

MSCI ESG Government Ratings Methodology

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Purpose of ESG Government Ratings

MSCI ESG Government Ratings provide an opinion of sovereign and sub-sovereign entities’ exposure to and management of ESG risks. MSCI ESG Research defines ESG risks to sovereign and sub-sovereign entities as environmental, social, or governance-related issues that could impact the long-term sustainability of economies.

MSCI ESG Government Ratings are point-in-time assessments¹ that rely mainly on a quantitative, data-based methodology to measure the ESG risks, using available indicators from reputable public sources. Based on the Exceptional Events Framework, MSCI ESG Research may also apply some factor adjustments for a particular sovereign entity, as explained in the section below.

MSCI ESG Research applies the same scoring methodology and weightings for all entities rated globally. The ratings are a global scale from AAA to CCC. For additional details on the definition of rating scales, refer to “MSCI ESG and Climate Symbols and Definitions” available [here](#).

Overview

ESG Risk Exposure and ESG Risk Management

MSCI ESG Government Ratings methodology is based on assessing a sovereign or sub-sovereign entity’s ESG Risk Management relative to its ESG Risk Exposure.

ESG Risk Exposure considers resources (natural capital, human capital, and financial resources) as prerequisites for a sovereign’s sustainable development and economic performance. Because countries are endowed with varying amounts of these resources, they have inherent advantages or disadvantages in converting these assets into productive goods and services. Other enabling factors are also included in our consideration of exposure – such as having an effective political governance structure and judicial system, low vulnerability to climate change and natural hazards, and a supportive socioeconomic environment. These can all help enable the effective utilization of an economy’s resources.

ESG Risk Management uses data on demonstrated performance on these ESG areas. For example, data capturing outcomes on environmental sustainability, standards of living, safety and freedom.

ESG Pillars and Risk Factors

MSCI ESG Research defines the Environmental, Social, and Governance pillars in ESG Government Ratings as follows:

¹ A point-in-time assessment is an assessment which is not monitored and does not change to reflect updates in underlying data, except at the time of assessment.

Exhibit 1: ESG Pillar Definitions

Pillar	Definition
Environmental (E)	Assesses a government’s ability to protect, harness, and supplement its natural resources, and to mitigate and adapt to climate change and natural hazards.
Social (S)	Assesses a government’s ability to develop a healthy, productive, and stable workforce, and knowledge capital to create a supportive economic environment and foster innovation.
Governance (G)	Assesses a government’s institutional capacity to support long-term stability and functioning of its financial, judicial, and political systems, and capacity to address the environmental and social risks.

These pillars are subsequently divided into six risk factors (Exhibit 2). Each risk factor has a corresponding assessment for ESG Risk Exposure and ESG Risk Management.

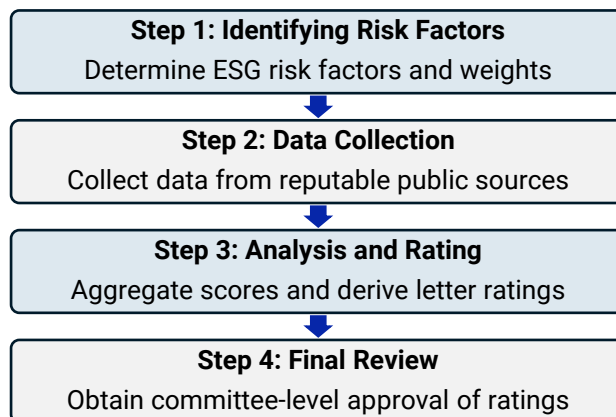
Exhibit 2: ESG Risk Factors

Pillar	Risk Factor
Environmental (E)	Natural Resources
	Climate Change and Natural Hazards
Social (S)	Human Capital
	Economic Environment
Governance (G)	Financial Governance
	Political Governance

Analytical and methodology-related process

The exhibit below shows the key steps in assigning MSCI ESG Government Ratings.

Exhibit 3: MSCI ESG Government Ratings: Analytical Process



Identifying Risk Factors

MSCI ESG Government Ratings framework begins by considering three types of resources: (1) natural capital, (2) human capital, and (3) financial resources that a sovereign or sub-sovereign entity is endowed with.

Given that the global population has already reached a high level, and at the same time, many developing countries are trying to reduce poverty and increase living standards, there is pressure on natural resources in both developed and developing countries. Countries with available **natural capital** such as land, energy and minerals, and freshwater resources, may have long-term competitive advantages.

In terms of **human capital**, countries benefit from a skilled, productive and healthy workforce to promote the generation of new and innovative ideas, business models, products and services that enable it to compete in a globalized economy. Countries that maintain a healthy population and minimize their health expenditure can invest more in other areas to foster economic growth and well-being. Additionally, a balanced demographic age profile is advantageous so that the working population of a country can support its dependent population (especially old-age population).

The availability of **financial resources** may have an impact on an economy's long-term sustainability and competitiveness. Higher debt levels may result in higher national interest payments in the future, resulting in reduced investment and expenditure in priority areas such as job creation, education, health and security. In the absence of sufficient financial resources in the future, a government may not be able to invest in management of its environmental and social risks.

The availability of resources is necessary for providing competitive advantage to a country's economy but alone cannot ensure its long-term competitiveness. There are other factors, which can facilitate or restrict the potential benefits of these resources, most notably a country's prevailing economic environment. The economic environment consists of factors such as fiscal policy, monetary policy, industrial policy, infrastructure, gross domestic product (GDP) growth and level of income. The economic environment has a great impact on commerce, which, in turn, affect utilization and management of resources. For example, a country may not be able to reap a demographic dividend unless it has a supportive economic environment that can create opportunities for its population; and without a supportive economic environment, this dividend may even become a liability.

A country's growth dynamics can also be constrained if it is vulnerable to natural hazards such as earthquakes, storms, tsunamis or floods, and environmental externalities such as pollution and waste. These natural hazards and externalities may affect national resources adversely by reducing their potential benefits and governments may need to devote some of their financial resources towards addressing these hazards and externalities.

The institutional mechanisms to effectively allocate, utilize and manage national resources may be another factor that can restrict or facilitate the potential benefits of these resources. In MSCI ESG Research's view, these institutional mechanisms are even more important than the actual availability of resources. For example, some countries with an abundance of natural resources, have not achieved higher living standards due to poor governance. In order to ensure effective management of national resources, a country should have an effective government and judicial system.

The definitions for all six ESG risk factors are as follows:

Exhibit 4: ESG Risk Factor Definitions

Risk Factor	Definition
Natural Resources	The Natural Resource Risk Factor assesses the availability of natural resources in a country, the quality of its ecosystems, and the ability to protect those resources to sustain its economic growth model and competitiveness.
Climate Change and Natural Hazards	The Climate Change and Natural Hazards Risk Factor assesses a country’s vulnerability to natural hazards, an economic dependence on carbon-intensive assets, and the ability to mitigate their impacts through transition to a low-carbon economy.
Human Capital	The Human Capital Risk Factor assesses the risk of a country not having balanced and productive human capital, including an educated, healthy, and skilled workforce that is a source of an economy’s innovation and competitiveness.
Economic Environment	The Economic Environment Risk Factor assesses how conducive a country’s economic environment and policy mix is to enable utilizing its resources effectively, including the macroeconomic stability, quality of infrastructure, and socioeconomic environment.
Financial Governance	The Financial Governance Risk Factor assesses the risk of a country lacking sufficient financial capital to manage resources in a sustainable way, as well as the level and quality of its fiscal transparency and resource governance.
Political Governance	The Political Governance Risk Factor assesses the effectiveness of a country’s political governance structure, and judicial and penal system in supporting the value creation process through transparency and accountability to its people.

Natural Resource Risk Factor

The **Natural Resource Risk Factor** focuses on three critical natural resources (energy and minerals, freshwater resources, and land), as well as a country’s biodiversity and its externalities from pollution and waste. This factor is comprised of 10 sub-factors:

Energy is part of almost every economic activity, and it is critical for maintaining living standards. However, energy resources are not distributed equally among countries – most countries rely on energy imports. In the **Energy Security Risk Exposure Score** assessment, MSCI ESG Research considers proven fossil and nuclear fuel reserves, and net energy imports to assess a country’s energy independence. Scarcity of energy resources in a country implies higher exposure to energy security risk. Countries with abundant energy resources have an advantage that – if properly managed – can enhance living standards and result in economic growth, development and foreign exchange income. Reliance on imports for meeting energy needs results in higher foreign currency outflows and makes a country’s economy vulnerable to global energy price fluctuations. Further, in

extreme situations like war, it can put a country at risk; energy imports may be disrupted, adversely affecting the country's productivity.

On the other hand, abundance of traditional energy resources can increase a country's economic dependence on the hydrocarbon sector, making its transition to a low-carbon economy more difficult. MSCI ESG Research assesses the **Energy Resource Risk Management Score** based on energy productivity, renewable energy, energy consumption and energy resource depletion. Energy security risk can be reduced or mitigated by increasing energy efficiency, reducing consumption levels, and producing renewable energy. Investments in technology to reduce energy intensity of processes can lead to a higher output per unit of energy used and reduce the resource depletion rate. A country with higher exposure to energy resource risks can also manage these risks in part by producing more renewable energy, which reduces its reliance on fuel and energy imports and can enhance its energy security. Higher energy consumption levels increase risk because this may result in high energy resource depletion and greater fuel and energy imports, leading to higher foreign currency outflow with an adverse effect on a country's trade balance.

In the **Water Resource Risk Exposure Score** assessment, MSCI ESG Research uses data for renewable water resources to assess a country's internal water supply. Availability of water resources in a country implies lower exposure to water resource risk. Because access to clean drinking water is a basic human requirement and water is also a key input for the agricultural sector and many industrial processes, scarcity of water may put severe constraints on a country's social stability, peace, and economic growth. Threats to access to this critical resource have resulted in conflicts within countries and between neighboring countries. Water shortages due to climate change-induced droughts may increase the competition for access to scarce water resource even further and may result in mass migrations.

Water withdrawal levels relative to internal renewable resources and a country's population together with water stress are used to calculate the **Water Resource Management Score**. Higher withdrawal may be unsustainable in the long term, and thus may increase water resource risk. Water resource risk can be managed in part by improving water utilization efficiency and changing water usage patterns. For example, wastewater treatment and recovery may be used to recycle water for industrial use. In the agricultural sector, adaptation measures such as developing drought-resistant crops may lead to a lower reliance on fresh groundwater and weather patterns.

Similar to the availability of energy and water resources, MSCI ESG Research considers the availability of productive land (agricultural and forest land), and mineral resources that can provide competitive advantage to a nation in a resource-constrained global economy. These indicators are considered in the **Productive Land and Mineral Resource Risk Exposure Score** assessment. Higher availability of productive land may support higher agricultural production and exports, and thus can contribute to greater food security and higher economic growth. Similar to energy-rich countries, mineral resources-rich nations have an advantage that – if properly managed – can enhance living standards and result in economic growth and development and become an important source of an economy's foreign exchange income.

