scenario.

The Commodities fund has a wildfire score of 29.2 – more than three times the ACWI score of 9.1 and one of the largest single-hazard deviations in the analysis. Like most funds, it also has high exposure to water stress and extreme heat. However, unlike the majority, its third-highest hazard is wildfire rather than drought. This is not a coincidence of fund construction. Economically viable deposits of copper, iron ore and critical minerals are disproportionately located in fire-prone regions, including Australia, the United States, Canada and parts of Latin America. Mining infrastructure must follow the location of

these fixed deposits, making wildfire exposure an unavoidable feature of the fund.

The Emerging Markets fund has a tropical cyclone score of 18.3, more than three times the ACWI score of 5.6. EMXC tracks the MSCI Emerging Markets ex China Index, with approximately 80% of its holdings concentrated in Asia-Pacific markets. Holdings in the Philippines, Vietnam, India, and Indonesia sit within major typhoon corridors and areas with significant tropical cyclone exposure, and 94% of the underlying assets owned by fund holdings are located in emerging markets. No other fund shows comparable exposure to this hazard. This illustrates how regional concentration, rather than sector selection, can be the primary driver of hazard-specific risk.

The Emerging Markets fund also shares the elevated water stress and extreme heat scores seen across most funds, but its hazard profile has one distinguishing feature: pluvial flooding (surface-water flooding caused by heavy rainfall) is its third-highest exposure. This aligns with the fund's position as the most exposed to tropical cyclones in the comparison set. Because tropical cyclones generate extreme rainfall across South and Southeast Asia, both

hazards are partly driven by the same weather events in key markets such as Taiwan, South Korea and India.

While the Nordics come out at the least exposed fund in comparison to the others, it is important to highlight that while not so significant by score, in comparison the fund does have the largest exposure to two hazards: fluvial flooding (river flood) and landslides.

The physical risk score at fund level is only the starting point

Fund exposure varies across market segments, but the headline composite score tells only part of the story. The nine-point spread across funds masks meaningfully different hazard profiles, geographic concentrations, and value chain positions that only become visible when the analysis moves from fund level to holding level, and

ultimately to individual assets. This layered approach is where exposure shifts from a number to a decision-useful signal. Furthermore, a lower score relative to the benchmark should not be read as an absence of physical risk exposure.

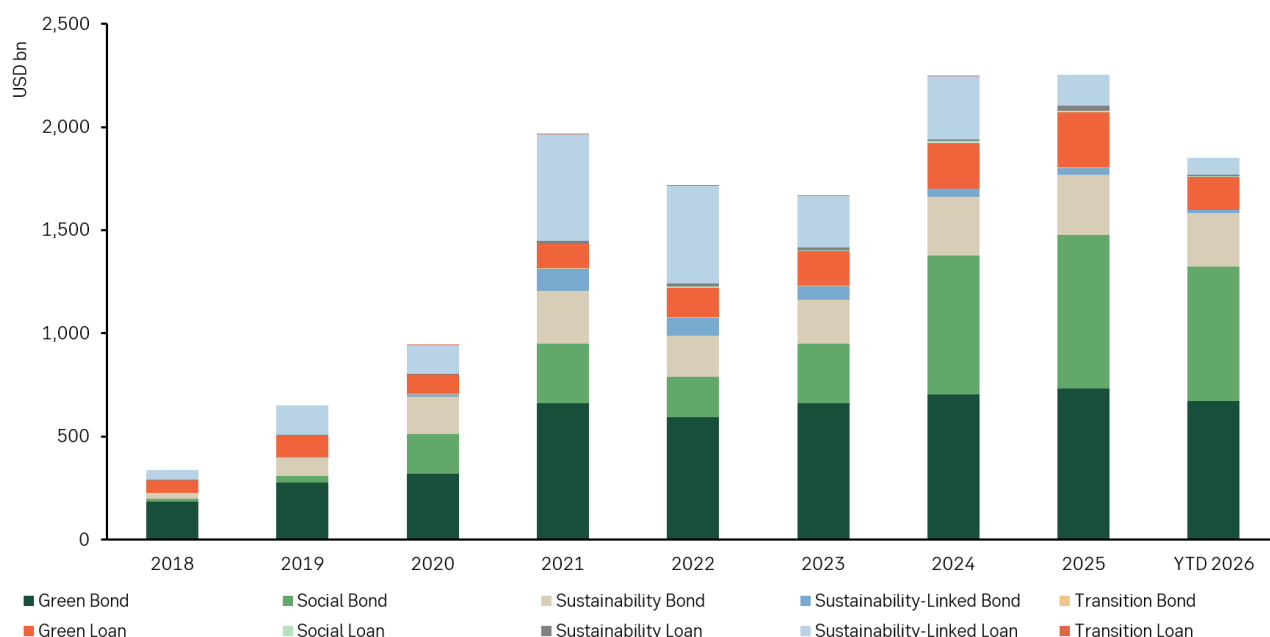
SEB's Physical Risk Intelligence Tool (PRIT) enables tailored physical exposure analysis for investors and corporates, benchmarking portfolios and companies against relevant peers and indices, from fund-level scores down to individual assets. This article offers a preview of that analysis. It is worth noting that the analysis presented here reflects one scenario and time horizon: the medium emissions pathway (SSP2-4.5) at 2030. Physical exposure is not static. PRIT allows this dimension to be explored across scenarios and time horizons, to assess not only current exposure but how it may evolve over time.

Sustainable finance market update

Sustainable bonds grow, but climate resilience remains underfunded

Sustainable bonds reached USD 1598bn resulting in a 15% YOY growth despite geopolitical turmoil. Corporate issuers generally allocate only a small share of sustainable finance to investments in climate resilience. By contrast, the most climate-hazard-exposed holdings in selected investment funds have allocated a substantially higher share to climate resilience than MSCI ACWI companies overall. Asset-level assessment is essential to assess whether sustainable finance can reduce companies' vulnerability to physical risks and protect investors from financial impacts.

Figure 15 Sustainable debt transactions by product

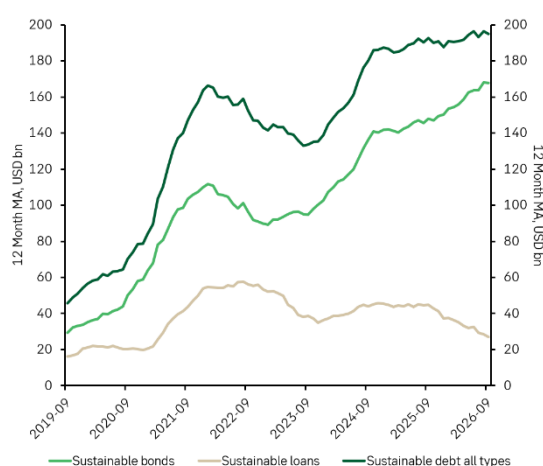


Source: BloombergNEF, SEB as of September 30, 2026

The global market for sustainable bonds continued to expand through September 2026, with issuance reaching USD 1,598bn, representing 15% YOY growth. Including labelled loans, total sustainable debt issuance reached approximately USD 1,850bn, an increase of around 5% compared to the first nine months of last year. The difference reflects the contrasting conditions across the two markets, with sustainable bond issuance remaining strong, and labelled loan issuance declining.

The 12-month moving average for sustainable debt remains close to record highs, with continued record-setting growth in bond issuance offsetting the ongoing decline in sustainable loan activity, which remains well below its 2021-2022 peak.

Figure 16 Sustainable debt transactions moving average



Source: BloombergNEF, SEB as of September 30, 2026

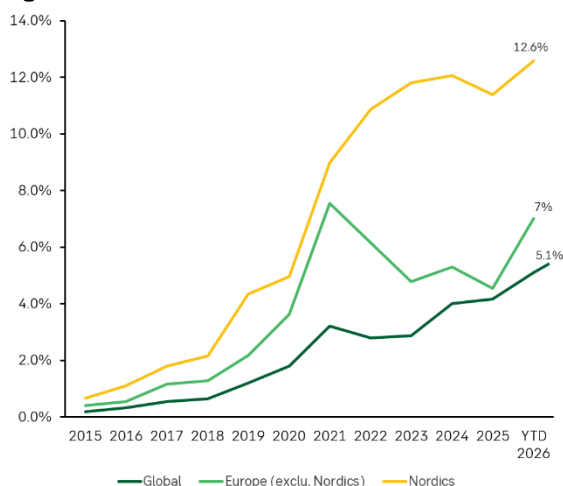
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Sustainable bonds represented 5.1% of global bond issuance in YTD 2026. market activity. The corresponding shares were 7% in Europe excluding the Nordics and 12.6% in the Nordics, confirming the Nordic region's position as the most established sustainable bond market. We note that, in comparison to previous reports, there has been a change in methodology. Preliminary securities have been removed from the screening, and only active and matured bonds are now included. This results in a higher reported share of sustainable bonds compared with earlier reports.

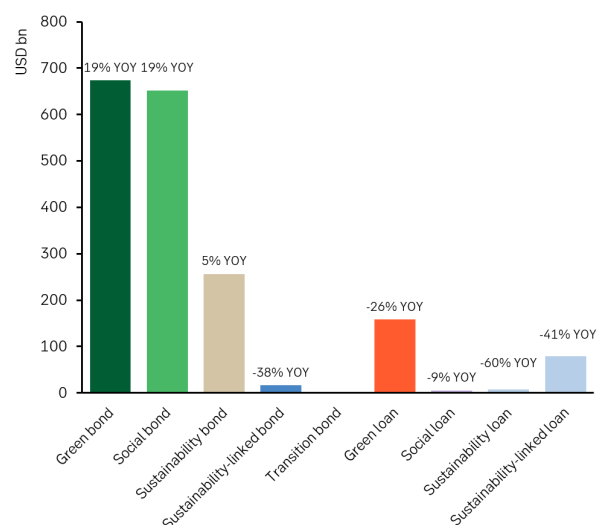
Figure 17 Sustainable bond market share



Source: BloombergNEF, SEB as of September 30, 2026

Use-of-proceeds bonds continue to dominate the market, with green and social bonds accounting for the majority of issuance. September shifted the year-to-date lead from social to green bonds. As a result, green bond issuance reached USD 674bn through September, ahead of social bonds at USD 652bn.

