

CARBON IMPACT QUARTERLY



LA FRANÇAISE
INVESTING TOGETHER

An aerial photograph of a dense forest, showing a variety of green trees. A single, tall, straight tree trunk is visible in the lower right quadrant, extending from the bottom edge towards the center. The forest canopy is thick and textured, with different shades of green. The text is overlaid in the center of the image.

***HOW TO ASSESS
THE IMPACT OF CLIMATE CHANGE
FOR COUNTRIES?***

SCORING CLIMATE-CHANGE RISKS AND OPPORTUNITIES FOR COUNTRIES

Overview

Climate change is one of the most important challenges the world is facing today. Green House Gas (GHG) emissions continue to increase for many countries and regions. Our planet is getting warmer. Extreme weather events happen with higher frequency and incur higher damage costs. Urgent actions are required to mitigate the negative impacts of climate change on the global economy.

Countries and governments alike must take more ambitious actions to tackle climate change and to reach the goal of the Paris Agreement, which limits global warming to well below 2°C. We need to accelerate the transition to a low-carbon economy before it is too late.

Climate change is expected to have a significant impact on the global economy. This is the reason why we have decided at La Française to develop a climate-transition investment methodology for all assets classes. We consider that climate change is an investment risk but also a source of opportunities that will impact the value of investments in the coming years.

Until now, investors have focused primarily on climate change at the corporate level (i.e., for equities and credit) but not at the sovereign level. Countries are directly exposed to climate change risks and government bond investors can no longer ignore these risks.

In this document, we introduce our climate-transition approach to sovereign debt.

EXECUTIVE SUMMARY

All countries, from high-income to low-income, are impacted by climate change risks, but the burden is not equally shared. Some countries are more exposed to climate risks, while others are less so.

Climate change analysis makes sense in a global universe that mixes developed and emerging countries, as it is a concern for all actors: governments, companies, world citizens and investors. In the first chapter of this paper, **we define climate change risks and explain why climate change is an important issue for government bond investors.**

We identify two risks for each country: **Physical and Transition**

In the second chapter, **we explain how to score countries and present the results of our in-house climate risk scoring model.** We score 180 countries in total and rank 101 developed and emerging countries (included in the J.P. Morgan GBI Global Index and the J.P. Morgan EMBI Global Diversified Index) according to climate risk and opportunities. These countries represent most of the world population, global GDP and generate more than 90% of global GHG emissions.

We identify and categorize countries into 4 sub-groups according to the risks and opportunities associated with climate change: Climate Change Winners, Outsiders, Survivors, and Losers.

Climate Change Winners are best positioned for the transition to a low-carbon economy and to adapt to climate change risks. Climate Change Losers are the most vulnerable to climate change risks and have not yet started their green transition.

Our findings: European countries dominate the Climate Change Winners category while the Middle East, Africa and oil producing countries dominate the Losers category.



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CHAPTER 1: UNDERSTANDING CLIMATE RISKS FOR COUNTRIES AND BOND INVESTORS

We believe that in addition to traditional macro indicators, like growth, inflation dynamics and central bank monetary policies, bond investors can and should incorporate climate change analysis into their investment process to strengthen investment decisions and asset allocation. This requires understanding the risks as well the opportunities related to climate change.

1 – What are climate risks?

