

Environmental risks: assessing sovereign transition, physical and resource risks



Scope
Ratings

Since October 2020, Scope's sovereign ratings include a quantitative and qualitative assessment of the environmental risks that, in our view, affect the credit profiles of sovereigns, namely, transition, physical and resource risks. While we currently rate 36 sovereigns publicly, our model includes 132 countries, enabling us to draw a few stylised conclusions for our environmental risk factors across and within regions.

The variables in our quantitative sovereign scorecard for assessing environmental risks include transition risks, captured via CO2 emissions per GDP, physical or natural disaster risks, as measured by the World Risk Institute, and resource risks, measured via a country's ecological footprint of consumption relative to its biocapacity. All 132 sovereigns are assessed on a 100-point scale, whereby a score of 100 (1) implies low (high) credit risk.

Figure 1: Transition, physical and resource risks per region

Points, 1 = worst (high risk); 100 = best (low risk)

| Risks Score | Transition | | | Physical | | | Resource | | |
|------------------|------------|--------|-------|----------|--------|-------|----------|--------|-------|
| | 25th | Median | 75th | 25th | Median | 75th | 25th | Median | 75th |
| Anglosphere | 28.1 | 49.2 | 69.0 | 87.9 | 92.4 | 95.1 | 68.3 | 100.0 | 100.0 |
| Euro area | 69.1 | 80.8 | 84.0 | 94.1 | 97.6 | 99.9 | 35.4 | 59.3 | 83.2 |
| Nordics & Switz. | 81.9 | 96.4 | 100.0 | 99.8 | 100.0 | 100.0 | 81.5 | 100.0 | 100.0 |
| CEE - EU | 48.3 | 62.0 | 74.5 | 85.4 | 90.8 | 95.8 | 72.8 | 88.9 | 95.4 |
| CEE - Other | 4.1 | 13.4 | 37.7 | 78.3 | 84.0 | 95.6 | 72.9 | 73.7 | 85.1 |
| CIS | 1.0 | 17.6 | 48.9 | 65.2 | 77.9 | 91.5 | 71.9 | 80.5 | 88.7 |
| Middle East | 1.0 | 21.3 | 41.9 | 88.4 | 96.0 | 98.7 | 1.0 | 1.0 | 6.7 |
| Asia | 48.2 | 65.2 | 84.8 | 16.1 | 62.2 | 76.7 | 51.1 | 69.7 | 84.3 |
| Africa | 68.1 | 92.2 | 98.7 | 12.2 | 36.8 | 57.6 | 71.1 | 90.9 | 100.0 |
| LatAm | 65.2 | 77.8 | 89.3 | 1.0 | 46.1 | 75.4 | 91.6 | 100.0 | 100.0 |
| Caribbean | 1.0 | 46.0 | 82.9 | 1.0 | 28.5 | 52.5 | 37.1 | 42.7 | 59.5 |

Source: Scope Ratings GmbH. The scores refer to the respective percentile of the distribution of each group. Note the scores are only comparable per risk category, not across categories given varying distributions and thresholds.

The analysis highlights the following key takeaways:

- **Transition risks:** These risks, including policy, technology and market changes that occur to meet the requirements for accelerating the transition towards a low-carbon economy, appear to be the most heterogeneous of the three identified environmental risks judging by the wide range of scores within geographical groups. Differences in economic structures, and specifically, the varying dependence on carbon to produce a unit of GDP drive this score. Eastern European sovereigns, mostly former Soviet states (CIS) and the Middle East are most exposed to this type of risk while the Nordics are the least exposed region. The euro area, overall, is less exposed than Anglo-Saxon countries.
- **Physical risks:** These risks, which can be event-driven or arise from longer-term shifts in climate patterns, appear to affect mostly African, Asian, Latin-American and Caribbean sovereigns. Still, the scores within the groups, including Anglo-Saxon and euro area sovereigns, range significantly pointing to idiosyncratic risks.
- **Resource risks:** These risks refer to potential natural resource constraints (resource-security) which may vary depending on a country's consumption and production patterns, its trade relations facilitating access to raw materials as well as the biocapacity physically available within its borders. Our assessment highlights that compared to their respective consumption, the Nordics, African and Latin-American sovereigns are among the most resource-rich regions while the Middle East is by far the most exposed region to this risk, followed by the Caribbean.
- **Limitations:** The quantitatively identified exposures to these environmental risks need to be complemented by additional indicators and qualitative assessments, including governments' willingness and ability to mitigate these risks.

