Scientific Climate Ratings
An EDHEC Venture

Scientific Climate Ratings spotlights nations most at risk for economic fallout due to climate change

Sovereign Climate Risk Ratings quantifies the future effects of chronic physical climate risk on the GDP of 190+ nations and 3K+ subregions, filling a sovereign pricing market blind spot

FOR IMMEDIATE RELEASE

24 JUNE 2026—Scientific Climate Ratings, an EDHEC Business School venture, is proud to announce the creation of **Sovereign Climate Risk Ratings,** a new scientific standard for understanding and pricing the macroeconomic impact of rising temperatures on sovereign economies.

Based on the academic research and expertise of the EDHEC Climate Institute and the in-depth market insights of Scientific Climate Ratings, Sovereign Climate Risk Ratings capture, for the first time, the winners and losers in a future global economy where the effects of chronic physical climate risk have real and lasting impacts on Gross Domestic Product (GDP).

These new ratings deliver economically interpretable, scenario-consistent expected macroeconomic impacts, enabling investors, asset managers and banks to put a price tag on sovereign climate risk. One of the key strengths of Sovereign Climate Risk Ratings is their subnational granularity: national GDP impacts are derived from estimates of Gross Regional Product (GRP), allowing the methodology to capture significant variations within a single country.

For example, the United States of America is a sovereign entity with high internal climate heterogeneity: projected impacts vary substantially between warmer southern states such as Arizona, Texas and Florida, and cooler northern states such as Minnesota, Montana and North Dakota. By accounting for these subregional variations and differences in population distribution, the methodology projects a **GDP-per-capita loss for the US of -4.6% in 2035 and -10.4% in 2050**.

Sovereign Climate Risk Ratings are calculated at two reference horizons, 2035 and 2050, providing investors with standardised benchmarks for comparing countries over time. Annual time series are also available, allowing users to analyse the evolution of projected impacts at specific intervals. Each country receives a letter grade from A to G, with G representing the highest level of exposure.

These grades provide a clear picture of winners and losers. For example, by 2035, the US has an overall grade of E, whereas most of Western Europe has grades ranging from A to C. Much of the African continent will be heavily exposed to extreme temperatures, with grades ranging from D to G. (See appendices for more information.) The table below illustrates the range of projected impacts across a selection of major economies, highlighting how exposure can vary significantly even among G20 countries.

Country	2035 impact (%)	2050 impact (%)	Sovereign Rating
USA	-4.6	-10.4	E
China	-3.8	-8.5	C
Russia	-0.8	-1.7	A
France	-2.6	-5.9	B
United Kingdom	-1.8	-4.0	A
Australia	-3.8	-8.6	C

Canada	-3.4	-7.7	C
Brazil	-5.8	-13.0	G
India	-4.8	-10.8	E

Table: Projected GDP-per-capita impacts in 2035 and 2050 under the Expected Scenario, and 2035 Sovereign Climate Risk Ratings, for a selection of G20 economies

To put these figures into perspective, the US economy contracted by 3.5% in 2020 due to the Covid-19 pandemic—its sharpest annual decline since 1946. Unlike the Covid-19 shock, however, climate-related economic losses are not expected to be temporary: they are expected to intensify further by 2050.

"Climate change is a global phenomenon, but climate risk is local and financial. Our framework captures the structural, compounding output losses caused by chronic warming at the regional level and aggregates them into sovereign-level impacts," said Rémy Estran-Fraioli, PhD, CEO of Scientific Climate Ratings. "It provides the missing transmission channel between climate warming and sovereign fundamentals, identifying structural exposure before spreads fully adjust."

Sovereign Climate Risk Ratings and their underlying macroeconomic impacts are available across nine forward-looking climate pathways: the seven scenarios published by the Network for Greening the Financial System (NGFS), complemented by two higher-warming pathways, Climate Breakdown and Climate Destabilisation. The framework also includes an Expected Scenario, derived from the probability-weighted aggregation of these nine pathways, which serves as the reference basis for the sovereign rating scale. Together, these form the Scientific Climate Scenarios developed by the EDHEC Climate Institute.

"Chronic risks rarely dominate headlines, but increasingly, they are impacting a nation's gross productivity, thereby reducing growth potential," said Nicolas Schneider, PhD, Senior Research Engineer-Macroeconomist at the EDHEC Climate Institute. "Our framework quantifies this risk as an unconditional expectation that can be added to investors' financial models. The competitive edge of this rating is the early identification of structural sovereign exposure before it is priced into market spreads."