We consider two main categories of risks: Physical and Transition

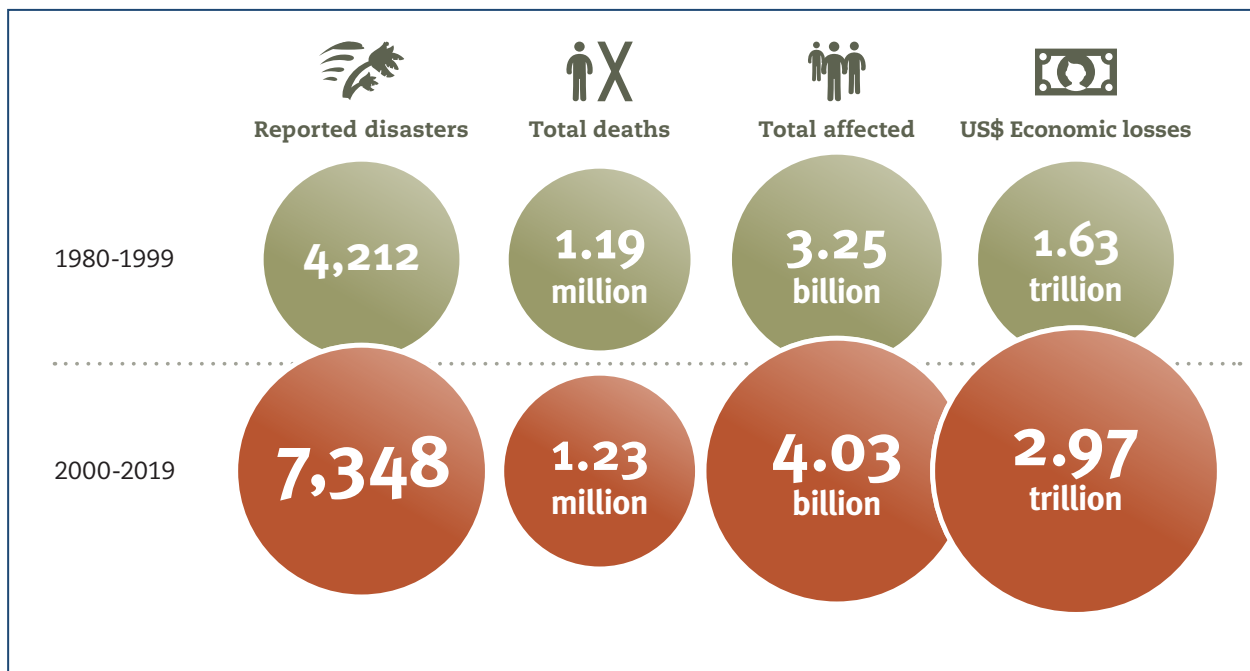
- ◆ **Physical risks** are linked to the negative impacts of extreme weather events and natural disasters.
- ◆ **Transition risks** are linked to the potential economic losses incurred due to the transition to a low-carbon economy.

Physical risks

Physical risks refer to the potential financial and economic losses incurred due to climate change related events.

The impacts of climate change are visible through rising temperatures that exacerbate extreme weather events (floods, storms, wildfires, droughts, extreme temperatures). Floods and storms are the most common types of disasters, accounting for more than 70% of events.