Sustainable conservation of existing natural resources is required to maintain or improve a country's long-term access to resources. The **Resource Conservation Risk Management Score** assessment considers data for net agricultural product exports, mineral resource depletion rate and net forest depletion rate. A negative value of a country's net agricultural products exports implies net imports of agricultural products, and thus higher food security risk to the country. A higher value for mineral

resource depletion and forest depletion represents greater reliance on income from mineral resources or forests. On the other hand, mining and production of commodities may increase land conversion for industrial or agricultural use, exerting pressures for land use and natural forest resources. Governments may protect these resources through conservation investments and land use management practices to ensure sustainable use of natural resources. Higher government spending on environmental protection indicates a country's commitment to conservation of its natural assets.

The **Biodiversity Risk Exposure Score** assesses the diversity of a country's natural ecosystems and their potential based on the richness and endemism of local plants and animal species. A higher share of endangered species represents higher biodiversity risks. A country's agricultural and economic development depends on the ecosystem services such as clean air and water, fertile soil, pollination, raw materials and stable climate. Greater biodiversity in ecosystems and species underpins increased resilience to weather disruptions, disease and pollution. Countries may also depend on the integrity of these ecosystems for generating tourism revenue and maintaining the livelihoods of local communities.

The degradation and overexploitation of natural resources and rising urbanization may lead to the loss of natural habitats and species, and adversely affect the long-term value of a country's ecosystem services. The **Biodiversity Risk Management Score** assessment captures the change in a country's forest cover over time, and the net depletion rate of forest resources relative to its national income. A negative value of a country's forest cover change implies deforestation, and therefore increasing biodiversity risks. It can also signify a higher net depletion rate, with the harvest rate of forest resources exceeding the rate of their natural growth. Finally, the assessment considers the extent of biodiversity-rich areas (terrestrial and marine areas) that are designated as protected to assess a government's efforts to preserve biological diversity. Given that forests are an important carbon sink, the protection of biodiversity areas could also contribute to a country's carbon mitigation targets.

The **Pollution and Waste Risk Exposure Score** evaluates the emission levels of four air pollutants (particulate matter, nitrogen oxide, sulfur dioxide and non-methane volatile organic compound emissions), and the levels of solid waste generated by a country's population and industrial activities. These externalities increase a country's vulnerability to environmental contamination from pollution and waste, and the scale of a potential cost burden from waste management.

The **Pollution and Waste Risk Management Score** incorporates data for deaths due to air and water pollution, fine particulate emissions damage, and the trend in air pollutants. Higher levels of air and water pollution lead to adverse impacts on human capital, such as poor health and premature mortality, as well as to land degradation. A negative emissions trend implies reduction in a country's emissions levels and consequently possible reduction in associated adverse health impacts. The assessment also considers the rate of treatment of waste materials through recycling. High waste recovery levels indicate the ability of a government to limit the financial and environmental costs of waste that is not treated and recycled.

Climate Change and Natural Hazards Risk Factor

Climate change impacts economies through associated physical and transition risks. The **Climate Change and Natural Hazards Risk Factor** is comprised of four sub-factors:

Physical risks include property and infrastructure damage, disruption to trade and productivity loss due to rising average temperatures. The **Physical Risk Exposure Score** considers the current exposure of a country to natural hazards such as earthquakes, storms, tsunamis or floods, as well as the projected change in exposure to climate change-related hazards over a longer time horizon. A higher exposure of the population (in absolute and relative terms) to these hazards implies a higher probability of loss of lives and livelihoods, potential damages to a country's capital assets, and disruption to economic activity when these events materialize. In addition, many countries do not recover from one natural disaster before they are affected by another one, which increases their multi-hazard risk and economic vulnerability.

A government's ability to cope with disasters, given its existing infrastructure and formal governance structures to reduce disaster risks, is assessed in the **Physical Risk Management Score**. Despite a high exposure to natural hazards, a country could effectively manage its physical risks by building resilience of the physical infrastructure, and institutional capacity to anticipate these hazards and mitigate their impacts (for example, through a multi-hazard early warning system).

Transition risks result from the adjustment to a low-carbon economy that could cause reassessment of asset values and generate stranded assets such as fossil fuel reserves. The **Transition Risk Exposure Score** assesses a country's dependence on hydrocarbon rents (coal, oil and gas rents) and the extent of hydrocarbon subsidies relative to GDP. Countries that derive a large share of their national income from the hydrocarbon sector face higher risks of economic disruption due to the low-carbon transition of the global economy. The assessment also considers potential regulatory risk to a country due to higher greenhouse gas (GHG) emission levels. International negotiations over climate regulations revolve around the carbon intensity of a country's economy and emissions embodied in international trade (imported emissions). A higher level of emissions may result in higher monetary implications for the country in future.

To assess the **Transition Risk Management Score**, MSCI ESG Research considers the trend of the Scope 1 emissions intensity of a country's economy. Scope 1 emissions are domestic GHG emissions from sources located within a country's territory. A negative value implies decreasing GHG intensity of its economy. The analysis of transition risks is also informed by a government's target emissions gap, which indicates the progress in reduction of emissions from the first nationally determined contribution (NDC) enforcement year in 2016 until 2030, and economic exposure to low-carbon technologies.

Human Capital Risk Factor

The **Human Capital Risk Factor** is comprised of seven sub-factors:

To determine a country's **Basic Human Capital Risk Exposure Score**, MSCI ESG Research assesses adult literacy and health levels, population demographics, and gender inequality. An educated and healthy workforce that can support the dependent population, indicates a good quality of human capital.

To develop its human capital, a country must be able to provide for the basic needs of its population at a minimum. The **Basic Needs Risk Management Score** assesses a country's performance on providing basic services to its population and measures the prevalence of food insecurity, access to electricity, access to basic water and sanitation services, and primary education enrollment rate.

The **Higher Education and Technology Readiness Risk Exposure Score** evaluates a country's higher-education levels and its population's technological readiness, as these enable efficient utilization of a skilled workforce. A technologically ready workforce will have more access to information and is likely to be more productive.

The **Human Capital Performance Risk Management Score** evaluates life expectancy, higher-education enrolment rate, youth literacy rate, and infant and maternal mortality rates. Improvement in these parameters indicates rising human development levels and increased focus on creating a healthy and productive workforce. Improvement in these parameters can also be due to improvement in the level of education and healthcare infrastructure, increased access to such infrastructure, or better management of environmental externalities.

Better provisioning of health and education infrastructure may increase access to education and healthcare, which can improve the quality and productivity of the future as well as the current workforce. The **Human Capital Infrastructure Risk Management Score** assessment includes pupil-teacher ratios at primary and secondary levels, and the availability of nurses and midwives, physicians, and hospital beds relative to the size of the population.

Knowledge capital enhances a country's competitiveness and thus enables it to increase the living standards of its population. MSCI ESG Research considers high-technology exports, patent applications, and journal articles to measure the **Knowledge Capital Risk Exposure Score**.

The **Knowledge Capital Risk Management Score** assesses a country's investment in creating knowledge capital by considering its research and development (R&D) expenditure, and researchers and technicians in R&D relative to the size of population.

Economic Environment Risk Factor

An economic environment conducive to effective utilization of natural, human, and financial resources is beneficial. For example, a country facing recession may not be able to utilize its human capital optimally and effectively irrespective of the quality of its human capital; and its economic environment may result in unemployment and working poverty, which, in turn, may lead to public unrest in the country. The **Economic Environment Risk Factor** is comprised of two sub-factors:

The **Economic Environment Risk Exposure Score** assesses the stability of a country's macroeconomic environment that is a key factor enabling a country's productive use of its natural and human capital. Inflation results in a decrease in the real value of money over time and uncertainty over future inflation may discourage investment and savings, while higher income growth may create additional jobs. A country with higher labor market freedom promotes a favorable environment for setting up businesses. The assessment also includes the quality of a country's infrastructure because lack of infrastructure can act as a bottleneck and may result in increased costs and delays, thereby making the country's products and services nonviable in competitive markets.

Features of a country's economic well-being include higher employment levels, no poverty, lower income inequality, and strong workers' rights. These metrics are considered in the **Wellness Risk Management Score**.

Financial Governance Risk Factor

High debt levels may reduce a country's ability to invest in the future, disrupt the business environment and may affect competitiveness and sustainability in the long term. Weak financial governance may also affect a country's capacity to manage other environmental and social risks such as energy security and job creation. The **Financial Governance Risk Factor** is comprised of two sub-factors.

The **Financial Capital and Trade Vulnerability Risk Exposure Score** considers public debt, trade vulnerability and net international investment position. Higher debt levels result in higher interest costs in the future and, in turn, less money to be used by the country for itself, which can constrain investment in the management of environmental and social risks. It can further increase a country's exposure to ESG risks and affect future growth and well-being adversely. The trade vulnerability of a country is assessed through geographic concentration of exports, and diversification of merchandise and commercial services exports.

Strong financial governance is a critical factor determining the long-term sustainability of an economy. The **Financial Management Risk Score** is informed by data on a country's fiscal and current account balances. A fiscal deficit may prompt a country's government to borrow, which may result in increased debt. The score also considers a country's fiscal transparency and resource governance. Trade vulnerability risk evaluates changes in the geographic concentration of exports, merchandise exports' concentration and commercial services exports' concentration. Negative values of these data points indicate decreasing concentration risk of exports.

Political Governance Risk Factor

Out of the six ESG risk factors, political governance is the highest weighted in the model. Political governance refers to how a government manages the state, establishes transparency and accountability to its people, and promotes a sense of nationhood. Poor political governance may not only affect the stability and security of a country, but it may also constrain its social and economic progress. Moreover, a country's political governance may also have important bearing on its financial governance. The **Political Governance Risk Factor** is comprised of six sub-factors:

The **Institutions Risk Exposure Score** evaluates the quality of institutions as the first step in assessing political governance. A country with a fully developed democracy allows all adult citizens to have an equal say in the decisions that affect their lives, which can facilitate effective allocation and management of national resources. Greater press freedom may promote the accountability of different stakeholders, which can lead to enhanced overall well-being.

An effective and efficient judicial and penal system is also considered a prerequisite for effective governance in a country, which is measured by the **Judicial and Penal System Risk Exposure Score**. An ineffective judiciary or penal system in a country may promote illegal activities, corruption, exploitation and poor law enforcement due to poor public and civil service delivery, which may result in social, economic and political crises.

The **Governance Effectiveness Risk Exposure Score** assesses the capacity of the government to effectively formulate and implement policies.

The **Stability and Peace Risk Management Score** evaluates the ability to provide security to its population and bring peace and political stability. The assessment considers political stability and

absence of violence or terrorism in a country, in addition to any ongoing domestic conflicts or involvement in international conflicts.

The **Corruption Control Risk Management Score** assesses the perceptions of prevalence of public sector corruption. Failure to control corruption may lead to rent-seeking behavior, economic inefficiencies, and capture of the political process. The environment of uncertainty created by corruption can lead to low development, higher income inequality, and lower economic growth.

The **Political Rights and Civil Liberties Risk Management Score** considers the level of political rights and civil liberties in a country, including perceived freedom of expression, freedom of association and free media. A higher level of political rights and civil liberties may imply greater human rights, greater participation and fewer internal conflicts.

MSCI ESG Government Ratings Framework

The MSCI ESG Government Ratings framework is presented in Exhibit 5. Six ESG risk factors combine to form three pillars (Environmental, Social and Governance). Exposure and management scores for every risk factor are computed after assessing a country's performance on sub-factors. Overall, 102 data points are evaluated to assess 31 sub-factors. Please refer to Appendix 1 for a comprehensive list of definitions and data sources that are used to calculate each sub-factor.