Figure 18 Sustainable debt transaction by type

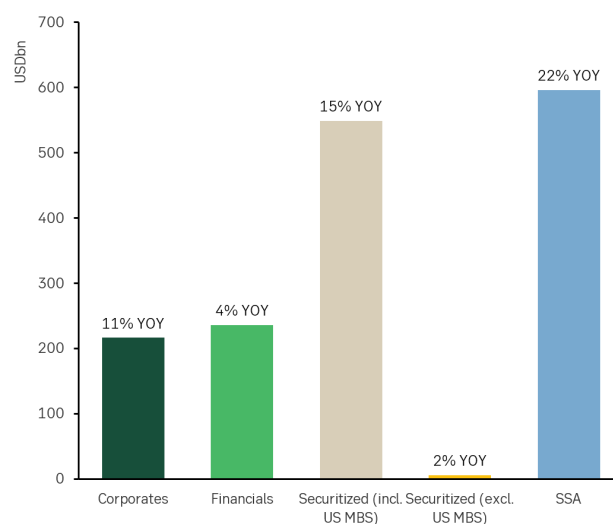


Source: BloombergNEF, SEB as of September 30, 2026

Sustainability bond issuance also remained strong, particularly in Europe, where volumes reached USD 89bn and increased by approximately 153% compared with January-September 2025. By contrast, global sustainability-linked bond issuance remained limited at approximately USD 16bn.

Sector growth remains concentrated in SSA and securitized bonds, with SSA sustainable bond issuance reaching USD 596bn through September, while securitized issuance reached USD 549bn. SSA was the leading sector in the recent month, and in Europe excluding the Nordics, SSA represented approximately 58% of sustainable bond issuance through September, underlining the importance of public-sector and development-finance issuers to the region's market. In comparison, regional SSA figure fell 25% as it counts only issuance booked to the SSA region, where there is no clear home country.

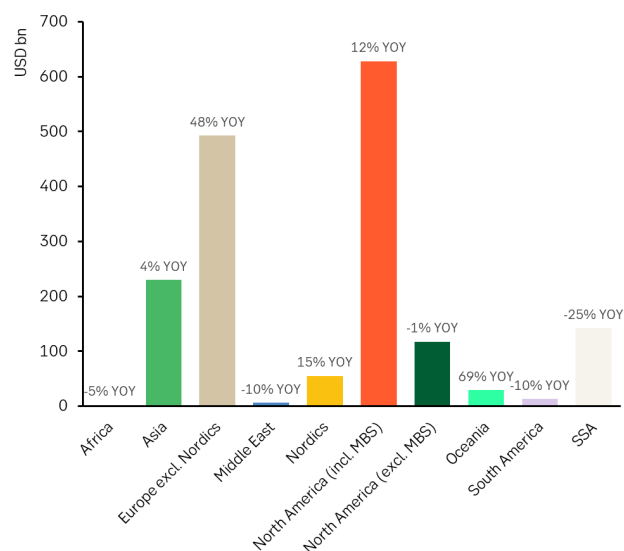
Figure 19 Sustainable bond transactions by sector



Source: BloombergNEF, SEB as of September 30, 2026

North America remains the largest regional sustainable bond market through September, with issuance of approximately USD 628bn. It was followed by Europe excluding the Nordics at USD 493bn, Asia at USD 230bn and the Nordics at USD 55bn. North America's leading position continues to be materially influenced by the scale of US securitized issuance, particularly mortgage-backed securities. Excluding mortgage-backed securities, however, North American issuance is down 26% YTD. Europe excluding the Nordics recorded a strong performance, with up 48% YOY, while the Nordics moved in the opposite direction. Nevertheless, Nordic issuance remained approximately 15% above its January-September 2025 level.

Figure 20 Sustainable bond transactions by region



Source: BloombergNEF, SEB as of September 30, 2026

The Nordics remain overwhelmingly a green bond market. Nordic sustainable bond issuance reached 55 bn USD through September, of which USD 53bn came from green bonds. As a result, green bonds accounted for approximately 97% of Nordic sustainable bond issuance, making the region structurally distinct from the broader global market. While global issuance is increasingly balanced between green and social formats, the Nordics story remains firmly centred on green bonds.

Little sustainable finance going to climate resilience

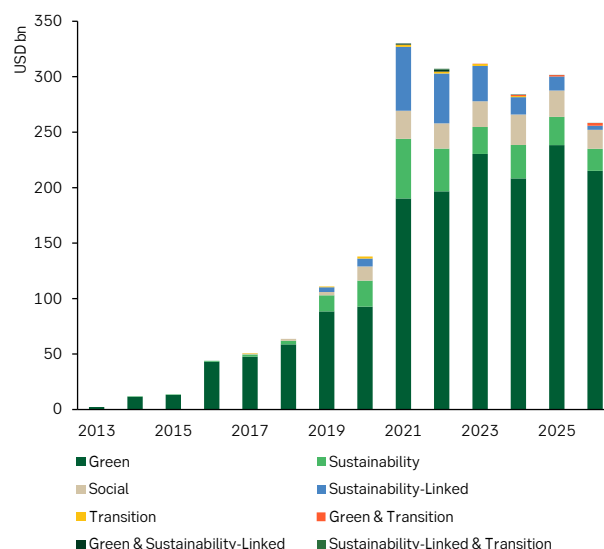
In this report we focus on how different investment funds are exposed to physical risk and how sustainable finance is being activated for climate resilience. In the Energy transition update we provide an in-depth analysis of the exposure of different investment funds to climate-related hazards. Here, we extend that analysis by assessing how much of the sustainable bond financing raised by companies held in different investment funds is going towards lowering companies' vulnerability to climate-related extreme events and strengthening their ability to prepare, recover and adapt.

Specifically, we consider available and standardised allocation reporting from use-of-proceed bonds – green, social, sustainable, sustainability and transition – into four investment categories most directly related to climate resilience – climate change adaptation, biodiversity, natural resource management and sustainable water.

To establish a benchmark across investment funds, we analysed sustainable bonds issued by companies in the

MSCI ACWI. The dataset covers more than 8,000 bonds issued between 2013 and 2026, totalling USD 2.23tn in issuance. Green bonds accounted for the largest share, at USD 1.64tn. Sustainability bonds and sustainability-linked bonds totalled USD 237bn and USD 178bn, respectively.

Figure 21 MSCI ACWI holdings' sustainable bond issuance by type



Source: BloombergNEF, SEB as of October 16, 2026

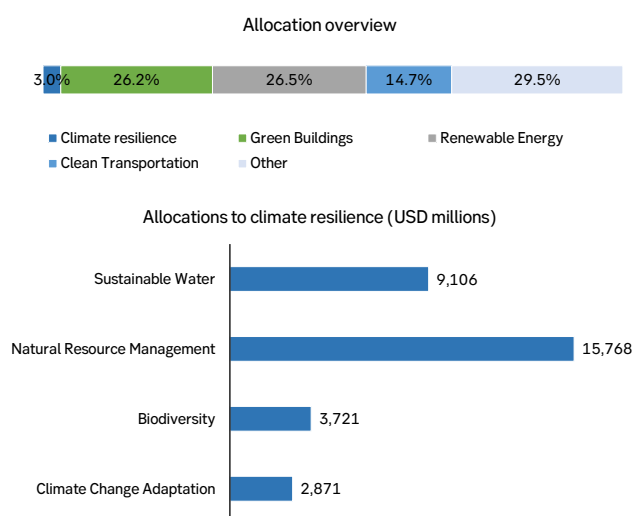
Standardised allocation reporting was available for USD 1.08tn of sustainable bonds issued by MSCI ACWI companies. The substantial reporting gap likely reflects two timing effects: allocation reports may not yet be available for recently issued bonds, while reports for matured bonds may no longer be accessible.

Overall, most sustainable bonds proceeds are going to other categories, mostly renewable energy, green buildings and renewable energy. Together, these three categories account for two-thirds of total reported bond proceed allocations. This suggests that sustainable finance continues to mostly fund climate change mitigation.

The results also indicate that a globally diversified group of corporate sustainable bond issuers makes limited use of these instruments to finance measures that reduce exposure to climate hazards. The four use-of-proceed categories most closely associated with climate resilience account for just under 3% of total reported allocations. This is consistent with broader evidence that corporate investment in climate adaptation remains insufficient to materially reduce vulnerability to climate risk⁷.

⁷ CDP Corporate Health Check 2026 - CDP

Figure 22 MSCI ACWI holdings' sustainable bond allocations

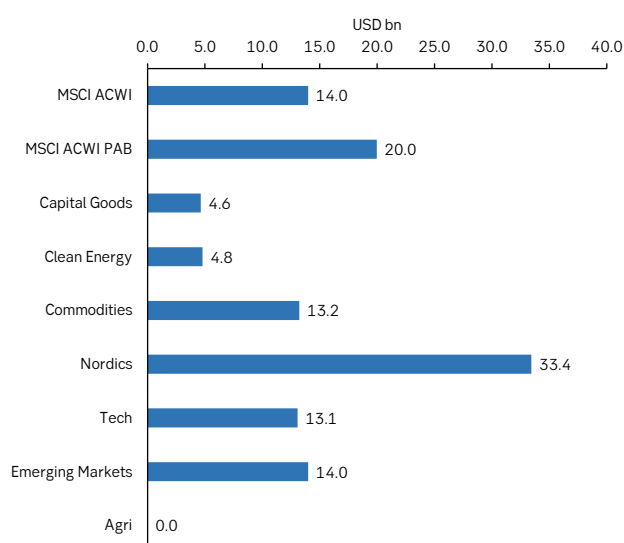


Source: BloombergNEF, SEB as of October 16, 2026

Sustainable bond issuance by investment funds' most exposed holdings

Companies most exposed to climate hazards may be more likely to use sustainable bond proceeds to enhance their climate resilience. Here we are assessing the most exposed companies in nine investment funds identified in the Energy transition update. These companies have issued USD 117bn since 2013, led by Nordic companies. Holdings in the agriculture fund's 90th percentile for hazard exposure have not issued any sustainable bonds, suggesting that these companies lag their peers in raising public debt for sustainability-related investments, including resilience.