Figure 1: Disaster Impacts: 1980–1999 vs 2000–2019



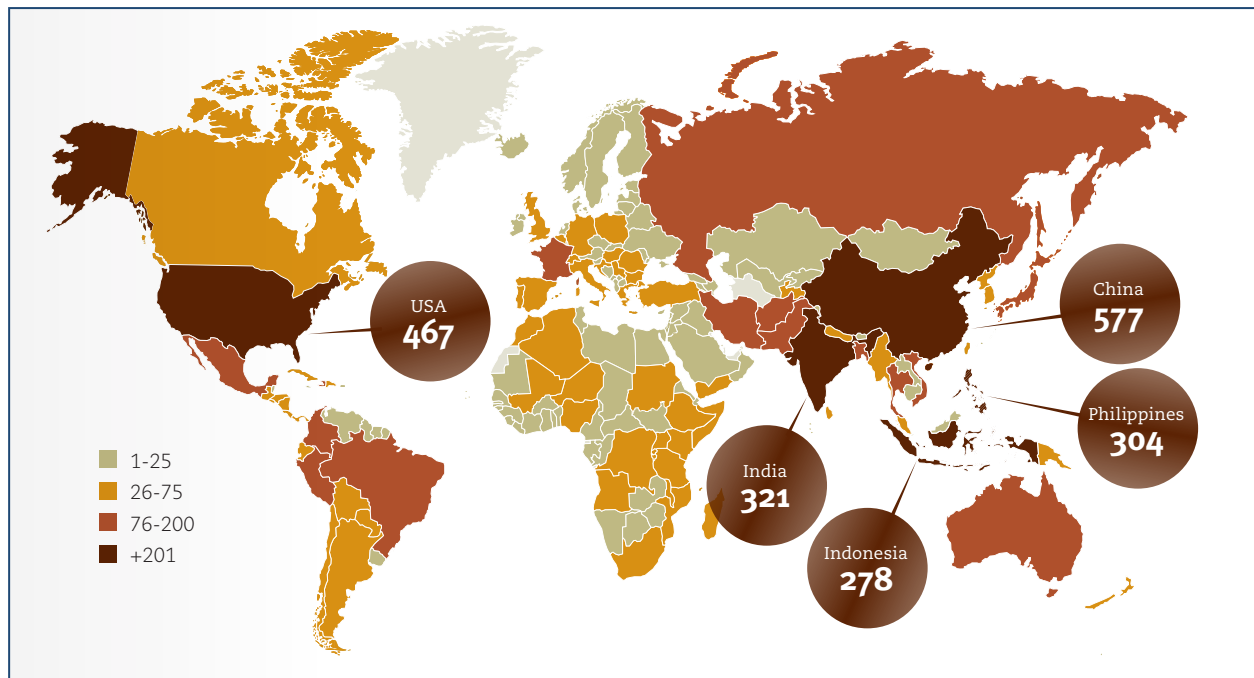
Source : CRED Centre for Research on the Epidemiology of Disasters, EM-DAT, UNDRR UN Office for Disaster Risk Reduction, Human cost of disasters – An overview of the last 20 years 2000–2019

Physical risks are clearly intensifying, as illustrated in **Figure 1**. Extreme weather events happen with ever greater frequency and severity as climate change accelerates. The global impact is

growing. Damage costs including financial, economic and human losses (population affected and related deaths) are rising at an even faster pace.

Over the last twenty years, 7 348 disasters were recorded worldwide affecting more than 4 billion people and generating approximately US\$2.97 trillion in economic losses worldwide.⁽¹⁾

Figure 2: Number of disasters reported by country (2000–2019)



Source : CRED Centre for Research on the Epidemiology of Disasters, EM-DAT, UNDRR UN Office for Disaster Risk Reduction, Human cost of disasters – An overview of the last 20 years 2000-2019

The report “Human cost of disasters – An overview of the last 20 years 200-2019” reveals:

- ◆ There has been sharp increase in the number of natural disaster events and in economic losses recorded over the last twenty years compared to the previous twenty years. Not all countries are not exposed to natural disasters in the same manner (**Figure 2**). Asian countries (China, India, the Philippines, Indonesia) suffered from the highest number of natural disasters, followed by the United States.
- ◆ In high-income countries, disaster events affect a smaller portion of the population, but suffer significantly larger economic losses in absolute value terms. In low-income countries, disasters touch larger portions of the population.
- ◆ The Americas accounted for 45% of total economic losses, followed by Asia and Europe at 43% and 9%, respectively. The United States, China and Japan recorded the majority of total losses.
- ◆ But when we compare economic losses to Gross Domestic Product (GDP), the results are different, and reflect the strong divergence of impacts between rich and poor countries. Low-income countries had the highest level of economic losses relative to GDP whereas high-income countries had the lowest.

(1) CRED Centre for Research on the Epidemiology of Disasters, EM-DAT, UNDRR UN Office for Disaster Risk Reduction, Human cost of disasters – An overview of the last 20 years 2000-2019

Transition risks

Transition risks are the economic losses associated with the transition to a low-carbon economy. They include climate policy risk (loss of revenue), carbon taxes (higher carbon prices), shifts in technology and in demand, from Brown to Green.

Significant efforts are required to transition to a green economy and to achieve the Paris Agreement's long-term temperature goal. Not all regions and countries are decarbonizing their economies at the same pace. Countries have different policies in place and different energy mixes. Carbon intensities are decreasing at different rates across the globe. Some countries have high carbon intensities given their level of GHG emissions and the reliance on fossil fuels in their energy mix.

