

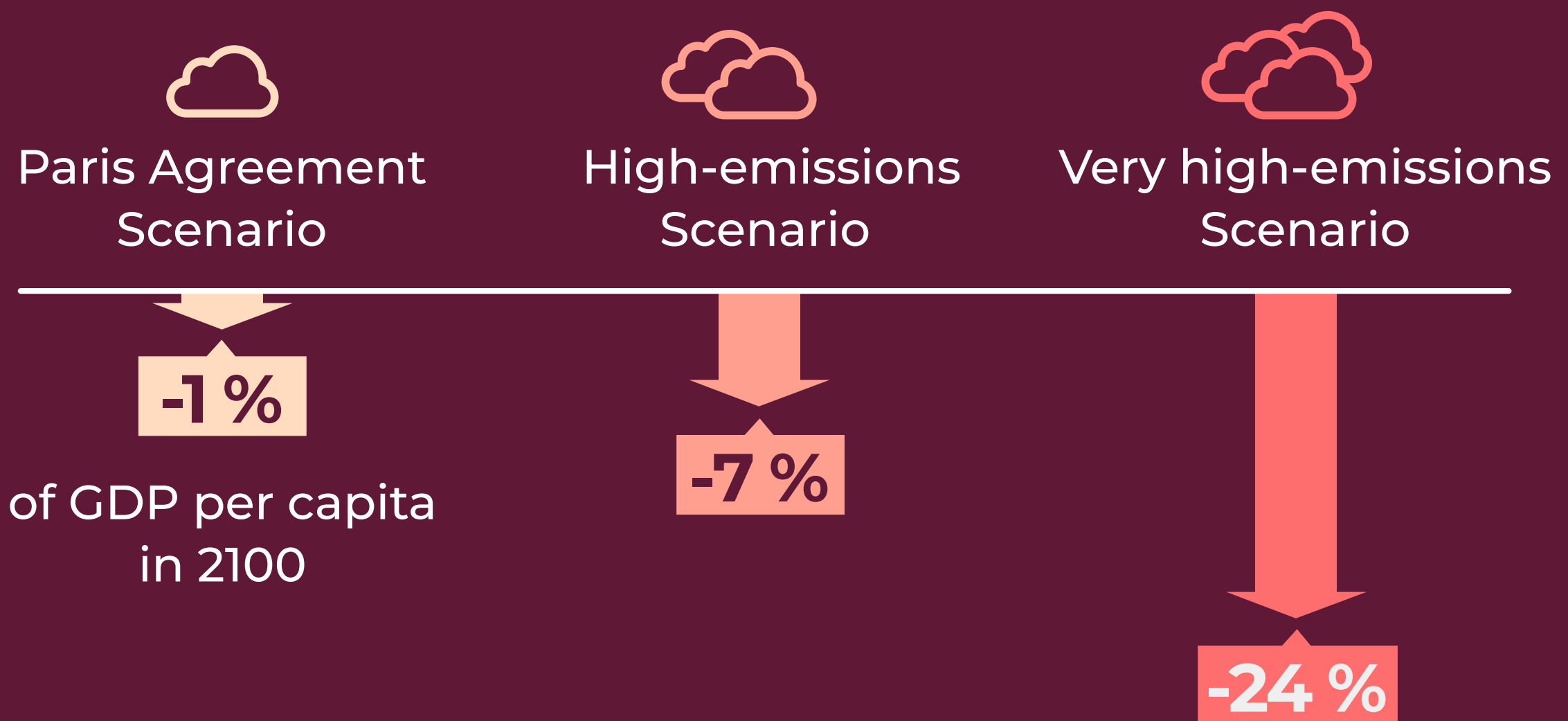


Climate change:

**the new geography
of economic losses**

Climate change has a major impact on global economy

By 2100, according to the IMF, the losses in GDP per capita would be:



But these figures are averages; they don't tell the whole story...