Exhibit 5: MSCI ESG Government Ratings Framework

Pillar	Risk Factor	Weight (%)	Risk Exposure Sub-factor	Weight (%)	Risk Management Sub-factor	Weight (%)
Environmental (E)	Natural Resource Risk	10%	Energy Security	2%	Energy Resource Management	2%
			Productive Land and Mineral Resources	2%	Resource Conservation	2%
			Water Resource Exposure	2%	Water Resource Management	2%
			Biodiversity Exposure	2%	Biodiversity Management	2%
			Pollution and Waste Exposure	2%	Pollution and Waste Management	2%
	Climate Change and Natural Hazards	15%	Physical Risk Exposure	7.5%	Physical Risk Management	7.5%
			Transition Risk Exposure	7.5%	Transition Risk Management	7.5%
Social (S)	Human Capital Risk	15%	Basic Human Capital	5%	Basic Needs	5%
			Higher Education and Technology Readiness	6%	Human Capital Infrastructure	3%
					Human Capital Performance	3%
			Knowledge Capital	4%	Knowledge Capital Management	4%

Pillar	Risk Factor	Weight (%)	Risk Exposure Sub-factor	Weight (%)	Risk Management Sub-factor	Weight (%)
	Economic Environment Risk	10%	Economic Environment	10%	Wellness	10%
Governance (G)	Financial Governance Risk	20%	Financial Capital and Trade Vulnerability	20%	Financial Management	20%
	Political Governance Risk	30%	Institutions	10%	Stability and Peace	10%
			Judicial and Penal System	10%	Corruption Control	10%
			Governance Effectiveness	10%	Political Rights and Civil Liberties	10%

Scoring and Rating Methodology

Risk Factors Weights

The ESG pillars and underlying risk factors are assigned weights to generate the final ESG Government Ratings. Risk factor weights are the same for all countries globally and are reviewed periodically.

The current weights of each ESG pillar were determined after assessing the *impact intensity* of that pillar on the long-term competitiveness over the short-, medium-, and long-term *time horizons*. The matrix in Exhibit 6, below, provides the preliminary weight of a pillar after considering the risk intensity in different time horizons. After determining the weights of pillars, MSCI ESG Research performed a similar exercise to determine weight of the six risk factors. In the next step, the weight of risk factors is distributed approximately equally to sub-factors underneath.

Exhibit 6: Weight-Determining Matrix

		Time horizon		
		Short-term (<2 years)	Medium-term (2 to 5 years)	Long-term (5+ years)
Impact intensity	High	Highest weight		
	Moderate			
	Low			Lowest weight

The Governance pillar is assigned a higher weight (50%) than the Environmental and Social pillars (25% each), based on the outcomes of the weight-determining matrix. Unlike environmental and social issues, which tend to materialize over longer time horizons, lapses in governance may

typically have shorter term consequences on financial management, institutional effectiveness, and political stability. Furthermore, weak governance could also hinder a country's development in other areas, such as environmental or social progress.

Raw Data to Score Conversion

In order to determine the rating, the raw data point values are first converted into 0 to 10 scores.

- For risk exposure data points, the best-in-class value is assigned a numeric score of zero (0) and worst-in-class value is assigned 10, that is, the best value represents the lowest risk exposure, and the worst value represents the highest risk exposure.
- For risk management data points, the scale is reversed because the best-in-class value is assigned a numeric score of 10 and the worst in class is assigned zero (0), that is, the best value means the strongest risk management and the worst value means the lowest risk management.

Standardization techniques are used to convert raw data into scored assessments. These standardization techniques typically rely on min-max scaling, where 0-10 scores are determined linearly between a range of two values. In certain cases, winsorization techniques are applied to help limit the impact of outliers when determining relative scores.

Determination of the ESG Government Score

An example aggregation for the ESG Risk Management score (see Exhibit 7 below) shows how scores are aggregated from the lowest data point level to the top level ESG Government Rating:

For this sample country, the raw value of water withdrawal relative to internal renewable resources is 190% and the corresponding numeric score (between 0 and 10) is **3.0**. This country does not have sufficient internal resources to meet its water demand and it relies on water imports to maintain its water consumption. Similarly, the numeric score for the water stress is used to assess the management of water resources, which is **6.8**.

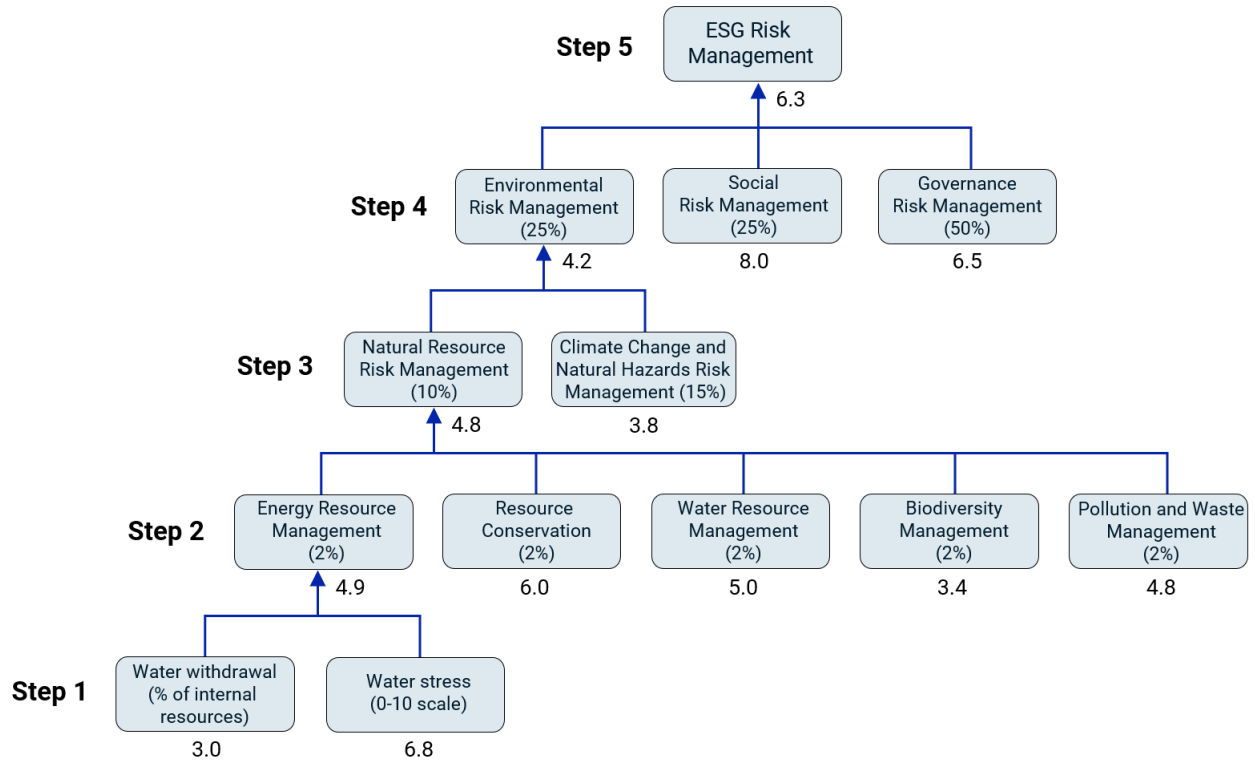
In the second step, a simple average of these two scores is calculated to determine the Water Resource Management Sub-factor score, which is **4.9**. The numeric scores for the other sub-factors, Energy Resource Management (**5.0**), Resource Conservation (**6.0**), Water Resource Management (**5.0**), Biodiversity Management (**3.4**), and Pollution and Waste Management (**4.8**) are determined the same way.

In the third step, the risk factor management score is computed as the weighted average of these five sub-factors. The resulting score for the Natural Resource Risk Management is **4.8**. Similarly, the Climate Change and Natural Hazards Risk score is calculated as **8.3**.

In the fourth step, the Environmental Risk Management score of **4.2** is computed as the weighted average of the Natural Resource Risk Management score and the Climate Change and Natural Hazards Risk Management score. The Social Risk Management score (**8.0**) and Governance Risk Management score (**6.5**) are determined the same way.

In the last step, the weighted average of the Environmental Risk Management, Social Risk Management, and Governance Risk Management scores is calculated to determine the ESG Risk Management score (**6.3**).

Exhibit 7: ESG Risk Management: Example Score Aggregation



Note: Values are for a sample country, for illustrative purposes only.

Using the same steps (step 1 to 5), the ESG Risk exposure score for this country is then calculated, which is 2.96. In order to determine the rating, the ESG Government Score is calculated as below:

ESG Government Score:

$$= \text{Min} \left\{ \begin{matrix} \text{Average}(10 - \text{ESG Risk Exposure Score}, \text{ESG Risk Management Score}) \\ (\text{ESG Risk Management Score} + 1), \end{matrix} \right\} \dots (1)$$

With this approach, a country’s ESG Government Score is constrained by its risk management score if its overall risk management is weak. This formula with minimum management threshold reflects MSCI ESG Research’s view that a country with poor risk management may not be able to harness its available resources effectively, even if those resources are abundant.

ESG Government Score to ESG Government Rating

ESG Government Scores are calculated for all countries and then converted into a letter rating. The AAA rating represents the highest ESG Rating (i.e., lower ESG risk exposure and stronger risk management) whereas the CCC rating represents the lowest ESG Rating (i.e., higher ESG risk exposure and weaker risk management).

Rating transition lines represent the score boundaries for each rating letter, from AAA to CCC. The rating transition lines are determined through statistical analysis of the ESG Government Scores each year:

1. Calculate the **average** and **standard deviation** of the current year's ESG Government Scores.²
2. Determine thresholds for AAA and CCC ratings:

Exhibit 8: Computation of AAA and CCC Rating Thresholds

ESG Government Score (formula)	Level
<i>Average + 2 x standard deviation</i>	Threshold for AAA rating
<i>Average</i>	Midpoint of BBB rating
<i>Average - 2 x standard deviation</i>	Threshold for CCC rating

Other rating thresholds (for **AA, A, BBB, BB and B**) are determined by **dividing the zone** between AAA and CCC ratings into **five equal zones**.

The exact values for rating thresholds vary slightly each year as these are calculated based on each year's ESG Government Ratings score distribution. They are available upon request from MSCI ESG Research.

Exhibit 9 shows an example of these rating threshold values in a hypothetical year, but is for illustrative purposes only, and does not represent the current year's rating threshold values.

