ESG GOVERNMENT "INDUSTRY CONSENSUS" RISK RATING

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INTRODUCTION

The ESG Government "Industry Consensus" Risk Rating quantifies the extent to which governments are exposed to and manage Environmental, Social and Governance (ESG) risks that could affect their economic prospects. Investors can use this rating to supplement traditional analysis of government debt risk.

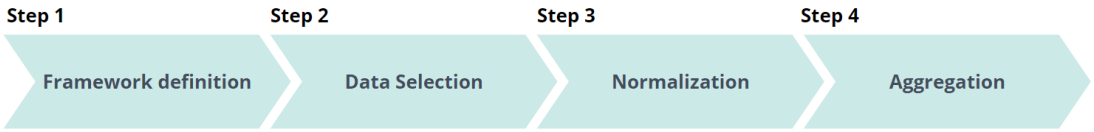
The **methodology** used for the ESG Government Risk Rating follows the principles of what Clarity AI defines as the "industry consensus", leveraging existing methodologies used by the asset management industry and ESG rating providers. The Clarity AI Rating implements this methodology to provide a comprehensive and transparent assessment of government risks delivered in a highly customizable and easy to use software tool.

In the 2020 edition, ratings are generated for 198 National Governments and 187 Sub-national Governments from 8 different countries (only first-level administrative division).[1] The full list of governments and the corresponding data availability are included in Annex A.

RISK RATING CALCULATION

The ESG Government Risk Rating **calculation process** can be broken down into four steps:

Figure 1- Risk Rating Calculation Process



STEP 1: Framework Definition

For governments, Clarity AI **uses a similar ESG framework** to the one it uses for companies, so that Government Ratings are consistent with and comparable to Company Ratings; an essential feature to analyze complex portfolios with different types of securities.

Clarity's conceptual framework includes **all ESG risk categories identified by the asset management industry and ESG rating providers as potential risks to the economic prospects of countries or regions**.[2] These risk categories are structured based on an existing consensus on the economic growth theory and production inputs. Clarity AI uses the same scope and description for these risks for national and sub-national

[1] The sub-national governments included in this edition cover the following eight countries: Australia, Canada, France, Germany, Japan, Spain, Switzerland, and the USA.

[2] The same risk categories form the basis of National and Sub-national Government Rating except for the human capital category related to poor working conditions, which is not included in the Sub-national Government Rating because of the lack of data.

government levels when appropriate and feasible. Nevertheless, the scope of some categories for sub-national governments had to be adjusted based on data. Details on the risk categories are included in Table 1.

A popular framework in the industry is to quantify the risk exposure level and risk management level for each risk category. Such an approach has two main limitations: 1) partial or inconsistent one-to-one mapping of exposure and management metrics; 2) subjective or an unreliable combination of the exposure and management dimensions within each risk category. Acknowledging the importance of both dimensions, Clarity AI includes relevant metrics for exposure and management in the rating but it does not force this framework onto every risk category.

Table 1- Risk categories included in the ESG Government "Industry Consensus" Risk Rating

PILLAR	RISK CATEGORY	DESCRIPTION
ENVIRONMENT	RESOURCE USE	Lack of access to **natural resources**, which could slow down a country's economic growth and development. It includes energy, water, land, oceans, and other natural resources (e.g., minerals).[3]
	EMISSIONS	**Air pollution**, given that it is the world's single largest environmental health risk resulting in a quantifiable economic cost to countries.
		Greenhouse gas emissions, given that policies limiting and punishing emissions are likely to be enacted to limit the rise in global temperature.
	ENVIRONMENTAL EXTERNALITIES	• Exposure and vulnerability to **natural disasters**. • Destruction of **biodiversity**.
SOCIAL	HUMAN CAPITAL	Limitations on the **quantity or quality of human capital**. It includes demographic transition, education, and health.
		Poor **working conditions** that could limit labor productivity.
		Misallocation of human capital that could drive economic productivity down. It includes inequality, economic environment, employment, and access to services .
	PHYSICAL CAPITAL: INFRASTRUCTURE	Poor transport and telecommunications **infrastructure** that could limit the growth and expansion of the private sector.
	TECHNOLOGY	Low **technological capabilities** that could limit economic growth. It includes ICT adoption and innovation.
GOVERNANCE	INSTITUTIONS	Weak **formal institutions** that could reduce the efficiency of investment and limit growth. It includes economic rules, judicial rules, political rules, government effectiveness, and corruption.
		Weak **social capital** that could affect the ability to improve asociety's efficiency through coordinated action.
	STABILITY	**Poor safety and security** that could reduce the effectiveness of formal and informal institutions.
		A negative **net migration** could affect the stability of a country.

[3] For Sub-National Government Rating oceans, biodiversity and other natural resources (e.g., minerals) are excluded.

STEP 2: Data Selection

The **total number of metrics** used to calculate the ESG **National Government** "Industry Consensus" Risk Rating is **92**:

- 32 for the environmental risk rating
- 40 for the social risk rating
- 20 for the governance risk rating

The full list of metrics, their descriptions and corresponding data sources are included in Annex B.

Admittedly, there is **no clear unanimity in the industry on which ESG metrics to consider**. Therefore, Clarity AI has included most of the metrics currently used across the industry in its rating, while also taking into consideration **data availability and avoiding duplication**. For example, Clarity AI does not include metrics that measure the same subject if are highly correlated to avoid duplications (see Annex F for examples of highly correlated metrics). Furthermore, Clarity AI also combines metrics when this strategy offers a more comprehensive and accurate picture than considering two metrics separately. For example, instead of looking at water withdrawal and water resources as two different metrics, Clarity AI uses the combined metric of water stress (i.e., water withdrawal as a percentage of water resources).