Sovereign Climate Risk Ratings cover chronic physical risk arising from temperature-driven productivity shifts across 191 countries and more than 3,400 subnational regions, which together represent over 95% of global economic output. The framework will continue to evolve through additional quantitative metrics, enhanced granularity and the progressive integration of estimates of expected sovereign spread adjustments.

Read more: https://scientificratings.com/sovereign-ratings/

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Appendix 1 – Sovereign Climate Risk Rating methodology

The complete 4-stage methodology is presented in detail in Schneider (2026a, 2026b). It consists of:

- The quantification of GRP per capita growth responses to historical climate
- The projections of future physical risk-induced damages to the level of GRP per capita
- The estimation of an aggregate damage function linking region-level projected damages to global mean temperature outputs from NGFS MAGICC over time
- The use of resulting region-specific parameters to re-project SSP–RCP macroeconomic damages under all NGFS Scenario × IAM trajectories, matched with scenario probabilities to compute the ultimate unconditional expected loss trajectory

This framework exploits within-region variation, removing the cross-sectional confounders that affect traditional country-level estimates. The estimated damage relationship is concave and non-linear, peaking near the 13°C productivity optimum referenced by the macroeconomic literature.[1]

These results are then aggregated from regions to sovereigns using population-density weights linked to sub-national administrative boundaries from GADM.

Each Sovereign Climate Risk Rating combines a letter-grade rating on an A–G scale. The letter grade serves as a summary convenience layer placed on top of these probability-weighted expected macroeconomic losses, expressed in terms of GDP per capita.

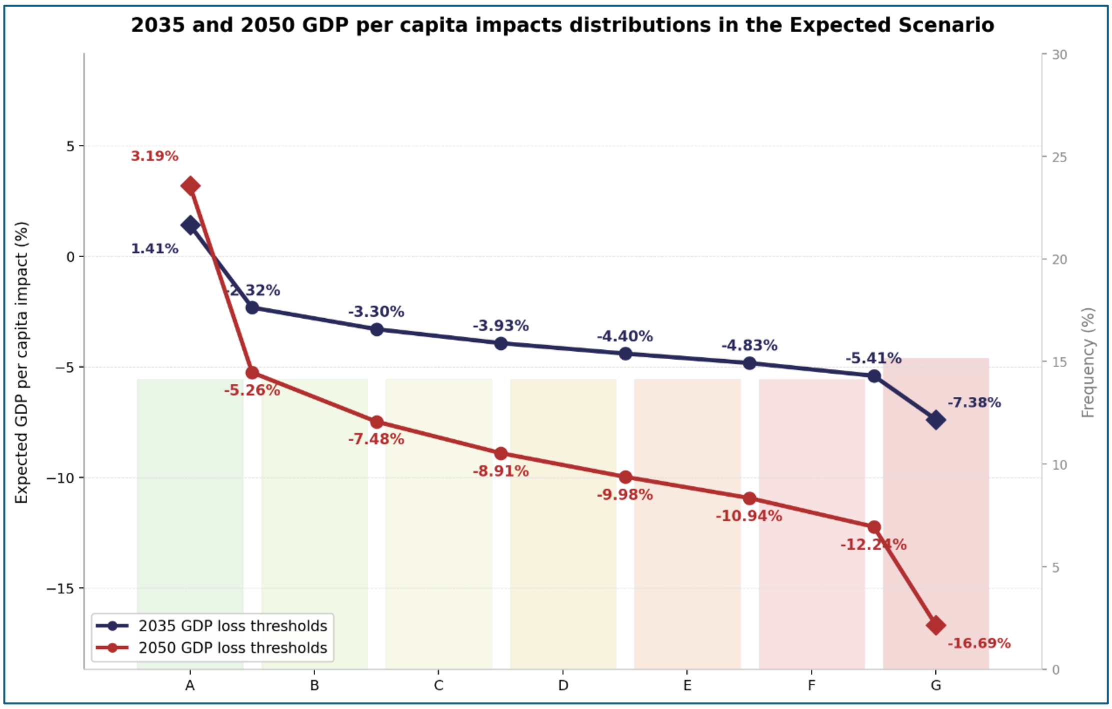

Figure 1: Sovereign Climate Risk Ratings GDP per capita thresholds along A-G scale distribution across the 191 sovereign countries universe