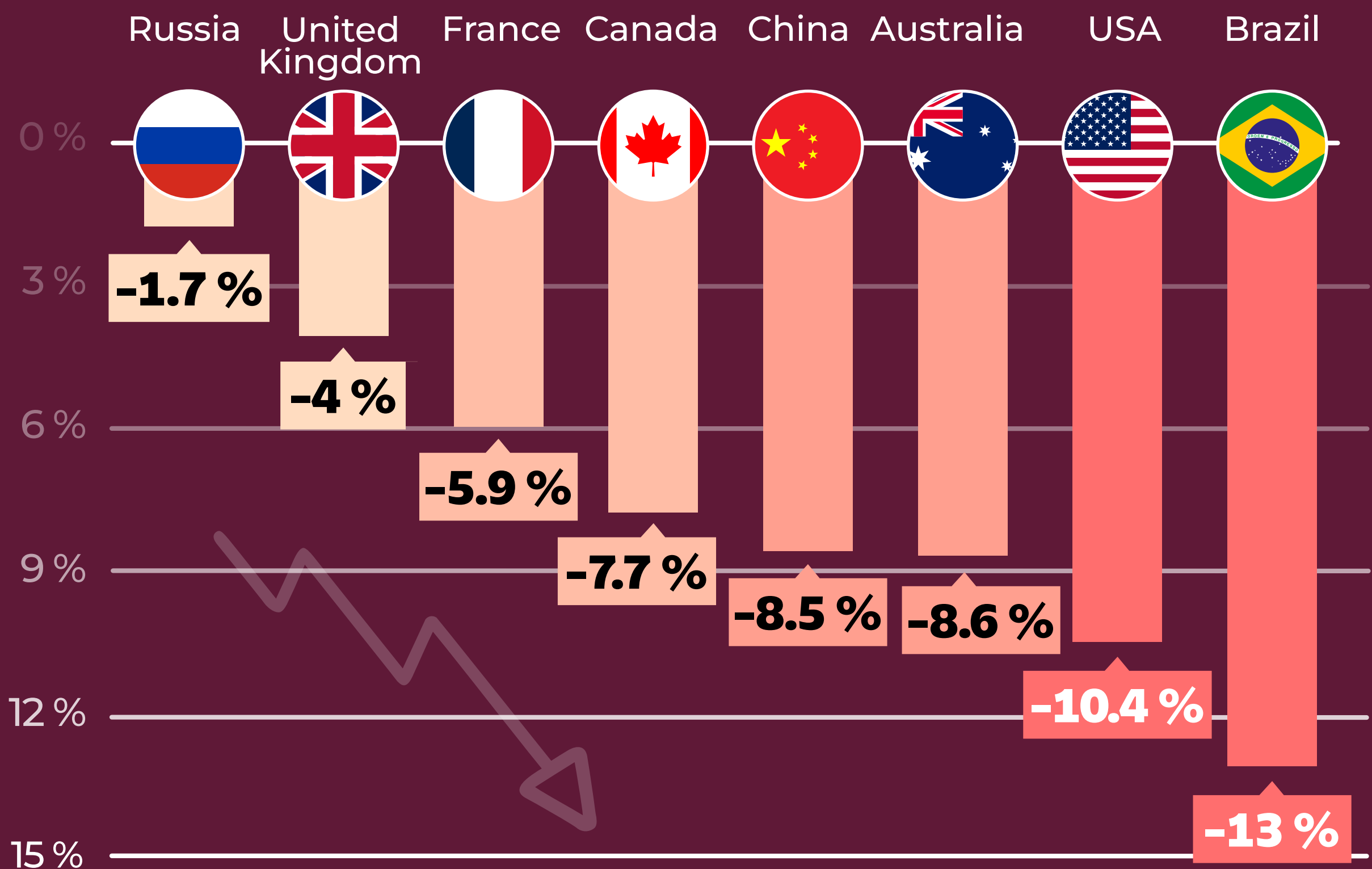
There is a **consensus** regarding the overall negative impact of climate change. However, its cost and its distribution - across time and across space - remain **uncertain**.



Depending on their location, climate, and sectoral structure, territories and their economies will be affected unevenly, with clear **winners and losers**.

By 2050, France would be severely affected... but less so than the USA or Brazil

Projected impacts on GDP per capita by 2050*, in a selection of G20 countries:



* EDHEC researchers also produced projections looking ahead to 2100

How were these estimates produced?
And, more importantly, what about the rest of the world?