Exhibit 9: ESG Rating Zones for ESG Government Ratings

ESG Government Rating	Minimum ESG Government Score	Maximum ESG Government Score
AAA	8.19	10.00
AA	7.15	8.19
A	6.12	7.15
BBB	5.08	6.12
BB	4.04	5.08
B	3.00	4.04
CCC	0.00	3.00

Average ESG Government Score: 5.60
Standard Deviation of ESG Government Score: 1.30

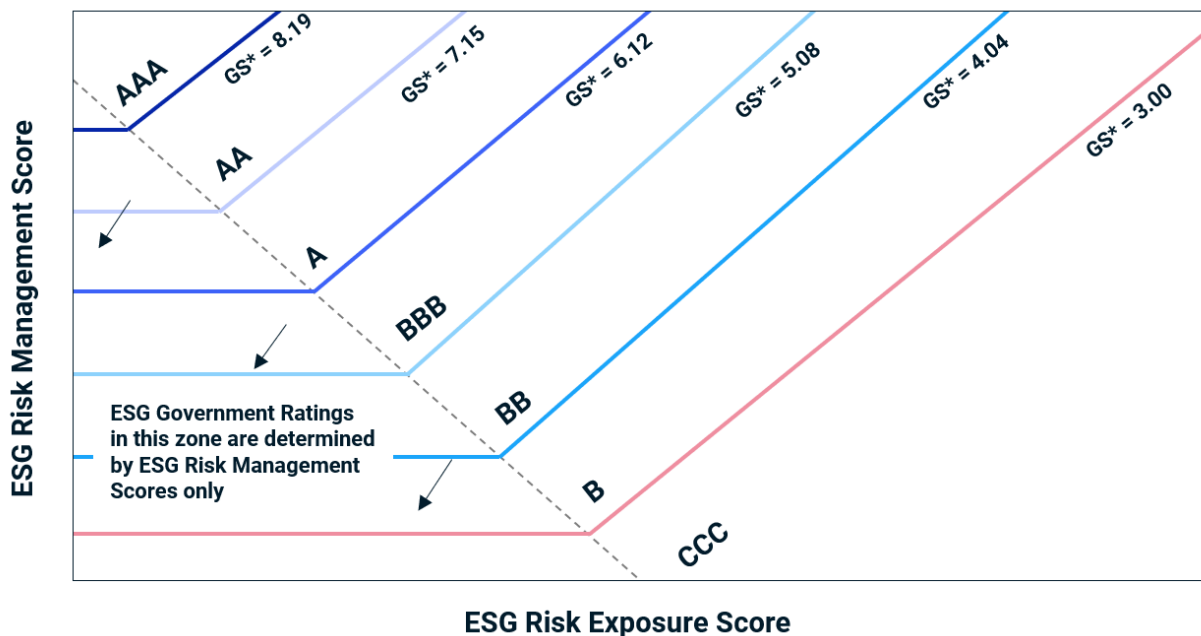
² The model's standard deviation and average calculations are based on a subset of countries and do not include all markets because: (i) they may be more likely to place erratic pressure on the average calculation and (ii) data availability issues for smaller countries may increase variability.

The markets that are used in the calculation are: MSCI Developed Markets, MSCI Emerging Markets, all MSCI Standalone Markets, and All MSCI Frontier Markets (except only the West African Economic and Monetary Union (WAEMU)). This approach helps to reduce variability in the model calculations related to data unavailability issues for smaller countries. These are defined as per MSCI classifications. See <https://www.msci.com/our-solutions/indexes/market-classification> for more details.

Note: This table is for illustrative purposes only and does not represent the values for the latest/current year (see explanation above).

Rating thresholds and ratings zones can be represented on a two-dimensional chart plotting ESG Risk Exposure Scores and ESG Risk Management Scores, as shown in Exhibit 10, below. The lines in Exhibit 10 represent the rating thresholds between one ESG Government Rating and another. Below a certain management level (dotted line), the ESG Risk Exposure Score does not affect the ESG Government Rating, which is solely determined by the ESG Risk Management Score.

Exhibit 10: Rating Thresholds and Rating Zones by ESG Risk Exposure and Management Scores

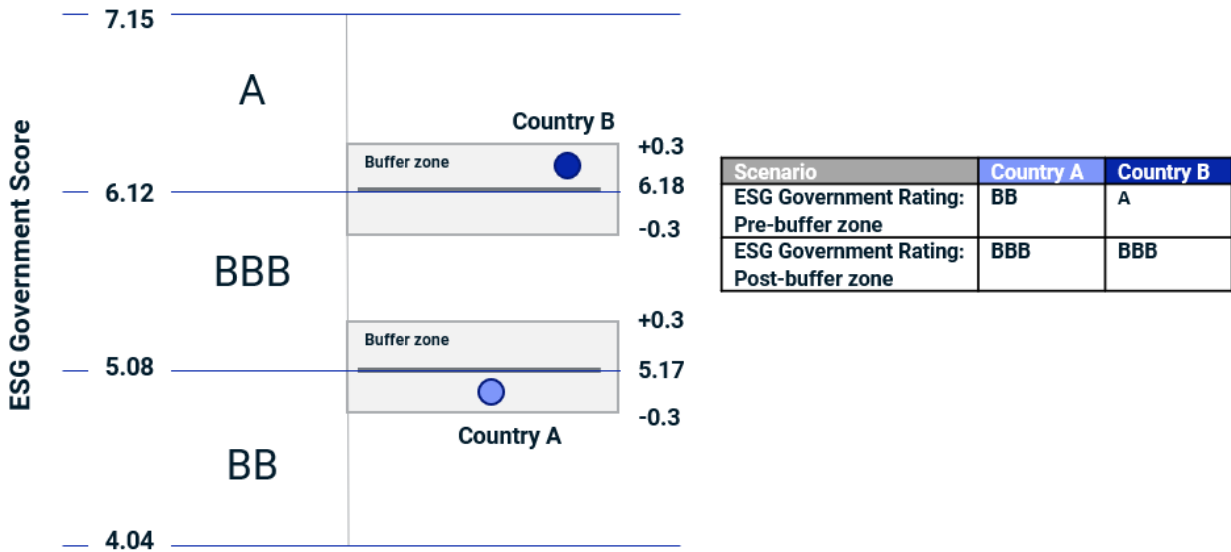


*GS = ESG Government Score

Determining Rating Buffer Zones

In cases where an ESG Government Score lies near a rating threshold separating two rating zones, it may be possible that a small change in the scoring of a single Risk Factor could result in a large enough change in the country’s ESG Risk Exposure or ESG Risk Management Score to trigger a change in ESG Government Rating. In order to address such potential rating volatility, MSCI ESG Research uses a buffer zone of 0.3-point score range around each rating threshold. Any country with an ESG Government Score within the buffer zone around a rating threshold retains its previous year’s ESG Government Rating, even if its ESG Government Score moved across the rating threshold between one rating zone and another. This approach results in fewer ratings fluctuations (see Exhibit 11).

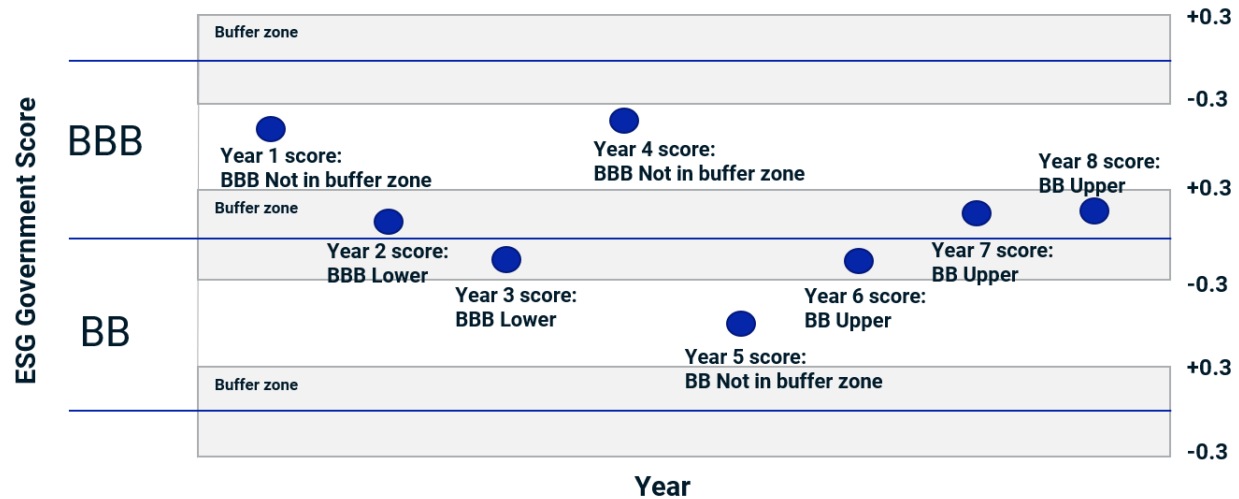
Exhibit 11: Rating Before and After Accounting for Buffer Zone



However, this logic is not applicable when a ESG Government Score transitions from one buffer zone to another buffer zone, in which case the rating as originally calculated is retained.

When there are changes to the methodology, the buffer zone may be increased to limit rating turnover driven purely by methodology changes. The buffer zone is reassessed each year. Upper or lower rating buffer zones are assigned to ESG Government Scores to reflect their placement within the rating zones. These buffer zones are assigned to highlight the upper or lower placement, respectively, of their ESG Government Scores from one year to the next. Buffer zone is assessed based on the direction of movement of an ESG Government Score, regardless of whether or not the score crossed a rating threshold from one rating zone to another. If a country's ESG Government Score has upward movement and lies in a buffer zone, it is assigned an Upper Buffer Zone. Similarly, if a country's ESG Government Score has downward movement and lies in a buffer zone, it is assigned a Lower Buffer Zone. A country with an ESG Government Score that lies outside any buffer zone is not assigned a buffer zone, even if it crossed a rating threshold. Different score movement scenarios and their resulting buffer zones are shown in Exhibit 12.

Exhibit 12: Government ESG Score Movements and Resulting Rating Buffer Zones and ESG Government Ratings



Exceptional Events Framework

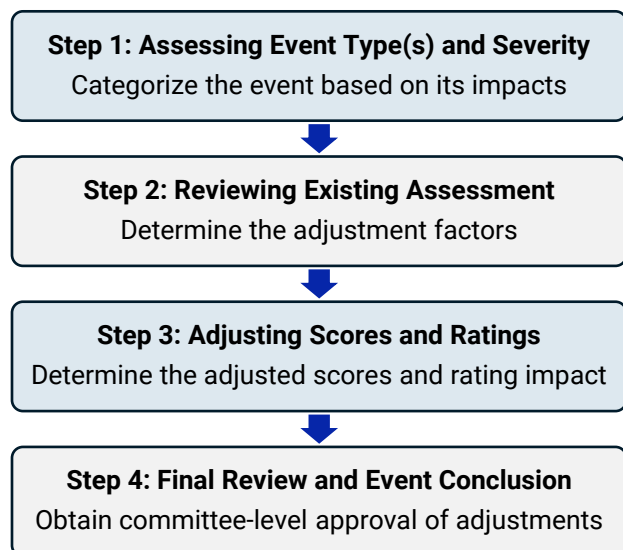
The Exceptional Events Framework is a mechanism that is used to track high-impact global events and incorporate their impact on ESG Government Ratings. This review process enables MSCI ESG Research to reflect exceptional events that have a severe or very severe impact (these severity levels are defined below) on a sovereign or sub-sovereign entity’s ESG profile, beyond what is already captured by the data in the quantitative model, which uses historical data. To reinforce the exceptional part of this assessment, the framework is only applied at the point of the annual review and events of moderate or minor severity do not result in an ESG score deduction. The Exceptional Events Framework does not consider human rights impacts or humanitarian situations in a country other than the country being assessed.