The framework has been designed to support the integration of climate risk into prudential risk-management processes, including:

- Banks' Internal Capital Adequacy Assessment Processes (ICAAP), scenario analyses, and broader risk-management frameworks

[1] See Schneider (2025) and Burke (2015) for further details

- Insurers' Own Risk and Solvency Assessments (ORSA) and climate-change scenario analyses

Appendix 2 – Main results

1. Sovereign universe and sub-national worldwide view

The geography of high-damage sovereigns concentrates in four contiguous bands of exposure: southern Europe, West Africa, tropical Asia, and the southern United States.

Under the NGFS-based sovereign-risk framework, equatorial and tropical subnational regions face the largest projected declines in Gross Regional Product (GRP) per capita over the 2050 horizon.

By contrast, several northern-latitude sovereigns currently operating well below the 13°C productivity optimum face near-zero or slightly positive losses at the 2035 horizon, before progressively turning slightly negative as cumulative warming pushes them through and past the optimum.

Figure 2 below provides a region-level view of macroeconomic losses by 2050, while Figure 3 showcases the resulting related Sovereign Climate Risk Ratings, derived from the modeling scheme described in Appendix 1.

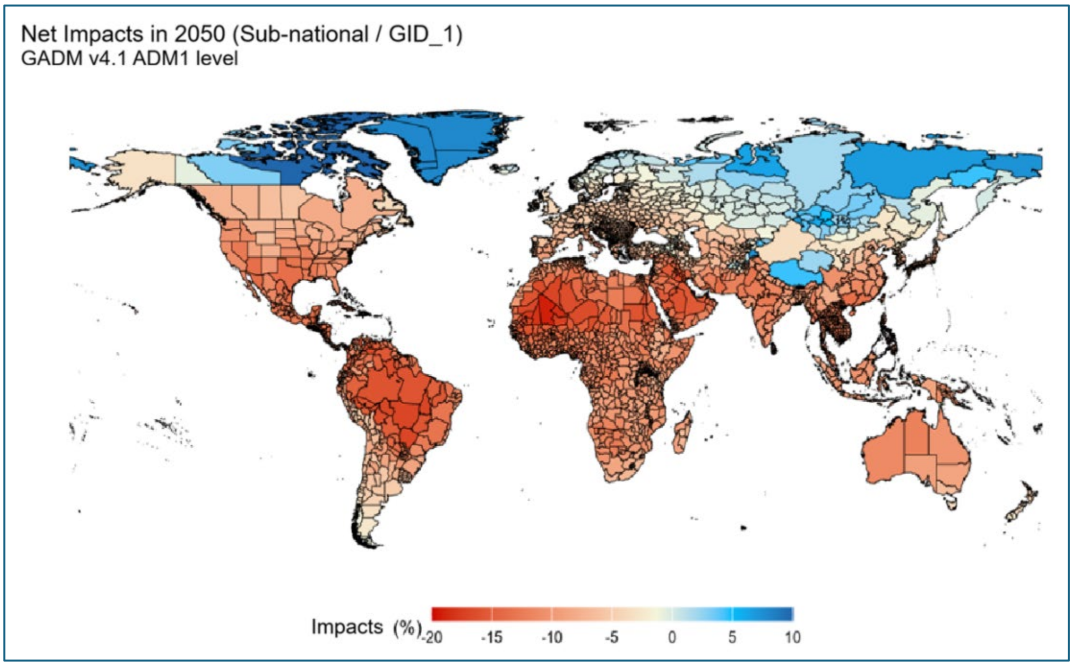

Figure 2: Region-level GRP impacts per capita under the Expected Scenario in 2050

The figure shows the globally distributed net unconditional expected GRP-per-capita impact in 2050 across >3,400 productive regions collectively covering 191 national economies. This unconditional expectation is computed using probabilistic weights across all nine scenarios × three IAMs. Probabilistic weights are taken from the ECI-emulated "probabilistic scenario framework" project. Except in some areas, region-level expected changes reveal a clear global gradient, with net gains at higher latitudes and net losses toward the tropics. The global ranking of countries (and regions within them) tends to correlate with the inverse distance from the equator, which is generally consistent with the conclusions of academic literature. For some high-latitude economies (e.g., Canada, Russia), the sign of the aggregate impact depends on the balance between net-damaging and net-benefiting regions. Within a country, the net outcome of these two opposing forces is ultimately modulated by the geographic distribution of economic activity, as proxied by population-density weights. Source: EDHEC Climate Institute.