Researchers have measured the potential impact of climate change on growth

To do this, they look at 191 countries:



Past

Average sensitivity of growth to climatic variations over four decades (across diverse climates, economies, and sectors).



Future

Projections of damages at the local level, based on various climate scenarios, looking ahead to 2035 or 2050.

On that basis, they create a ranking of countries:

	A winners	B losers with the fewest losses	C	D	E	F	G biggest losers
Effects on GDP	Up to +3.2% GDP per capita by 2050	Up to -5.3 %	Up to -7.5 %	Up to -8.9 %	Up to -10.9 %	Up to -12.2 %	Up to -16.7 % GDP per capita by 2050

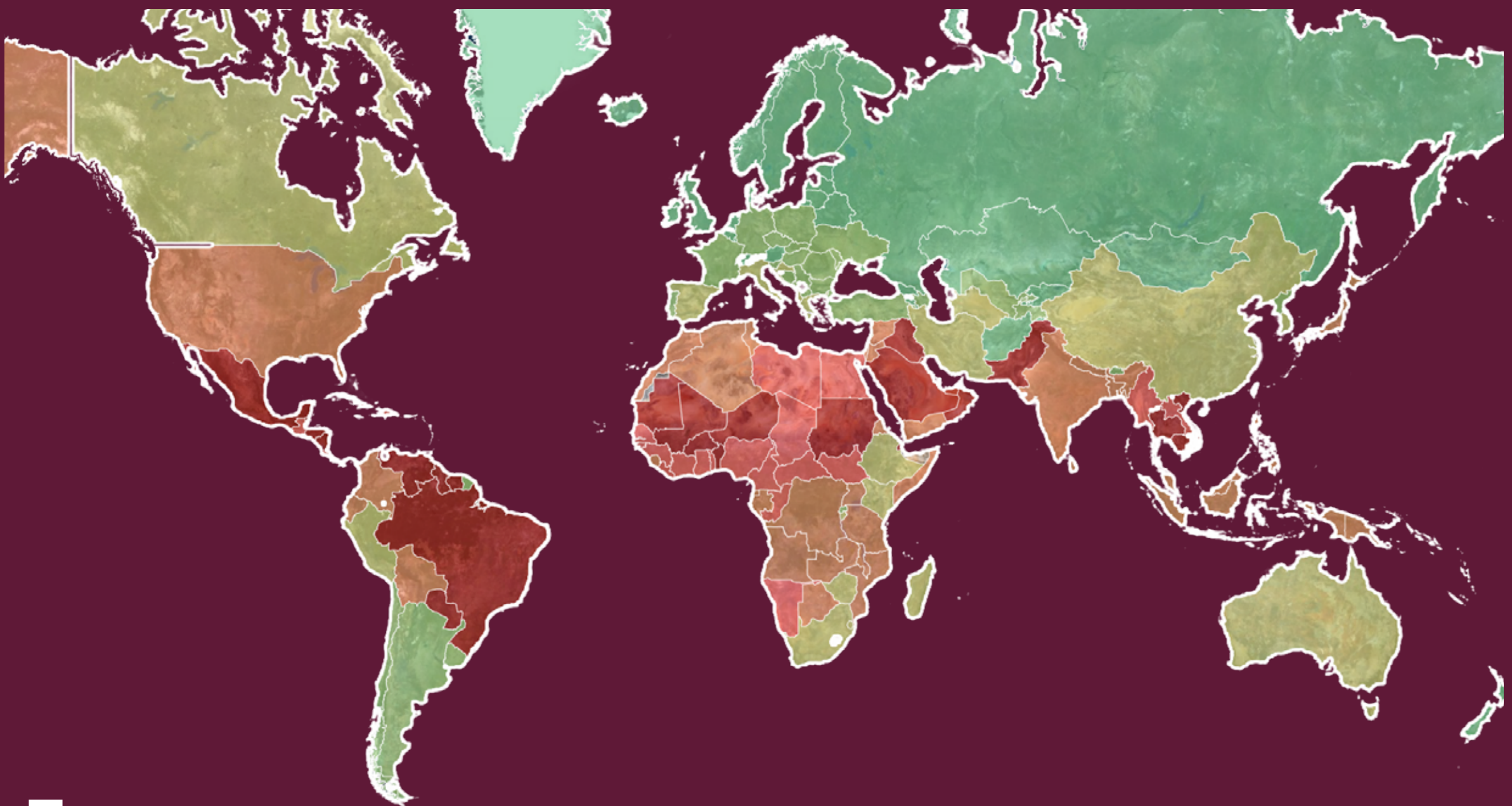
How can there be net winners?