The framework categorizes events into four types (natural hazards, domestic political events, geopolitical events, and economic crises). MSCI ESG Research may apply an adjustment to ESG risk factors based on the outcome of the Exceptional Events Framework. The process compares the severity of the event against the existing score in the ratings model for the affected topic and applies a deduction to the relevant ESG risk factor score. Examples of such events may include (but are not limited to):

- **Natural hazards** such as earthquakes, wildfires or floods that could have a significant negative impact on a sovereign’s economic activity, the local population and environment.
- **Domestic political events** including a civil war, a military coup or an internal conflict that may prevent an orderly functioning of government institutions and impact a country’s socio-economic stability.
- **Geopolitical events** that may manifest in various forms, for example a country’s engagement in a cross-border armed conflict or international sanctions imposed on the leadership or economic sectors of a country.

- **Economic crises** that are accompanied by a severe currency crisis, balance of payments crisis, debt default or banking crisis.

Exhibit 13: Exceptional Events Framework: Assessment Process



Step 1: Assessing Event Type(s) and Severity.

Identify and assess exceptional event that have occurred: An event could be classified into one or more categories based on the information available at the time of the annual ratings review. For example, a civil war (domestic political risk) could escalate to a regional conflict (geopolitical risk). Similarly, a season of record wildfires (natural hazards risk) could lead to economic and domestic political instability (economic crisis and political risk).

Each event category has a dedicated Severity Assessment Scorecard. The objective of the scorecard is to break down the event into several quantitative and qualitative observations to capture a wide spectrum of risks. MSCI ESG Research determines whether an observation has occurred or not by accessing data from reputable public sources (such as the United Nations resolutions, UNICEF’s humanitarian action and emergencies, Amnesty International reports, forecasts from local government or international development organizations).

In order to understand what kind of observations are considered in the severity assessment, consider an example scorecard for an exceptional event related to natural hazards (see Exhibit 14).

Exhibit 14. Severity Assessment Scorecard: Example for Natural Hazards

(1) Benchmarking in terms of area affected		
Description of the event	Severity assessment	Affected Risk Factors
The flooding in the country affected 3.5% of the country's total area.	Severe	Climate Change and Natural Hazards Risk Exposure, Natural Resource Risk Management
(2) Benchmarking in terms of population affected		

Description of the event	Severity assessment	Affected Risk Factors
More than 8,000 people died, 30,000 people were injured and 1,500,000 people were displaced as a result of the flooding. In total, more than 7% of the country's population were affected.	Very Severe	Climate Change and Natural Hazards Risk Exposure, Economic Environment Risk Management, Human Capital Risk Management
(3) Benchmarking in terms of GDP affected		
Description of the event	Severity assessment	Affected Risk Factors
An international financial institution estimated the total economic losses of the flooding to exceed USD 10 billion. This constitutes around 11% of the country's GDP.	Very Severe	Economic Environment Risk Exposure, Financial Governance Risk Exposure, Economic Environment Risk Management

Every observation is mapped to the most relevant risk factor(s) in ESG Government Ratings model and corresponds to a certain level of impact severity and severity points. The highest impact severity (for natural hazards) or the cumulative severity points of the observations that have been met (for domestic political events, geopolitical events, and economic crises) are used to assess the outcome of the Severity Assessment Scorecard. The severity level corresponds to one of four categories as mentioned below:

- Very severe
- Severe
- Moderate
- Minor

Step 2: Reviewing Existing Assessment.

The severity assessment of the event is compared to the existing performance of a country on the relevant factors and sub-factors that reflect its susceptibility to that type of event risk. MSCI ESG Research determines the quartile placement of the factor score based on the distribution of scores for all countries for a given factor (see Exhibit 15).

Score adjustments are proposed only for those events, which were assessed as severe or very severe in the Severity Assessment Scorecard. Events of moderate or minor severity do not result in an ESG score deduction.

Exhibit 15: Comparing Severity Assessment with Existing Assessment

Existing assessment³

Severity assessment	Best in class (7.5-10.0)	Second quartile (5.0-7.5)	Third quartile (2.5-5.0)	Worst in class (0.0-2.5)
Minor	No adjustment needed	No adjustment needed	No adjustment needed	No adjustment needed
Moderate	No adjustment needed	No adjustment needed	No adjustment needed	No adjustment needed
Severe	Adjustment required	Adjustment required	Adjustment required	No adjustment needed
Very severe	Adjustment required	Adjustment required	Adjustment required	Adjustment required

Step 3: Adjusting Scores and Ratings.

A score adjustment is made to reflect the impact of the event on a sovereign entity’s overall ESG assessment: If any adjustment is required as per step 2, the following values (Exhibit 16) are used to make appropriate adjustments in the risk factor scores.

Exhibit 16: Adjustment Factors

Existing assessment

Severity assessment	Best in class (7.5-10.0)	Second quartile (5.0-7.5)	Third quartile (2.5-5.0)	Worst in class (0.0-2.5)
Minor	0	0	0	0
Moderate	0	0	0	0
Severe	3	2	1	0
Very severe	4	3	2	1

In the case of risk exposure factors, the adjustment factor is **added** in the risk factor exposure score (to indicate higher risk exposure).

In the case of management factors, the adjustment factor is **deducted** from the risk factor management score (to represent weaker risk management).

After the adjustment is made to the relevant risk factor scores, all of a sovereign entity’s derived scores are re-calculated, which could have an impact on its ESG Government Rating or Rating Buffer Zone.

³ Scores in table represent ranges for management sub-factors; for exposure sub-factors the ranges should read 0.0-2.5, 2.5-5.0, 5-7.5, 7.5-10.0.

Example of Natural Hazards Exceptional Event: 2022 Floods in Pakistan

- **Country of Assessment:** Pakistan
- **Event details:** Historic monsoon rains and flooding
- **Possible Sub-factors:** Physical Risk, Economic Environment, Financial Capital and Trade Vulnerability, Wellness
- **Related Risk Factors:** Climate Change and Natural Hazards, Economic Environment Risk, Financial Governance Risk
- **Severity:** Very severe

Step 4: Final Review and Conclusion of Exceptional Events. Any existing events assessed in the Exceptional Events Framework are reviewed at the time of the annual publication of MSCI ESG Government Ratings. The annual frequency of the review enables MSCI ESG Research to identify if the latest available data began to reflect the impact of the exceptional events relative to its severity. In addition, the impact assessment of new events may also be initiated during the annual review.

An event may be considered concluded after one year, if there is evidence that the event is no longer ongoing and if similar incidents have not occurred following the initiation of the assessment, resulting in lower severity assessment for that event. These could include, but not limited to, a change in the quartile placement of the relevant factor score due to availability of updated data.

All factor score adjustments and any resulting changes to ESG Government Ratings require a committee approval. Conclusion of exceptional events is also subject to the committee approval.

Appendix 1: MSCI ESG Government Rating Data

Environmental Pillar Risk Exposure

Risk sub-factor	Data point	Description
Energy Security Risk Exposure Score	Proven fossil and nuclear fuel reserves (TJ/ capita)	Proven reserves of coal, oil, natural gas, and nuclear fuel (uranium) in terajoules per capita (TJ/ capita). Data sources: MSCI ESG Research, EIA, World Nuclear Association, World Bank, IMF.
	Net energy imports (% of energy production)	Net energy imports are estimated as total energy production minus energy consumption and represented as a percentage of total energy production. Data sources: MSCI ESG Research, EIA.
Productive Land and Mineral Resources Risk Exposure Score	Agricultural and forest land (km ² / thousand people)	Agricultural and forest land in square kilometers per thousand people (km ² / thousand people). Data sources: MSCI ESG Research, World Bank, IMF, national sources.
	Mineral wealth (USD/ capita)	Value of minerals (including tin, gold, lead, zinc, iron ore, copper, nickel, silver, aluminum, phosphate, potash, and platinum group metals) in USD per capita (USD/ capita). MSCI ESG Research uses a 15-year average price to determine a country's mineral wealth. Data sources: MSCI ESG Research, USGS, World Bank.
Water Resource Risk Exposure Score	Internal renewable water resources (thousand m ³ / capita)	Internal renewable water resources (internal river flows and groundwater from rainfall) in thousand cubic meters per capita (thousand m ³ / capita). Data sources: MSCI ESG Research, World Bank.
Biodiversity Risk Exposure Score	Endangered species (% of total species)	Percentage of animal species (including mammals, birds, reptiles, amphibians, fish and invertebrates) classified as either critically endangered, endangered or vulnerable by the International Union for the Conservation of Nature (IUCN). Data sources: MSCI ESG Research, World Bank.

Risk sub-factor	Data point	Description
	National Biodiversity Index (0-1 score)	Biodiversity potential in a country based on estimates of its richness and endemism in four terrestrial vertebrate classes and vascular plants. Values range from 1 (best) to 0 (worst). Data source: Convention on Biological Diversity.
	GEF Benefits Index for Biodiversity (0-100 score)	Biodiversity potential in a country based on the species represented in each country, their threat status, and the diversity of habitat types. Values range from 100 (best) to 0 (worst). Data source: World Bank.
Pollution and Waste Risk Exposure Score	Fine particulate matter concentrations (mcg/ m3)	Annual mean levels of fine particulate matter of PM2.5 in urban and rural areas in micrograms per cubic meter (mcg/ m3). Data sources: WHO, national sources.
	Nitrogen oxide emissions (Gg/ thousand km2)	Nitrogen oxide emissions by land area in gigagrams per thousand square kilometers (Gg/ thousand km2). Data sources: MSCI ESG Research, EDGAR, UNFCCC, World Bank, national sources.
	Sulfur dioxide emissions (Gg/ thousand km2)	Sulfur dioxide emissions by land area in gigagrams per thousand square kilometers (Gg/ thousand km2). Data sources: MSCI ESG Research, EDGAR, UNFCCC, World Bank, national sources.
	Non-methane volatile organic compound emissions (Gg/ thousand km2)	Non-methane volatile organic compound emissions by land area in gigagrams per thousand square kilometers (Gg/ thousand km2). Data sources: MSCI ESG Research, EDGAR, UNFCCC, World Bank, national sources.
	Solid waste generation (tons/ capita)	Solid waste generation (including residential, commercial, and institutional waste) in tons per year per capita (tons/ capita). Data sources: MSCI ESG Research, World Bank, national sources.

Risk sub-factor	Data point	Description
Physical Risk Exposure Score	INFORM Risk Hazard and Exposure Index (0-10 score)	Physical exposure to earthquakes, river and coastal floods, tsunamis, tropical cyclones, droughts and epidemics. Exposure is measured in terms of the number and share of affected population. Maximum score of exposure to any of these hazards is considered. Regional average is assumed for missing values. Values range from 0 (best) to 10 (worst). Data sources: MSCI ESG Research, European Commission.
	World Risk Index Exposure (0-100 score)	Physical exposure to earthquakes, river and coastal floods, tsunamis, droughts, storm winds and sea level rise. Exposure is measured in terms of the number and share of affected population. Maximum score of exposure to any of these hazards is considered. Regional average is assumed for missing values. Values range from 0 (best) to 100 (worst). Data sources: MSCI ESG Research, World Risk Index.
	INFORM Climate Change Risk Index (0-10 score)	Change in exposure to climate-related hazards that include river and coastal floods, droughts and epidemics. Exposure is measured in terms of the number and share of affected population. Score is computed as an average of pessimistic and optimistic scenarios in 2050. Regional average is assumed for missing values. Values range from 0 (best) to 10 (worst). Data sources: MSCI ESG Research, European Commission.
Transition Risk Exposure Score	Scope 1 excl. LULUCF intensity (tCO ₂ e/ USD million GDP-PPP)	The most recently reported or estimated Scope 1 emissions intensity of greenhouse gases excluding land use, land-use change and forestry (LULUCF) for the country or territory in tons of CO ₂ equivalent per year per purchasing power parity-adjusted GDP (tCO ₂ e/ USD million GDP-PPP). Data sources: MSCI ESG Research, UNFCCC, MRIO/PRIMAP, EDGAR, World Bank, IMF.