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Transition risks

These risks refer to policy, technology and market changes that occur to meet the requirements for accelerating the transition towards a low-carbon economy. Transition risks for sovereigns refer to the likely economic and fiscal costs they face because of global policies and regulatory actions to foster carbon-free economies.

As and when policymakers and regulators adopt and expand carbon pricing mechanisms, economies with a higher share of carbon-intensive industries are likely to face higher: i) economic costs, which include the structural change economies may have to undergo, and ii) fiscal costs, which include direct expenditures, investments and subsidies. In addition, the impact on sovereign risk may further materialize via trade channels in cases where trade barriers for carbon intensive products adversely impact domestic industries not subject to carbon-pricing at home. The below two charts show the distribution of the score for this risk for our 132 sovereigns, highlighting the 19 euro area countries:

Figure 2a: Transition risks

Score (1 to 100); CO₂ t/ GDP

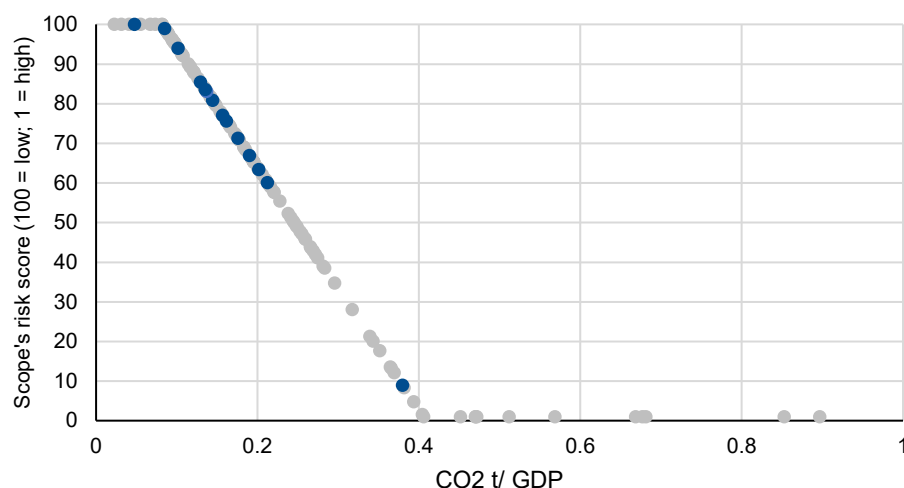
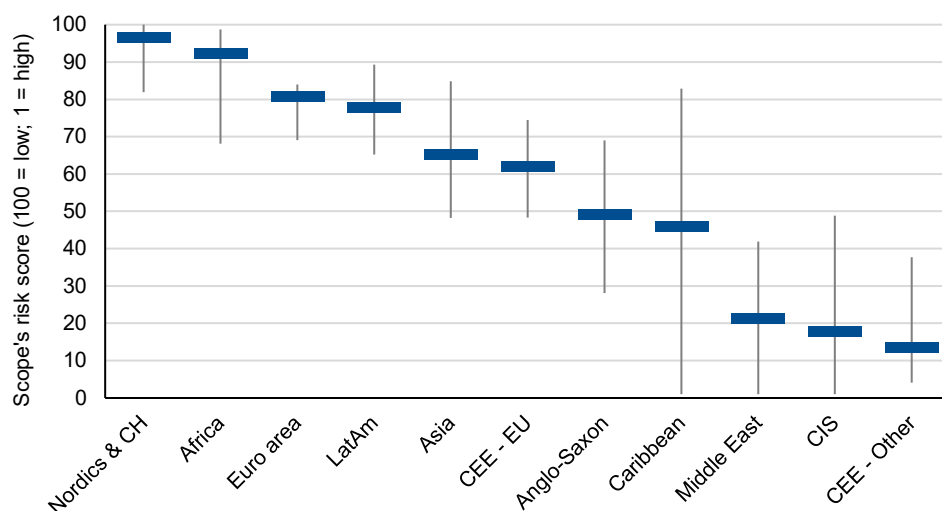