Studies have shown the existence of an inverted U-shaped relationship between temperature and growth, with an optimum around 13°C: global warming benefits countries with cold climate baselines that are moving closer to this optimum, but negatively impact hotter countries that are moving further away from it. This does not call into question the overall negative effect.

Who are the biggest losers when it comes to climate change?

Country ratings based on climate risk to their economies, looking ahead to 2050:

 A  B  C  D  E  F  G



Focus

The countries projected to experience the largest losses are concentrated in tropical and equatorial regions, where the baseline historical temperature already exceeds.

Nationwide, these ratings and all related data are available on the SovCRR platform:
<https://scientificratings.com/app/map>



**Chronic risks rarely make headlines,
but they are increasingly entering countries'
production functions, thereby reducing
their growth potential.**

Our framework quantifies this risk in the form
of a probability-weighted expectation that can be
directly incorporated into investors' financial models.



Nicolas Schneider, Senior Research Engineer
/ Macroeconomist at
the EDHEC Climate Institute

Hence the need to examine the impacts at
an even finer scale than the national level.
That is why more than 3,400 “subnational”
regions were analysed in these 191 countries.

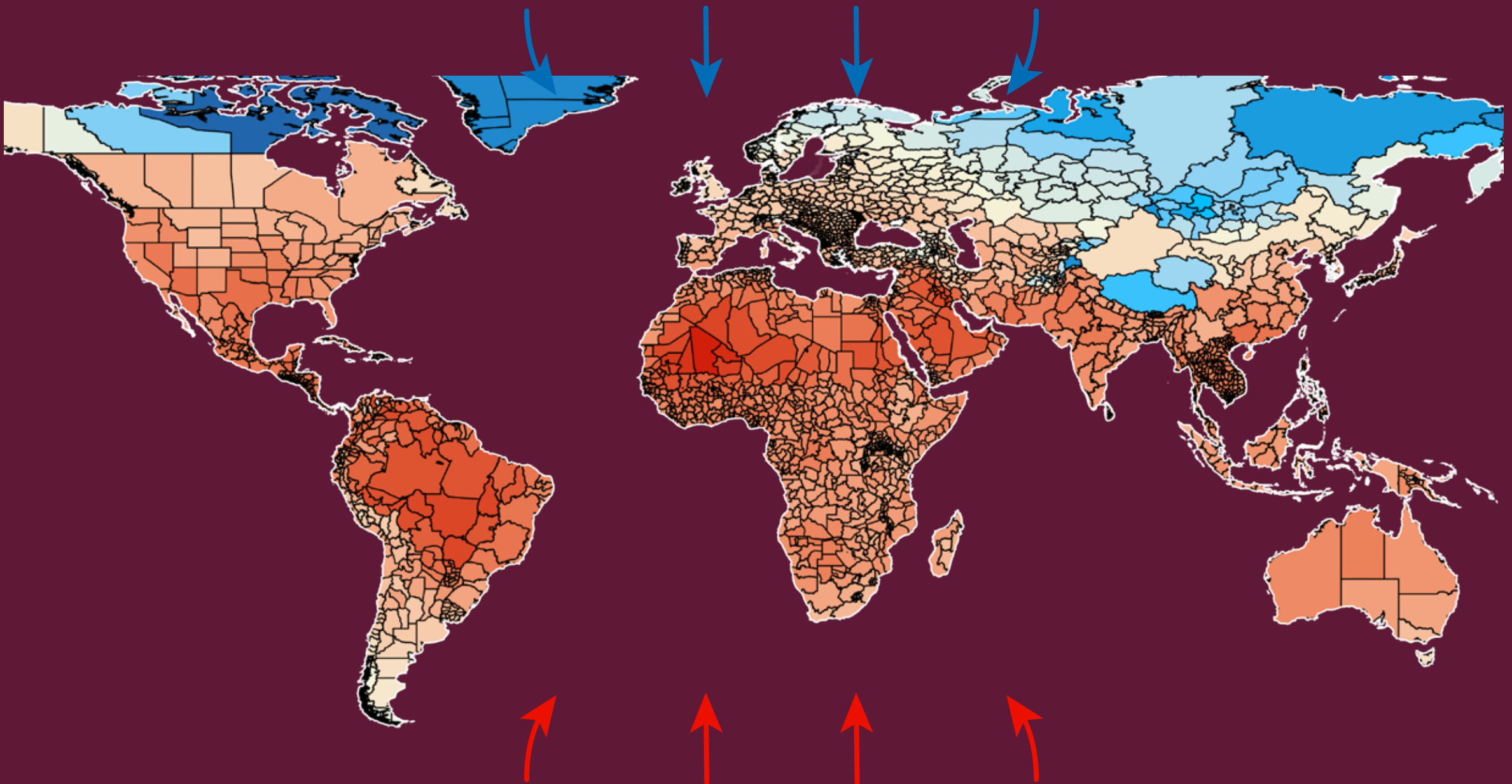


At the local level, which areas have the most to lose?

Regional impacts on gross domestic product (GDP) per capita by 2050—average damage weighted by the probability of each climate scenario

Impacts (%) 
-20 -15 -10 -5 0 5 10

The coldest regions are currently below the optimum. A moderate rise in temperatures could therefore result in virtually no losses—or, in some cases, even marginal gains in productivity.



Equatorial and tropical regions face the sharpest projected declines in GDP per capita by 2050.

Focus: In Europe, the impacts are more pronounced along the Mediterranean coast

Rating of regions based on climate risk to their economies, by 2050:

● A ● B ● C ● D ● E ● F ● G



Around the Mediterranean, the impacts are particularly pronounced, and there is a significant heterogeneity from one country to another, and across economic regions within them.