Risk sub-factor	Data point	Description
	Imported emissions intensity (tCO2e/ capita)	The estimated imported emissions intensity in tons of CO2 equivalent per capita (tCO2e/ capita) for the country or territory (if available). MSCI ESG Research calculates imported emissions as a sum of Scope 2 and Scope 3 emissions. Data sources: MSCI ESG Research, MRIO/PRIMAP, OECD, Climate Watch.
	Hydrocarbon rents (% of GDP)	The 3-year average value of hydrocarbon rents as a percentage of GDP. The hydrocarbon rents include coal, oil and gas rents. Data sources: MSCI ESG Research, World Bank.
	Explicit and implicit fossil fuel subsidies (% of GDP)	Value of explicit and implicit fossil fuel subsidies as a percentage of GDP. Explicit subsidies measure the amount that the fuel’s supply cost exceeds the price paid by the fuel user. Implicit subsidies measure the difference between the fuel’s full social cost and the price paid by the fuel user. Data source: IMF.

Environmental Pillar Risk Management

Risk sub-factor	Data point (unit)	Description
Energy Resource Risk Management Score	Energy productivity (USD million GDP-PPP/ kgoe)	Energy intensity measured as purchasing power parity-adjusted GDP per unit of energy consumption in kilograms of oil equivalents per year (USD million GDP-PPP/ kgoe). Data sources: MSCI ESG Research, EIA, World Bank, IMF.
	Renewable energy (% of total final energy consumption)	Renewable energy (including hydropower, geothermal, biofuels, renewable waste, solar, wind, biogas, and marine sources) as a percentage of total final energy consumption. Data source: World Bank.
	Energy consumption (kgoe/ capita)	Primary energy use before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport in kilograms of oil equivalents per capita (kgoe/ capita). Data sources: MSCI ESG Research, EIA.

Risk sub-factor	Data point (unit)	Description
	Energy resource depletion rate (% of GNI)	Depletion rate of energy resources calculated as a ratio of the value of the stock of coal, crude oil and natural gas to the remaining reserve lifetime (capped at 25 years) as a percentage of gross national income. Data source: World Bank.
Resource Conservation Risk Management Score	Net agricultural product exports (% of GDP)	Difference in the value of exports and imports of all food items (Standard International Trade Classification [SITC] 0 + 1 + 22 + 4) and agricultural raw materials (SITC 2 less 22, 27 and 28) as a percentage of GDP. Data sources: MSCI ESG Research, UNCTAD, World Bank, IMF.
	Mineral resource depletion rate (% of GNI)	Depletion rate of mineral resources calculated as a ratio of the value of the stock of tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate to the remaining reserve lifetime (capped at 25 years) as a percentage of gross national income. Data source: World Bank.
	Government expenditure on environmental protection (% of total government expenditure)	Sovereign entity's spending on the protection of biodiversity landscape, environmental protection R&D, pollution abatement, waste and wastewater management as a percentage of total government expenditure. Data sources: IMF, national sources.
Water Resource Risk Management Score	Water withdrawal (% of internal renewable water resources)	Total annual freshwater withdrawals that comprise water consumption for agriculture, industry and domestic use as a percentage of internal renewable water resources (internal river flows and groundwater from rainfall). They include withdrawals from desalination plants in countries where they are a significant source but exclude evaporation losses from storage basins. Data source: World Bank.
	Water withdrawal (m3/ capita)	Total annual freshwater withdrawals that comprise water consumption for agriculture, industry and domestic uses in cubic meters per capita (m3/ capita). They include withdrawals from desalination plants in countries where they are a significant source but exclude evaporation losses from storage basins. Data sources: MSCI ESG Research, World Bank,

Risk sub-factor	Data point (unit)	Description
		national sources.
	Water stress (0-10 score)	Exposure to baseline water stress measured as a ratio of total water withdrawals to available renewable surface and ground-water supplies. Water withdrawals include domestic, industrial, irrigation, and livestock uses. Values range from 0 (best) to 10 (worst). Data sources: MSCI ESG Research, WRI.
Biodiversity Risk Management Score	Forest cover change (%)	The 3-year compound annual growth rate (CAGR) of the percentage change in forest cover relative to a country's land area. Forest cover includes natural or planted trees of at least 5 meters in situ, and excludes trees in agricultural production systems, urban parks and gardens. Data sources: MSCI ESG Research, World Bank, national sources.
	Net forest depletion rate (% of GNI)	Depletion rate of forest resources calculated as the product of unit resource rents and the excess of roundwood harvest over natural growth as a percentage of gross national income. Data source: World Bank.
	Terrestrial and marine protected areas (% of territorial area)	Biodiversity-rich areas designated as protected areas through legal or other effective means as a percentage of a country's total territorial area. Data sources: MSCI ESG Research, World Bank, national sources.
Pollution and Waste Risk Management Score	Deaths due to indoor and outdoor air and water pollution (per million people)	Indoor and outdoor air and water pollution-related deaths per million people based on ambient and household attributable death rate, and the mortality rate attributed to exposure to unsafe water, unsafe sanitation and lack of hygiene services. Data sources: MSCI ESG Research, WHO.
	Fine particulate emissions damage (% of GNI)	The damage due to exposure of a country's population to ambient PM2.5 and ozone pollution, and household air pollution as a percentage of gross national income. Damages are calculated as foregone labor income due to premature death. Data source: World Bank.

Risk sub-factor	Data point (unit)	Description
	Fine particulate matter emissions trend (%)	The 3-year compound annual growth rate (CAGR) of the percentage change in PM2.5 emissions concentration. Data sources: MSCI ESG Research, WHO, national sources.
	Nitrogen oxide emissions trend (%)	The 3-year compound annual growth rate (CAGR) of the percentage change in nitrogen oxide emissions concentration. Data sources: MSCI ESG Research, EDGAR, UNFCCC, World Bank, national sources.
	Sulfur dioxide emissions trend (%)	The 3-year compound annual growth rate (CAGR) of the percentage change in sulfur dioxide emissions concentration. Data sources: MSCI ESG Research, EDGAR, UNFCCC, World Bank, national sources.
	Non-methane volatile organic compound emissions trend (%)	The 3-year compound annual growth rate (CAGR) of the percentage change in non-methane volatile organic compound emissions concentration. Data sources: MSCI ESG Research, EDGAR, UNFCCC, World Bank, national sources.
	Waste treatment recycling (% of treated waste)	Rate of treatment of waste materials through recycling as a percentage of total waste treated. Data sources: World Bank, national sources.
Physical Risk Management Score	INFORM Lack of Coping Capacity (0-10 score)	Ability of a government to cope with disasters through formal and organized activities, existing infrastructure and efforts to reduce disaster risk. Regional average is assumed for missing values. Values range from 0 (best) to 10 (worst). Data sources: MSCI ESG Research, European Commission.
Transition Risk Management Score	Scope 1 excl. LULUCF intensity trend (%)	The 3-year compound annual growth rate (CAGR) of the percentage change in the most recently reported or estimated Scope 1 emissions intensity of greenhouse gases excluding land use, land-use change and forestry (LULUCF) for the country territory. Data sources: MSCI ESG Research, UNFCCC, MRIO/PRIMAP, EDGAR, World Bank, IMF.
	Target emissions gap (%)	Progress in reduction of a sovereign entity's emissions from the first nationally determined contribution (NDC) enforcement year in 2016 until 2030. It is calculated as a percentage difference

Risk sub-factor	Data point (unit)	Description
		between the average annual growth rate of a country's emissions between 2016 and 2021, and the growth rate required to meet its NDC target in 2030. Data sources: MSCI ESG Research, IMF.
	Exports of low-carbon technology products (% of total exports)	Exports of low-carbon technology products (including mechanics like wind turbines, solar panels, biomass systems and carbon capture equipment) of a country as a percentage of its total exports. Data source: IMF.
	Imports of low-carbon technology products (% of total imports)	Imports of low-carbon technology products (including mechanics like wind turbines, solar panels, biomass systems and carbon capture equipment) as a percentage of its total imports. Data source: IMF.

Social Pillar Risk Exposure

Risk sub-factor	Data point (unit)	Description
Basic Human Capital Risk Exposure Score	Old-age dependency ratio (% of labor force)	Number of people older than 65 years as a percentage of the total labor force (those aged 15 years and above). Data sources: MSCI ESG Research, World Bank, CIA.
	Gender Inequality Index (0-1 score)	Gender inequalities in reproductive health, political empowerment, educational attainment and labor market participation. Values range from 0 (best) to 1 (worst). Data sources: HDR, national sources.
	Adult literacy levels (% of population)	Number of people aged 15 and above who are literate as a percentage of total population. Data sources: World Bank, CIA, national sources.
	Health levels (0-10 score)	Health of the population based on average incidence rates of diseases such as tuberculosis, HIV, obesity and diabetes. Data are estimated as an average of disease incidence rates. Values range from 0 (best) to 10 (worst). Data sources: MSCI ESG Research, World Bank, World Obesity Federation, IDF, CIA.
Higher Education and Technology Readiness Risk	Higher education levels (% of	Number of people in the labor force with advanced education as a percentage of the working-age population with advanced education. Advanced

Risk sub-factor	Data point (unit)	Description
Exposure Score	working-age population)	education is defined as short cycle tertiary education, bachelor’s degree, master’s degree, doctoral degree or equivalent education level according to the International Standard Classification of Education 2011. Data source: World Bank.
	Technological readiness (0-10 score)	Prevalence of technology based on broadband availability, internet users and mobile phone users. Broadband availability and mobile usage are determined based on fixed broadband subscriptions and mobile cellular subscriptions per hundred people. Internet usage is determined based on a percentage of total population. Data are estimated as an average of prevalence rates. Values range from 0 (best) to 10 (worst). Data sources: MSCI ESG Research, World Bank, national sources.
Knowledge Capital Risk Exposure Score	High-technology exports (USD/capita)	Value of exports of high-technology products such as aircraft, computers, pharmaceuticals, scientific instruments, and electrical machinery in USD per capita (USD/ capita). Data sources: MSCI ESG Research, World Bank.
	Journal articles (per million people)	The average number of scientific and technical journal articles published per million people in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences. Data sources: MSCI ESG Research, World Bank, national sources.
	Patent applications (per million people)	The average number of patent applications by residents per million people. Patent applications are worldwide patent applications filed through the Patent Cooperation Treaty procedure or with a national patent office for exclusive rights for an invention. Data sources: MSCI ESG Research, World Bank, national sources.
Economic Environment Risk Exposure Score	Infrastructure (0-10 score)	Assessment of the quality of a country’s infrastructure based on the trade and transport-related infrastructure, the quality of power, the number of fixed telephone subscriptions per hundred people, and the number of mobile phone users per