Figure 23 Sustainable bond issuance by funds' most exposed holdings

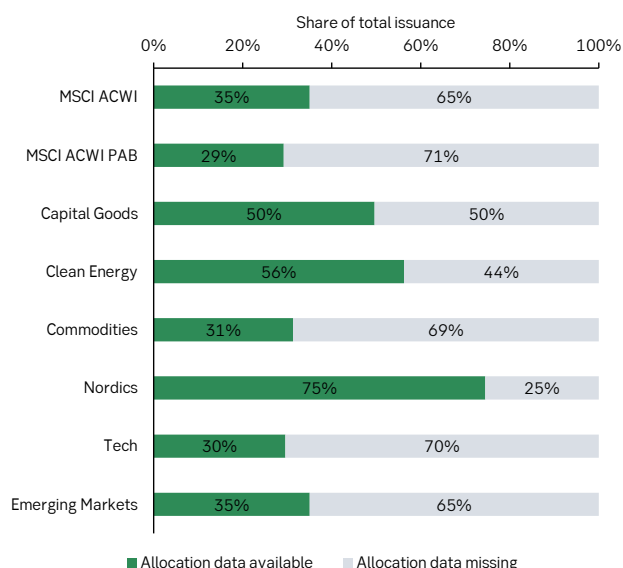


Source: BloombergNEF, SEB as of October 16, 2026

Allocation-reporting coverage varies markedly across the funds' most climate-hazard-exposed holdings, limiting direct comparisons between investment funds. Coverage is

strongest for the Nordic group, where allocation data is available for 75% of sustainable bond issuance by the ten most exposed companies, while other fund groups show larger reporting gaps.

Figure 24 Allocation reporting for sustainable bonds of funds' most exposed holdings



Source: BloombergNEF, SEB as of October 16, 2026

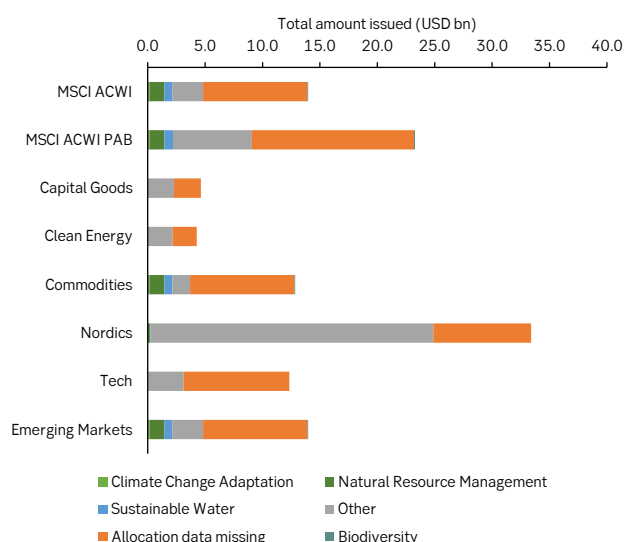
Climate-resilience allocations vary widely by investment funds

Across the most climate-hazard-exposed holdings of the investment funds analysed, natural resource management and sustainable water account for the largest climate-resilience-related allocations from sustainable bond proceeds. Reported allocations to these categories total USD 5.3bn and USD 3bn, respectively, indicating that issuers prioritise investments linked to resource efficiency, ecosystem management and water infrastructure. By comparison, allocations to climate change adaptation and biodiversity remain very limited: across all funds, the most exposed companies allocated only USD 600m to adaptation and USD 300m to biodiversity. The results therefore suggest that sustainable bond financing for climate resilience is concentrated in a narrow set of investment categories, with relatively little capital explicitly directed towards adaptation or biodiversity.

The allocation mix also differs across investment funds. The most exposed holdings in the MSCI ACWI, MSCI ACWI PAB, Commodities and Emerging Markets funds each reported USD 1.3bn of sustainable bond proceeds allocated to natural resource management and USD 0.7m to sustainable water infrastructure. The Nordic group shows a notably different pattern: despite having the largest amount of sustainable bond issuance, its most exposed companies reported no allocations to either

climate change adaptation or biodiversity, and only USD 200m to natural resource management and USD 100m to sustainable water. This indicates that Nordic companies don't see a big need to invest in measures that can lower their vulnerability to climate risk.

Figure 25 Allocation of sustainable bonds by funds' most exposed holdings



Source: BloombergNEF, SEB as of October 16, 2026

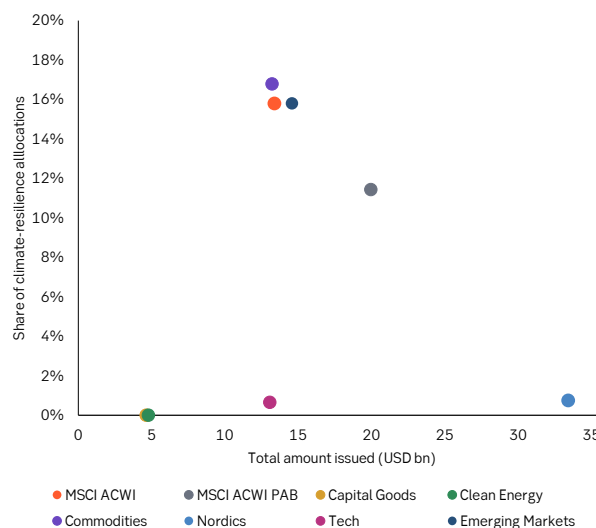
Across all funds, reported climate-resilience allocations were equivalent to 8% of total sustainable bond issuance, including issuance without allocation data. This suggests that the funds' most exposed holdings direct a larger share of proceeds to climate resilience than MSCI ACWI companies overall. The aggregate result masks substantial variation across investment funds. The most exposed holdings in the MSCI ACWI, Commodities and Emerging Markets funds allocated 16–17% of sustainable bond proceeds to investments that could strengthen resilience to climate-related extreme events.

The data also shows that the most exposed companies in the Capital Goods, Clean Energy and Tech funds reported no allocations to climate-resilience projects. Among the most exposed Nordic companies, climate resilience accounted for just 0.8% of reported allocations. This suggests that despite their greater exposure to climate hazards than sector peers, these companies prioritised climate-change mitigation and energy efficiency.

Issuer concentration and overlapping holdings limit causal inference and may overstate climate-resilience allocations. Most reported allocations in the MSCI ACWI, MSCI ACWI PAB, Commodities and Emerging Markets funds derive from sustainable bonds issued by Saudi Arabia's Public Investment Fund. The Public Investment Fund raises capital for several holdings represented across these funds, but the available data do not allow its financing to be attributed

precisely to individual holdings. As a result, bond issuance by the Saudi Arabia's Public Investment Fund may disproportionately influence multiple fund-level estimates.

Figure 26 Climate-resilience allocations of sustainable bonds by funds' most exposed holdings



Source: BloombergNEF, SEB as of October 16, 2026

Conclusion

Taken together, our findings indicate that corporates generally do not use sustainable bonds to direct meaningful amounts of capital towards climate resilience; most proceeds instead finance climate-change mitigation and energy efficiency. Among the most exposed holdings across different investment funds – particularly MSCI ACWI, Emerging Markets and Commodities – the share of bond proceeds allocated to projects that could strengthen issuers' climate resilience is substantially higher.

However, gaps in allocation reporting, issuer concentration and overlapping holdings mean that the results indicate only an association between climate-risk exposure and investment in climate resilience, rather than a causal relationship.

SEB Physical Risk Intelligence Tool (PRIT), described in the next chapter, enables a more comprehensive understanding of how sustainable finance affects the climate resilience of investment funds' holdings and underlying assets. Location-specific assessment of hazard exposure is essential for investors and corporates to determine how sustainable finance strengthens resilience to current and future climate risks across assets, companies and portfolios.

Regulatory update

Physical climate risk: From disclosure to financial decision-making

Regulators, standard setters and financial institutions increasingly expect physical climate risk to be translated into financial consequences and credible adaptation responses. Across corporate reporting, sustainable finance and prudential supervision, frameworks are converging on a more location-specific and forward-looking assessment process, even as differences in materiality, methodology and data continue to constrain comparability.

Figure 27 Key regulatory and disclosure frameworks for physical climate risk

Framework	Primary purpose	Materiality lens	Scenario analysis	Adaptation
ESRS E1	Corporate sustainability reporting	Double materiality	Forward-looking resilience analysis where material	Policies, actions and resources
IFRS S2 / UK SRS S2	Investor-focused corporate reporting	Financial materiality	Core tool for assessing climate resilience	Relevant where response affects company prospects
SFDR	Entity- and product-level investor disclosure	Sustainability risk and adverse impacts	No complete prescribed physical-risk model	Relies substantially on issuer and portfolio evidence
EBA standards & guidelines ECB Banking Supervision CRR Pillar 3 disclosures	EU prudential risk management, banking supervision and public disclosure	Financial and prudential materiality across established risk types and the business model	Short-term resilience testing plus medium- to long-term business-model analysis	Embedded in governance, risk appetite, ICAAP, controls, monitoring, capital planning and disclosure
EU Taxonomy adaptation criteria	Environmental performance of eligible activities	Activity-level technical criteria	Forward-looking and proportionate to activity and asset life	Adaptation solutions for material risks
IORP II	Pension risk management and own risk assessment	Financial and prudential materiality	Climate risks considered in own risk-assessment	Risk management and long-term obligations

Source: SEB

Physical risks are becoming a key compliance issue

Physical climate risk is no longer treated as a niche environmental topic. Across European, UK and international frameworks, companies are increasingly expected to identify where climate hazards intersect with vulnerable assets, operations, ecosystems and counterparties; look beyond historical loss experience; and explain how the resulting exposure could affect strategy, cash flows, asset values, access to finance and financial resilience. The frameworks do not impose a single universal model, and several are voluntary rather than binding. Yet they increasingly describe the same assessment chain: identify

hazards and nature dependencies, locate exposures, test vulnerability, estimate financial consequences, assess resilience and demonstrate an effective response.

Cross-sector foundations of risk disclosure

Disclosure frameworks provide a central starting point for understanding how physical climate risk is identified, governed and communicated across the sustainable finance landscape. The Task Force on Climate-related Financial Disclosures (TCFD) recommendations established the now-familiar structure of governance, strategy, risk-management, metrics and targets, while explicitly distinguishing acute from chronic physical risk and promoting scenario analysis.