2 - Implications for investors

Climate change is a major threat for global economies as the occurrence of disaster events accelerates. All countries are not exposed in the same manner to climate risks. Some countries are more exposed to physical risks, and others to transition risks.

Bond investors should take climate risks into consideration in their investment processes and asset allocation decisions, given their impact on a variety of economic factors:

- ◆ **Inflation:** the transition to a low-carbon economy will affect the energy mix, driving up prices.
- ◆ **Growth:** long-term damage costs of extreme weather events and economic costs associated with the green transition should weigh on short-term growth. However, we believe that for countries engaged in the energy transition at an accelerated pace, the balance of these risks will be positive beyond 2030.
- ◆ **Investment and mitigation policy:** the transition to a low-carbon economy is not only a risk for investors, but it is also a source of opportunities. A large amount of investment in green technologies is required to finance the climate transition. Public investment needs to increase to strengthen the resilience of local economies.
- ◆ **Social risk:** climate change increases the risks associated with migration and social conflicts in poorer countries. By 2050, without climate action, it could mean that as many as **143 million people** across developing regions will become climate migrants. Climate change could push an additional 100 million people into poverty over the next fifteen years.⁽²⁾

(2) World Bank, Groundswell Report – Preparing for Internal Climate Migration, March 19, 2018.

CHAPTER 2: HOW TO MEASURE CLIMATE RISKS AND SCORE COUNTRIES?

1 – What is our objective?

Measuring and understanding the climate risks of a country requires the analysis of multiple factors.

The scoring methodology we introduce in this paper provides a quantitative assessment of climate risks and is based on two pillars: **Adaptation** and **Transition**.

We believe that Adaptation and Transition are the two most important aspects to assess climate risks.

- ◆ **Adaptation pillar:** from physical risks to adaptive capacity
- ◆ **Transition pillar:** from carbon economy to green opportunities

Our framework seeks to identify and favor countries that are resilient to climate change and are building a low-carbon economy to meet the challenges of climate change. **We cover 180 countries in total and rank 101 developed and emerging countries** that are included in the J.P. Morgan GBI Global Index and the J.P. Morgan EMBI Global Diversified Index, according to climate risks and opportunities.

Twenty-six Key Performance Indicators (KPIs) are computed in our scoring model. Data is collected from international organizations, international agencies and databases dedicated to sustainable development, energy, and climate analysis. The raw data is then reviewed and adjusted accordingly by our in-house extra-financial research team. All KPIs are normalized to produce a score on a scale of 0 to 10 (0 being the worst score and 10 the best).

The 26 KPIs contribute to the calculation of two umbrella scores for each country: Adaptation and Transition. This methodology provides a clear assessment of how climate risks affect each country.

2 – Our methodology: a two-pillar scoring model

2.1 – Adaptation pillar: from physical risks to adaptive capacity

Which countries are the most vulnerable to climate change?

Our assessment of Adaptation is based on two main factors: a country's **vulnerability** to climate change and its **adaptive capacity**. A country's **vulnerability** takes into consideration two parameters: the country's **exposure** to climate change related events and the costs of **damages** (economic and human losses as described before in Chapter 1). Exposure can be defined as the degree to which a country is exposed to physical impacts (rising temperature, rising sea level, water scarcity...) and can be linked to the country's geographic location. Some countries are more exposed to flooding (India), wildfires (Australia), storms (USA), etc.

- ◆ As explained in Chapter 1, extreme weather events do not have the same impact on High-income countries as on Low-income countries. According to our data, Ethiopia, Pakistan, Senegal, Papua New Guinea and Kenya are the countries with the highest exposure to extreme weather events.
- ◆ In terms of disaster related costs, the Philippines, Thailand, Namibia, Sri Lanka and Mozambique are subject to the highest.

After identifying each country's vulnerability to climate change, we look at whether the country has the capacity to adapt or not.