Figure 2b: Transition risks

Score (1 to 100); 25th, 50th and 75th percentile



Source: Scope Ratings GmbH, EDGAR. We apply a min-max approach to assign scores between 1 (most exposed) and 100 (least exposed). Blue dots in Figure 2a refer to euro area sovereigns.

Physical risks

These risks can be event-driven or arise from longer-term shifts in climate patterns resulting from climate change and may have economic and fiscal implications due to direct damage to assets or indirect impacts because of disruptions of the supply chain. Specifically, sovereigns more exposed to natural disasters may face higher economic and fiscal costs resulting from an increased incidence and severity of extreme weather conditions. Our quantitative indicator is taken from the World Risk Institute¹, which we assess non-linearly. The below two charts show the distribution of the score for this risk for our 132 sovereigns, highlighting the 19 euro area countries:

Figure 3a: Physical risks

Score (1 to 100); World Risk Index

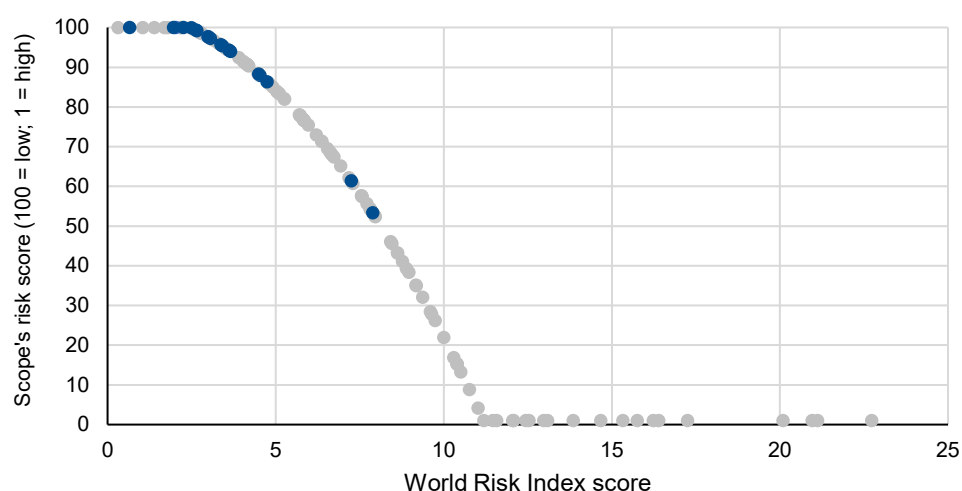
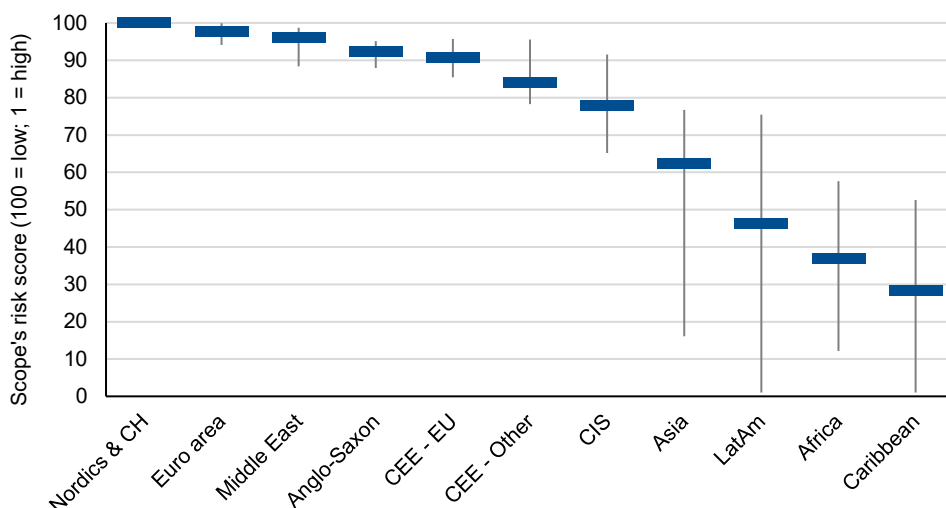