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Although the task force completed its work in 2023, its architecture remains embedded in the International Financial Reporting Standards Climate-related Disclosures (IFRS S2), issued by the International Sustainability Standards Board (ISSB), UK reporting requirements and prudential supervisory guidance, particularly the UK Prudential Regulation Authority's expectations for banks and insurers to integrate climate-related financial risks into governance, risk management, scenario analysis and disclosure.

The TCFD provides the common conceptual and operational foundation for physical climate-risk disclosure across both the corporate and financial sectors. Its four-pillar architecture together with its emphasis on scenario analysis established a shared structure for identifying, assessing and communicating climate-related financial risks.

Corporates and financial institutions can therefore use a common TCFD-aligned assessment process by drawing on asset and activity location, relevant hazards, vulnerability, adaptation measures, forward-looking scenarios and financial transmission channels, while documenting how differences in legal purpose, scope, materiality and time horizon alter the perimeter and conclusions.

Corporates: Different materiality lenses, shared evidence

The TCFD architecture was carried directly into IFRS S2 and therefore underpins the UK's Sustainability Reporting Standard Climate-related Disclosures (UK SRS S2), which is based on IFRS S2. The EU's European Sustainability Reporting Standard for Climate Change (ESRS E1)¹ is not legally based on TCFD but is substantially aligned with its architecture.

The standards nevertheless apply different materiality lenses: ESRS E1 operates within double materiality, covering both how physical climate risks may affect the undertaking and how the undertaking's activities and value chain affect people and the environment, including through impacts relevant to climate adaptation. IFRS S2 and UK SRS S2 focus instead on climate-related risks and opportunities that could reasonably be expected to affect an entity's prospects, including its cash flow, access to finance or cost of capital over the short, medium or long term.

Investors: From disclosure to actionable analysis

Financial product-level frameworks use issuer- and portfolio-level information for investment and product

disclosures rather than replicating the corporate reporting assessment.

The EU's Sustainable Finance Disclosure Regulation (SFDR) Articles 3.1 and 6.1 requires financial market participants and financial advisers to disclose how sustainability risks are integrated into investment decisions or advice, and the results of their assessment of the likely impacts of those risks on financial-product returns.

SFDR defines sustainability risk as 'environmental, social or governance event or condition that, if it occurs, could cause an actual or a potential material negative impact on the value of the investment'. Its technical standards add mandatory templates and principal-adverse-impact indicators, but none of them provide a complete physical risk model. Investors must therefore develop their own approaches to connect issuer, asset-level and third-party data to due diligence, portfolio monitoring and product disclosure.⁸

In the UK, the Financial Conduct Authority's TCFD-aligned disclosure rules require in-scope asset managers and certain asset owners to disclose how they identify, assess and manage climate-related risks and opportunities, and to provide climate-related information at entity and product level. These disclosures can support assessment of physical climate risk, but the FCA does not prescribe a single asset-level methodology for quantifying climate-related financial losses.

This creates an important distinction between a disclosure obligation and an analytical method: SFDR and the In the UK, the Financial Conduct Authority's disclosure rules determine where sustainability-risk information enters product governance and reporting, but it does not prescribe a complete location-level physical risk assessment. The robustness of investors' risk assessments and regulatory disclosures therefore still varies depending on the quality and compatibility of corporate disclosures, geospatial hazard data and portfolio-level aggregation.

Turning risk assessment into adaptation

The EU Taxonomy provides the regulatory context for one of the clearest operational approaches to physical climate-risk assessment and adaptation. Commission Delegated Regulation (EU) 2021/2139 establishes technical screening criteria for climate change adaptation. Its Appendix A, Generic criteria for doing no significant harm (DNSH) to climate change adaptation, specifies how a robust climate-risk and vulnerability assessment is to be conducted where the criteria apply.⁹ For relevant activities, the assessment should cover acute hazards such as floods,

⁸ Regulation - 2019/2088 - EN - sfdr - EUR-Lex

⁹ Delegated regulation - 2021/2139 - EN - EUR-Lex

storms and wildfires, as well as chronic shifts such as heat, water stress and sea-level rise. It should be location specific, forward-looking and proportionate to the activity and expected asset life, with adaptation solutions for material risks.

Once material physical climate risks have been identified, the EU Taxonomy requires relevant activities to identify and implement adaptation solutions capable of reducing the most important risks. The regulation does not prescribe particular measures or how residual risk should be priced or accepted. In practice, responses may include asset protection, relocation, operational redundancy, water-efficiency measures or supply-chain diversification. For investors, such expenditure may be relevant to valuation and financing analysis where the company explains the risk addressed, the expected reduction in vulnerability and the remaining exposure.

The EU Climate Adaptation Strategy and the EU Climate Resilience Framework – set to be announced on 28 October – provide the broader policy direction: better risk knowledge, faster and more systematic adaptation, and integration into investment-while the EU Mission on Adaptation supports regions and cities through technical assistance and demonstration projects. None of these initiatives creates the same direct corporate obligation as the Taxonomy, but both can improve the place-based evidence and adaptation options available to companies and investors.

Embedding physical risk in prudential management for financial actors

Prudential regulation translates physical risk data into financial-risk management. The sixth Capital Requirements Directive (CRD VI) and the European Banking Authority (EBA) guidelines require banks to identify material ESG risk drivers and integrate physical risk into credit, market, operational, liquidity, concentration and business-model risk, as well as risk appetite, ICAAP (Internal Capital Adequacy Assessment Process), controls and monitoring. EBA scenario guidance distinguishes short-term financial resilience testing from medium- to long-term business-model analysis, while ECB's guide on climate-related risks, CRR Pillar 3 disclosures and UK PRA supervision reinforce integration and transparency. The Basel Committee principles provide the global prudential reference point for governance, internal controls, capital and liquidity adequacy, risk management and scenario analysis, although implementation occurs through national supervisors. Solvency II developments apply comparable

logic to insurers through governance, modelling, scenarios and solvency assessments.

Occupational pension funds face related requirements under IORP II. Article 25(2)(g) requires the risk-management system, where relevant, to cover environmental, social and governance risks relating to the investment portfolio and its management, while Article 28(2)(h) requires the own-risk assessment to include new or emerging risks, including risks related to climate change. Although IORP II does not prescribe a detailed physical-risk methodology, these provisions make physical climate risk relevant where it may affect the investment portfolio, the IORP's risk profile or its ability to meet its obligations over time.

Scenario analysis is the linking mechanism across several of these regimes. The Network for Greening the Financial System (NGFS) is a global network of central banks and financial supervisors that develops climate scenarios and analytical guidance to support the integration of climate- and nature-related risks into financial supervision and risk management. NGFS climate scenarios provide a common reference point for many financial-sector exercises, but they are not a ready-made asset-level loss model.¹⁰ Corporates must still translate macroeconomic and climate pathways into local hazards, exposure, vulnerability and financial transmission channels, while documenting the additional assumptions introduced in that translation.

Extending the lens to nature

Nature-related frameworks widen the assessment boundary beyond climate hazards alone toward a more holistic approach to physical risk. The TNFD Recommendations use the LEAP approach: Locate, Evaluate, Assess and Prepare, to support the identification and assessment of nature-related dependencies, impacts, risks and opportunities. Science Based Targets for Nature, developed by the Science Based Targets Network, use a five-step process: Assess, Prioritise, Set targets, Act and Track, to help companies assess their impacts and dependencies on nature, prioritise relevant locations and environmental pressures, and establish measurable science-based targets.

None of these frameworks constitute climate-risk regulation or, by itself, provides a methodology for quantifying financial losses. Rather, they can help financial actors and corporates identify nature-related dependencies, impacts and vulnerabilities that may give rise to financial risks and may be missed by climate-only assessments.

¹⁰ [NGFS Scenarios Portal](#)

The ECB's supervisory good-practice compendium also illustrates how banks can identify climate- and nature-related risk drivers and assess the channels through which they may translate into established financial-risk categories.¹¹ This example should be understood as supervisory good practices rather than as standalone binding requirements. Read alongside TNFD and Science Based Targets for Nature, The ECB compendium indicates a movement beyond hazard overlays toward analysis of location, ecosystem condition, dependencies, impacts and financial transmission channels.

The broader convergence across voluntary, market-led nature-related frameworks remains process-based: the scope, granularity and sophistication of the assessment increase where screening indicates potentially material risks; location and asset characteristics matter; acute and chronic effects are tested over relevant horizons; and scenario analysis should inform decisions rather than exist only as a disclosure appendix. Commercial methodologies follow a similar analytical sequence. This convergence helps investors see that regulatory expectations and market analytics increasingly ask comparable questions. Their outputs may nevertheless differ materially because providers use different asset coverage, geocoding assumptions, hazard models and vulnerability functions.

Data gaps still constrain comparability

The expanding focus on physical risk is developing faster than the underlying data infrastructure. Climate-hazard information is increasingly available, yet datasets vary considerably in spatial resolution, scenario design, time horizon and treatment of uncertainty. More fundamental gaps often concern exposure and vulnerability: public reporting may identify a country, business segments or fund holdings rather than individual assets, while information on construction, operating dependencies, protection measures, supply chains and private assets remains uneven. Historical losses are also an imperfect guide to emerging chronic stresses and future extremes. As a result, two assessments of the same portfolio may produce materially different conclusions because they use different hazard models, value-at-risk assumptions or vulnerability functions rather than because the underlying risk has changed.

This data fragmentation helps explain why the regulatory landscape converges more clearly on process than on a single metric. The frameworks increasingly require forward-looking analysis, geographic and sectoral

differentiation, disclosure of methods and limitations, and sophistication proportionate to materiality; they generally stop short of prescribing one dataset or model. This preserves flexibility but constrains comparability across corporates and creates dependence on commercial providers whose scores and assumptions may not be transparent.

Nature-related assessment introduces a further challenge because ecosystem condition, dependencies and financial transmission channels are less standardised than many climate variables. In practice, corporates and financial actors are expected to use the best available evidence, document proxies and uncertainty, and improve material data gaps over time. These steps, however, remain supporting elements within a broader market need for more consistent, interoperable and decision-useful data.