Regarding **adaptive capacity** our methodology takes into consideration 3 parameters: the effectiveness of governance, the social readiness and economic readiness of the country. We believe that investors must increasingly consider adaptive capacity as climate change intensifies. Countries must prove capable of adaptation in order to improve their

resilience. Tackling climate change requires broad political support as well as social and economic readiness. Governments have a role to play in implementing climate policy. Climate change is not just an economic issue for countries but also a social issue. We find that countries with strong institutional quality, low corruption, and higher income per capita are better positioned to address climate risks. Low-income countries with unstable governance structures tend to have lower adaptive capacity.

Our findings (Figure 3):

Country	Top 5 Adaptive capacity
New Zealand	8.65
Sweden	8.65
Canada	8.63
Switzerland	8.62
Denmark	8.61

Country	Worst 5 Adaptive capacity
Mozambique	3.16
Cameroon	3.38
Angola	3.42
Nigeria	3.50
Ethiopia	3.61

◆ An Interesting point to note is that some high-income countries such as the United States, Japan and Australia, are highly vulnerable to climate change but have strong adaptive capacity which helps them to mitigate climate risks.

Finally, we calculate an overall Adaptation score which is the average of the vulnerability score and the adaptive capacity score.

We conclude that Mozambique, Ethiopia, Pakistan, Angola, Papua New Guinea are the

five most vulnerable countries (i.e., with the lowest Adaptation scores).

The transition to a low-carbon economy requires radical change in the way the world produces and consumes resources.

2.2 - Transition pillar: from a carbon-intensive economy to a green economy

Which countries have the highest transition risk?

Our assessment of Transition risk is based on two main factors: the carbon economy and the green opportunity.

◆ **The carbon economy integrates two parameters: GHG emissions and fossil fuel dependency.** As the world transitions to a low-carbon economy, countries must cut GHG emissions drastically and adopt more ambitious climate policies to achieve the Paris Agreement targets. Reaching Net-Zero emissions by 2050 requires the transformation of the global energy mix. GHG emissions must be reduced 50% by 2030.

China, the United States, India, Russia and Japan are the top GHG emitters in the world, whereas Qatar, the UAE, Kuwait, Oman and Australia show the highest GHG emissions per capita.

The green transition requires moving away from fossil fuels to renewable energy. Countries are required to decarbonize and diversify their energy mix in terms of production and consumption. Fossil fuels currently account for around 83% of the total world primary energy supply and renewables for only 12%. The share of renewables must increase to 85% by 2050 in the Green scenario.⁽³⁾

We examine the following indicators to assess the **carbon economy factor: GHG emissions per capita, GHG emissions relative to GDP, fossil fuel revenues and share of fossil fuels in exports and in primary energy supply.**

(3) BloombergNEF – New Energy Outlook 2021, July 2021

Logically, countries that are highly dependent on fossil fuels (coal, oil, gas), both in term of revenues and consumption, have the highest carbon intensity.

*Kazakhstan, Qatar, Oman, Kuwait and Russia rank at the bottom of the **carbon economy** (with the lowest scores). Among developed countries, Australia, Canada and the United States are the developed countries with the highest risks.*

◆ **The green opportunity is gauged relative to two parameters: renewable energy and green investments.**

The green transition does not only imply substantial reductions in GHG emissions, but also requires the massive deployment of new technologies such as renewable, and massive investment flows into green technology by 2030. Renewables, electrification (transportation, buildings, industry) and energy efficiency are the main pillars of the energy transition.

To gauge **renewable energy**, multiple criteria are analyzed: energy efficiency, renewable energy capacity, share of renewables in power generation and in total final energy consumption.

Denmark, Switzerland, the United Kingdom, Costa Rica, Ireland, Uruguay, Panama and Brazil are TOP rankers relative to renewable energy and are well engaged in the energy transition. Bahrain, Qatar, Oman, Kuwait and Iraq are laggards and have not begun the energy transition.