The ESG **Sub-National Government** "Industry Consensus" Risk Rating, which is based on a **reduced set of metrics**, is **39**:

- 13 for the environmental risk rating
- 16 for the social risk rating
- 10 for the governance risk rating

Certain metrics, such as literacy rate or prevalence of undernourishment, were excluded from the Sub-national Government Rating because they present low variability for the regions covered by the current version of the scores, limiting the usefulness of this data. Others, such as the ocean health index or the red list index of species survival had to be removed because the data is not available at the sub-national level. For the governance pillar, the metrics used to measure economic and judicial rules remain unchanged despite the lack of regional data because of their relevance; sub-national ratings for all regions within a country were calculated using the national level estimate for those metrics. Details on the reduced set of metrics used for sub-national governments are included in Annex C.

STEP 3: Normalization

The next step in calculating the ESG Government "Industry Consensus" Risk Rating is to identify and treat extreme values from the distributions (i.e., limit extreme values in the statistical data) to prevent skewing the results of the rating.[4] Outliers are always assigned a score smaller than 6 or a score larger than 95 (depending on whether they are outliers from the right or left tail of the distribution). National and sub-national

[4] While there are several methods for determining outliers in a sample, Clarity AI's government rating applies the outlier definition of points with a distance to the third quartile (i.e., 75th percentile) or the first quartile (i.e., 25th percentile) larger than 3 times the interquartile range (i.e., difference between 75th and 25th percentiles).

governments are considered to belong to a single universe of peers (i.e., governments), therefore data is aggregated for identification and treatment of outliers.

We then normalize the data by comparing the relative performance of governments for each metric to enable aggregation and comparability of very different issues. Each indicator is rescaled from 1 to 100 where 1 corresponds to the worst performer and 100 to the best performer.[5]

This **normalization method** helps increase the sensitivity of the score for indicators lying within a small interval. Alternative methods, such as z-score normalization (i.e., converting all metrics to a common scale with an average of zero and a standard deviation of one), often limit the range of the scale used for rating as the distance between the minimum and maximum value differs across normalized indicators (see Annex G for an example on the effect of the normalization method on the score range.)

STEP 4: Aggregation

The final step in calculating the ESG Government "Industry Consensus" Risk Rating is to aggregate metrics within and across pillars. Weights are applied to each metric based on the **"Industry Consensus"** regarding their importance. This results in the following aggregation processes:

- ***Metric aggregation within each pillar****:* there is no clear consensus in the industry on the relative weights of the different risk categories; Clarity AI uses the most common patterns that emerge across stakeholders,

  Environment Pillar

  - The use of natural resources, on aggregate, is the most important environmental risk.
  - Within natural resources, energy-related risk categories, on aggregate, have the highest weight.
  - Emission-related risks are more important than risks related to other environmental externalities (i.e., biodiversity and natural disasters).
  - Within other environmental externalities, natural disaster risk has a higher weight than biodiversity risk.

  Social Pillar

  - Human capital, on aggregate, is the most important social risk.
  - The definition and aggregation of human capital risks varies across stakeholders, but the major emerging risks are the population's demographic transition, health, education, inequality, economic environment, and employment.

  Governance Pillar

  - All metrics within the Governance pillar are highly correlated with each other: countries tend to perform at a similar level across all governance dimensions. As a result, an equal weight scheme at the risk category level is followed for this pillar because the weights selected have little influence on the Governance score.

- ***Metric aggregation across the three pillars*** (i.e., E, S and G aggregation): 25% E, 25% S, and 50% G. While there is again no clear consensus in the industry on the E and S weights, all stakeholders agree that Governance factors are more material than Environmental or Social ones.

[5] Min-Max normalization converts all metrics to a common scale by subtracting the minimum value and dividing by the range of the metric values. Metrics are rescaled so the higher values always denote better performance.

Details on the materiality matrix used are included in Annex D.

Finally, it should be noted that the **Clarity AI tool allows the user to fully customize weights to adjust the relative importance of metrics, risk categories and the three pillars of the ESG score based on their own preferences.**

FUTURE IMPROVEMENTS

Future versions of the rating will include improvements to the steps discussed previously.

- **Step 1 & 2: Include additional metrics to enhance the granularity of certain topics.** Certain topics might be revisited to expand their scope and include new metrics. For example, future versions could include separate metrics for the different types of air pollution (i.e., disaggregate ambient pollution due to PM and indoor pollution) or new metrics to capture energy and water infrastructure.

- **Step 3: Alternative normalization functions.** Future versions might include the option of changing the normalization method when relevant. In the case of greenhouse emissions, if countries commit to certain quotas and economic consequences are expected if quotas are not met, it might make sense to evaluate the risk level for these countries based on their performance against their target quota rather than against other countries' performance.

- **Step 4: Risk materiality adjusted based on applicability to each government**. While all risk categories could apply to all governments, the relevance of some of these risks depend on the specific government under consideration. For example, water scarcity is a local problem that predominantly affects countries in certain geographies; the potential economic consequences of water scarcity will depend on whether a government belongs to those geographies or not. Similarly, access to and quality of land resources is most relevant for agriculture-based economies. Future versions of the rating will take those differences into account for higher accuracy and relevance of the scores.

- **Step 5: Quantitative models to estimate materiality of risk categories**. In order to increase the objectivity of the scores, future versions of the rating will increasingly rely on quantitative models that leverage existing research and evidence of economic impact estimates. The models will estimate, for example, the order of magnitude of the potential economic loss (as a % of GDP) the government would suffer if the risks materialized by 2030. These orders of magnitude will be used to guide the allocation of relative weights across risk categories.