Toward an integrated assessment model

Taken together, our analysis points toward increasing regulatory pressure on financial actors and corporates to adopt an integrated approach to physical-risk assessment. Climate hazards are no longer viewed in isolation, but in relation to the location and vulnerability of assets, the resilience of infrastructure and supply chains, dependencies on ecosystems, and the financial channels through which disruption can affect value. This marks a gradual shift from broad exposure screening toward more differentiated analysis capable of informing disclosure, investment decisions and prudential resilience.

Significant methodological differences nevertheless remain: time horizons, materiality thresholds, scenario assumptions and vulnerability models are not yet standardised, and climate and nature related risks are often assessed through separate systems. The direction of travel is therefore toward interoperable evidence and consistent governance rather than a single universal risk score. For corporates, the practical implication is to maintain a traceable assessment basis that can support several regulatory uses while preserving the distinctions between their materiality lenses and objectives.

Evolving compliance expectations are moving from hazard identification and disclosure towards financial materiality, adaptation and capital allocation. Effective responses will depend less on a single, seemingly precise risk score than on the ability to demonstrate how location-level hazards translate into vulnerability, financial consequences, investment decisions and measurable risk reduction across several reporting and supervisory frameworks

¹¹ [Guide on climate-related and environmental risks](#)

Asset level physical risk analysis

SEB's new tool, PRIT- Physical Risk Intelligence Tool enabling fund to asset level analysis

Asset-level insights from SEB's Physical Risk Intelligence Tool reveal location-specific and overlapping climate exposures in mining holdings and data centres. Two case studies highlight material physical risk exposure at a mining company's Chilean properties and identify 48 European data centres with significant exposure to a hazard combination that could strain electricity systems without effective adaptation measures.

From broad exposure to the assets driving it

In this report's [Energy Transition Update](#), we examined physical risk exposure across nine funds — identifying which funds carry elevated exposure relative to the broad market benchmark and which hazards dominate each fund's profile. Fund-level scores are a powerful lens for understanding where exposure is concentrated, the next step would be to identify what is driving them.

For investors, physical risks affect company value through revenues, operating costs, and asset values — yet conventional ESG screening largely overlooks them. A company can have low carbon intensity and strong governance while operating assets exposed to acute hazards such as floods and cyclones, or chronic hazards such as drought and extreme heat.

For corporates, supply chain resilience, operational continuity, and access to capital increasingly depend on how well physical risk is managed and disclosed. As regulators around the world introduce climate-related disclosure requirements, knowing where exposure is concentrated and how it varies across business models and geographies is becoming essential to strategic planning.

This article takes the analysis further, moving from the top down to the bottom up. Using SEB's Physical Risk Intelligence Tool (PRIT) together with S&P physical risk data, we present two asset-level case studies.

The first picks up where the Transition Update left off, examining the most exposed holdings across the nine funds and interrogating the individual assets driving their scores.

The second is a standalone analysis demonstrating a different application of the tool: focusing on a single asset

type, we assess physical risk exposure across data centres in the US, Europe, and China — and what that exposure means for energy demand and electrification as climate hazards intensify.

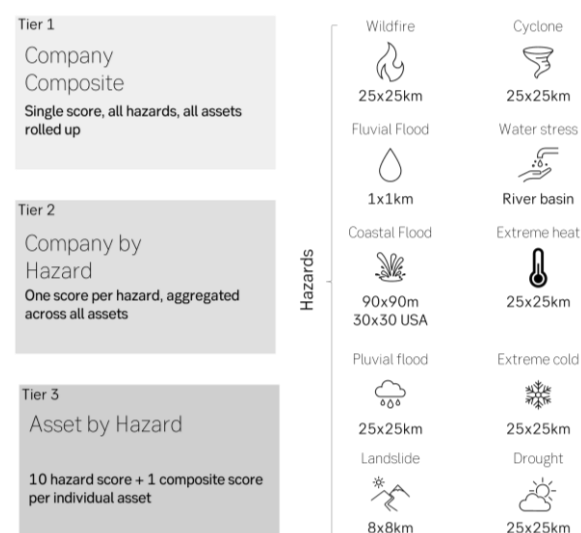
Together, these case studies demonstrate how drilling down to the asset level turns a headline exposure score into something you can interrogate, challenge, and act on.

Methodology

Metric¹²

The physical risk score measures exposure¹³ on a scale from 1 (lowest exposure) to 100 (highest exposure), relative to global conditions. It aggregates ten climate hazards, as illustrated in Figure 28. The metrics in the analysis are mainly comprised of tier 1, tier 2 and tier 3 data.

Figure 28 Data structure



Source: S&P, SEB analysis

¹² The analysis is based on asset data sourced from publicly available information, which means the dataset may not capture every asset a company owns. Coverage gaps are possible.

¹³ A high exposure score tells you that a hazard is present and intense at that location. It does not tell you whether the asset would actually be damaged, disrupted, or affected in a financially meaningful way, further analysis is needed to fill these gaps.

Scenario and time horizon

We use the **medium-emissions scenario** (SSP2-4.5), which is the pathway most consistent with the world's current emissions trajectory, and a **2030 horizon** to keep the analysis focused on near-term exposure.

How to interpret the scores

The scores are comparative rather than absolute: they indicate whether one holding or asset has higher or lower exposure than another, but do not define a universally acceptable level of risk. Appropriate risk tolerances vary.

Case study 1: Most exposed holdings

Our Energy transition update identified that out of 9 funds the commodities fund which tracks MSCI ACWI Select Metals and Mining producers Ex Gold and Silver Index, had the largest exposure to physical risk in comparison to the other funds. While this headline composite scoring provides a starting point for assessing fund level physical risk exposure, managing that exposure demands a clearer understanding of the underlying holdings, specifically, which positions carry the largest composite exposure and why.

Without that granularity, it is difficult to determine where risk mitigation efforts should be directed, whether through engagement with the holding companies, position sizing, or divestment. Where elevated exposure does translate into operational impact, the financial consequences are real: physical damage or disruption at the asset level can ultimately flow through to investment returns.

We use a top-down approach to identify the holdings most exposed to physical risk. Holdings are ranked primarily by their overall exposure score, with the number of significant individual hazards and fund weight used as secondary criteria.

We then compare the highest-ranked holdings across all funds to identify the 10 most exposed overall and highlight those appearing in the top 10 of multiple funds. Holding names are anonymized due to data licensing constraints.

The overall top ten holdings, spans composite scores of 79 to 88. On average, four individual hazards exceed the fund-level threshold per holding where water stress is identified as the leading hazard. Eight of the ten holdings appear in the Commodities fund, confirming that the fund's elevated composite score is driven by a concentration of genuinely high-scoring individual companies. Two holdings appear across multiple funds simultaneously: one diversified mining company is held in both ACWI and Commodities, while a large-scale metals producer appears in ACWI, PAB, Commodities, and Emerging Markets.

Table 3 Most exposed holdings across all 9 funds

Holding description	Fund(s)	Composite score	Crossed Threshold	Leading Hazard Exposure
Metals and mining exploration company	Commodities	88	4	Water Stress
Diversified metals and materials producer	Commodities	84	4	Water Stress
Critical minerals producer	Commodities	82	4	Water Stress
Consumer products manufacturer	Emerging Markets	82	4	Water Stress
Base-metals mining company	Commodities	81	4	Water Stress
Diversified mining company	ACWI, Commodities	80	5	Water Stress
Industrial materials manufacturer	Commodities	80	4	Water Stress
Food and agricultural products company	Agri producer	80	4	Water Stress
Diversified mining company	ACWI, Commodities	80	3	Water Stress
Large-scale metals producer	ACWI, PAB, Commodities, Emerging Markets	79	5	Water Stress

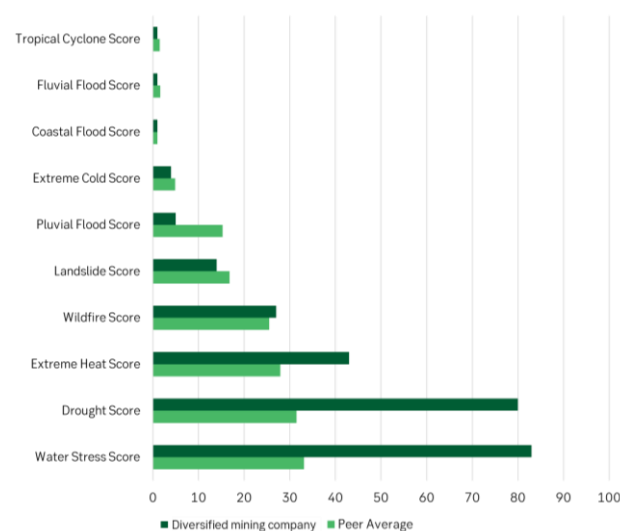
Source: S&P, SEB analysis

Is the exposure legitimate? Holding deep dive

As illustrated, each step in the top-down fund analysis, has its different purpose. The third step, analyzing the asset-level data reveals whether elevated exposure can translate into genuine operational vulnerability. To illustrate what that deeper layer of analysis can show, we take one of the holdings identified above, a diversified mining company, as a case study.

To contextualize the company's exposure, we benchmark it against a peer group of ten global metals and mining companies. This allows us to identify where the company's hazard scores are elevated relative to peers, and where they are not, providing a more targeted basis for deciding which exposures warrant deeper investigation. This would be the type of analysis an investor is likely to conduct when assessing a company's physical risk profile.

Figure 29 Diversified mining company exposure score vs global peer average exposure



Source: S&P, SEB analysis

The company's largest exposures are water stress, drought, and extreme heat, all materially above the peer average. Two factors could explain this divergence: the geographic distribution of the company's assets relative to peers, or differences in the types of assets included in the score aggregation. Distinguishing between these requires moving to the asset level.

The company's geographic concentration is a plausible driver: 80% of its assets are located in Chile, with the remainder split between the US and Canada. Peers hold assets across a broader set of geographies, including Zambia, Brazil, Argentina, and South Africa, which may dilute their aggregate scores across a wider range of

climatic conditions. On asset composition, both the company and its peers are overwhelmingly represented by mining properties in the underlying data, with minimal exposure to offices or headquarters. This means the composite scores reflect operational asset exposure rather than administrative footprint.

Having identified the company's largest hazard exposures, the next step is to determine which assets are driving them. For each of the company's top hazard exposures, we identify the ten most exposed assets and compare their scores against the country average for the same asset type and hazard.