Large investments in infrastructure and technology are needed for the energy

transition. Despite uncertainties regarding the pathway, BNEF estimates that annual clean energy investment will have to more than triple to between c.a. \$3.1 trillion and \$5.8 trillion to achieve net-zero emissions by 2050. This will create millions of employment opportunities and contribute to additional economic growth, most notably in the energy sector.

To assess **green investments**, clean energy investment flows are used.

The Asia Pacific region was both the largest region in terms of clean energy investment volume with \$368 billion, and in terms of growth with +38% in 2021.⁽⁴⁾

China is the leading investor, with the United States in second place and European countries (Germany, the UK, France) following closely. Vietnam is the second-best EM country in terms of investment volume and ranked in the top ten globally (developed and emerging markets combined).

As a last step, we calculate the Transition score which is the average of the carbon economy and green investments scores.

Not all countries are positioned to benefit from the energy transition. *Sweden, France, Switzerland, Germany, Chile, Spain and the United Kingdom are leading the green transition. Alternatively, Kuwait, Bahrain, Qatar, Oman and Azerbaijan present high levels of transition risk (i.e., the lowest Transition scores) according to our model. Indeed, they remain heavily dependent on fossil fuels and have not yet diversified their energy mix with renewables.*

(4) BloombergNEF – Energy Transition Investment Trends 2022, January 2022

3 - Defining the carbon matrix

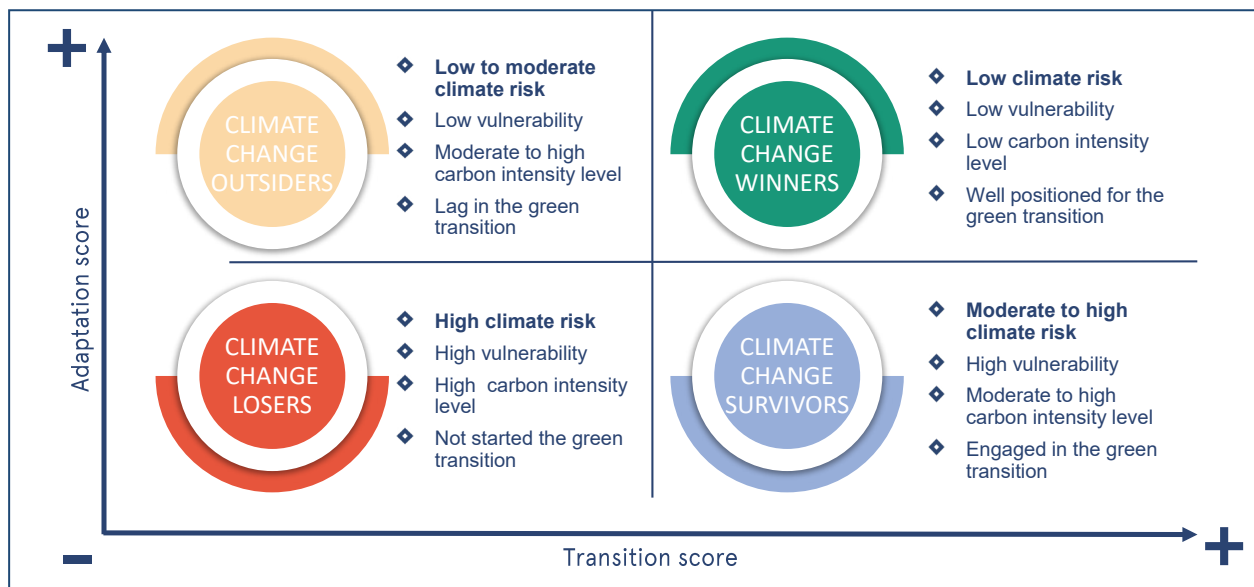
How can countries be categorized?

The carbon matrix allows for a comparative analysis of different countries, their exposure to climate risks and their ability to take climate-risk mitigation actions.

The values of the vertical axis correspond to the Adaptation score and the horizontal axis to the Transition score. The matrix is divided into four quadrants. Quadrant lines correspond to the median Adaptation and Transition scores of the global universe.