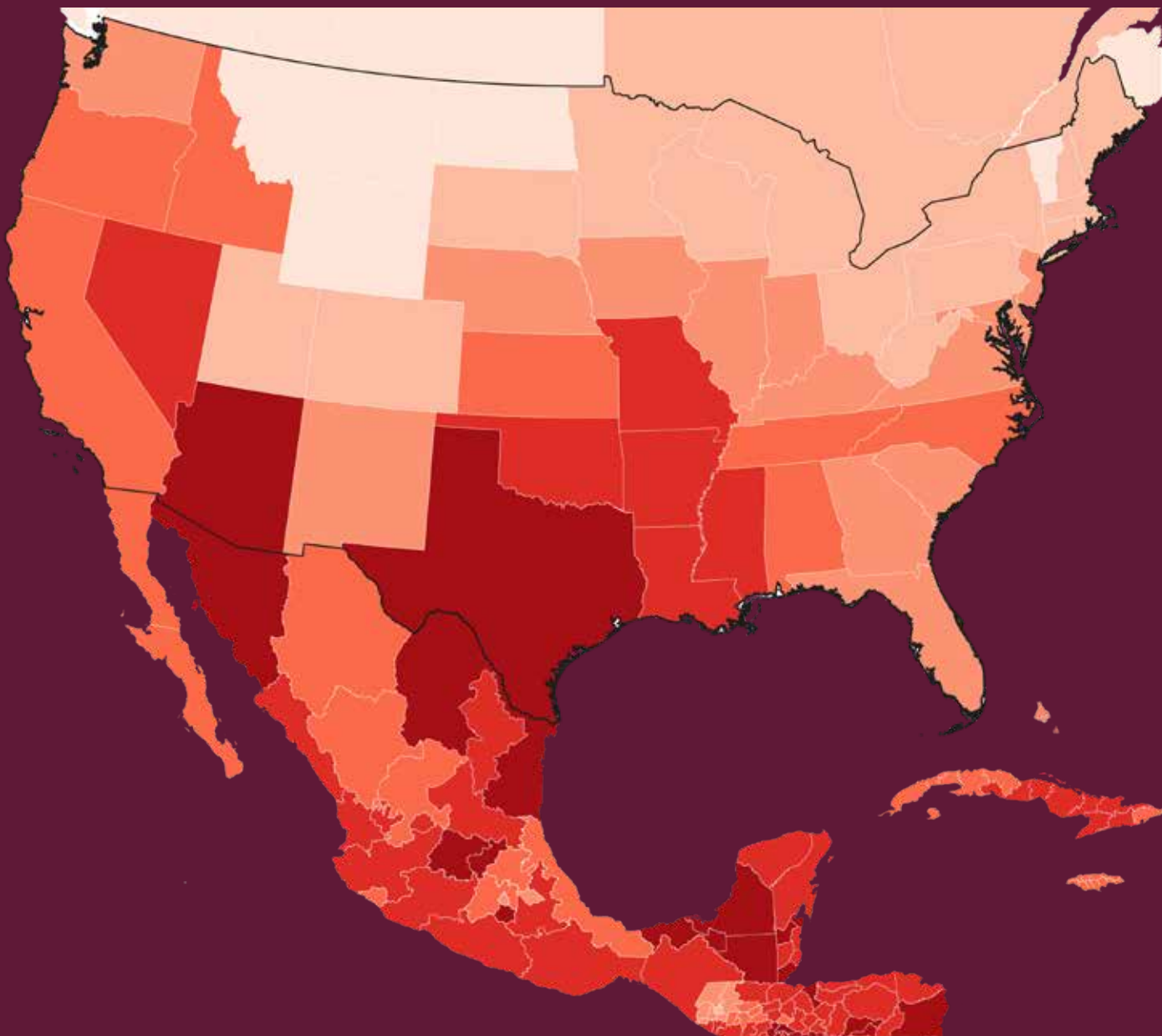
Focus

The SovCRR platform for the general public provides results by country; regional ratings are available only to professionals.

Why Are Local-Level Ratings Important? A Look at the United States

Regional Impacts on Gross Regional Product (GRP) per Capita
in the United States (2050)

Impacts (%) — -6 % -7,5 % -9 % -10,5 % -12 % -13,5 % -15 %



This regional rating, developed by Scientific Climate Ratings (an EDHEC Venture) based on the work of the EDHEC Climate Institute, is intended for professionals only.

Focus

The United States illustrates how national average temperatures can be misleading. Although the national average lies close to the optimum, subnational data reveal greater losses in warmer states, such as Texas, whose large populations and economic weight imply larger aggregate losses than the unweighted national average would suggest.

Methodology (1/2)

This research was conducted by the EDHEC Climate Institute as part of the EDHEC-CLIRMAP research project.

Nicolas Schneider drew on this research to further develop the methodology, with the aim of:

- Improving the structural damage estimation model;
- Mapping the contingent damages from the SSP-RCP scenarios to the scenario × IAM combinations in Phase V of the NGFS*;
- Aggregate them into expected loss (weighted by the probabilities of the 9 scenarios)
- While incorporating two complementary scenarios specifically developed by the Institute (Scientific Climate Scenarios).
<https://climateinstitute.edhec.edu/climate-scenarios>

**The NGFS (Network for Greening the Financial System) brings together central banks and supervisory authorities to better integrate climate and environmental risks into financial risk management*

This methodology was subsequently implemented and commercialized through the launch of a sovereign rating by Scientific Climate Ratings, which is publicly available via an interactive platform called “Sovereign Climate Risk Ratings” (SovCRR).

Methodology (2/2)

Sovereign Climate Risk Ratings provides a unique assessment of the impact of chronic physical climate risks on the GDP of more than 190 sovereign economies and 3,400 subnational economic regions, which together account for more than 95 percent of global economic production.

The ratings, ranging from A to G, are determined for the predefined time horizons of 2035 and 2050 based on a total of nine prospective climate scenarios.

In the coming months, the platform will evolve to include:

- ➔ The impact of GDP losses on sovereign credit spreads for government bonds.
- ➔ Provision of temperature increase trajectories relative to pre-industrial levels, consistent with NGFS scenarios, down to a subnational regional resolution.
- ➔ A segmentation of impacts covering more than 15 economic sectors, across multiple physical risk hazards, with global coverage.