Figure 3b: Physical risks

Score (1 to 100); 25th, 50th and 75th percentile



Source: Scope Ratings GmbH, WRI. We apply a min-max approach to assign scores between 1 (most exposed) and 100 (least exposed). Blue dots in Figure 3a refer to euro area sovereigns.

¹ The World Risk Index measures the risk of disaster in consequence of extreme natural events. It is calculated through the multiplication of exposure and vulnerability. Exposure covers threats of the population and other certain protected entities due to earthquakes, cyclones, floods, droughts and sea-level rise. Vulnerability is comprised of three components: a) Susceptibility, which indicates the likelihood of suffering from harm in an extreme natural event; b) Coping, which comprises various abilities of societies to be able to minimize negative impacts of natural hazards and climate change through direct action and the resources available; and c) Adaptation, which includes measures and strategies dealing with and attempting to address the negative impacts of natural hazards and climate change in the future.

Resource risks

Sovereigns with limited resources may face natural-resource constraints (resource security) which may vary depending on a country's consumption and production patterns as well as the biocapacity physically available within its borders. This risk may also be affected by: i) trade policies, and ii) the availability and substitutability of raw resources².

Our quantitative indicator is taken from the Global Footprint Network. We calculate the log of a country's ecological footprint of consumption relative to the biocapacity within a country's borders to identify either a biocapacity surplus, which we assess credit positive, or deficit, which we view credit negative. The below two charts show the distribution of the score for this risk for our 132 sovereigns, highlighting the 19 euro area countries:

Figure 4a: Resource risks

Score (1 to 100); Biocapacity surplus/ deficit

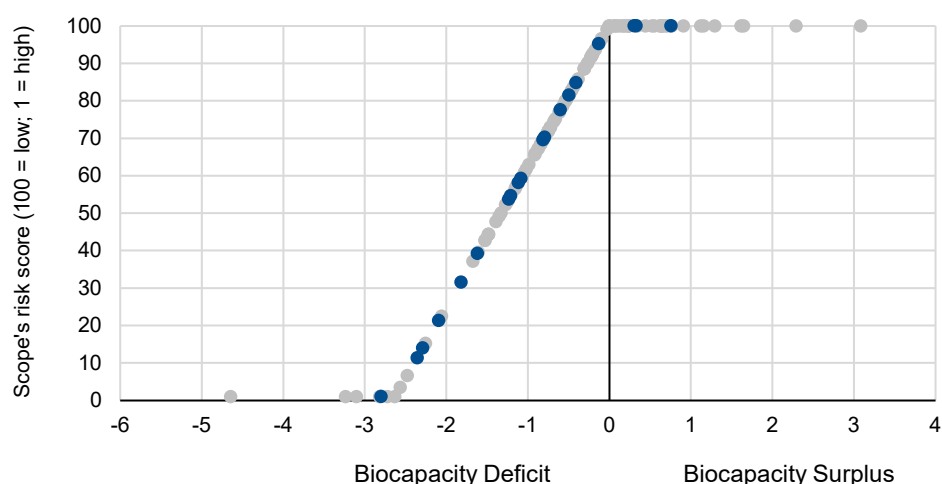
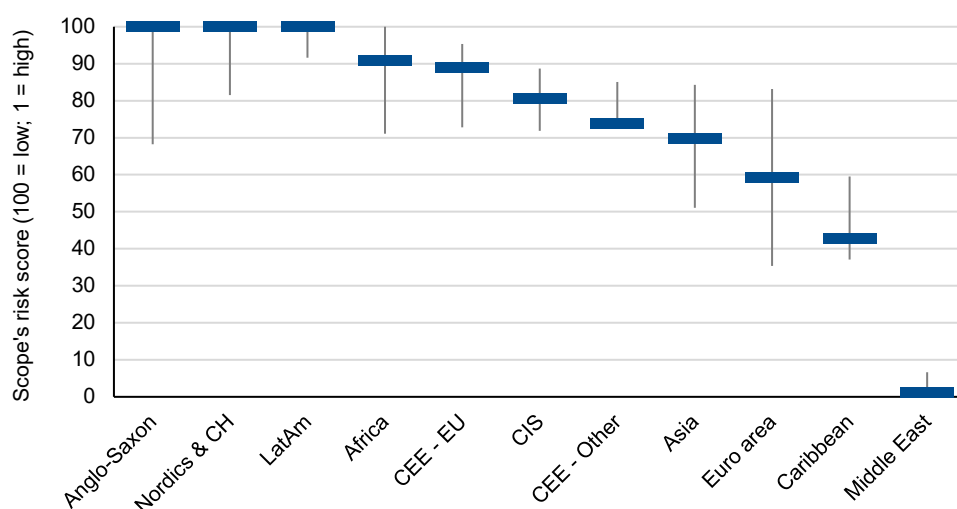


Figure 4b: Resource risks

Score (1 to 100); 25th, 50th and 75th percentile



Source: Scope Ratings GmbH, Global Footprint Network. We apply a min-max approach to assign scores between 1 (most exposed) and 100 (least exposed). Blue dots in Figure 4a refer to euro area sovereigns.

² UNEP, 2012. A new angle on sovereign credit risk.

Limitations

Uncertainty: While economic, fiscal and financial stability costs are already rising as a result of growing environmental and climate risks, it is difficult to ascertain the precise impact of these risks on sovereign creditworthiness over a given time horizon. This is because the tail-risk nature of environmental risks, which are characterized by deep uncertainty and non-linearity, is such that the chance of them materialising is not reflected in historic data and the possibility of extreme values cannot be ruled out. We also note, in line with [ECB research](#), that transition and physical risks are ultimately intertwined. In the absence of climate policies, economies may face higher costs from increasing physical risks while the policies to limit carbon emissions, such as a carbon tax, may increase transition costs, particularly if introduced abruptly. The impact of these risks, however, is likely to vary across regions.

As a growing body of literature confirms, we believe there is a high degree of certainty that some combination of physical and transition as well as resource risks will ultimately materialise in the future, informing our decision to incorporate these risks into our methodological update last year³.

Impact on ratings: By incorporating environmental risks explicitly into our model as independent variables, we determine *de facto* exogenously the extent of the impact these variables can have on our sovereign ratings. However, this does not mean that environmental risks could not have an additional impact on sovereign ratings⁴. This is because transition, physical and resource risks could affect the economy and the financial system through channels that are already captured and reflected via the traditional macro-economic and fiscal variables in our model.

Here, the interaction between variables is critical and we expect it to be dynamic over time. Specifically, the interaction between our selected environmental risk variables and the macro-economic, fiscal and external variables is low. This implies that, on the basis that these variables do affect the credit profile of sovereigns over the longer term, we are obtaining *additional* information from incorporating these environmental variables into our models today, making our sovereign ratings more forward-looking.

However, over time, this relationship could change, and potentially even give rise to multi-collinearity concerns, amplifying, erroneously, the actual impact on final ratings. For these reasons, we will monitor the quantitative relationship between these variables with each methodological update to continue to inform our selection of variables and the weight we attribute them in our scorecards.