Risk sub-factor	Data point (unit)	Description
		<p>hundred people. Quality of power is determined as the percentage of annual sales lost due to power outages. Quality of trade and transport-related infrastructure is based on surveys for logistics professionals' perceptions. Values range from 0 (best) to 10 (worst).</p> <p>Data sources: MSCI ESG Research, World Bank, national sources.</p>
	Macroeconomic environment (0-10 score)	<p>Assessment of a country's macroeconomic environment based on the 3-year average of primary balance and savings rate as a percentage of GDP, real GDP growth rate and inflation rate. Values range from 0 (best) to 10 (worst).</p> <p>Data sources: MSCI ESG Research, IMF.</p>

Social Pillar Risk Management

Risk sub-factor	Data point (unit)	Description
Basic Needs Risk Management Score	Prevalence of food insecurity (% of population)	<p>Percentage of a country's population exposed to moderate or severe food insecurity. A household is classified as moderately or severely food insecure when at least one adult in the household has reported being exposed to low-quality diets or having reduced the quantity of food they would normally eat because of lack of resources.</p> <p>Data source: World Bank.</p>
	Access to electricity (% of population)	<p>Percentage of a sovereign entity's population with access to electricity.</p> <p>Data source: World Bank.</p>
	Primary education enrolment rate (% of children)	<p>Percentage of primary-school-age children enrolled in primary or secondary education.</p> <p>Data sources: World Bank, UNICEF, national sources.</p>
	Access to basic water services (% of population)	<p>Percentage of a country's population using at least basic and safely managed drinking water services. Basic drinking water services are defined as drinking water from an improved source (piped water, boreholes or tube wells, protected dug wells, protected springs, and packaged or delivered water).</p> <p>Data sources: World Bank, national sources.</p>

Risk sub-factor	Data point (unit)	Description
	Access to basic sanitation services (% of population)	Percentage of a country’s population using at least basic and improved sanitation services (pit latrines with slabs at a minimum). Data sources: World Bank, national sources.
Human Capital Performance Risk Management Score	Life expectancy (years)	The average number of years a newborn is expected to live if mortality patterns at the time of its birth remain constant in the future. Data sources: World Bank, CIA.
	Higher-education enrolment levels (0-10 score)	The average school gross enrolment rate at secondary and tertiary levels. Values range from 0 (best) to 10 (worst). Data sources: MSCI ESG Research, World Bank.
	Youth literacy rate (% of youth population)	The percentage of the population of 15-24 years of age who can both write and read with understanding a short simple statement about their everyday life. Regional and income classification average is assumed for missing values. Data sources: MSCI ESG Research, World Bank.
	Infant mortality rate (per thousand live births)	The number of infants dying before reaching one year of age per thousand live births in a given year. Data sources: World Bank, CIA.
	Maternal mortality rate (per million live births)	The number of maternal deaths from pregnancy-related causes (excluding accidental or incidental causes) per million live births. Data sources: World Bank, CIA, national sources.
Human Capital Infrastructure Risk Management Score	Pupil-teacher at primary level (ratio)	The ratio of students in primary school to teachers in primary school. Regional and income classification average is assumed for missing values. Data sources: MSCI ESG Research, World Bank, national sources.
	Pupil-teacher at secondary level (ratio)	The ratio of students in secondary school to teachers in secondary school. The regional and income-classification average is assumed for missing values. Data sources: MSCI ESG Research, World Bank, national sources.
	Nurses and midwives (per thousand people)	The number of professional, auxiliary and enrolled nurses and midwives, and other associated personnel such as dental nurses and primary case nurses per thousand people. Regional and income classification average is assumed for missing values. Data sources: MSCI ESG Research, World Bank.

Risk sub-factor	Data point (unit)	Description
	Hospital beds (per thousand people)	The number of inpatient beds available in public, private, general and specialized hospitals and rehabilitation centers per thousand people. Regional and income classification average is assumed for missing values. Data sources: MSCI ESG Research, World Bank.
	Physicians (per thousand people)	The number of generalist and specialist medical practitioners per thousand people. Regional and income classification average is assumed for missing values. Data sources: MSCI ESG Research, World Bank.
Knowledge Capital Risk Management Score	Researchers in R&D (per million people)	The number of professionals who conduct research and improve or develop concepts, theories, models techniques instrumentation, and software of operational methods including graduate and postgraduate PhD students (International Standard Classification of Education 2011 level 7 or 8) per million people. Regional and income classification average is assumed for missing values. Data sources: MSCI ESG Research, World Bank.
	Technicians in R&D (per million people)	The number of people whose main tasks require technical knowledge and experience in engineering, physical and life sciences or social sciences and humanities per million people. They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers. Regional and income classification average is assumed for missing values. Data sources: MSCI ESG Research, World Bank.
	R&D expenditure (% of GDP)	Current and capital expenditures (both public and private) as a percentage of GDP on creative work undertaken on a systemic basis in order to increase the stock of knowledge and use it to devise new applications. Data sources: World Bank, World Intellectual Property Organization, national sources.
Wellness Risk Management Score	Vulnerable employment (% of total employment)	The number of unpaid family workers and own-account workers as a percentage of total employment. Regional and income classification average is assumed for missing values. Data sources: MSCI ESG Research, World Bank.

Risk sub-factor	Data point (unit)	Description
	Poverty headcount (% of population)	The number of people living on less than USD 2.15 a day at 2017 purchasing power parity-adjusted prices as a percentage of total population. Regional and income classification average is assumed for missing values. Data sources: MSCI ESG Research, World Bank.
	Gini Index (0-100 score)	The extent to which the distribution of income in a country's population deviates from a perfectly equal distribution. Values range from 0 (best) to 100 (worst). Data sources: World Bank, WIDER, WHO, CIA.
	Unemployment (% of labor force)	The percentage share of the total labor force that is without work but available for and seeking employment. Data sources: World Bank, ILO, CIA.
	Youth unemployment (% of youth labor force)	The 5-year average percentage share of the labor force aged 15-24 without work but available for and seeking employment. Data sources: World Bank, national sources.
	Workers' rights (1-5 score)	The level of workers' rights in law and in practice based on the International Labour Organization (ILO) Conventions including civil liberties, the right to establish and join unions, trade union activities, the right to collective bargaining and the right to strike. Data sources: MSCI ESG Research, ITUC.

Governance Pillar Risk Exposure

Risk sub-factor	Data point (unit)	Description
Financial Capital and Trade Vulnerability Risk Exposure Score	Public debt (% of GDP)	The 3-year average of general government gross debt as a percentage of GDP. Data sources: MSCI ESG Research, IMF, CIA.
	Trade vulnerability (0-1 score)	The concentrations of a country's merchandise exports, commercial services exports, and export destinations based on the Herfindahl-Hirshman index. Maximum score for concentration of any of these export characteristics is considered. Values range from 0 (best) to 1 (worst). Data sources: MSCI ESG Research, UNCTAD, World Bank, CIA.

Risk sub-factor	Data point (unit)	Description
	Net international investment position (% of GDP)	The 3-year average of foreign assets and liabilities position of a country as a percentage of GDP. Data sources: MSCI ESG Research, IMF, World Bank, national sources.
Institutions Risk Exposure Score	Democracy Index (0-10 score)	The level of democracy based on the assessment of electoral process and pluralism, functioning of government, political participation, political culture, and civil liberties. Values range from 10 (best) to 0 (worst). Data source: EIU.
	World Press Freedom Index (0-100 score)	The ability of journalists as individuals and collectives to select, produce and disseminate news in the public interest independent of political, economic, legal and social interference, and in the absence of threats to their physical and mental safety. Values range from 100 (best) to 0 (worst). Data source: Reporters Without Borders.
Judicial and Penal System Risk Exposure Score	Rule of law (-2.5 to 2.5 score)	Perceptions of the extent to which agents have confidence in and abide by the rules of society, including the quality of contract enforcement, property rights, the police and the courts, and the likelihood of crime and violence. Scores range from 2.5 (best) to -2.5 (worst). Data source: World Bank.
Governance Effectiveness Risk Exposure Score	Government effectiveness (-2.5 to 2.5 score)	Perceptions of the extent to which agents have confidence in and abide by the rules of society, including the quality of contract enforcement, property rights, the police and the courts, and the likelihood of crime and violence. Scores range from 2.5 (best) to -2.5 (worst). Data source: World Bank.
	Regulatory quality (-2.5 to 2.5 score)	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Scores range from 2.5 (best) to -2.5 (worst). Data source: World Bank.

Governance Pillar Risk Management

Risk sub-factors	Data point (unit)	Description
Political Rights and Civil Liberties Risk Management Score	Political rights (1-7 score)	The level of political rights, including electoral process, political pluralism and participation, and functioning of government. Values range from 1 (best) to 7 (worst). Data source: Freedom House.
	Civil liberties (1-7 score)	The level of civil liberties, including freedom of expression and belief, associational and organizational rights, rule of law, and personal autonomy and individual rights. Values range from 1 (best) to 7 (worst). Data source: Freedom House.
	Voice and accountability (-2.5 to 2.5 score)	Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Scores range from 2.5 (best) to -2.5 (worst). Data source: World Bank.
Stability and Peace Risk Management Score	Global Peace Index (1-5 score)	The relative peacefulness of a nation, including the level of societal safety and security, the extent of ongoing domestic and international conflict, and the degree of militarization. Values range from 1 (best) to 5 (worst). Data source: Vision of Humanity, Institute for Economics and Peace.
	Political stability and absence of violence or terrorism (-2.5 to 2.5 score)	Perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Scores range from 2.5 (best) to -2.5 (worst). Data source: World Bank.
Corruption Control Risk Management Score	Corruption Perceptions Index (0-100 score)	Perceptions of public-sector corruption, including bribery, diversion of public funds, use of public office for private gain, nepotism in the civil service, state capture and mechanisms available to prevent corruption. Values range from 100 (best) to 0 (worst). Data source: Transparency International.
	Control of corruption (-2.5 to 2.5 score)	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Scores range from 2.5 (best) to -2.5 (worst).

Risk sub-factors	Data point (unit)	Description
		Data source: World Bank.
Financial Management Risk Score	Current account balance (% of GDP)	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as “capture” of the state by elites and private interests. Scores range from 2.5 (best) to -2.5 (worst). Data source: World Bank.
	Fiscal balance (% of GDP)	The 3-year average of general government net lending or borrowing as a percentage of GDP, calculated as revenue minus total expenditure. It measures the extent to which general government is either putting financial resources at the disposal of other sectors in the economy and non-residents (net lending), or utilizing the financial resources generated by other sectors and non-residents (net borrowing). Data sources: MSCI ESG Research, IMF.
	Open Budget Index (0-100 score)	The level of budget transparency and accountability system including public availability of budget information, opportunities for the public to participate in the budget process, and the role of formal oversight institutions (such as a legislature or national audit office). Value ranges from 100 (best) to 0 (worst). Data source: International Budget Partnership.
	Resource Governance Index (0-100 score)	The level of budget transparency and accountability system including public availability of budget information, opportunities for the public to participate in the budget process, and the role of formal oversight institutions (such as a legislature or national audit office). Values range from 100 (best) to 0 (worst). Data source: Natural Resource Governance Institute.
	Geographic concentration of exports trend (-1 to 1 score)	Year-over-year change in the geographic concentration of a sovereign entity’s exports. Up to seven most important trading partners are considered for a given country. Export concentration is estimated based on the Herfindahl-Hirshman index. Values range from -1 (best) to 1 (worst). Data sources: MSCI ESG Research, CIA, national sources.