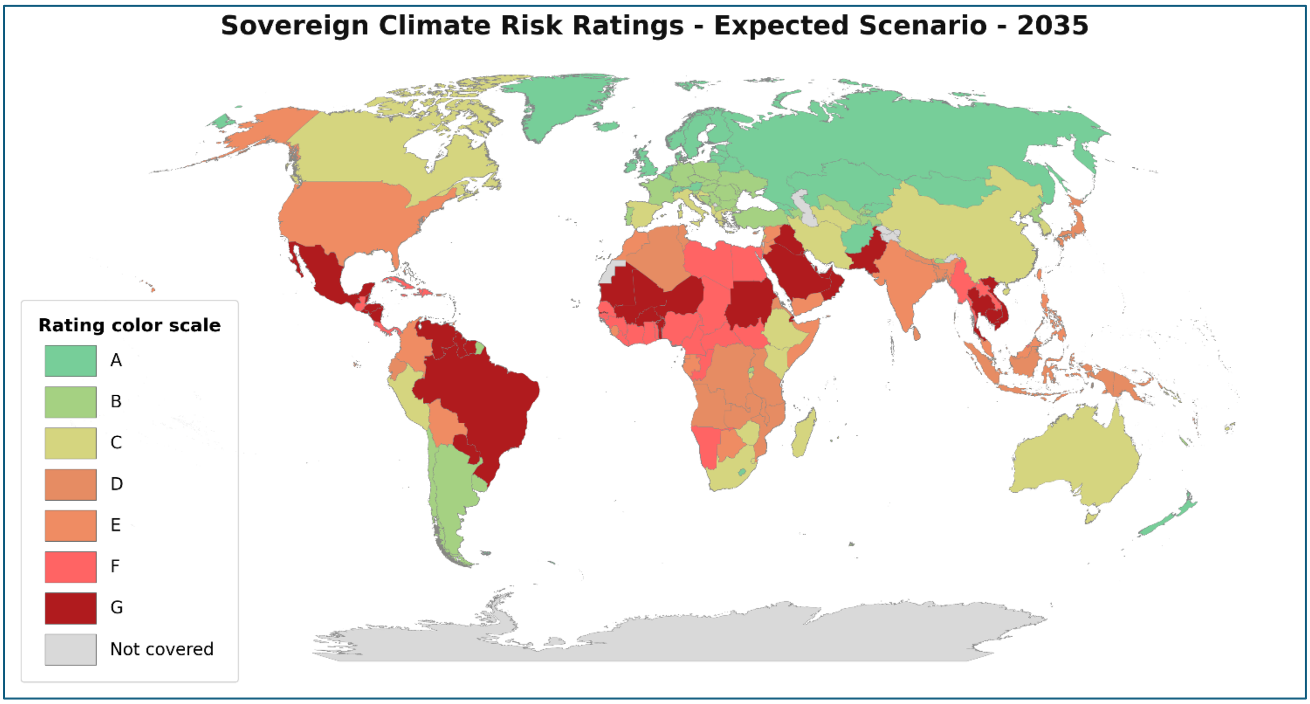

Figure 3: Sovereign Climate Risk Rating universe under the Expected Scenario

This figure shows the Sovereign Climate Risk Rating (A–G) for 191 nationally rated economies in 2035 under the unconditional expected scenario. Each country's rating is derived from a point-in-time GDP-per-capita impact estimate in 2035. Countries are then ranked by their expected impact within the global cross-country distribution of 191 sovereigns and assigned to one of seven rating bands (A = least exposed, G = most exposed), each band covering approximately 27 countries. Consistent with the sub-national damage gradient, the global distribution of ratings exhibits a broad latitudinal pattern, with higher-rated (more exposed) sovereigns concentrated in tropical and equatorial regions and lower-rated sovereigns prevailing at higher latitudes. This pattern reflects the well-documented non-linear temperature–productivity relationship, which produces the largest marginal damages in already-hot economies.

2. The USA: A compelling example to demonstrate why sub-national granularity matters

The United States illustrates why sub-national granularity is decisive for sovereigns with high internal climate heterogeneity. A naïve country-level assessment based on the US national average temperature (approximately 12–13°C) would place the country near the 13°C productivity optimum, thereby generating an artificially benign aggregate damage estimate.