Table 4 Asset level hazard scores

Below country avg. Above country avg.

Water Stress					Drought					Extreme Heat					Wildfire				
Top score 100 · +2 vs country avg.					Top score 100 · +22 vs country avg.					Top score 57 · +20 vs country avg.					Top score 99 · +38 vs country avg.				
Asset	Ctry	Type	Score	Avg.	Asset	Ctry	Type	Score	Avg.	Asset	Ctry	Type	Score	Avg.	Asset	Ctry	Type	Score	Avg.
Chilean mining property 01	CL	Mine	100	98	Chilean mining property 03	CL	Mine	100	78	Chilean mining property 09	CL	Mine	57	37	Chilean mining property 14	CL	Mine	99	61
Chilean mining property 02	CL	Mine	100	98	Chilean mining property 04	CL	Mine	100	78	Chilean mining property 03	CL	Mine	52	37	Chilean mining property 06	CL	Mine	98	61
Chilean mining property 03	CL	Mine	100	98	Chilean mining property 06	CL	Mine	100	78	Chilean mining property 04	CL	Mine	52	37	Chilean mining property 10	CL	Mine	98	61
Chilean mining property 04	CL	Mine	100	98	Chilean mining property 07	CL	Mine	100	78	Chilean mining property 07	CL	Mine	52	37	Chilean mining property 09	CL	Mine	97	61
Chilean mining property 05	CL	Mine	100	98	Chilean mining property 08	CL	Mine	100	78	Chilean mining property 08	CL	Mine	52	37	Chilean mining property 05	CL	Mine	91	61
Chilean mining property 06	CL	Mine	100	98	Chilean mining property 09	CL	Mine	100	78	Chilean mining property 06	CL	Mine	51	37	Chilean mining property 12	CL	Mine	69	61
Chilean mining property 07	CL	Mine	100	98	Chilean mining property 10	CL	Mine	100	78	Chilean mining property 10	CL	Mine	51	37	Canadian mining property 01	CA	Mine	13	2
Chilean mining property 08	CL	Mine	100	98	Chilean mining property 11	CL	Mine	100	78	Chilean mining property 11	CL	Mine	51	37	US mining property 01	US	Mine	2	29
Chilean mining property 09	CL	Mine	100	98	Chilean mining property 12	CL	Mine	100	78	Chilean mining property 14	CL	Mine	50	37	US mining property 02	US	Mine	2	29
Chilean mining property 10	CL	Mine	100	98	Chilean mining property 13	CL	Mine	100	78	Chilean mining property 13	CL	Mine	48	37	Chilean mining property 01	CL	Mine	1	61

Mine = mining properties · Score shading compares each asset with the country average for the same asset type

Source: S&P, SEB analysis

Take water stress, the company's largest exposure. Its ten most exposed assets are all Chilean mining properties, each scoring at the maximum of 100. Compared against the average water stress score for mining properties in Chile, the company's assets are only 2 points above the country average. This is significant and tells us that this is not a company specific risk, but a hazard shared by any operator with mining assets in Chile. The practical implication cuts both ways; governments may already have adaptation frameworks in place, or the burden of adaptation investment may fall on operators across the sector.

Wildfire is a stronger asset specific risk exposure. Six of the ten most wildfire-exposed assets are Chilean mining properties, scoring 91–99 which is around 30–38 points above the country average for the same asset type. Three of these properties also appear in the top ten for water stress, drought, and extreme heat, making the compounding dynamic explicit. It clearly illustrates how

compounding hazards interact: elevated water stress, drought, and extreme heat create conditions that amplify wildfire risk, particularly where mining assets sit near burnable vegetation.

The US assets tell a different story, that a top ranking does not necessarily mean high exposure risk. Although they appear among the company's ten most wildfire-exposed properties, their scores remain materially below the US country average of 29, suggesting that on a relative basis, wildfire exposure at these sites is well within the norm for the asset type and location.

Across all three of the company's largest hazard exposures, asset scores exceed the country average for the same asset type. This points to material, location-specific exposure with limited ability to mitigate exposure through relocation as mining properties cannot be relocated. The company is therefore dependent either on

Chilean government adaptation measures or on making its own adaptation investments.

For an investor, this is precisely the type of finding that could be decision useful for portfolio management and investment reallocation. If a physical risk event were to cause operational disruptions at these assets, beyond what insurance could absorb, the financial impact would ultimately flow through to the portfolio. The asset-level analysis is where that materiality becomes visible.

For corporates, this type of analysis can serve as an early signal, directing attention to the assets most warranting scrutiny before a physical event translates into operational or financial loss

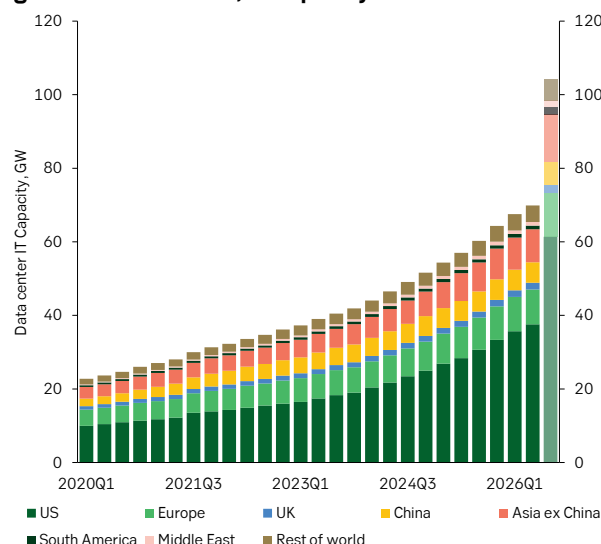
Case study 2: Data centre physical risk exposure across EU, US, and China

Electrification is moving more of the economy onto the power grid, and data centres are among the fastest-growing loads it must carry. They are also among some of the most climate-sensitive. Their dependence on cooling means that heat, water stress and drought translate directly into higher electricity demand, typically in the same hot, dry periods when grids are already stretched and thermal power plants may have to reduce output. Where these hazards materialise, physical risk at data centres is therefore not only an operational issue for operators; it becomes an additional load on the electricity system and a factor in how quickly and reliably the transition can proceed.

Data centre growth is reshaping electricity demand

Datacentres boost demand for electricity. The build-out of AI infrastructure is already visible. Global live data centre IT capacity has tripled since the start of 2020, from 23 GW to 70 GW in Q2 2026, and the past two years alone have added roughly as much capacity as the previous four. The pace is still picking up, with further 34 GW under construction, up 40% from a year ago, which would lift global capacity to more than 100 GW once completed. Running at full load, the capacity under construction alone would consume around 300 TWh of electricity a year resulting in around 910 TWh total consumption for just the IT equipment inside the data centres.

Figure 30 Dacacenter, IT capacity



Source: Macrobond, SEB Strategy Research

Data centres depend on cooling, and cooling depends on climate

Data centres rely on three core systems: power, cooling and network connectivity. They are engineered to stay online around the clock, with redundancy built in to ride through grid outages, maintenance and equipment failures.¹⁴ Physical climate hazards, however, can strain several of these systems at once. Given how data centres operate, we focus on four hazards that could disrupt a site if an event occurs at or near it: extreme heat, water stress, drought and flooding.

Extreme heat

As outside temperatures rise, cooling systems have to work harder and become less efficient, so electricity use climbs. This typically happens during heatwaves, when grid demand is already at its peak and thermal power plants may be forced to cut output because their cooling water is too warm. If temperatures exceed what a facility was designed for, cooling can fail altogether. During the UK's record heatwave in July 2022, when temperatures passed 40°C, Google shut down part of a London data centre after several redundant cooling systems failed at the same time, and Oracle reported similar problems at its London site.¹⁵

Water stress and drought

Data centres must continuously remove the heat their servers produce, and many do so with water. The International Energy Agency estimated that in 2023, 140bn litres of water were consumed directly for data centre cooling globally, an equivalent to 56,000 Olympic swimming pools.¹⁶ Switching to air cooling conserves water at an electricity cost. Where water is scarce,

¹⁴ DataCentreNews.org

¹⁵ [Google, Oracle Data Centres Knocked Offline by London Heat](https://www.google.com/pressroom/articles/Google-Oracle-Data-Centres-Knocked-Offline-by-London-Heat)

¹⁶ [IEA: Energy and AI](https://www.iea.org/energyandai)

operators trade water for electricity, which is why water risk is also an electrification issue.

Flood events

Flooding may not directly damage servers, but it can disable the infrastructure that keeps them running. In 2012, flooding in Manhattan disrupted fuel pumps for backup generators, forcing data centres offline.

Research questions & methodology

This analysis covers data centres in the three largest markets, Europe, the US and China, and asks two questions: which market has the largest share of its data centres among the most exposed sites, and for which hazards? In the analysis, the same high-exposure threshold is set across the three markets meaning the results are a relative comparison between those markets rather than a global ranking. The results could nonetheless be representative for the global market as Europe, the US and China account for around 85%¹⁷ of global data centre electricity use according to EIA. Because the sample covers most of the world's data centre activity, a global benchmark would unlikely change the main findings in a significant way.

Using S&P's asset-level physical risk exposure data, we identified 6092 data centres across Europe, the US, and China. The analysis uses the medium emissions scenario and the forecast year of 2030. The sample covers all assets that S&P classifies as data centres, run by cloud, colocation, telecom and enterprise operators. Hyperscale cloud providers, such as Amazon, Microsoft, Alphabet, Meta, Alibaba and Tencent, account for about 8% of the assets. Most of the rest are colocation providers and telecom & network operators.

A data centre counts as highly exposed to a hazard when its score is in the top 10% most exposed data centres in the three regions combined, a threshold set by SEB.

The metric used is physical risk exposure scores as defined above under Metric. Exposure shows where a hazard is present at a site, not whether it will cause damage, an uncertainty that remains as models cannot predict weather or physical hazard events for certain. Many data centres will have adaptation measures in place, such as backup cooling, raised equipment or redundant sites. However, locations of data centres are typically driven by

connectivity, power and land rather than climate risk, so the results indicate where exposure, and with it pressure on operations and grids, may exist.¹⁸

Three regions, three exposure profiles

On composite score level (combined exposure of all data centre assets in Europe, US, and China combined, to all climate hazards), Europe is slightly less exposed overall: 9% of its data centres fall in the top 10% of the most exposed data centres in the three regions combined, against 11% for the US and 13% for China. A typical European site has a physical risk exposure score¹⁹ of 51, against 53 in the US and 61 in China, as indicated in Table 3, where the top 10% cross a score of 68. However, the composite overview in Table 3, doesn't distinguish between hazard or regional profiles.