Countries are categorized into 4 groups relative to climate risks and opportunities: Climate Change Winners, Survivors, Outsiders and Losers (Figure 4).

Figure 4 : La Française AM proprietary carbon matrix



- ◆ **Climate Change Winners** (Upper right quadrant): These countries illustrate low vulnerability to climate risk. They are well positioned for the transition to a low-carbon economy and have strong adaptive capacity. *Ex: Spain, Sweden, the United Kingdom, Chile, Costa Rica, Hungary.*
- ◆ **Climate Change Survivors** (Lower right quadrant): These countries are engaged in the transition to a green economy but are highly vulnerable to physical risks. They need to increase their adaptive capacity in order to mitigate the negative impacts of climate change (disaster events). *Ex: Brazil, Mexico, Dominican Republic, China, India.*
- ◆ **Climate Change Outsiders** (Upper left quadrant): These countries lag in their energy transition. They have the capacity and economic resources to adapt but need to take urgent action. *Ex: Australia, Canada, Japan, Uruguay, Romania, South Africa.*
- ◆ **Climate Change Losers** (Lower left quadrant): These countries are the most vulnerable to climate risks (i.e., lowest Transition and Adaptation scores). They have not started their energy transition. Urgent actions are required to tackle climate change and transition to a green economy. *Ex: Kuwait, Qatar, Oman, Mozambique, Ethiopia, Pakistan.*

For investors who seek to apply an exclusion policy to their investment universe, the exclusion of Climate Change Losers would be appropriate.

Figure 5: La Française AM proprietary climate risk scoring model

Adaptation score			Transition score		
Top 10			Top 10		
Country	Adaptation	Category	Country	Adaptation	Category
Switzerland	8,44	Winners	Sweden	6,21	Winners
New Zealand	8,29	Winners	France	5,75	Winners
Austria	8,11	Winners	Switzerland	5,74	Winners
Germany	8,10	Winners	Germany	5,73	Winners
Canada	8,03	Outsiders	Chile	5,70	Winners
Norway	8,01	Winners	Spain	5,66	Winners
Sweden	7,90	Winners	United Kingdom	5,63	Winners
Finland	7,88	Winners	Japan	5,55	Winners
Ireland	7,85	Winners	Brazil	5,54	Survivors
United Kingdom	7,82	Winners	Macedonia	5,42	Survivors
Worst 10			Worst 10		
Country	Adaptation	Category	Country	Adaptation	Category
Mozambique	3,77	Losers	Kuwait	1,46	Losers
Ethiopia	3,90	Losers	Trinidad and Tobago	1,69	Losers
Pakistan	4,17	Losers	Bahrain	1,86	Losers
Angola	4,18	Losers	Qatar	1,89	Losers
Papua New Guinea	4,18	Losers	Oman	1,92	Losers
Cameroon	4,33	Losers	Azerbaijan	2,28	Losers
Zambia	4,35	Losers	Iraq	2,41	Losers
Nigeria	4,41	Losers	Bolivia	2,44	Losers
Cote d'Ivoire	4,55	Losers	Mongolia	2,81	Losers
Bolivia	4,59	Losers	Serbia	2,94	Losers

CONCLUSION

Climate change is fast becoming a priority for investors.

The climate scoring methodology based on two pillars is a tool dedicated to sovereign bond investors, eager to take part in the energy transition by investing in low-carbon strategies.

Our framework provides sovereign bond investors with a robust methodology to quantify country specific climate risks. The rational categorization into four sub-groups allows investors to manage the climate risk of their portfolios.

All countries are different in terms of risks and pace of transition. Investors must therefore consider a flexible allocation between Climate Change Winners, Outsiders and Survivors to build a portfolio resilient to climate risks and representative of countries well engaged in the transition to a low carbon economy.

By doing so, investors can improve the carbon intensity of their portfolios (better Adaptation and Transition scores than a benchmark) and mitigate climate risks.



THE CARBON IMPACT QUARTERLY REPORT

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