Looking at the data region by region tells a different story, because of where most people live. The hot, densely populated states of the South and Southwest-Arizona, Texas, Florida-already sit at an average of 20-25°C. That puts them well past the peak of the inverted-U damage curve, on the steep downslope where each additional degree of warming causes rapidly mounting losses. By contrast, northern states like Minnesota, Montana, and North Dakota sit at just 4–8°C. They fall below the ideal temperature, but they're home to far fewer people and much less economic activity.

Averaging across the country and weighting by population doesn't erase these regional extremes. Because the damage curve drops off more steeply above the ideal temperature than below it, the heavily populated southern states end up dominating the national total

The resulting sovereign-level expected GDP per capita loss is materially larger than what country-level aggregated damage models would have predicted**. This results in a consolidated GDP per capita loss for the USA of -4,6% in 2035 and -10,4% in 2050, under the Expected Scenario**.

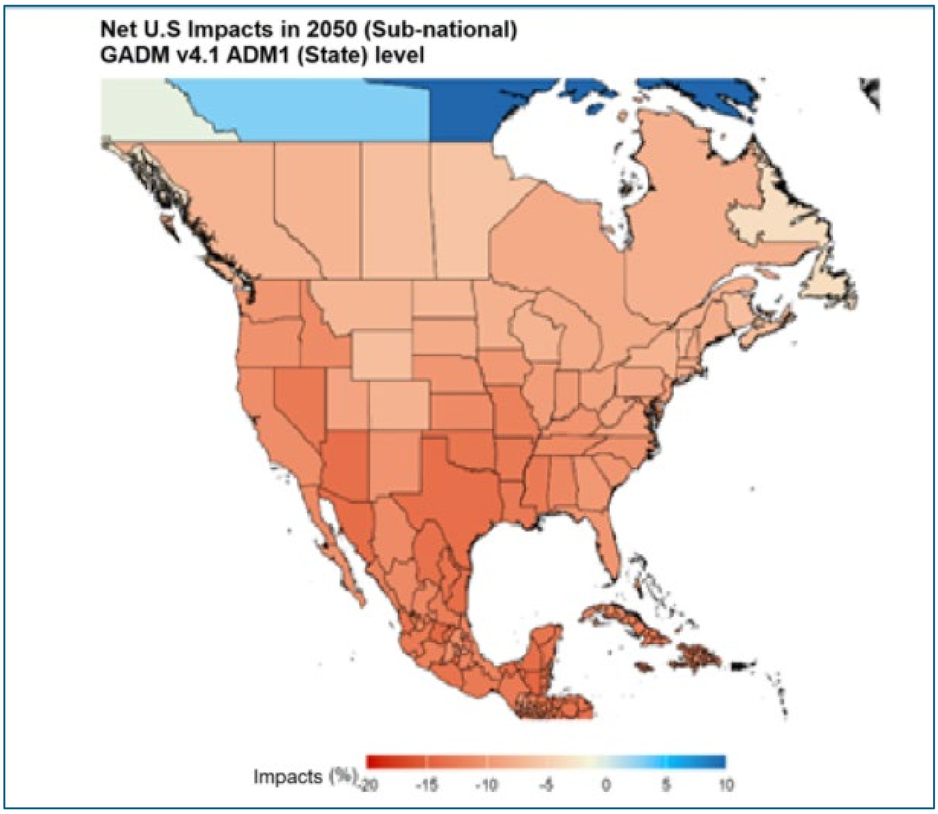

Figure 4: Sub-national Gross Regional Product per capita, zoomed in on North and Central America regions

Another interesting insight is to observe that, while the consolidated USA 2035 rating might be quite insensitive to scenario choice in the 2035 time horizon-reflecting the narrow cross-scenario global mean temperature spread before mid-century, as compared to 2050 ratings' sharp divergence across scenarios-the regional-level disaggregated view provides a different storyline as highlighted in Figure 6. Depending on which scenarios are accounted for, regional-level minimum and maximum values already vary significantly across scenarios within a 10-year time horizon, reaching drastic levels of macroeconomic loss.