Table 5 Exposure score median comparison across regions

Region	Median composite within the region	Combined region 90th percentile	Difference between 90th percentile and regional median	# of Data Centers exceeding top 10% threshold	% of data centers exceeding 10% threshold
Europe	51	68	17 points below	189	9%
US	53		15 points below	290	11%
China	61		7 points below	176	13%
All three	54		14 points below	655	10.7%

Source: S&P, SEB Analysis

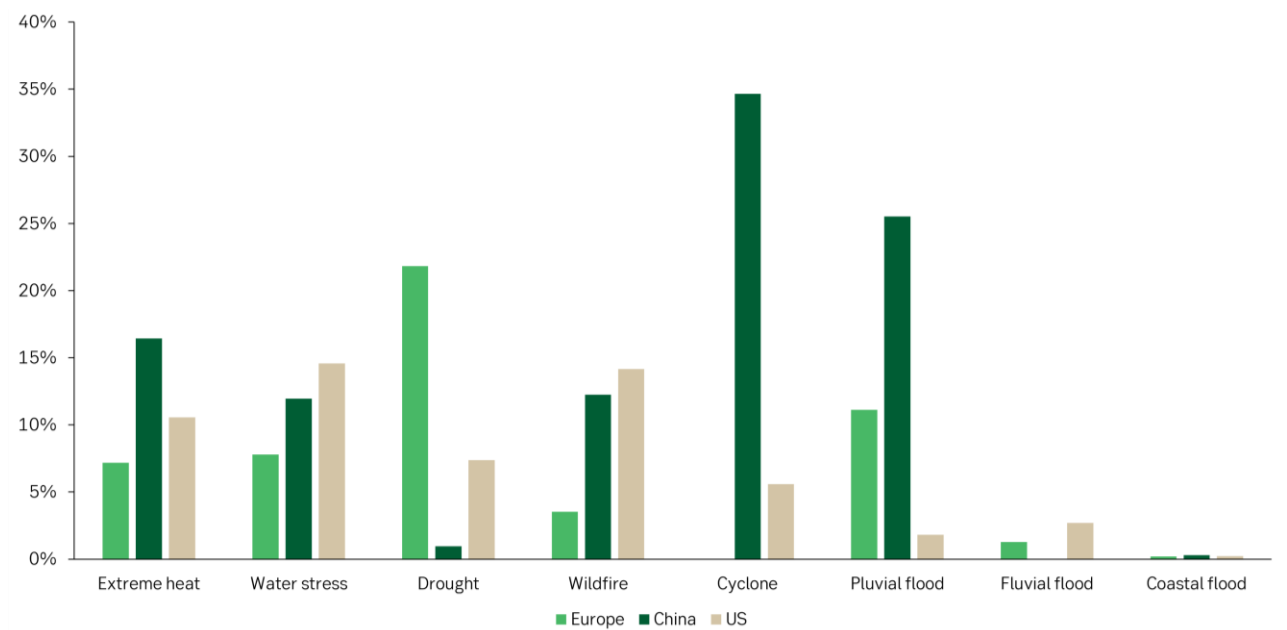
Largest physical risk exposures by hazard per region

Each region has a distinct hazard profile (Figure 31). China's exposure is driven by storms and heat: 35% of its data centres show cyclone exposure, 26% heavy-rain flooding and 16% extreme heat. The US is driven by water stress (15%) and wildfire (14%). In Europe, the exposure is mostly driven by drought (22%) and to some extent heavy rain flooding (11%).

¹⁷ IEA Website Temporarily Down

¹⁸ A limitation to this analysis is that a small edge site and a 300 MW hyperscale campus carry equal weight, so the results describe the share of *sites*, not the share of *capacity* or *electricity load*.

Figure 31 Share of each region's data centres in the top 10% for each hazard (threshold across all three regions)



Source: S&P, SEB Analysis

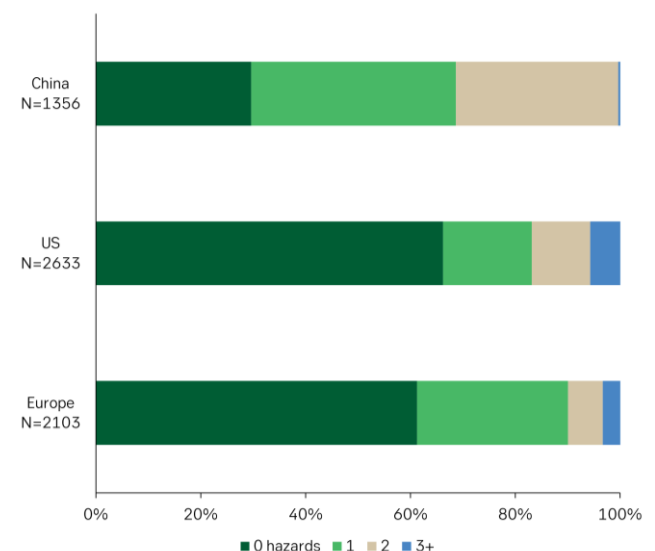
Figure 31 shows how exposed each region is to each hazard on its own. Figure 32 adds a second dimension and the starting point at the data centre, analysing for how many hazards each data centre ranks in the top 10% most exposed across all three regions.²⁰

Data centres in China have the broadest exposure: seven in ten sites exceed the top-10% threshold for at least one hazard, and 31% exceed it for two. Tropical cyclones are the most common hazard above the threshold, followed by pluvial (heavy-rain) flooding.

The most stacked exposure, however, sits in the US and Europe. Only 0.4% of data centres in China exceed the threshold for three or more hazards, against 5.7% in the US and 3.3% in Europe. Exposure in China is therefore widespread but rarely stacked, while in the US and Europe it is less common but more concentrated at individual sites.

A word of caution when interpreting the numbers. A data centre not exposed to hazards above the 10% threshold is not necessarily free from physical risk exposure. It is a consequence of the chosen threshold in this specific analysis and the relative nature of the data.

Figure 32 Share of data centres by number of hazards for which they rank among the 10% most exposed



Source: S&P, SEB Analysis

When cooling becomes a grid problem

Not all hazards weigh equally on data centres. Floods and cyclones mainly cause direct damage, disabling power systems, equipment or access at the site. Extreme heat, water stress and drought work differently: they reduce how well a data centre can cool itself, so keeping it running requires more electricity. These are chronic hazards that are often overlooked in the market. When these slow-onset events materialise, the impact therefore extends beyond

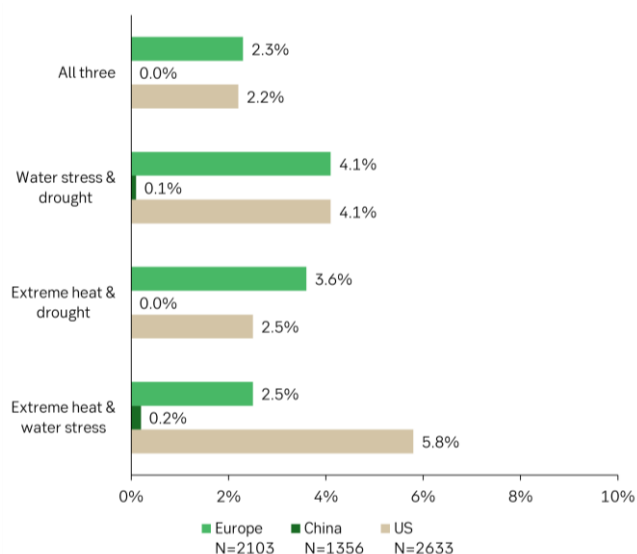
²⁰ Extreme cold and landslide are excluded because their scores take only a few values, so too many assets tie at the threshold, therefore insights are not valuable.

the facility to the grid it relies on, which makes them an electrification issue as well as an operational one. For this reason, these hazards are the focus of the analysis that follows.

Figure 33 shows the share of each region's data centres that rank in the top 10% for different combinations of extreme heat, water stress and drought, with the same threshold set across all three regions combined.

The results show that almost no Chinese data centre is exposed to any combinations of these hazards: the share is 0–0.2% for every pair and zero for all three.²¹ China has many hot sites and many water-stressed sites, but they are largely in different places, and drought barely features. Its physical risk exposure comes mainly from storms, cyclones and heavy-rain flooding, rather than from the combination of heat and water scarcity. Europe and the US, by contrast, share the same core exposure. About 2.3% of European and 2.2% of US data centres, 48 and 58 sites respectively, are in the top 10% for heat, water stress and drought simultaneously.

Figure 33 Share of each region's data centres on top 10% for each combination of hazards



Source: S&P, SEB Analysis

Mainz: a data centre cooled by the Rhine

A new campus in Mainz, near Frankfurt, shows how these hazards exposures can compound. The 54 MW FRA-Mainz data centre, developed by Green Mountain and the utility KMW and due to be ready for service in the fourth quarter of 2026, is cooled with water from the Rhine, and its waste heat is fed into Mainz's district heating network.²²

According to KMW, the site has three cooling routes: heat recovery into district heating is preferred, Rhine-water cooling takes over when the waste heat cannot be used, and conventional rooftop compression cooling is the final option.²³

Each cooling route is exposed to different hazards. During a heatwave, lower demand for district heat means that heat must be removed through other routes. If this coincides with drought, as in summer 2026 with the lowest Rhine water levels in more than 50 years, reduced river cooling increases reliance on mechanical cooling, increasing electricity use and costs and, in extreme cases, limiting cooling capacity.²⁴ The key risk here is not failure of one route, but that all three come under pressure at the same time. Assessing hazards individually can therefore miss compound exposure.

Where does the physical risk exposure for European data centres come from?

Table 6 Share of each country's data centres in the top 10% for each hazard, across Europe, the US and China combined covers a sample of European countries having at least 30 data centres, plus Greece, with only 15 centres, included because of high exposure; its figures should be read as indicative. The heatmap shows that Europe's exposure splits into four geographic groups, each dominated by a different hazard.