Risk sub-factors	Data point (unit)	Description
	Merchandise export concentration trend (-1 to 1 score)	Year-over-year change in the merchandise export concentration of a sovereign entity by product group based on the Herfindahl-Hirshman index. Values range from -1 (best) to 1 (worst). Data sources: MSCI ESG Research, UNCTAD.
	Commercial services export concentration trend (-1 to 1 score)	Year-over-year change in the commercial services export concentration of a sovereign entity. Commercial services include transport and travel services, insurance and financial services, and computer, communication and other services. Export concentration is estimated based on the Herfindahl-Hirshman index. Values range from -1 (best) to 1 (worst). Data sources: MSCI ESG Research, World Bank.

Appendix 2: Sub-national political entities (local authorities)

Entities with an ESG Entity Sub-type of Sub-national Political Entity, also known as local authorities, are exposed to similar ESG risk factors as countries. These ESG risk factors may affect the performance and competitiveness of local authorities in the medium to long-term. Hence, MSCI ESG Research has adapted the MSCI ESG Government Ratings framework and methodology to rate local authorities such as states, provinces, cities, and municipalities. These modifications fall into the following categories:

- Under the six risk factors, MSCI ESG Research collects additional local entity specific data, sourced manually from individual national and sub-national sources (up to 14 local data points that include, but are not limited to, renewable energy consumption, GHG emissions, income inequality and public debt, dependent on data availability fields).
- To compute risk factor scores for a local authority, MSCI ESG Research assigns 50% weight to country level risk factor scores and the remaining 50% weight to local entity specific data.
- To calculate political governance scores for local authorities, MSCI ESG Research uses the country-level political governance score as a base score for local authorities. Exceptional Events Framework may also be applied if they are specific to the local authority.

Joint Local Authority Issuers

Selected joint local authority issuers such as the German Laender issuers are assessed by calculating the weighted average scores and ratings of the underlying local authority entities, weighted by the proceeds going to each individual entity.

Supranational Bodies

Entities with an ESG Entity Sub-type of supranational administrative body receive the weighted average scores and ratings of their underlying sovereign shareholders, weighted by the contribution or ownership of each sovereign to the underlying supranational. Unrated sovereigns contributing less than 5% to the overall entity are excluded from consideration.

Entities with an ESG Entity Sub-type of International Financial Institution, such as multilateral development banks, are evaluated according to the MSCI ESG Ratings methodology rather than under the MSCI ESG Government Ratings methodology. Country-level assessments are considered in the overall assessment of the institution alongside institution-level assessments of issues such as governance, transparency, accountability, and the environmental impact of financing.

Appendix 3: MSCI ESG Government Ratings Data Sources

- Climate Watch
- Economist Intelligence Unit (EIU)
- Eora Global Supply Chain Multi-Regional Input-Output (MRIO)
- Emission Database for Global Atmospheric Research (EDGAR), European Commission
- Disaster Risk Management Knowledge Centre (DRMKC), European Commission
- Freedom House
- Human Development Report (HDR), UN Development Programme
- Institute for International Law of Peace and Armed Conflict (IFHV)
- International Budget Partnership
- International Diabetes Federation (IDF)
- International Labor Organization (ILO)
- International Monetary Fund (IMF)
- International Trade Union Confederation (ITUC)
- Natural Resource Governance Institute (NRGI)
- Organization for Economic Cooperation and Development (OECD)
- Potsdam Real-Time Integrated Model for Assessment of Emission Pathways (PRIMAP)
- Reporters Without Borders
- Transparency International
- United Nations Conference on Trade and Development (UNCTAD)
- United Nations Convention on Biological Diversity (CBD)
- United Nations University World Institute for Development Economics Research (WIDER)
- United Nations Framework Convention on Climate Change (UNFCCC)
- United Nations International Children’s Emergency Fund (UNICEF)
- US Central Intelligence Agency (CIA)
- US Energy Information Administration (EIA)
- US Geological Survey (USGS)
- Vision of Humanity, Institute for Economics and Peace
- World Intellectual Property Organization (WIPO)
- World Bank
- World Health Organization (WHO)



- World Nuclear Association
- World Obesity Federation
- World Resources Institute (WRI)
- National sources (such as the National Statistical Office, Central Bank, Ministry of Environment and Ministry of Education)

Appendix 4: Determining the Adjusted ESG Government Scores

ESG Government Score rating thresholds for AAA and CCC ESG Ratings do not match the corresponding rating thresholds for corporate MSCI ESG Ratings, an example of which are shown in Exhibit 17. In this example, the Industry-Adjusted Company Score threshold values for AAA and CCC Company ESG Rating are 8.57 and 1.43, respectively. MSCI ESG Research follows the method described in this section to derive an equivalently scaled Adjusted ESG Government Score for each country that can be used for comparison with companies. Adjusted ESG Government Scores can be used to enable multi-asset-class portfolio-level analytics.

Exhibit 17: Example Rating Thresholds for Corporate ESG Ratings

Rating	Minimum final score	Maximum final score
AAA	8.57*	10.00
AA	7.14	8.57
A	5.71	7.14
BBB	4.29	5.71
BB	2.86	4.29
B	1.43	2.86
CCC	0.00	1.43

*Appearance of overlap in the score ranges is due to rounding.

Adjusted ESG Government Scores are calculated to derive an equivalently scaled score between corporate ESG Ratings scale and ESG Government Ratings scale. It is calculated by following the steps outlined below:

1. MSCI ESG Research calculates the ESG Government Scores corresponding to the best-in-class threshold and the worst-in-class threshold on the corporate ESG Ratings thresholds (Exhibit 18). Linear interpolation is used to fill in all the remaining values.

Exhibit 18: Translation to Equivalent Adjusted ESG Government Scores

ESG Government Score (formula)	Equivalent Adjusted ESG Government Score	Rationale
Average + 2 x standard deviation	8.57	Threshold for AAA rating
Average	5.00	Midpoint of BBB rating
Average - 2 x standard deviation	1.43	Threshold for CCC rating

2. For countries that are in a buffer zone of an adjacent rating band but retaining the prior ESG Government Rating, the Adjusted ESG Government Score is constrained to the minimum and maximum range associated with the same prior corporate ESG Rating. Countries that meet

these criteria will have Adjusted ESG Government Scores that are +/- 0.01 away from the transition point in corporate ESG Ratings scale in Exhibit 13. For example, a country with a ESG Government Rating of BBB that is in the buffer zone of the 'BBB-A' ESG Government Rating band, will have a maximum Adjusted ESG Government Score of 5.70, which is -0.01 away from the 'A' corporate ESG Rating threshold.

- The above two steps result in the following conversion formula for Adjusted ESG Government Score (equation 2). Importantly, this translation does not alter the ESG Government Ratings – it is simply a linear translation of scores.

Adjusted ESG Government Score

$$:= \text{Max} \left\{ \begin{array}{l} \text{Min} \left\{ \begin{array}{l} \text{Linear Factor} \times \text{ESG Government Score} + \text{Linear Intercept}, \\ \text{Max score on corp. ESG Ratings scale for the country's} \\ \text{ESG Government Ratings} \end{array} \right\}, \\ \text{Min. score on corp. ESG Ratings scale for the country's} \\ \text{ESG Government Ratings} \end{array} \right\} \dots (2)$$

The 'Linear Factor' and 'Linear Intercept' values change each year, and hence are available upon request from MSCI ESG Research.

Calculation of the ESG Government Score, Adjusted ESG Government Score, and ESG Government Rating is explained using following example (Exhibit 19).

Exhibit 19: Example Calculation of ESG Government Score, Adjusted ESG Government Score and ESG Government Rating

Example Country:

ESG Risk Management Score = 7.03

ESG Risk Exposure Score = 2.09

ESG Government Score (using Equation 1) is calculated as follows:

$$\text{ESG Government Score} = \text{Min} \{ (7.03 + 1), \text{Average}(10 - 2.09, 7.03) \}$$

$$\text{ESG Government Score} = \text{Min} \{ 8.03, \text{Average}(7.91, 7.03) \}$$

$$\text{ESG Government Score} = \text{Min}(8.03, 7.47)$$

$$\text{ESG Government Score} = 7.47$$

ESG Government Ratings (using Exhibit 9) are calculated as follows:

The ESG Government Score of 7.47 lies above the lower rating threshold (7.15) and below the upper rating threshold (8.19) defining the rating zone corresponding to a ESG Government Rating of **AA**. The Government ESG Score is not in the buffer zone (+/-0.2 on either side of lower and upper rating threshold), and so will retain the rating as originally calculated - **AA**.

Adjusted ESG Government Score (using Equation 2) is calculated as follows:

In this particular hypothetical year, the Linear Factor = 1.37, and the Linear Intercept = -2.69

$$\text{Adjusted ESG Government Score} = \text{Max} \{ \text{Min} \{ 1.374 \times 7.470 - 2.686, 8.56 \}, 7.15 \} = 7.578$$

Appendix 5: ESG Government Ratings model history

MSCI ESG Government Ratings uses the following numeric notation to indicate the model version: MAJOR.MINOR. These two parts are numeric and indicate a specific type of model update.

- **Major** version number indicates a major model update.
- **Minor** version number indicates a minor model update.

The following is the history of the MSCI ESG Government Ratings model from its beginning in 2012.

January 1, 2012 – MSCI ESG Government Ratings model version 1.0

- MSCI ESG Government Ratings start date with 91 sovereign entities in ratings coverage.

January 1, 2014 – MSCI ESG Government Ratings model version 2.0

- Changes to the Social Pillar Sub-factors:
 - Health Levels Sub-factor removed. Underlying metrics moved to Basic Human Capital Sub-factor.
 - Employment Sub-factor removed. Underlying metrics moved to Wellness Sub-factor.
 - Human Capital Performance Sub-factor added.
 - Human Capital Infrastructure Sub-factor added.
- Ratings coverage expanded to 132 sovereign entities.

January 23, 2015 – MSCI ESG Government Ratings model version 3.0

- Changes to the Environmental Pillar Sub-factors:
 - Bio-capacity Sub-factor and Consumption Levels Sub-factor consolidated into Productive Land and Mineral Resources Sub-factor.
- Ratings coverage expanded to 198 sovereign entities.

February 8, 2023 – MSCI ESG Government Ratings model version 3.1

- Calculation method of Adjusted Government ESG Scores in buffer zone changed to the minimum and maximum range associated with the corporate ESG Ratings.

March 18, 2024 – MSCI ESG Government Ratings model version 4.0

- Substantial revision to the Environmental Pillar structure:
 - Climate Change and Natural Hazards Risk Factor replaced Environmental Externalities and Vulnerability Risk Factor.
 - Climate Change and Natural Hazards Risk Factor assigned a higher weight of 15% while Natural Resource Risk Factor assigned a lower weight of 10%.
 - Physical Risk Sub-factor added.
 - Transition Risk Sub-factor added.
 - Biodiversity Risk Sub-factor added.
 - Pollution and Waste Risk Sub-factor added.



- Sovereign Watch mechanism replaced by Exceptional Events Framework.
- Updated coverage list based on the IMF World Economic Outlook and minimum data availability criteria. 182 sovereign entities in ratings coverage.

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