Comparability only within each risk factor: As each of the three environmental risk variables is assessed separately on a 100-point scale, whereby the min-max algorithm identifies thresholds dependent on the distribution of the variable, the risk that sovereigns are exposed to can only be compared within each risk category not across variables.

Qualitative factors: The quantitative variables are clearly not exhaustive and provide only a first indicative assessment of a sovereign's exposure to environmental risks. They thus need to be complemented by additional factors, including, for example, a sovereign's environmental taxation level and expenditure, its share of renewable energy of its total energy consumption as well as an assessment of a governments' willingness and ability to implement policies that mitigate these risks in a sustained way.

³ See for example, [ECB 2021](#), [IMF Climate Change Portal](#)

⁴ See for example Bennet Institute 2021. 'Rising Temperatures, Falling Ratings: The Effect of Climate Change on Sovereign Creditworthiness'.

Annex I. Sovereign list

| Sovereigns per region | | | | | | | | | | |
|-----------------------|-------------|--------------|----------------|----------------------|------------|--------------|------------------|--------------|-------------|--------------------|
| Anglosphere | Euro area | Nordics & CH | CEE – EU | CEE - Other | CIS | Middle East | Asia | Africa | LatAm | Caribbean |
| Australia | Austria | Denmark | Bulgaria | Albania | Armenia | Israel | Bangladesh | Algeria | Argentina | Barbados |
| Canada | Belgium | Iceland | Croatia | Belarus | Azerbaijan | Jordan | Burma (Myanmar) | Angola | Bolivia | Belize |
| New Zealand | Cyprus | Norway | Czech Republic | Bosnia & Herzegovina | Georgia | Kuwait | Cambodia | Benin | Brazil | Dominican Republic |
| United Kingdom | Estonia | Sweden | Hungary | North Macedonia | Kazakhstan | Lebanon | China | Botswana | Chile | Jamaica |
| United States | Finland | Switzerland | Poland | Serbia | Kyrgyzstan | Oman | Hong Kong | Burkina Faso | Colombia | Trinidad & Tobago |
| | France | | Romania | Ukraine | Moldova | Qatar | India | Cameroon | Costa Rica | |
| | Germany | | | | Montenegro | Saudi Arabia | Indonesia | Congo (DRC) | Ecuador | |
| | Greece | | | | Russia | Turkey | Japan | Djibouti | El Salvador | |
| | Ireland | | | | Uzbekistan | U.A.E. | Laos | Egypt | Guatemala | |
| | Italy | | | | | | Malaysia | Ethiopia | Guyana | |
| | Latvia | | | | | | Nepal | Gabon | Honduras | |
| | Lithuania | | | | | | Pakistan | Gambia | Mexico | |
| | Luxembourg | | | | | | Papua New Guinea | Ghana | Nicaragua | |
| | Malta | | | | | | Philippines | Guinea | Panama | |
| | Netherlands | | | | | | Singapore | Ivory Coast | Paraguay | |
| | Portugal | | | | | | South Korea | Kenya | Peru | |
| | Slovakia | | | | | | Sri Lanka | Madagascar | Uruguay | |
| | Slovenia | | | | | | Thailand | Malawi | | |
| | | | | | | | Vietnam | Mali | | |
| | | | | | | | | Mauritius | | |
| | | | | | | | | Morocco | | |
| | | | | | | | | Mozambique | | |
| | | | | | | | | Namibia | | |
| | | | | | | | | Niger | | |
| | | | | | | | | Nigeria | | |
| | | | | | | | | Rwanda | | |
| | | | | | | | | Senegal | | |
| | | | | | | | | South Africa | | |
| | | | | | | | | Tanzania | | |
| | | | | | | | | Tunisia | | |
| | | | | | | | | Uganda | | |

Source: Scope Ratings GmbH.



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