In southern Europe, Greece, Spain and Italy are geographically exposed to a combination of drought, water stress and extreme heat, and they also host all of Europe's triple-exposed data centres apart from two in Cyprus. These are sites where cooling demand, water scarcity and grid stress coincide.

France and Germany form a drought band. With about 600 data centres between them, the two countries account for two-thirds of Europe's drought-exposed sites (309 of 459), although exposure to heat and water stress is low.

In northern Europe and Benelux, the pattern reverses: the main hazard is heavy-rain flooding rather than heat or drought with data centres in Belgium (100%), Denmark (69%) and Norway (63%) particularly exposed but also in Sweden (21%) and the Netherlands (17%). Belgium data centres are interestingly also exposed to high water stress.

As indicated in the heatmap, the major hubs in the UK, Ireland, Poland, Switzerland, Austria and Finland, show few

²¹ The exposure to the combination of these hazards for Chinese data centres may exist however, below the set threshold of this analysis.

²² <https://greenmountain.no/data-centre/fra-mainz/>

²³ <https://greenmountain.no/data-centre/fra-mainz/>

²⁴ <https://www.brusselstimes.com/2333385/water-levels-on-the-rhine-reach-a-new-record-low>

or zero data centres with top-10% exposure to any hazard, despite hosting close to 900 of the data centres analysed.

Table 6 Share of each country's data centres in the top 10% for each hazard, across Europe, the US and China combined

Country	# of data centres	Drought	Water stress	Extreme heat	Pluvial	Fluvial	Coastal
Greece	15	100%	87%	87%	0%	0%	0%
Spain	63	98%	73%	32%	0%	0%	0%
Italy	131	21%	24%	32%	0%	1%	0%
France	226	67%	8%	11%	8%	0%	0%
Germany	372	42%	0%	0%	7%	0%	0%
Belgium	43	0%	77%	0%	100%	0%	0%
Denmark	42	0%	0%	0%	69%	0%	0%
Norway	52	0%	0%	0%	63%	31%	0%
Sweden	67	0%	19%	0%	21%	4%	0%
Netherlands	183	0%	0%	0%	17%	0%	2%
United Kingdom	367	0%	0%	2%	4%	1%	0%
Ireland	81	0%	0%	5%	0%	0%	0%
Austria	64	0%	0%	8%	0%	0%	0%
Poland	77	0%	0%	0%	0%	0%	0%
Switzerland	75	0%	0%	0%	0%	0%	0%
Finland	32	0%	0%	0%	0%	0%	0%

Source: S&P, SEB Analysis

Our analysis suggests that Europe is, on most measures, less exposed than the US and China. Drought is the exception, and where exposure exists it is concentrated: a southern belt where heat, water stress and drought coincide, and a drought band across France and Germany, two of Europe's largest data centre markets. These are precisely the regions where cooling choices carry an electricity cost. Moving from evaporative to air cooling to save water raises power demand, and every new data centre sited in a hot, drought-prone area adds peak load to grids that are themselves weather-exposed.

From broad exposure to targeted investigation

Every fund holds companies with assets spread across geographies, and a single asset in the wrong place at the wrong time can disrupt operations and ultimately affect investment returns. Moving from macro score to hazard - level exposure, to asset-level benchmarking, turns exposure from a number to a decision-useful signal.

In the absence of a standardised methodology for physical risk data, this granularity matters. Without understanding what is driving a score and whether it reflects genuine exposure, composite figures can mislead as easily as they inform. A physical risk event can affect revenues and costs, but also have wider financial consequences as lenders and insurers reprice exposure, and affected assets become less insurable, financeable and valuable over time.

SEB's Physical Risk Intelligence Tool (PRIT) enables tailored physical exposure analysis for investors and corporates, benchmarking portfolios and companies against relevant peers and indices, from fund-level scores down to individual assets. This article offers a preview of that analysis. It is worth noting that the analysis presented here reflects one scenario and time horizon: the medium emissions pathway (SSP2-4.5) in 2030. Physical exposure is not static. PRIT allows this dimension to be explored across scenarios and time horizons, to assess not only current exposure but how it may evolve over time.

Water: from systemic risk to bankable opportunity

Water is both a systemic financial risk and a significant investment opportunity

Water is fundamental to economic growth, industrial production and societal development. Yet ageing infrastructure, persistent underinvestment, pollution and growing demand are putting water systems under increasing pressure, while climate change brings increasing unpredictability through droughts and floods. This article sets out why water is becoming a material financial risk and how SEB is working with clients to turn it into bankable opportunities.

From environmental concern to systemic financial risk

Water is increasingly recognised as a material financial risk by leading international institutions.

The European Central Bank (ECB) has identified water scarcity and ecosystem degradation as threats to financial stability, with almost 15 per cent of euro area economic output potentially at risk from surface water scarcity under an extreme but plausible drought scenario. Research published by the Bank for International Settlements (BIS) similarly connects water scarcity with risk to economic growth, investments and inflation. Meanwhile, the World Economic Forum (WEF) highlights an estimated EUR6.5 trillion water infrastructure investment gap by 2040, reinforcing the need for innovative financing structures and private capital.

Water availability, quality and reliability are becoming important considerations for economic resilience, financial stability and long-term capital allocation.

Dealing with the Water paradox

Water is both a fundamental human right, requiring public accountability and equitable access, and an essential economic resource with substantial financial value.

Historically, reliable water infrastructure made water an almost invisible dependency for businesses and financial institutions, with risks often considered beyond conventional credit and investment horizons. That is changing. Ageing infrastructure, tighter regulation, rising costs and more frequent droughts and floods are bringing

water risks into today's financial decisions, affecting operations, asset values and creditworthiness.

For essential public water services, the central question is not necessarily who owns or finances the infrastructure, but how governance ensures that public interests remain in control. Experiences from privately financed water markets, including the UK²⁵ and US,²⁶ underline the importance of accountability, effective regulation and the ability of public authorities to intervene.

From a private capital perspective, with strict fiduciary requirements and expertise but with limited water expertise, mobilisation of capital should happen in close collaboration with public players, governance- and water-experts, as well as ongoing dialogue with other stakeholder groups (like NGOs) to identify risks and prevent mismanagement. These considerations must be embedded in financing structures, not only to protect affordability, service quality and public trust, but also to strengthen the long-term stability and predictability of cashflows.

In industrial water, wastewater treatment and flood protection, private capital can often be mobilised more directly where investments deliver identifiable operational benefits, contracted revenues or measurable risk reduction. Public infrastructure may nevertheless require similar safeguards.

These are complementary markets requiring different governance and financial structures, but sharing the same objective: accelerating investment in water resilience while safeguarding public interests and social stability.

²⁵ Ofwat, [Statutory duties and consumer protection](#)

²⁶ US EPA, [Public water system oversight and enforcement](#)

Turning Water challenges into financial solutions

Together with clients, SEB approaches water through four interconnected financial perspectives:

Risk management: Collaboration with clients to understand how water scarcity, flooding, pollution and infrastructure vulnerabilities affect their operations, assets and financial exposures.

Balance sheet perspective: Identification of ways where financial solutions can unlock required Water investments (like - efficiency, treatment, reuse, infrastructure renewal and resilience).

Product development: To enable dedicated water solutions, internal and external experts co-work on product development to manage risk reduction, capital optimisation and new investment opportunities.

Institutional capital mobilisation: Water-related infrastructure, which often has a lifetime of 50+ years with stable returns, provides a good asset (when properly structured) for long term pension liabilities. By aligning risk allocation, investment horizons and return expectations, we seek to create more systematic and scalable access to capital for clients and projects.

A central part of this work is overcoming barriers that have traditionally constrained water investment. Together with clients and partners, we explore service-based and performance-linked models that can convert upfront capital requirements into predictable operating expenditure, alongside on- and off-balance-sheet solutions and risk-sharing arrangements.

By combining predictable revenue structures, appropriate risk allocation and long-term investment horizons, we seek opportunities that meet investors' return requirements while delivering affordable and resilient water services.

SEB Water: from expertise to transactions

SEB Water was established in 2024 to strengthen our capabilities in addressing water-related financial risks and opportunities.

Building on our experience in Green Bonds, sustainable finance, blue financing and corporate advisory, we work across the bank and alongside clients to identify, structure and finance water-related investments.

By engaging directly with clients' finance, operational and sustainability teams, we seek to translate water challenges into solutions that strengthen resilience, optimise capital allocation and support long-term business performance.

In the near term, we see much of the growth potential in industrial water (efficiency/circularity), wastewater and

flood protection, where investment needs can be connected more directly to commercial value and risk reduction.

For essential public water infrastructure, we see a longer-term opportunity to develop governance models that enable private investment while safeguarding public accountability, control and affordable access.

Not every opportunity will immediately meet commercial or credit requirements. Our role is to work together to identify viable structures, allocate risks appropriately and find practical routes towards transactions.

Mobilising existing financial capabilities

The challenge is not necessarily a shortage of capital, but how quickly existing financial infrastructure can be mobilised.

Banks have established capabilities for risk assessment, capital allocation and transaction execution. Yet these are organised around existing business areas and performance measures, including shorter term return on equity (RoE) and cost-to-income (C/I) ratios for business managers.

Developing new markets requires cross-divisional collaboration and investment, while the financial benefits may take time to materialise or might be split between units. This creates a mismatch between society's long-term infrastructure needs and the financial sector's shorter-term commercial incentives, which need to be assessed.

At SEB, we address this by connecting existing capabilities around concrete client needs, building on established financial disciplines while enabling innovation across organisational boundaries.

The green bond market demonstrated how financial innovation can scale with practical transactions, common standards and cooperation. We believe water presents a comparable opportunity, but with increasing urgency.

We build through partnerships and welcome additional engagement with companies, investors and public institutions seeking solutions to water-related challenges. Where the business case, governance and risk allocation are sound, we are keen to contribute our advisory, structuring and financing expertise.

Water has long been an essential but largely invisible foundation of economic activity. As its reliability becomes less certain, its financial relevance is increasingly clear. At SEB, we are proud to work with our clients and partners to turn these challenges into opportunities through innovation, collaboration and transactions, not simply because water is an essential infrastructure, but because we believe it is prudent banking and required for long-term stability

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