This final view ultimately highlights the difference between two dominant approaches, which our product captures well in both cases:

- "What-if" approaches, widely used in risk management stress-test frameworks by prudential authorities, and recently praised again in the May 2026 ECB working notes. These aim at evaluating resilience under low-probability most adverse situations.
- "What's likely" approaches, much needed by financial institutions and business planners in order to account for in their financial statements and investment decisions. In that sense, the probability-weighted NGFS-aligned "Expected Scenario" appears as the much-needed solution for the market.

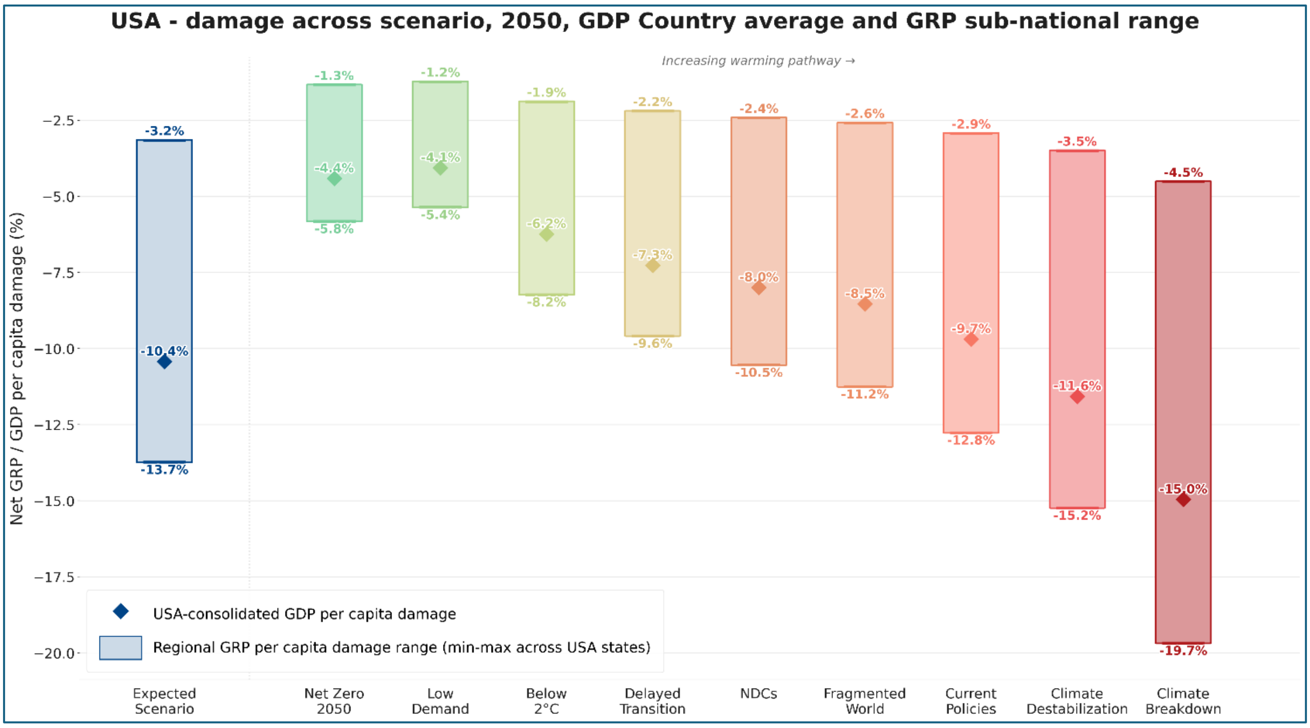

Figure 5: USA-consolidated GDP per capita and sub-national GRP per capita disaggregated range, displayed across the 9 NGFS-aligned probabilised climate pathways defined under the "Scientific Climate Scenarios" framework, compared against the probability-weighted "Expected Scenario"

About: Scientific Climate Ratings is an independent rating agency within the EDHEC Business School venture ecosystem. We provide science-based, forward-looking ratings to help investors and corporates assess the financial materiality of climate risks and drive effective decarbonisation and resilience strategies. Leveraging EDHEC's award-winning expertise in climate finance, Scientific Climate Ratings delivers transparent, standardised assessments covering over 6,000+ infrastructure assets, 191 sovereign countries and 3400+ sub-national regions worldwide, with coverage to expand to 4,000+ listed equities by 2026. Our ratings enable the financial community to quantify and manage both physical and transition risks - setting a new global benchmark for climate risk assessment.

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